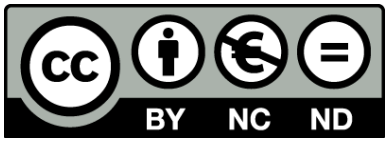
UNIVERSITAT DE BARCELONA

# Spanish scientific journals in Web of Science and Scopus

## Adoption of Open Access, relationship between price and impact, and internationality

Miguel E. Navas-Fernández



UNIVERSITAT DE BARCELONA

Department of Library and Information Science

School of Information Science

**Doctorate in Information and Documentation in the Digital Era**

# ***Spanish scientific journals in Web of Science and Scopus:***
## *adoption of Open Access, relationship between price and impact, and internationality*

PhD candidate:

**Miguel E. Navas-Fernández**

PhD Supervisors:

**Ernest Abadal**

**Rosângela S. Rodrigues**

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To Nieves Barea, in loving memory

Thanks to my wife, family and friends for their love, support and patience

Elwood: *It's 106 miles to Chicago, we got a full tank of gas, half a pack of cigarettes, it's dark... and we're wearing sunglasses.*

Jake: *Hit it.*

(The Blues Brothers)

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## Abstract

This doctoral thesis focuses on active Spanish scholarly journals which follow internationally-recognized quality standards, in order to analyze their main features, study the adoption of Open Access, observe the relationship between their price and bibliometric impact, and examine its internationality characteristics.

Web of Science (WoS) and Scopus have been selected as the sources for identifying the journals. After depurating mistakes, a final list of 445 journals has resulted. A set of indicators has been defined and all data has been collected from the journals' primary source (website or hard copy). Correlations and association tests have been carried out to explore relationships among variables.

The population of Spanish journals indexed in WoS and Scopus grew steadily over the last years – there were 300 titles by 2012, 406 by 2013 and 445 by 2015. A 69.7% of these were launched after 1980 and their average age is 30 years.

This selection of 445 journals stands for a 25% of journals published in Spain, but the subject areas are not equally distributed – Science, Technology and Medicine fields (STM) are overrepresented, while Social Sciences and Humanities (SSH) appear less frequently. Indeed, 84% of all journals concentrate in only three of the seven subject areas considered for this study – 35% on Social S., 32% on Health S. and 18% on Arts & Humanities.

Universities and research centers (mostly the Spanish National Research Council, CSIC) publish 43% of the journals. To run their publishing services, most of them use OJS platforms (34% of the total population). They publish mostly on Arts & Humanities (in Spanish language) and Social Sciences. Online-only format and free access are their favorite output.

Commercial publishers are the second in importance, accounting for the 32% of the journals. They focus on Health Sciences and run most of the few free-access journals with APCs. They also account for most of the few hybrid journals, which are usually published in English. Elsevier is the largest commercial publisher, publishing about 17% of all the journals in this study.

Scientific societies, professional associations and other not-for-profit private institutions publish 21% of the journals. They own or participate in another 24% of the journals, which are published by companies like Elsevier. Indeed, their scientific participation is crucial, reaching almost half of the population studied (45%). Government agencies publish only a 4% of all the journals.

As to languages, almost half of the journals (47%) are published only in Spanish. Nonetheless, 26% are published both in Spanish and English, and 18% only in English. Remaining languages are residual.

Free access is the most common type of publication (64.5%), followed by restricted (16.6%), embargo (14.4%) and hybrid (4.5%). Free-access is associated with academic publishers and Social Sciences, while restricted-access and hybrid journals are more common among companies and usually refer to STM fields.

Open Access, as measured by free access with self-archiving permissions, results in 56.9% of the total of journals. This indicates a sustained increase according to previous studies. Article Processing Charges (APCs) are beginning to be introduced in Spain, but only in 7% of these journals. Both free-access and hybrid journals charging APCs are associated with commercial publishers, English language and high bibliometric impact rates.

Annual subscription prices are much higher for STM, commercial companies and English language content, but the difference is lower when using price per article, because expensive journals usually provide more scientific content. APC prices are on average ten times higher in hybrid titles than in free-access ones.

Impact Factor (IF, which is only available for 27% of the studied journals), Scimago Journal Rank (SJR) and Source-Normalized Impact per Paper (SNIP) have in general higher impact values for STM fields, journals with APCs and journals published in English. While the highest IFs usually appear in journals issued by commercial publishers, highest SNIPs are related to journals published by associations and societies.

Subscription prices, both at volume and article level, have no relationship with any impact indicator. On the contrary, APC prices correlate moderately with impact indicators, but only with SJR and SNIP, not with IF.

English language, foreign-authored articles, international collaborations and foreign members at scientific teams have been identified and measured as elements that indicate internationality. Except for international collaborations, with very few appearances (especially in Arts & Humanities), all elements have global averages of around 33%, although they vary depending on subject areas and access types.

The English language is most common in STM fields, journals published by companies and journals charging APCs. Foreign authors are more present in Health Sciences and Mathematics & Physics, and journals with APCs. The proportion of foreign experts is similar to that of foreign authors', but with smoother differences among categories – also, they are lower in Health Sciences and higher in Engineering. Academic publishers usually include more members from foreign institutions than the rest. Internationality elements present a similar pattern, especially as far as the participation of foreign authors and foreign experts is concerned.

Limitations of the study, future research lines and final considerations are provided.

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# 1. Introduction

Scholarly journals are a basic pillar of the scientific community – they are the visible part of a complex communication system among researchers, and the primary means for guaranteeing scientific advances. Research and scientific dissemination boost the economic development of a country, and its journals constitute a valuable source for assessing such development.

Spanish journals are not well-known, both at national and international level. Reliable and updated data are scarce, and secondary information sources such as Web of Science (WoS), Scopus, Ulrich's, DOAJ, etc. are not accurate enough and do not comply with the necessary quality standards so as to have a reliable outlook of the situation.

In addition, there are not many updated descriptive studies on Spanish journals, and most of them focus on specific disciplines and periods of time. Their data come from secondary information sources, and this leads to incomplete, inexact studies, whose findings should be approached carefully.

There is, then, a need for a universal, thorough, updated study on Spanish scholarly journals, using first-hand data directly from the journals' primary sources. This thesis aims to be such study, focusing on three of the most relevant issues affecting journals today: Open Access (OA), the relationship between price and quality, and internationality.

Open Access is a major subject in scientific communication. Its impact in the last two decades has created a new panorama, where OA journals and self-archiving in repositories have become protagonists. Degree and model of OA adoption follow different patterns which vary depending on regions, disciplines and publishers, among other factors and actors.

Discussions about the relationship between the cost and the quality are in the spotlight nowadays. Quality can be measured by means of a variety of methods, but bibliometric impact is the indicator par excellence. WoS and Scopus produce some of the best known indicators (e.g. Impact Factor).

Although Academia has reported weaknesses and biases as regards these indicators, funders and decision-makers based their decisions upon them, and this is why scholars seek to publish in high impact journals. One can argue that they are not the best tool for measuring quality of content and research, but there is no point in ignoring them. If the community pays attention to them, the relevant issue is to know if subscription-based journals have higher impact than free-access ones, and if there is a relationship between price and impact. In other words, the key question would be: are more expensive journals really "better"?

The phenomenon of paying for having an OA paper published in a journal is relatively new but established in some Western countries. According to the latest works, this funding source has barely entered Spain. An accurate and deep look into the Spanish current situation is needed, in order to find out what journals are charging authors for fees, and under which circumstances. The relationship between the price paid (in this case for publishing, not for accessing) and the bibliometric impact of the journals has to be analyzed as well.

Internationality is another relevant issue in scientific publication. When a journal is international, it is considered to be of quality. But, what is internationality? This term has different meanings varying according to the region where the journal is published, and this is not without controversy. In the case of Spanish journals, although Spanish is a global language, authors and editors consider that publishing in English is a sign of internationality, along with other indicators.

The previous issues having been considered, this study adopts the following objectives: to identify journal types together with their relative weight and characteristics; to assess the adoption degree of Open Access across journal types and to determine the aspects that favor or block its development; to find out the differences in subscription prices, publication fees and bibliometric impact across categories and their relationships; and to identify and measure internationality elements and internationalization processes.

Analysis will include active Spanish scholarly journals that comply with internationally recognized quality standards. Scopus and Web of Science databases are supposed to index the most relevant journals, which have met specific quality criteria during a sufficient period of time. These databases have biases, which will be analyzed later, but they ensure enough quality and make up a population that can be studied thoroughly.

With regard to the structure, this work begins with a deep, systematic review of previous studies and current data from journals databases, carried out in chapter 2. Scholarly journals and Open Access are reviewed in parallel, including concept, global data and regional/country data.

Since quality is a complex and multidimensional concept, a variety of approaches to its assessment is discussed. Among the possible approaches, bibliometric impact is chosen because of its influence in Academia. Publishing costs are defined as the expenses that have to be paid by the publisher, while subscription prices and publication fees are the amounts to be paid by readers and authors, respectively. Thus, this study avoids using the terms “quality” and “cost”, which are ambiguous and not precise, and chooses “bibliometric impact” and “price”, which are much more specific and tangible. Works and data on relationships between both prices and bibliometric impact are included.

Internationality concept is discussed, and studies on internationality aspects and internationalization processes inside and outside Spain are addressed. Finally, internationality elements are identified and described.

Formulation of objectives and an accurate description of the methodology follow in chapter 3, including full research methods, procedures and indicators set.

The analysis and discussion chapter is divided into five sections – description of the population, subject areas and publishers, characteristics of access, pricing and impact, and internationality.

Chapter 5 summarizes conclusions, and gives way to critical analysis and recommendations.

# 2. Review and state of the art

## 2.1. Scholarly journals

### 2.1.1. Scholarly journals in scientific communication

Merton, creator of the sociology of science[1], described the four values that make up the ethos of science (**Merton**, 1942): universalism, communism[2], disinterestedness and organized skepticism. According to this theoretical framework, scientific findings are evaluated in terms of universal and impersonal criteria, without any censorship, bias or restriction. Scientific findings have to be commonly owned by the society, while scientists give up their intellectual property rights in exchange for validation of their work and social recognition. The work of scientists is disinterested, and all ideas must be questioned and discussed rigorously by the community. Although these statements were written long ago, they are absolutely valid today, and are connected with current concerns of the academia that will be described throughout this study.

He also connected social and cultural structures with Science (**Merton**, 1973, first written in 1957). Thus, analyzing science is analyzing society, to some extent. Culture, on the other hand, was described as an organized group of normative values that rule the common behavior of a particular society. Science (and society) has specific and reciprocal relationships ruled by order and democratic structures. He depicted a particular vision of intellectual property: creators can own their findings only if they make them publicly available for other scientists. He also reported that the dramatic percentual decrease of simultaneous scientific discoveries that ended in disputes was coincidental with the massive acceptance and publication of such discoveries in the form of academic journal papers[3].

The famous "Matthew effect" was also coined by **Merton** (1968). This phenomenon describes how well-known scientists are likely to get more credit than unknown researchers. It is a cumulative advantage that can be observed, for instance, in citations to works and journals. This topic, again, is in the spotlight today.

Newton used a famous sentence, attributed to Bernard of Chartres in the 12th century, to state that scientific discovery is built on previous research: "If I have seen further, it is by standing on the shoulder of giants"[4]. Merton, who supported this idea, traced the history of this quote in his homonymous book[5], and Google displays it in its Google Scholar search home page (Figure 1).

[1] This is different from the sociology of scientific knowledge (SSK), which "emerged in the 1970s in self-conscious opposition to the sociology of science associated with the American Robert K. Merton". SSK "aimed at providing sociological explanations of scientific ideas themselves", while Merton "left the cognitive content of science out of sociological account" (https://en.wikipedia.org/wiki/Sociology_of_scientific_knowledge). All hyperlinks have been consulted on September 2016, except when indicated.

[2] Not necessarily related to the political ideology with the same name.

[3] https://en.wikipedia.org/wiki/Academic_publishing

[4] https://en.wikipedia.org/wiki/Standing_on_the_shoulders_of_giants

[5] Merton, Robert K. "On the shoulders of giants: a shandean postscript: the post-italianate edition". Chicago: The University of Chicago Press, 1991. 320 p. ISBN 0226520862.


**Figure 1 – Google Scholar search box**
Source: https://scholar.google.com, July 3, 2016

Bordieu followed and improved Merton's work. According to him, all cultural and intellectual activities should be analyzed in specific terms. He introduced the topic of "authority" in science, referring to prestige of institutions, control of impact journals, and power over the selection of research grants or promotions. He also coined the term "field", not only to describe a part of the knowledge, but also to identify a space where scientists fight for scientific authority (**Bourdieu**, 1975). The "field" of scientific publishing is also a field of battle, as will be explained below.

**Ziman** (1968) described "science" as an important part of the acquis of our minds. It's a conscious product of the mankind. He made a difference between science and other "intellectual fields", as religion, arts, poetry, law, philosophy, technology, etc. Thus, he excluded social sciences and humanities, as well as some applied sciences, when all these disciplines are considered "science" nowadays. According to him, the true goal of every scientific research is contributing to universal and agreed knowledge. The intellectual aspect of such knowledge is determined by the scientists' absolute need to communicate their findings and receive approval from the rest of the community. Scientific knowledge is more than just published information – facts and theories have to pass through critical analysis and tests by other competent and impartial individuals, who must determine if those findings can be universally accepted.

He also pointed out the importance of analyzing not only the findings, but also the scientific activity itself. He criticized the lack of studies on scientific communication and its role in selecting and separating materials. In a way, this PhD thesis intends to reflect upon this sort of practices.

Scholar, academic or scientific communication has been carried out from centuries in different ways, both formally and informally. In the ancient Greece, it was oral, and texts were written by hand. Communication was local, slow, limited.

Gutenberg's printed press "was a major step forward and enabled the cost-effective reproduction of monographs, and helped establishing more systematic forms of communication, in the form of regularly appearing scholarly journals" (**Björk**, 2005, p. 165). Germany and France had to recover from World War II damages, and UK and especially USA

took advantage of this situation and became massive scientific producers and publishers. These countries place themselves in the "center", and the English language turned into the scientific "lingua franca", while their commercial publishers clearly dominated the market. The rest was the "periphery" and had little importance in the eyes of the former (**Guédon**, 2008).

From then on, science was increasingly perceived as a "major driver for economic development", and the "number of scientists increased dramatically". Later in the 20th century, the development of information technology (IT) had a "profound impact by setting up electronic databases of bibliographic data, which greatly facilitated the search for relevant publications" and "increasing efficiency in both the writing of manuscripts and in the handling of them during the printing process". The advent of the Internet and the World Wide Web facilitated faster content access and publishing processes. The WWW supported the original nature of science, which is "both global and collaborative" (**Björk**, 2005, p. 165).

As **Peters** (2007) described, "the history of scientific communication demonstrates that the typical form of the scientific article presented in print-based journals in essay forms a result of development over two centuries beginning in the seventeenth century with the emergence of learned societies and cooperation among scientists".

According to **Ware & Mabe** (2015) "journals play a key role in the communication and recording of scientific findings, and in the assessment of research performance at all levels from the individual researcher to the nation". They added that "journals do not just disseminate information but also provide a means of (formally) recording the author's precedence, maintain quality through peer review and provide a fixed archival version for future reference". Thus, they not only serve as vehicles, they also ensure content quality and access, and give support to research evaluation of authors and their countries (and the countries of the journals). In the same line, scholarly journals "for over 300 years now (…) have served as a vital cornerstone of learning, teaching and discovery", and they "play a substantive role in the dissemination of knowledge among academics" (**Greco et al.,** 2006). **Guédon** (2008) reminded that Bordieu's definitions of "authority" and "scientific field" are perfectly applicable in the publishing process of a journal – "scientific journals are not only organs of diffusion; they also serve as gatekeeping platforms" (p. 2). Thus, editing a journal, selecting papers, occupying an editorial board position, etc., are forms of exercising authority and power. Continuing with Bordieu, not all journals are created equal – just like scientific fields, they tend to specialize and become ground for competition.

In Spain, **Delgado López-Cózar et al.** (2006) stated that scholarly journals are the major channel for scientific communication and for social institutionalization of science. Both creators and consumers of knowledge resort to journals in order to transmit it or receive it.

Scientific journals can also be a tool for certification of research findings. Their peer-review system ensures scientific validity, although there are enough evidences for questioning that and challenging the truthfulness of certain published findings. In addition, journals involve quality assessment methodologies for scientific research. Bibliometric impact and international databases coverage are criticized for not being fair and suitable for all works, but the point is that funding agencies and decision-makers are still relying on them and therefore researchers

need to publish in quality journals (according to these standards) in order to develop their academic career.

Nonetheless, journals are not the only means for scholarly communication. As **Guédon** (2008) wrote, "publishing a monograph is the highest form of publication a professor of humanities can produce", while "in the sciences, on the other hand, articles dominate and books play a secondary role because they do not incorporate cutting edge research". Conference proceedings "became an important form of communication", mostly from the late 20th Century, "thanks to the enhanced possibilities for travel" (**Björk**, 2005, p. 165). This type of publication is popular for specific subject areas as computer science[6].

In addition, new online-based resources are increasingly important. Thematic repositories are valuable resources for physics and mathematics[7]. Social networks boosted the capacity of scholars to communicate among them, to share publications and to offer different ways of quality assessment (use and not citation, or "altmetrics"). **Nentwich & König** (2014) highlighted that they "are, in principle, functional for scholarly communication and that they have serious potential within the academia". Social networks can be used "for all major tasks within the academia – from knowledge production and distribution" and go even further, serving to "public relations and other connections between science and its environment". **Björk** (2016) wrote that some (e.g. ResearchGate) were taking over repositories, because, apart from the advantages that social network platform have, they allow sharing "potentially illegal publishers' versions of the articles" (something that repositories do not).

Some argue that journals involve the survival of some injustices: private companies lobby, bibliographic impact measurement, biases towards English language and faster-impact disciplines, dependence on the sustainability of the journals themselves, etc. Thus they say that journals are something from the past, and that there are, or there should be, other fairer means for scientific communication. Some have even testified to or anticipated the end of the journal article, without any evidences (**Laine**, 2015). The fact is that, for better or worse, the number of journals grows every day[8] and they are still considered the prime vehicle for scientific communication.

### 2.1.2. Global data

#### *2.1.2.1. Demographics*

The French "Journal des Sçavans" was the first scholarly journal, published in 1665, followed immediately by the British "Philosophical transactions of the Royal Society" – the oldest journal still alive. **Ware & Mabe** (2015) reported that, due to the growth in the number of active researchers, the number of journals has increased at a very steady rate of 3.5% per year since

[6] E.g., the ACM "Computer Science Proceedings Series" (http://dl.acm.org/events.cfm)
[7] E.g., Arxiv.org, a paradigmatic example.
[8] See 2.1.2.1.

then. According to Ulrich's data, there were 23,000 active scholarly peer-reviewed journals in 2001, and 28,100 in 2012.

**Ulrich's**[9] is perhaps the most comprehensive international and universal source. **Abadal** (2012) consulted it and found that there were 93,000 active scholarly journals, of which 54,358 (58%) were peer-reviewed. Currently[10], there are 119,253, of which 73,349 are peer-reviewed (62%). Nevertheless, those records include all the versions that a journal may have. A search for journals and not for journals' records retrieves 68,819 titles[11], of which 38,759 are refereed[12] (56%). This number is in line with the previous figures (8,700 in 2001, 28,100 in 2012). However, the number that will be used for all country and region calculations will be 68,819, obtained before filtering by "peer-reviewed/refereed". The reason is that, by mistake, carelessness or negligence, Ulrich's classifies many (sometimes most) refereed journals from "peripheral" countries as not reviewed, when this is not true.

Journals can be used as a tool for measuring and studying the scientific ecosystem in a country, yet there are huge differences among regions. **McVeigh** (2004) wrote that geographic distribution of ISI journals varied significantly. That is, journals indexed in ISI (previous WoS) are more present in Western, English-speaking countries (the so-called "center" or "core" publishing region) than in other countries. As a matter of fact, McVeigh found that Northern America and Western Europe accounted for 90% of ISI journals.

Journals from countries in the rest of the developed world, sometimes known as the "scientific periphery", have common particularities. For instance, they are commonly written in their own local languages, have less presence of big commercial publishers, and are less frequently indexed in international databases. Among them, journals from Latin America (plus Spain and Portugal) have their own characteristics, with obvious presence of Spanish and Portuguese languages and a massive participation of universities as publishers and a widespread adoption of Open Access.

Recently, some emerging countries, known as BRICS (Brazil, Russia, India, China and South Africa), have called the attention of the West as they started to compete in the world economy. Sometimes South Korea is included[13], thus the acronym becomes "BRICKS". They represent the 40% of the world's population and account for 18% of world's economy (**Schöpfel**, 2015).

"Latin America" refers to Spanish and Portuguese-speaking countries in the American continent; when the Caribbean is added, the acronym becomes "LAC".

There is another term, "Ibero-America"[14], rarely used in English, which includes countries of the Iberian Peninsula plus all the American territories that belonged to them. Therefore, it currently

[9] Currently available online, through subscription, at http://ulrichsweb.serialssolutions.com.
[10] Ulrich's consulted on May 14, 2016.
[11] Query: Active, Journal, Scholarly/Academic, Primary edition type (option only available in the results list).
[12] Query: Active, Journal, Scholarly/Academic, Refereed/Peer-reviewed, Primary edition type.
[13] For instance, in **Bhattacharya & Kaul** (2015).
[14] https://en.wikipedia.org/wiki/Ibero-America

accounts for almost all Latin America plus Spain and Portugal[15]. This concept is important in this study, because these countries share are a number of common particularities that will be explored[16].

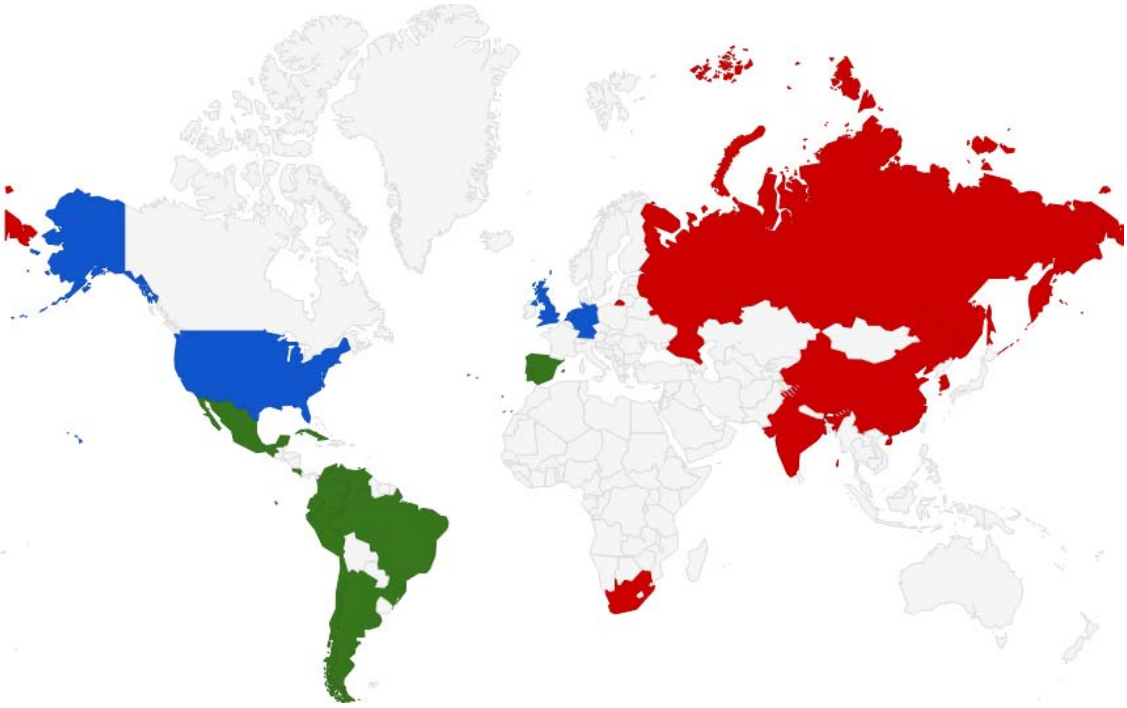

**Figure 2 – World scientific publishing regions**
Blue color: the "center". Green color: Ibero-America (only main countries). Red color: BRICKS, excluding Brazil (already in Ibero-America).

According to Ulrich's data, the "center" region (USA, UK, Netherlands and Germany) accounts for 41.3% of the world. BRICS countries publish 19.4%. This percentage reaches almost half of that for the core region (20.4%) if South Korea is added (BRICKS). Latin America publishes a 6.8% of the world journals – 9.1% if Ibero-America is considered. A 30.2% of the world journals is not included in the previous divisions.

With regard to Latin America, **Alperin et al.** (2014) stated that, although Ulrich's had the most comprehensive coverage of its journals among the commercial databases available, these titles represented only a 1% of all world production. Therefore, it was biased against journals from developing regions and may not be adequate for analyzing journals in these areas. Currently, as mentioned, LAC coverage in Ulrich's is much higher (6.8%).

[15] Technically, it excludes territories in Southern and Central America where other languages as French and Dutch are the official (Haiti, Guiana, French Guiana, Surinam), together with English-speaking countries in the region (Jamaica, etc.)
[16] See 2.1.3.2 and 2.2.3.2.

When dividing the total by continents and countries (Figure 3), it turns out that almost 1/3 is published in Western Europe, 22% in Northern America, 21% in Asia, 12% in Eastern Europe, 7% in Latin America, and the remaining 4% between the Pacific region and Africa.

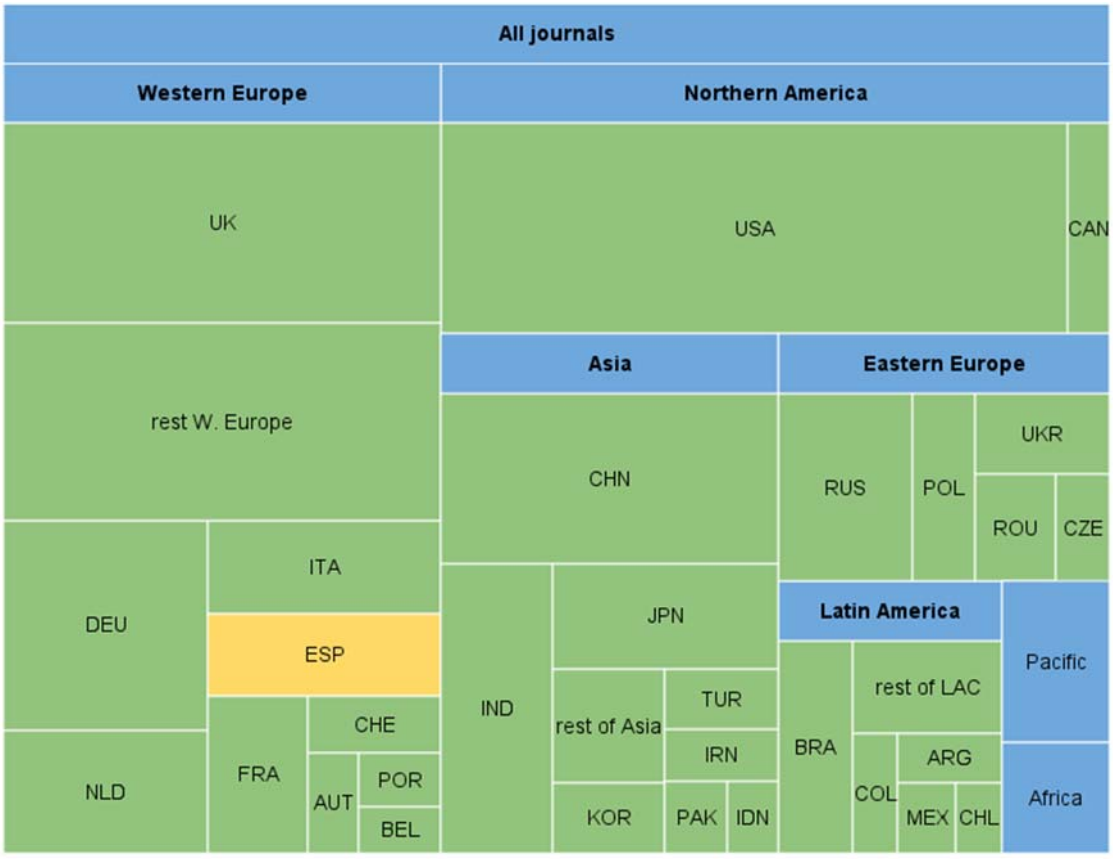


**Figure 3 – Scholarly journals by continents and countries**
Source: Ulrich's, May 2016.

The relative weight of countries varies very much. USA is responsible for the 20.7% of the world production, almost the total for Northern America. UK, Germany and the Netherlands publish almost 70% of the Western European region. Italy and Spain follow, with less than 3%. Russia produces about 1/3 of all Eastern journals. Similarly, China, India and Japan are responsible for 83% of all Asiatic journals production. The participation in Latin America is quite balanced, with Brazil as the clear leader of the area, publishing about 35% of the region's journals and 2.5% of the total production.

The world relative production by major countries is described in Figure 4, where Spain is no. 10 with a 2.5% of the total.

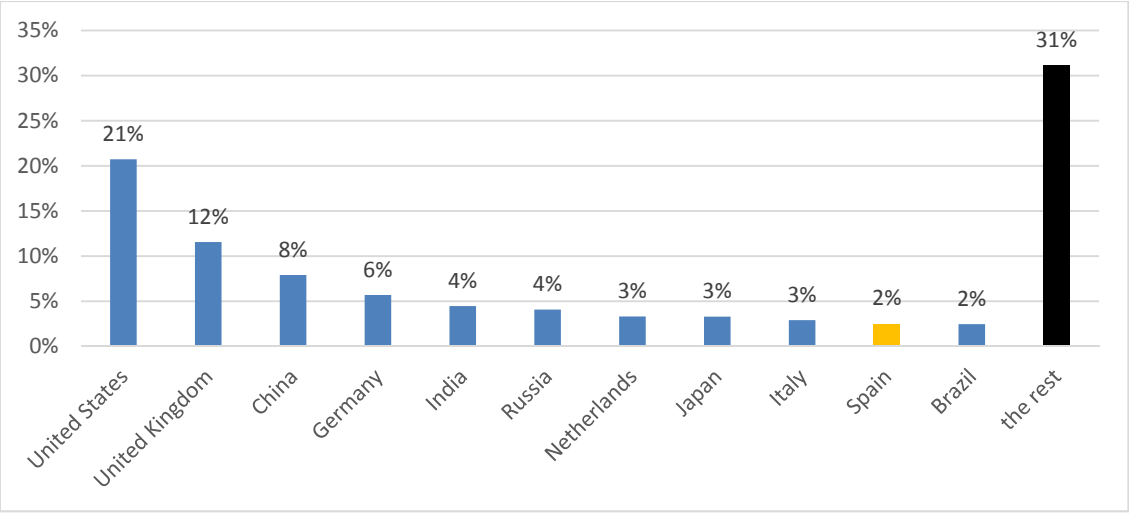


**Figure 4 – Journal world distribution by country**
Source: Ulrich's, May 2016.

A world heat map shows the prevalence of USA and UK, the importance of some BRICKS countries (China, Russia, Brazil) and the journal "desertification" in Africa, center of Asia and some LAC countries.

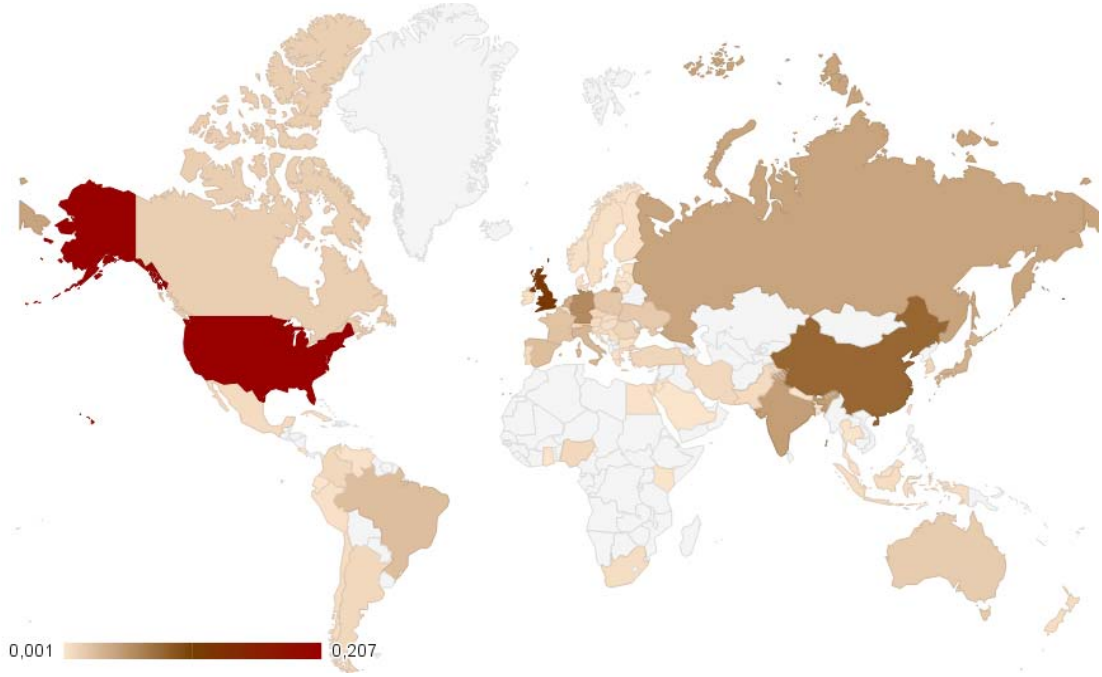


**Figure 5 – Journal world distribution by country (map)**
Source: Ulrich's, May 2016.

**Haider** (2005) also used Ulrich's database to obtain journal data by countries. That data (Table 1) seem to indicate[17] that BRIC(K)S countries have climbed many positions (China, Russia, India, Brazil, and South Korea as well).

### *2.1.2.2. Indexation in main international databases*

Web of Science (WoS) by Thomson-Reuters and Scopus by Elsevier are the most influent journal databases in the world, at least from the Western point of view. They only index journals that accomplish a certain level of quality, according to specific criteria. WoS Core Collection includes Science Citation Index (SCI), Social Science Citation Index (SSCI) and Arts & Humanities Citation Index (A&HCI)[18]. Journal Citation Reports (JCR)[19], which excludes A&HCI, indexes "more than 10,800 journals from over 2,550 publishers in approximately 232 disciplines from 83 countries"[20] and calculates the Impact Factor (IF) of every title. Scopus includes 22,283 titles, over twice the number of titles included in JCR. Most of the journals in Scopus are included in Scimago Journal & Country Rank (SJR)[21], which uses its own impact indicators (SJR), among others.

The same four countries belonging to the core publishing region are leaders in both sources, but with different percentages (Table 1). Proportionally, more titles from these countries are indexed in JCR, where they sum 79.44%[22] of all the content, while they account for 63.67% in Scopus. This information indicates that Scopus has more lax inclusion criteria, and/or is more interested in including titles from the "periphery".

[17] It depends on the queries that **Haider** used. Since that author did not provide world percentages, the only thing that is comparable are relative world positions.
[18] It also includes Conference Proceeding Citation Index and Book Citation Index, but these do not apply to journals.
[19] http://wokinfo.com/products_tools/analytical/jcr/
[20] http://thomsonreuters.com/content/dam/openweb/documents/pdf/scholarly-scientific-research/fact-sheet/esi-jcr-brochure.pdf
[21] http://www.scimagojr.com/countryrank.php
[22] It was a 72.6% of the journals on Nov. 25 2015 and 75% according to **Abadal et al. (2015)** with 2013 data. Therefore, the percentage fluctuates.

| | Ulrich's 2005[23] | Ulrich's 2016 | | | JCR 2014 | | | Scopus 2014 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Pos.** | **Country** | **Country** | **n** | **%** | **Country** | **n** | **%** | **Country** | **n** | **%** |
| 1 | USA | USA | 14,261 | 20.72% | USA | 4,250 | 39.35% | USA | 6,100 | 27.38% |
| 2 | UK | UK | 7,955 | 11.56% | UK | 2,745 | 25.42% | UK | 4,606 | 20.67% |
| 3 | Germany | China | 5,434 | 7.90% | Netherlands | 882 | 8.17% | Netherlands | 1,990 | 8.93% |
| 4 | Netherlands | Germany | 3,907 | 5.68% | Germany | 702 | 6.50% | Germany | 1,490 | 6.69% |
| 5 | China | India | 3,066 | 4.46% | Japan | 247 | 2.29% | China | 587 | 2.63% |
| 6 | Japan | Russia | 2,796 | 4.06% | Switzerland | 227 | 2.10% | France | 547 | 2.45% |
| 7 | Italy | Netherlands | 2,279 | 3.31% | France | 204 | 1.89% | Japan | 449 | 2.01% |
| 8 | France | Japan | 2,260 | 3.28% | China | 186 | 1.72% | Spain | 446 | 2.00% |
| 9 | Australia | Italy | 1,994 | 2.90% | Australia | 174 | 1.61% | India | 442 | 1.98% |
| 10 | Poland | Spain | 1,720 | 2.50% | Russia | 150 | 1.39% | Italy | 416 | 1.87% |
| 11 | Canada | Brazil | 1,694 | 2.46% | Poland | 136 | 1.26% | Switzerland | 383 | 1.72% |
| 12 | India | France | 1,441 | 2.09% | Canada | 135 | 1.25% | Brazil | 321 | 1.44% |
| 13 | Spain | Poland | 1,292 | 1.88% | Italy | 133 | 1.23% | Poland | 318 | 1.43% |
| 14 | Switzerland | Ukraine | 1,181 | 1.72% | Brazil | 125 | 1.16% | Canada | 308 | 1.38% |
| 15 | Russia | Australia | 1,101 | 1.60% | Spain | 122 | 1.13% | Australia | 293 | 1.31% |
| 16 | Belgium | Canada | 954 | 1.39% | S. Korea | 119 | 1.10% | Russia | 230 | 1.03% |
| 17 | Austria | Romania | 731 | 1.06% | India | 108 | 1.00% | Czech Rep. | 202 | 0.91% |
| 18 | Sweden | South Korea | 703 | 1.02% | Denmark | 79 | 0.73% | S. Korea | 200 | 0.90% |
| 19 | Denmark | Switzerland | 697 | 1.01% | Turkey | 64 | 0.59% | Serbia | 186 | 0.83% |
| 20 | Brazil | Turkey | 662 | 0.96% | Singapore | 59 | 0.55% | Bulgaria | 177 | 0.79% |

**Table 1 – Country classification by scholarly journal production**
Blue color: Northern America and Western Europe; red: Eastern Europe; orange: Asia; green: LAC; yellow: Spain.

The proportion of world journals in JCR and Scopus are higher for the countries from the "center", meaning that their journals are over-represented. This difference is higher in JCR than in Scopus, where USA and UK have lower proportions of journals, while Netherlands and Germany stay practically the same. On the other hand, relative contributions from "peripheral" countries is very low in all sources (Figure 6).

[23] According to **Haider** (2005).

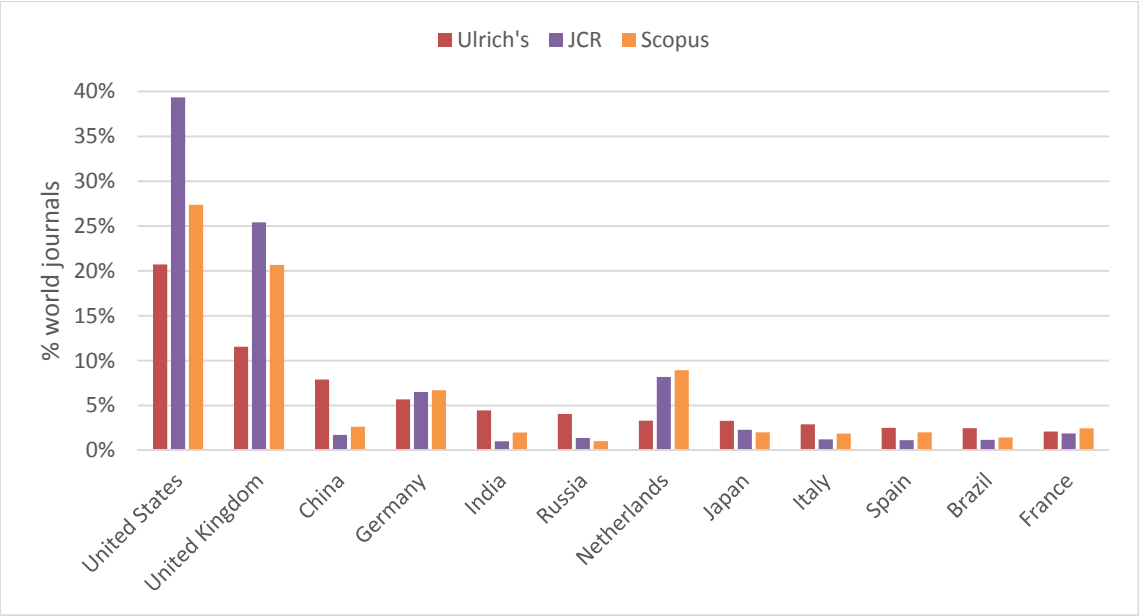


**Figure 6 – Percentage of world journals by country**
Sources: Ulrich's, JCR, Scopus, on March 2016. Top 12 countries from Ulrich's selected.

Absolute proportions of indexation in these sources cannot be taken as an ultimate measure of a country's quality performance in its journals. JCR and Scopus have their own selection criteria, which may be not suitable of every country or region of the world – one size does not fit all. Besides, titles indexed in JCR or Scopus might not be indexed in Ulrich's, they could be repeated there, etc.

| Pos. | Country | Journals | % world | in JCR | % country |
|---|---|---|---|---|---|
| 1 | USA | 14,261 | 20.72% | 3,507 | 24.59% |
| 2 | UK | 7,955 | 11.56% | 2,982 | 37.49% |
| 3 | China | 5,434 | 7.90% | 93 | 1.71% |
| 4 | Germany | 3,907 | 5.68% | 730 | 18.68% |
| 5 | India | 3,066 | 4.46% | 111 | 3.62% |
| 6 | Russia | 2,796 | 4.06% | 114 | 4.08% |
| 7 | Netherlands | 2,279 | 3.31% | 852 | 37.38% |
| 8 | Japan | 2,260 | 3.28% | 161 | 7.12% |
| 9 | Italy | 1,994 | 2.90% | 92 | 4.61% |
| 10 | Spain | 1,720 | 2.50% | 100 | 5.81% |
| 11 | Brazil | 1,694 | 2.46% | 91 | 5.37% |
| 12 | France | 1,441 | 2.09% | 171 | 11.87% |

**Table 2 – Country classification by % of journals indexed in JCR**
Source: Ulrich's, on March 2016. Top 12 countries with higher % of their journals in JCR selected.

According to Ulrich's, 10,482 of the total 68,819 active scholarly journals are indexed in JCR. This means a global indexation of 15.2%, which could be considered as an average, but all countries are quite distant from it (Table 2). Thus, relative proportions of indexation are very unequal as well. Percentages are much higher for the countries of the "center" (UK and Netherlands 37.38%, USA 25%, Germany 19%) than for the BRICS. For instance, Chinese journals in JCR are

only 1.7% of the Chinese total, while proportions for India and Russia are 3.6% and 4.1%, respectively. Indexation for other "peripheral" countries is a little better (Spain 5.8%, Brazil 5.4%, Japan 7.1%). It is necessary to bear in mind that JCR does not include journals on A&H, and consequently countries with greater production on this subject areas will suffer a detriment in this analysis.

The enormous difference in indexation among countries can be easily appreciated when comparing, for instance, UK and China (Figure 7). These are two antagonist cases. While their number of journals is not dramatically different (7,955 and 5,434), JCR indexes 37% of British journals while only 2% of Chinese ones.

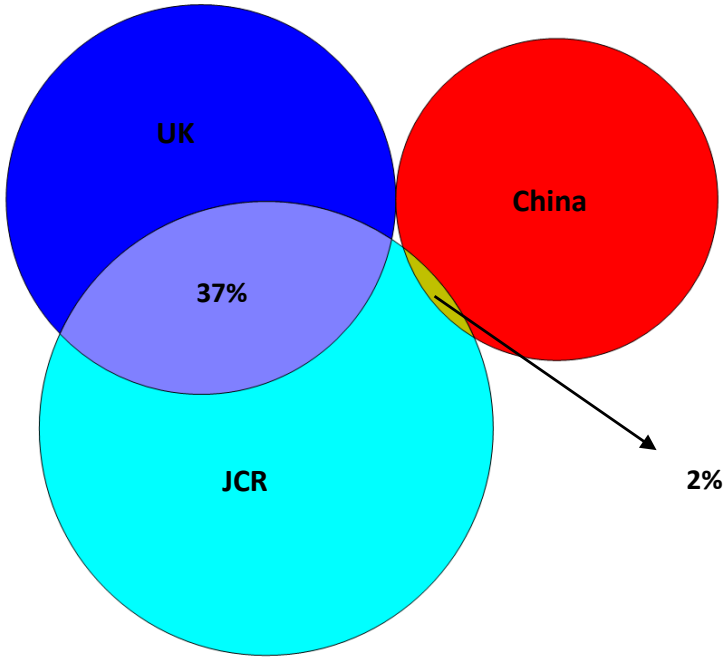


**Figure 7 – Percentage of journals from UK and China indexed in JCR**
Source: Table 2 (Ulrich's).

**Mongeon & Paul-Hus** (2016) also used Ulrich's, WoS and Scopus. They downloaded records of 13,605 journals in WoS, 20,346 in Scopus and 63,013 in Ulrich's, and crossed them. The authors found out that journals on Natural Sciences and Engineering as well as Biomedical Research, and those published in English language, were overrepresented to the detriment of Social Sciences (SH) fields and other languages. In addition, they confirmed findings described here on the different coverage of WoS and Scopus, and therefore bibliometric analysis and international studies on scholarly journals would differ much according to the database selected. They warned that both WoS and Scopus should be used with caution, "especially when comparing different fields, institutions, countries or languages". The authors also encourage the bibliometric community to continue developing alternative systems that include journals not appearing in WoS or Scopus, especially in specific disciplines and countries.

### *2.1.2.3. Subject areas*

Fields of research are fundamental aspects for studying scientific publications. Usually, these are divided into two main groups with strong differences: the Social Sciences and Humanities (SSH, including Arts), and Science, Technology and Medicine (STM). The first are also known as "soft sciences", or sometimes are considered not science at all. They have a slow impact in academia, and very little in business – therefore, in general public research institutions and associations take care of them. An article on SSH could be still valid for current research after a number of years. On the other hand, STM (also known as "hard science" or just "science") has a fast impact both in academia and industry, and thus it is more appealing for commercial publishers. This speed also applies for its quick obsolescence. Nevertheless, not every subject field within these two main groups behaves the same, and there are factors as the region and the language that have specific relationships with them. Usually, relative weight of domestic languages is higher in SSH than in STM, where English is predominant[24].

There are publications different from journals that are more suitable for some disciplines[25]. While journal articles are the absolute major publication format for STM in general, books are important for SSH and conference proceedings, and repositories for Information and Communication Technology (ICT).

Distribution of journals by STM and SSH groups is balanced (STM 49%, SSH 51%[26]), but specific fields used in Ulrich's have huge differences among them (Table 3 and Figure 8). Medicine & Health and Social Sciences & Humanities[27] have the highest results (25% and 24%, respectively). Technology & Engineering follows (16%), and other categories related to Law, Biology, Agriculture, Economics, Education and Earth Sciences lay between the 7% and 12%. Arts & Literature and Philosophy & Religion are less frequent subjects (8% and 4%). Chemistry, Mathematics and Physics represent only a 2-3% of the journals in the world, but their degree of indexation in JCR is the highest (30-39%), along with other STM subject categories related to Medicine, Biology, Agriculture and Earth Sciences (which have 21-26% of their journals indexed in JCR). The average indexation for STM journals in JCR is 23.3%, while that for SSH is only 9.5%[28].

[24] See 2.1.2.1.
[25] See 2.1.1.
[26] The total records by specific subject fields in Ulrich's is 93,901, a number much higher than the real (68,819). This is due to the fact that many journals are classified in more than one field at the same time. Percentages are calculated over the 68,819 journals, though.
[27] The name of this field is equal to the name of the main group "SSH". It does not seem correct since there are other fields that belong to Social Science or Humanities as well (e.g. Law, Economics, Arts, Literature, Philosophy, Religion, etc.)
[28] JCR is by definition STM-biased since, as has been already mentioned, excludes journals from Arts & Humanities. Actually, Table 3 indicates that there are 107 journals on Arts & Literature indexed in JCR, which is strange.

| Subject Field | Journals | % of world | Journals in JCR | % in JCR |
|---|---|---|---|---|
| Medicine & Health | 17,462 | 25.4% | 4,074 | 23.3% |
| Social Sciences & Humanities | 16,259 | 23.6% | 1,666 | 10.2% |
| Technology & Engineering | 10,652 | 15.5% | 1,739 | 16.3% |
| Government, Law, & Public Administration | 8,478 | 12.3% | 1,039 | 12.3% |
| Biological Sciences & Agriculture | 7,725 | 11.2% | 1,973 | 25.5% |
| Business & Economics | 7,552 | 11.0% | 1,037 | 13.7% |
| Arts & Literature | 5,131 | 7.5% | 107 | 2.1% |
| Education | 4,879 | 7.1% | 383 | 7.8% |
| Earth, Space, & Environmental Sciences | 4,679 | 6.8% | 1,024 | 21.9% |
| Philosophy & Religion | 2,969 | 4.3% | 101 | 3.4% |
| Chemistry | 2,165 | 3.1% | 838 | 38.7% |
| Mathematics | 1,963 | 2.9% | 593 | 30.2% |
| Physics | 1,378 | 2.0% | 484 | 35.1% |
| Ethnic Studies, Gender, & Lifestyle | 1,061 | 1.5% | 86 | 8.1% |
| Reference & Bibliographies | 883 | 1.3% | 69 | 7.8% |
| Sports, Hobbies, & Recreation | 655 | 1.0% | 63 | 9.6% |
| General Interest Periodicals | 10 | 0.0% | 0 | 0.0% |
| **Total journals (search matches)** | **93,901** | | | |
| **Total journals (titles)** | **68,819** | | | |

**Table 3 – Journals by subject field and indexation in JCR**
Source: Ulrich's, March 2016.

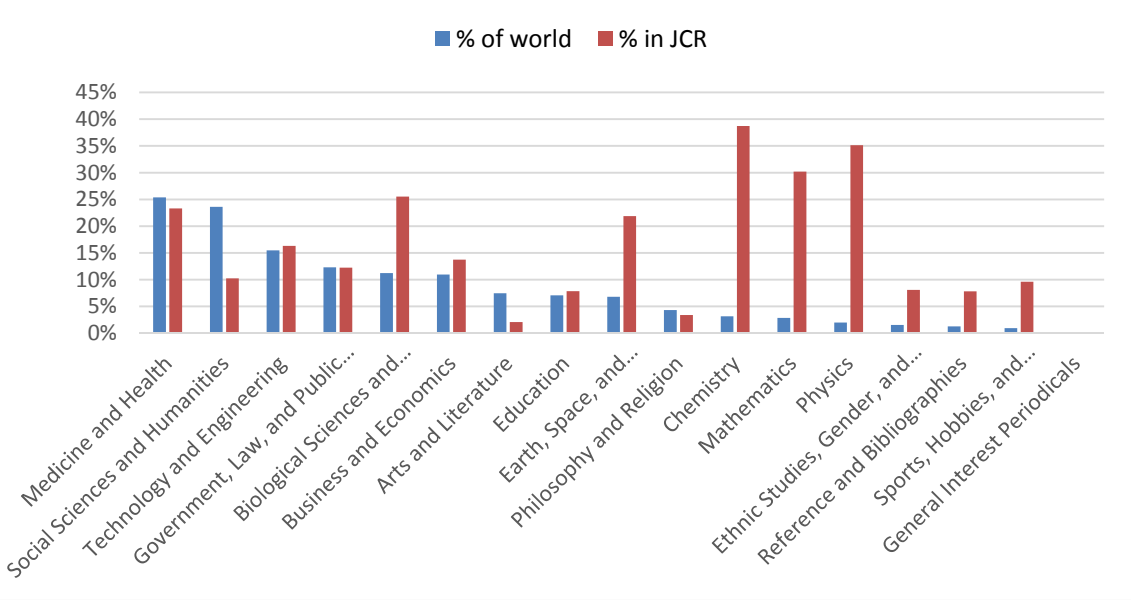


**Figure 8 – Journals by subject field, and relative % of indexation in JCR**
Source: Ulrich's, March 2016.

*2.1.2.4. Languages*

With regard to languages, 64.2% of all the journals are in English. Chinese (8%), Spanish (7%), German (5.8%), Russian (5.3%) and Portuguese (2.7%) follow. Thus, although there are other languages, English is the language of science par excellence. After World War II, German and French lost power in science, while English boosted and became the "lingua franca" for scholarly communication, as once was Latin. It is more frequent in STM journals (68.4%) than in SSH ones (59%).

As mentioned above, 64% of all the journals are in English, and only 15% of all titles are indexed in JCR. In addition, 94.2% of the latter use English as main language. These data draws a clear picture of the absolute supremacy of this language in scientific publishing and in quality indexes (Figure 9).

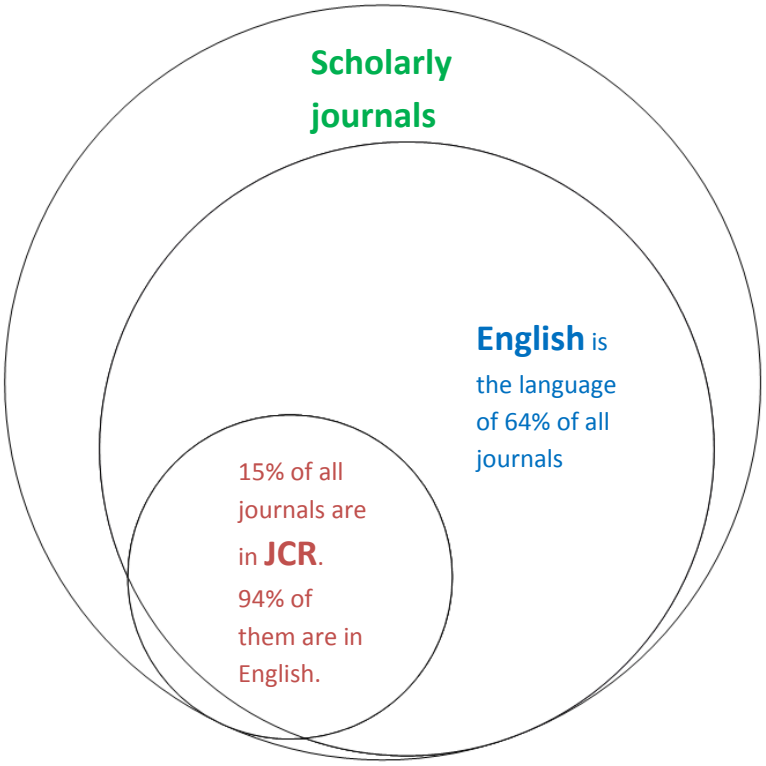


**Figure 9 – Indexation of English-language journals in JCR**
Source: Ulrich's, March 2016.

*2.1.2.5. Alternative indexes*

It is known that WoS and Scopus are biased towards big publishing countries, STM disciplines and the English language. Or, in other words, their inclusion criteria reflect that the world scientific research is grounded on these premises.

Countries publishing important journals on "soft sciences", about local, domestic or regional topics, and in languages other than English, are excluded from those indexes. As a result, regional and national indexes have been created in order to cover and qualify their national

journals, especially in SSH subject areas. One of them, SciELO[29], became international by covering 1,249 refereed and quality journals from Latin America (especially Brazil) and South Africa. There are others, e.g. Indian Citation Index (ICI), Serbian Citation Index (SCIndeks) and Thai-Journal Citation Index (TCI).

The Western English-language, commercially-supported scientific world has been observing the evolution of the "periphery", and thus WoS has recently included regional indexes: KCI Korean Journal Database[30], SciELO Citation Index[31], Chinese Science Citation Database[32] and Russian Science Citation Index[33]. These indexes are not in JCR or the WoS Core Collection, but some journals appear in both a regional index and the JCR at the same time.

The Emerging Sources Citation Index (ESCI) has been included in this Core Collection. It "expands the citation universe and reflects the growing global body of science and scholarly activity", including "additional high-quality, peer-reviewed publications of regional importance and in emerging research fields"[34]. These journals have to go through an evaluation period in order to abandon this temporary index and jump to SCI, SSCI or A&HCI.

There are currently 2,374 journals indexed in ESCI. It is not possible to extract the exact number of journals from every country, because records of the database stand for articles. Nevertheless, article output is similar to journals in WoS – USA accounts for 18.40%, India 6.80%, England and Australia 6.28% and 4.96% respectively, and the fifth place is for Spain with 4.68%. Countries that follow in the rank are China, Canada and Brazil. There are 416 Spanish journals[35], which could be added to the mentioned indexes if they succeed.

"Peripheral" journals are facing many problems nowadays. Some authors as **Salager-Meyer** (2015) affirmed that their main problems are lack of funds, editors and reviewers, and other obstacles related to publication ethics and endogamy. Nevertheless, those problems cannot be interpreted as affecting every "peripheral" journal that fails to reach international audience or cannot obtain bibliographic impact in WoS or Scopus, because there are "specific scientific, social, cultural and economic features", described before, that prevail in their contexts. Solutions for improving them are to "bring global awareness" and "not to publish more and more journals in peripheral countries" but "to upgrade local journals to global ones".

[29] www.scielo.org/ [consulted March 31, 2016]
[30] http://thomsonreuters.com/en/products-services/scholarly-scientific-research/scholarly-search-and-discovery/kci-korean-journal-database.html
[31] http://thomsonreuters.com/en/products-services/scholarly-scientific-research/scholarly-search-and-discovery/scielo-citation-index.html
[32] http://thomsonreuters.com/en/products-services/scholarly-scientific-research/scholarly-search-and-discovery/chinese-science-citation-database.html
[33] http://wokinfo.com/products_tools/multidisciplinary/rsci/
[34] http://wokinfo.com/products_tools/multidisciplinary/esci/ [consulted April 1, 2016]
[35] https://www.recursoscientificos.fecyt.es/sites/default/files/2016_abril_listado_de_revsitas_indexadas_en_esci.pdf [consulted June 30, 2016]

*2.1.2.6. Publishers*

**Ware** (2006) collected data from Ulrich's Directory, and reported that there were about 2,000 journal publishers in the world. 33% of those belong to English-language countries and publish about 50% of the total number of journals worldwide, and, of these, 73% of the publishers and 20% of the journals is non-for-profit. Those 2,000 publishers were divided into learned societies, university presses and commercial publishers. In terms of share of article output, and according to JCR, their respective proportion is 30%, 4% and 64%. The latter percentage includes society journals published by companies.

Major publishers are also based on scientific publishing developed countries. Table 4[36] shows that four companies belonging to the four Western publishing powers (Taylor and Francis, Elsevier, Wiley-Blackwell and Springer) are responsible for the 20.89% of all journals. Single publishers from other countries as Russia and China do not reach 1%. Regarding full Open Access publishers, the Egyptian Hindawi and the Chinese Scientific Research Publishing deserve an especial recognition[37].

| Publisher | Country | World % |
|---|---|---|
| Taylor & Francis | UK | 6.66% |
| Elsevier | Netherlands | 6.03% |
| Wiley-Blackwell | USA | 4.17% |
| Springer | Germany | 4.03% |
| Sage | USA | 2.39% |
| Wolters-Kluwer | Netherlands | 1.21% |
| Hindawi | Egypt | 1.14% |
| Inderscience | Switzerland | 1.04% |
| Oxford Univ. Press | UK | 1.00% |
| Cambridge Univ. Press | UK | 0.96% |
| Walter de Gruyter | Germany | 0.89% |
| Nauka | Russian Fed. | 0.79% |
| Emerald | UK | 0.76% |
| Brill | Netherlands | 0.58% |
| Scientific Research Pub. | China | 0.54% |
| Bentham Science | U. Arab Emirates | 0.53% |

**Table 4 – World largest publishers**
Source: Ulrich's.

If the relative importance of publishers is measured by articles[38], Reed-Elsevier, Wiley-Blackwell, Springer and Taylor & Francis account for the 50% of all the papers published in WoS during the

[36] Only independent publishers are considered. They may include printing houses, branches and offices abroad. E.g. Taylor and Francis includes Routledge, Elsevier includes all its foreign offices and printing houses as Pergamon, Springer has diverse offices in Europe and owns BioMed Central and Nature, etc. Also, some companies have a separate name for publishing Open Access journals (e.g. Springer Open, Walter de Gruyter Open).
[37] See also 2.2.1.3.
[38] See 2.1.2.7.

period 1973-2013, and they have increased their share in both STM and SSH, especially since the advent of the Internet in the mid-1990s (**Larivière et al.**, 2015).

Figure 10 displays dots for every country where publishers are based (dots do not represent single publishers or specific cities). It is also important to bear in mind that the country of origin of the publisher does not always indicate the "nationality" of a journal. For instance, a journal edited by a Spanish society and published in Spanish language may be published by an office of Elsevier in Spain. This does not make this journal Dutch, of course. Nevertheless, there are different ways for assigning a country of publication to a journal; it is just a matter of methodology.

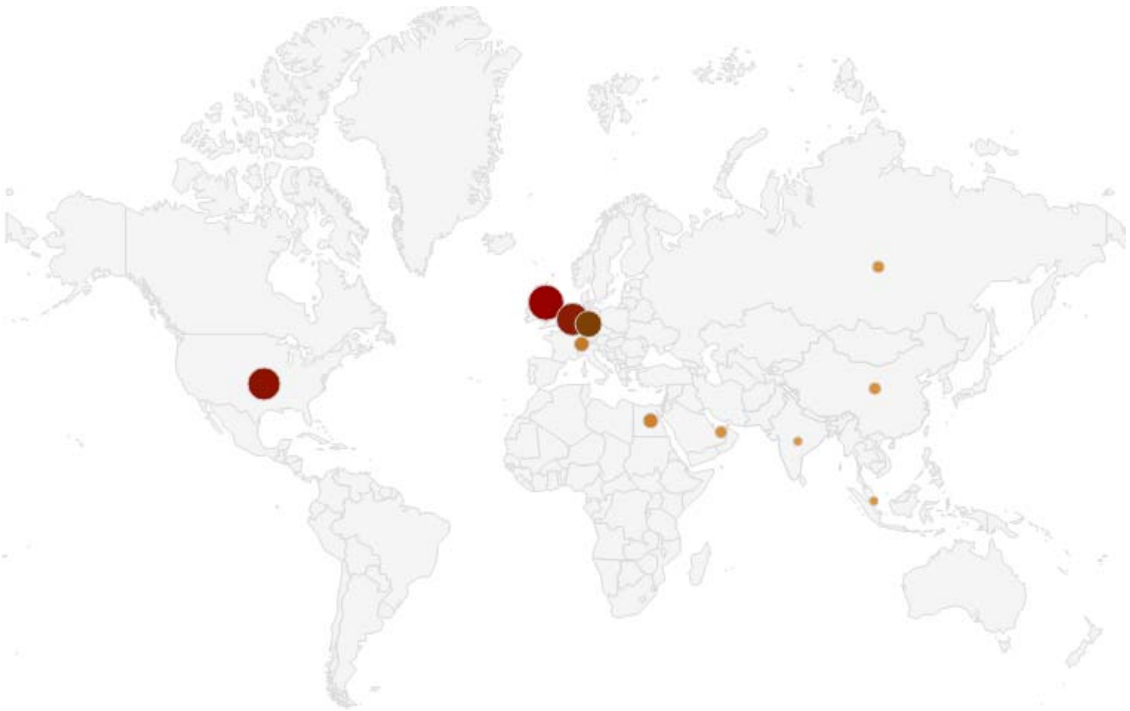

**Figure 10 – Countries with world largest publishers**
Source: Ulrich's.

Apart from private companies, academic institutions are a very important publisher type in the scientific communication ecosystem. Research is produced at universities and other institutions, and their own presses play a key role. **Greco et al.** (2006) reported that "university presses have been exceptionally active as journal publishers", and "journals play a significant role in the intellectual life of universities", but "since 1981 a series of events has affected, and in some instance adversely affected, journal publishing" (p. 155). They refer to the serial crisis, which had not affected all the publishers in the same way – those in SSH, precisely more related to university presses, could not dare to raise prices because they feared to receive cancellations, while STM, dominated by private publishers, did so. Open Access was a response to this situation and thus develops differently by regions and publisher types[39].

[39] See 2.2.3.

Journals were mainly published by scientific societies until the 1960s, but the difficulty of affording publishing costs lead them to sell or assign their titles to commercial players (**Fecher & Wagner**, 2016). Thus, learned societies and associations are major players in scholarly communication, because they create and manage many journals, but account for a little proportion of the market as publishers.

#### *2.1.2.7. Article production*

Article production, also known as scientific production or research output, will not be studied here, but it is interesting to see the relationships between R&D investment, journal publication, article production and employment of researchers.

**Greco et al.** (2012)[40] analyzed scientific publishing in the so-called "emerging regions", using World Bank economic classifications such as developed, developing and least developed countries. They found that most productive regions/countries were the EU, USA and Japan (called there "The Triad"), but China was gaining relevance. Other developing countries such as India and Brazil were investing their growing resources in research and becoming more productive.

There are very recent evidences that emerging economies are gaining ground. Thus, the global publication share of advanced scientific countries is decreasing while India, South Korea, Brazil, and especially China, are raising theirs. Currently, BRICS produce 22% of the scientific documents indexed in Scopus (**Schöpfel**, 2015b). Although quality, as measured by citations, is still low, it is growing by means of international collaboration (**Bhattacharya & Kaul**, 2015). Indeed, **Bouabid et al.** (2015) reported that BRICS were increasing their international collaboration specially with G-7 countries, but their "intra-BRICS" collaboration was very low.

Table 5 has been filled with data from SJR. It shows the cumulative number of articles published for the period 1996-2014, and the number of articles published in specific years. Only the first 25 countries for the whole available period have been included, with the exception of one of the BRICS (South Africa). Spain is no. 10, both upon considering the whole period and the last available year (2014).

Western countries, leaders in academic publishing, are also the most article-productive, with the exception of the Netherlands. This is due to the fact that Elsevier, one of the world major publishing companies, is based in that country but is international, thus it does not necessarily publish Dutch authors' articles.

[40] They used data from the **UNESCO** Science Report (2010).

| Pos. | Country | 1996 | 2000 | 2005 | 2010 | 2014 | 1996 – 2014 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Articles per year | | | | | Increase | Cumulative | % world |
| 1 | USA | 330,949 | 332,848 | 482,523 | 574,412 | 552,690 | 167% | 8,626,193 | 23.42% |
| 2 | China | 28,704 | 45,578 | 161,146 | 335,565 | 452,877 | 1,578% | 3,617,355 | 9.82% |
| 3 | UK | 83,480 | 93,032 | 126,314 | 163,791 | 160,935 | 193% | 2,397,817 | 6.51% |
| 4 | Germany | 72,808 | 83,940 | 119,774 | 145,970 | 149,595 | 205% | 2,176,860 | 5.91% |
| 5 | Japan | 84,906 | 94,804 | 119,928 | 125,087 | 114,999 | 135% | 2,074,872 | 5.63% |
| 6 | France | 54,427 | 60,462 | 82,198 | 105,138 | 114,449 | 210% | 1,555,629 | 4.22% |
| 7 | Canada | 41,167 | 40,837 | 67,601 | 87,575 | 104,739 | 254% | 1,227,380 | 3.33% |
| 8 | Italy | 37,726 | 41,248 | 61,782 | 83,208 | 93,064 | 247% | 1,200,448 | 3.26% |
| 9 | India | 20,625 | 23,749 | 40,083 | 78,955 | 88,117 | 427% | 998,544 | 2.71% |
| 10 | Spain | 23,597 | 28,723 | 47,898 | 71,572 | 78,817 | 334% | 952,099 | 2.58% |
| 11 | Australia | 23,480 | 26,616 | 43,888 | 67,196 | 77,880 | 332% | 890,458 | 2.42% |
| 12 | South Korea | 10,101 | 17,216 | 36,900 | 60,052 | 72,269 | 715% | 739,229 | 2.01% |
| 13 | Russia | 31,482 | 31,487 | 38,878 | 39,432 | 59,736 | 190% | 701,029 | 1.90% |
| 14 | Netherlands | 22,248 | 23,656 | 36,099 | 48,429 | 50,732 | 228% | 681,804 | 1.85% |
| 15 | Brazil | 8,741 | 13,943 | 25,745 | 49,642 | 50,430 | 577% | 598,234 | 1.62% |
| 16 | Switzerland | 15,136 | 17,047 | 25,661 | 34,604 | 38,308 | 253% | 493,857 | 1.34% |
| 17 | Taiwan | 10,357 | 12,846 | 25,437 | 40,103 | 37,966 | 367% | 491,560 | 1.33% |
| 18 | Sweden | 16,206 | 18,208 | 24,449 | 29,738 | 33,847 | 209% | 460,607 | 1.25% |
| 19 | Poland | 11,593 | 13,616 | 23,420 | 30,261 | 35,591 | 307% | 431,016 | 1.17% |
| 20 | Turkey | 5,628 | 7,817 | 20,476 | 32,616 | 37,095 | 659% | 390,874 | 1.06% |
| 21 | Belgium | 11,119 | 12,518 | 19,766 | 26,277 | 28,679 | 258% | 372,093 | 1.01% |
| 22 | Iran | 829 | 1,730 | 8,165 | 29,588 | 39,573 | 4774% | 287,010 | 0.78% |
| 23 | Israel | 10,317 | 11,267 | 14,787 | 17,145 | 17,388 | 169% | 272,352 | 0.74% |
| 24 | Austria | 7,453 | 8,767 | 14,198 | 19,079 | 21,117 | 283% | 268,472 | 0.73% |
| 25 | Denmark | 7,851 | 9,347 | 12,950 | 17,917 | 22,187 | 283% | 263,026 | 0.71% |
| | | | | | | | | | |
| 34 | South Africa | 4,289 | 4,656 | 7,568 | 12,427 | 17,464 | 407% | 167,440 | 0.45% |

**Table 5 – World country classification by article publishing**
Source: SJR, March 2016.

BRICKS are really emerging in research output. China's output has dramatically increased in a 1,578% since 1996, already reaching the absolute no. 2 position, only after the US. South Korea's increase is also enormous (715%). India, Brazil and South Africa have also increased their output in more than a 400%, while Russia has had more moderate average increase of less than 200%. Two countries from the Middle-East must be mentioned: Iran (4,774%, a growing power) and Turkey (659%). USA and China are the clear world leaders, and the latter is gaining ground fast (Figure 11).

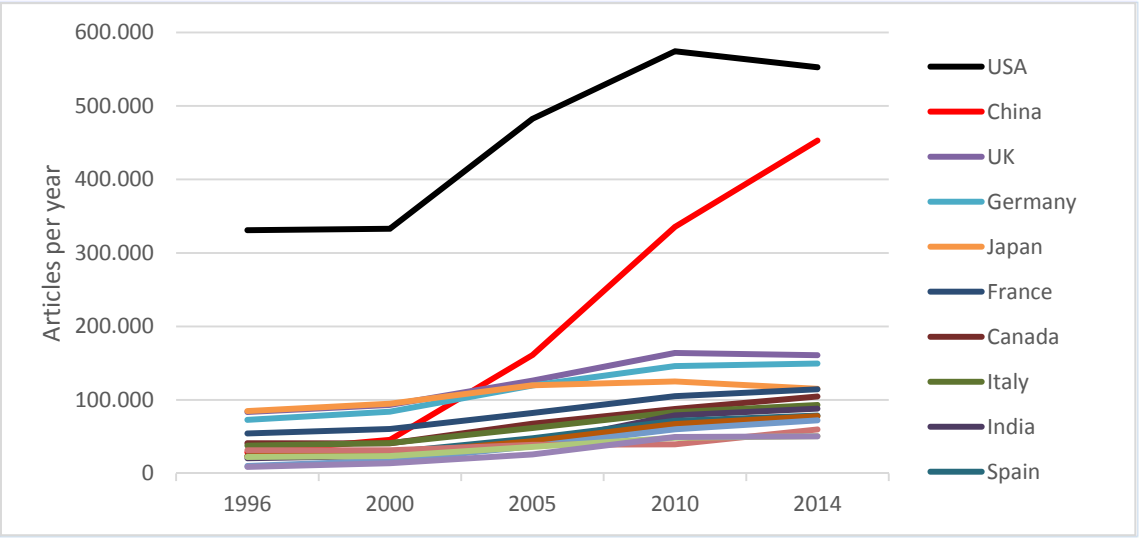


**Figure 11 – Evolution of articles published per year, by country.**
Only years 1996 (first available), 2000, 2005, 2010 and 2014 (last available) are shown. Only the 15 most productive countries for the whole period 1996-2014 are included. Source: SJR.

| | National article output | | | Journals |
|---|---|---|---|---|
| Pos. | 1996 | 2014 | 1996 - 2014 | (active 2014) |
| 1 | USA | USA | USA | USA |
| 2 | Japan | China | China | UK |
| 3 | UK | UK | UK | Netherlands |
| 4 | Germany | Germany | Germany | Germany |
| 5 | France | Japan | Japan | China |
| 6 | Canada | India | France | France |
| 7 | Italy | France | Canada | Japan |
| 8 | Russian Fed. | Italy | Italy | Spain |
| 9 | China | Canada | India | India |
| 10 | Spain | Spain | Spain | Italy |
| 11 | Australia | Australia | Australia | Switzerland |
| 12 | Netherlands | South Korea | South Korea | Brazil |
| 13 | India | Brazil | Russian Fed. | Poland |
| 14 | Sweden | Netherlands | Netherlands | Canada |
| 15 | Switzerland | Russian Fed. | Brazil | Australia |
| 16 | Poland | Iran | Switzerland | Russian Fed. |
| 17 | Belgium | Switzerland | Taiwan | Czech Rep. |
| 18 | Taiwan | Taiwan | Sweden | South Korea |
| 19 | Israel | Turkey | Poland | Serbia |
| 20 | South Korea | Poland | Turkey | Bulgaria |
| 21 | Brazil | Sweden | Belgium | Turkey |
| 22 | Denmark | Belgium | Iran | Egypt |
| 23 | Finland | Malaysia | Israel | Belgium |
| 24 | Austria | Denmark | Austria | Romania |
| 25 | Norway | Austria | Denmark | Hungary |

**Table 6 – Country classification by article output and active journals**
Source: SJR, March 2016.

In terms of national output (Table 6), the rise of China, India, South Korea and Brazil, and the fall of Japan and Russia are remarkable. Some European countries are losing ground in the world's

article production (e.g., France, Sweden, Switzerland, Poland, Belgium and the Nordic countries), while others as Spain and Italy are maintaining their relative contribution.

Country classification by national authors' production is similar to journals published by country (Table 6). Source is the same for both (SJR – Scopus), thus one can say that there is a reliable relationship between these classifications. Apart from the mentioned case of the Netherlands (no. 3 in journals but current no. 14 in article output), the rest shows some connection. As described before, Chinese relative contribution in the world scientific publishing is higher in article output (no. 2 with 9.8% for 1996/2014 period, and also no. 2, but with 15.2% for 2014) than in journals (no. 5 with only 2.6% of world's titles). Other emerging countries as India, South Korea and Russia follow similar patterns, being more productive in article output than in journal publishing. Some of these countries do not publish many journals, but they produce researchers that publish abroad. Or, at least, scientists affiliated to their research institutions publish a lot.

Spain and Brazil are particular, since they keep similar positions in both classifications – a little more journal-productive than article-productive, though. It is worth mentioning that some Eastern Europe countries missing in the research output classification enter the top-25 journal list – e.g. Czech Republic, Serbia, Bulgaria, Romania and Hungary.

With regard to scientific production on specific subjects, **Miguel et al.** (2016) reported that OA is an emerging subject within LIS field, and the most productive researchers on that topic are from USA, Canada, France and Spain, according to Scopus database.

There are a number of studies on STM articles output. **Greco** (2012) edited a study that analyzed **UNESCO's** report on the state of science (2010). Such report was a quantitative and comparative analysis about the publication of journal articles on science, technology and medicine in developed countries, developing countries and poor countries. USA and Japan were in the first group, with more than 270,000 and 75,000. In the second, there were emerging countries as Brazil (26,000), India (36,000) and China (105,000). In the last group, there were a number of some of the least developed countries in the world, with little or none production.

The last edition of the last STM Association report on science, technology and medicine (**Ware & Mabe**, 2015) also highlights growing of China and East Asia. China is now no. 2 in the world STM article output, with 17%, following USA with 23%. Nevertheless, if citations and not raw article production were considered, USA would carry on as no. 1 receiving 36% of citations while China would be 11th with only 6%. The volume of bibliographic production does not imply quality, neither does the proportion of Open Access[41].

Other sources as the US **National Science Board** (2016) indicate that, according to Scopus data, as from 2013, China overtook USA in global share of Science and Engineering articles, while the European Union was leading.

[41] See 2.2.2.2 and 2.2.2.3.

The last report (**UNESCO**, 2015) collected % GDP[42] on GERD[43], showing that South Korea (0.95%), Germany (0.80%), USA and Russia (0.76%) were some of the countries expending more domestic resources on R&D. At the same time, though, the geographical distribution of investment in knowledge is unequal – USA has 28% of all, China 20%, EU 19%, and Japan 10%. It is important to highlight that the rest of the world represents 67% of the world population but only 23% of the global investment on R&D.

Regarding researchers, their number has grown by a 21% since 2007, and this fact is related to the explosion of scientific publications. EU is the world leader with 22.2% of the world researchers, China has reached second place with 19.1% before USA (16.7%), and Japan (8.5%) and Russian Federation (5.7%) follow. These "big five" account then for the 72% of all the researchers in the world, yet they are ceding some ground to upper middle-income countries, mostly China. Not only publicly funded research is growing, also the propensity of business to invest in R&D has increased.

The trends in scientific publications worldwide show different growth patterns depending on regions. Thus, although European authors account for the greatest share of publications (world 39.3%), it has only grown a 13.7% while publications with authors from Africa has raised a 60.1% and those with Arab states authors has grown a 109.6%.

The distribution of scientific articles depends very much on disciplines. G7 countries vary the most, while one of them, France, leads the mathematics field. Among emerging economies, Russian Federation is the leader in geosciences, physics and mathematics, but is the last in life sciences. South Korea, China and India dominate engineering and chemistry, while Brazil specializes in agricultural sciences and South Africa in astronomy.

Although these data come from different sources, it is clear that there is a relationship between investment on R&D and scientific publication output. Emerging economies are tracing developed countries, yet there are still big differences in the relative weight in the world.

### 2.1.3. Regional and country data

Apart from the current global data already analyzed, it is worth reviewing works covering specific regions and countries[44].

#### *2.1.3.1. Northern America*

Commercial publishing and STM subjects are very important both in USA and Canada, however the first country is much more productive, publishes much more journals and receive more citations. English is the main language, of course, and although Spanish is becoming more and

[42] Gross domestic product.
[43] Gross domestic expenditure on R&D.
[44] Some of these studies will be mentioned again in section 2.2, because they also report on the state of the art of Open Access.

more important, mainly in the West coast, it is not considered a language for science. French language is residual in indexed Canadian journals.

**Tenopir & King** (2012) reported that there were 6,771 journals in the US in 1995. Most important subject areas were social sciences (31.6%) and life sciences (31.1%). Commercial publishers accounted for 40% of the titles (half of those on life sciences), professional societies for 23% (half on physics), and academic publishers for 17% (70% of which specialize on social sciences). The rest of the publisher types were government agencies, non-for-profit organizations, etc., and accounted for the remaining 21%, 63% of which were on social sciences. Comparing with 1977, most important changes had been the loss of relative weight of professional societies (from 39% to 23%) and the growing impact of commercial companies (from 35% to 40%) and the other types (from 8% to 21%).

**Inhaber** (1975a & 1975b) informed that Canadian journals represented 1.8% of the 2,638 journals indexed in ISI. They only covered 31% of ISI subject categories, and French language appeared only in 3% of these titles. He analyzed the relationship between number of inhabitants and journals published, and those with highest proportion were Switzerland and Netherlands – Canada had a proportion similar to Hungary, Austria, France and Germany.

#### *2.1.3.2. Latin America*

First of all, English term "Latin America" refers to Spanish and Portuguese-speaking countries in the American continent. Nevertheless, SciELO, Latindex and Redalyc include also Spain and Portugal, which constitutes Ibero-America. SciELO includes another "peripheral" OA-based country, South Africa. That said, if no further explanation is given, the term "Latin America" will be used here only with its original English meaning.

Latin America does not have a long tradition of academic publishing industry, as Northern America and Europe. Universities and associations have been main drivers of the development of the scientific communication system. As mentioned before, Redalyc, Latindex and especially SciELO play a key role in journals from Latin America and also Ibero-America. The degree of adoption of Open Access is high[45]. The most common languages are Spanish and Portuguese; the proportion of articles in Portuguese is decreasing while that in English is growing, according to WoS data (**Packer**, 2016).

The number of journals increased remarkably in all the countries, especially in Brazil, that was responsible for 50% of all LAC production in 2007. This region has increased its world contribution in both articles and citations, but its visibility continues to lie under the global average in terms of citation per document (**Santa** & **Herrero Solana**, 2010).

**Cetto et al.** (2010) extracted a sample from Latindex and found that countries with more journals were Brazil, Argentina, Mexico and Chile, while subject areas with more titles were social sciences, medicine, arts & humanities. Multilingualism was underrepresented, because

[45] See 2.2.3.2.

articles available in languages other than Spanish were only 16%. Currently, there are 3,013 active scientific peer-reviewed journals in Latindex directory[46], and 2,808 of those are in the catalog[47], that includes only journals complying with Latindex quality criteria. Countries with more journals in the complete catalog[48] are Brazil (29.1%), Spain (25.8%), Mexico (10.9%), Argentina (7.7%), Colombia (5.5%), Chile (4.8%), Venezuela (2.4%) and Portugal (2.4%).

Brazil and Spain are the most important publishing countries in Ibero-America. **Rodrigues** & **Abadal** (2014a) found 879 Ibero-American journals in WoS and Scopus – 36% were Spanish, 29% Brazilian, and the remaining 36% came from other 11 countries. The medicine field is the most populated (29%), followed by agriculture and biology (15% each), and social sciences (11%). Main publishers were universities (38%) and associations (31%).

Another study by the same authors (**Rodrigues & Abadal**, 2014b) compared Spanish and Brazilian journals. Main publishers in Brazil were universities and scientific societies (87%), while in Spain these accounted only for the 32%, and commercial companies for the 28%. In Brazil, most populated areas were health Sciences and agricultural sciences, with over 60% of the titles, followed by SSH (16%). In Spain, health sciences accounted for a 40%, while SSH reached a 28%. With regard to print-only version, in Brazil it was residual (0.8%) while in Spain it was 7.3%, perhaps due to the fact that some SSH journals still use that format.

Brazil is the clear leader of journal production in Latin America, and one of the leaders in BRICS. **Packer** (2011) informed on the growth of Brazilian titles in WoS – from 19 journals to 71 in 2009. Great part of this success is due to SciELO, and, because of that, WoS created its Scielo Citation Index later.

**Sánchez Hernández et al.** (2008) studied the case of Mexico, the third Ibero-American country in importance. They found 102 journals in Latindex, 54% of which were on SSH. Main publishers were universities and research centers, and there was no mention of commercial companies.

#### *2.1.3.3. Asia*

Japan is a world major journal publisher according to Ulrich's (no. 15), JCR (no. 5) and Scopus (no. 7). Their journals are also well indexed (16.72% in JCR). Nevertheless, there is a lack of studies on Japanese scientific journals. One of the few (**Kamada**, 2007) studied "kiyo" journals (those published by research institutions). 3,000-4,500 of the total of 9,000 journals were in Japan. Those journals were not peer-reviewed and generally failed to meet minimum quality criteria, but self-archiving in institutional repositories, digitalization and Open Access could help, according to the author.

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[46] http://www.latindex.org/latindex/bAvanzada, selecting "directorio" and specifying "situación: activa", "naturaleza de la publicación: revista de investigación científica", "revista arbitrada: sí". "Unique titles" considered in results. Consulted April 17, 2016.

[47] http://www.latindex.org/latindex/bAvanzada, selecting "catalogue" and the same filtering criteria appearing in previous note. Consulted on April 17, 2016.

[48] http://www.latindex.org/latindex/gCatalogo. Catalog includes 8,413 periodicals from all types. Consulted on April 18, 2016.

China has been described as one of the emergent economies and according to recent data this country has taken over the first position in scientific output[49].

**Yun** (2014) summarized China's scientific publishing history and divided it in 3 periods: communization and centralization (1949-1956), oscillation between decentralization and recentralization under the planned economy (1956-1979) and commercialization and decentralization (1979-1992). Communism, publications control for censorship and propaganda were characteristics of the first years, while embracing the "socialist market economy" were typical of the more modern years. "Publishers gradually became more market-oriented" and "local publishers increased rapidly and they acquired more operational autonomy" (p. 144). This information relates to book publishing, but it is also applicable for journals, as confirmed by **Wu & DongFa** (2014), who stated that "the reform and opening-up policy of 1979 brought about rapid development for Chinese academic journals" (unpaged).

**Ren** (2005) reported the existence of 4,497 scientific journals, from which only 210 were published in English and 20 in other minority languages. The largest publishers were universities (45%), government (22%), professional societies (18%) and research institutes (15%). SCI indexed 76 Chinese scientific journals, 67 of which were also included in JCR – 49 of the latter were published in English. According to the author, the main problems were the excessive birth of new journals, the low visibility (related to low subscription rates) and the lack of quality articles. **Xian** (2006) confirmed a little increase in the number of titles – 4,876, of which only 196 were in English. **Cheng & Ren** (2008) added that most common publishers were, by far, associations and societies, universities and research centers. The presence of government agencies and companies was residual. Medicine and agriculture were the largest subjects.

In 2010, there were 4,936 journals according to governmental sources, and 6,400 according to the Institute of Scientific and Technical Information (**Xiao-Jun et al.**, 2012). The same year, **Hu** (2012) criticized the dominance of private companies – something that does not seem to fit with **Cheng & Ren** (2008) findings on publisher types.

There were about 8,000 journals in China according to **Feng-Nian** (2012a), but **Cheng et al.** (2012) reported the existence of 9,890 journals, from which 4,950 can be considered scientific. Thus, it seems that authors are extracting data from a variety of resources having very different information. In any case, a slow and progressive increase can be testified. Following with the latter work, they studied only STM journals, and found that Chinese Science and Technology Journal Citation Reports (CJCR 2009 edition) was covering 1,868 titles. Regarding SSH journals, **Hu** (2012) analyzed 2,960 journals listed in the Chinese National Knowledge Information database (CNKI). The 53% of the titles were on social sciences, the 35.5% on economy and management and the 13.4% on philology and humanities.

**Ren et al.** (2013) summarized the current state of scientific journal publishing in this country. According to them, 80% of the 5,000 scientific journals existing by 2013 in China were created

[49] See 2.1.2.7.

after 1980, coinciding in time with the open up of the country. Most of the titles have been sponsored by government or public institutions, particularly those subject to censorship. A 28.8% of the journals are published and subsidized by universities, a 25.6% by research institutes and a 24.3% by societies and associations.

Nevertheless, **Wu & DongFa** (2014) reported the existence of almost twice the number of journals (9,549), according to the China Periodical Yearbook, although it was including not only scientific publications. Table 18.1 of that document (unpaged) indicates that there were 7,382 scientific journals, a figure which is still much higher than the one reported in the previous study. Of the latter number, 2/3 of the journals were on STM and the remaining third on SSH. They have a growth rate of 11.4% and 9.1%, respectively, during the period 2001-2009. Most of them are published in Beijing and in Mandarin language. According to these authors, industrialization, internationalization and digitization will be the drivers of development of Chinese academic journals. Regarding internationalization, English-language titles are growing, but they are still a minority. There were 240 academic journals published in that language in 2011, mostly on STM (212). However, even these have a very limited international impact. Regarding industrialization, their opinion was opposite to Hu's (Dehua Hu 2012); they stated that transforming original public cultural institutions into private cultural enterprises and operating under market conditions will help to this development and will support the improvement of quality standards.

Perhaps the more updated information belongs to the study by **Hu** (2015). According to this report, there were 8,601 academic journals in the CNKI, of which 61% were on STM and the remaining 39% on SSH.

As described before, STM national article output has grown much more than number of journals. **Ren et al.** (2013) indicated that, according to SCI data, articles published by Chinese authors have risen by 381% from 2000 to 2009, but number of articles published in China's journals have only grown by 141% when that for articles published in foreign journals have risen by 546%. That may indicate that China should improve its scientific journals quality, but at the same time Chinese science is getting more international. According to **Leydesdorff et al.** (2013)[50], "China has become the first partner of the USA in terms of international co-authorship", and it is also the second country in the world with more STM articles co-authored. Some specific international collaboration and co-authorship have been described – e.g., with Germany in physics (**Zhou & Lv**, 2015).

Chinese SSH journals, at least those published by universities, have developed rapidly but they are still facing big problems (**Feng-Nian** 2012b). Some of these problems are the limited regional authorship, the lack of strict peer-review, and the need for strengthening market awareness and of expediting internationalization. These problems and needs are, however, not exclusive from universities' SSH journals. **Qing et al.** (2012) also reported the lack of quality and speed in peer-review processes. Another problem is the publication lag, reported by **Feng-Nian** (2012b), who proposes using electronic technologies and improving communication between authors and editors in order to shorten the time from submission to publication. **Fenglian & Li** (2012) also

[50] This study uses SCI database, ed. 2011 in DVD.

suggested shortening publishing periods and making a stricter peer-review system, together with the need to attract high-quality articles, in order to improve international influence of Chinese academic journals.

Most of journals published in India, another BRICS country, followed peer-review processes and were indexed in international databases – nevertheless, their availability and impact outside the Southern-Asiatic region was limited (**Ghosh & Das**, 2006). Later, **Sawant** (2009) identified 178 peer-reviewed journals, from which only 10 were published by professional companies. This information does not seem to go in line with more updated data, since Ulrich's indexes 2,884 Indian scholarly journals, 108 of which (3.7%) also appear in JCR and therefore have IF.

South Korea, another BRICKS country (the one bringing the K to BRICS) was publishing 1,437 journals, where learned societies are predominant publishers. There was a lack of English, though, and that was hindering internationality (**Sharma**, 2014).

**Hew** (2012) reported that Malaysian ongoing journals have an age average of only 20 years. There were 149 journals in the 80s (38.2% published by universities and 37.6% by associations). During the 90s, the number of journals increased dramatically and reached 228 titles (59% on SSH, and 41% on STM). Predominant publisher types were universities (33%), associations (23%), and academic and research institutions (14%). Governmental agencies only accounted for the 6.5%. 50% of journals were bilingual Malaysian-English, 30% only English and 10% only Malaysian. Quality standards were low, because of the lack of funding, few reviewers, slow publishing processes, etc., but were improving. Malaysian authors tended to publish more in foreign journals.

Just one year later, **Zainab et al.** (2013) informed of a much bigger number of journals (464), from which 42.5% were born during the 2000s. Only 51 of the total (10.9%) were indexed in WoS or Scopus. A 55.5% of the journals were published by university and college presses, 22.4% by societies and associations, 20.6% by government agencies – contrasting with Hew's study – and only a 1.5% by private companies.

Even when the economies of the Middle East are currently in better shape than those in most of the Asian countries, scholarly publishing is not proportionally developed. For instance, in Saudi Arabia, the market is dominated by a few commercial publishers and universities lack proper publishing training. Traditional print publishing is still the most used, and it is necessary to attract more capital and technology for electronic publishing (**Islam**, 2012). Low research output of Islamic countries – except Iran and Turkey – and their lack of international collaboration is not helping (**Sarwar & Hassan**, 2015).

#### *2.1.3.4. Africa*

Sadly, scientific publishing in Africa lags behind the progress of other developing or peripheral regions as Asia and LAC. A number of barriers and challenges for its development have been described long ago, and yet it seems that the situation is not improving much. **Tenywa** (2014) identified the following: lack of experienced editors, rising costs of publishing, slow peer review,

lack of public funding and plagiarism, among others. As a matter of fact, African scientific output accounted for less than 1% of the world (Teferra 2012).

**Murray & Clobridge** (2014) reported that scientific publishing activity was mostly concentrated in only two countries: South Africa and Nigeria. Journals were usually supported by a few individuals or small groups of academics, and only 19% of them were published by commercial companies. Journals were young, because most of them were launched in the early 2000s.

Sub-Sahara region was facing technological, socio-political and economic challenges that were hindering scholarly publishing, as reported by **Ondari-Okemwa** (2007). This author also criticized the undervelopement of information technology, the lack of Internet access for most scholars in the region, and the need for more co-authoring. Nowadays, these technological constraints have been improved and yet the situation of the region is still lagging behind.

Sub-Saharan countries, excluding South Africa, accounted for only 400 journals (Jaygbay 1998). What is more, these are in a precarious state, with poor quality standards and questionable content (Teferra 2012). More recently, a number of 2,000 titles has been estimated, of which South Africa and Nigeria account for 450 each – only 88 were indexed in WoS, 81 of them belong to these countries (**Smart & Murray**, 2014). The majority of the journals were published in English, followed by French and Afrikaans.

Other countries as Ghana are "still at an embryonic stage in scholarly publishing" (**Ganu**, 2012, p. 180). There, university presses play a key role because of the absence of commercial publishers' interest, and the lack of resources for developing associations and societies. This is also the case of Nigeria (**Aguolu & Aguolu**, 2012).

As **Le Roux & Galloway** (2012, p. 162) wrote, "it is often assumed that African scholarly publishing is poorly resourced and unappealing to authors, both African and otherwise". These authors found that, by means of a qualitative survey, there is a need of more African publishers and, at least according to the answers, an intention of supporting locally based publications. However, authors still try to avoid African publishers.

According to **Jaygbay** (2012), a major problem for scholarly publishing in Africa is "self-censorship" – that is, censorship self-inflicted by the authors and the publishers. There is an important lack of criticism because of the long-term established practice, due to the authoritarian government control. Also, always according to the author's opinion, researchers use international scientific languages (English, French and Portuguese) that are not known by the majority of the society, and some societal values (e.g., taboos, esotericism, and secrecy) hinder quality publishing.

A more recent work by **Smart & Murray** (2014) was more optimistic. They reported that, despite the fragile, poorly funded, and diverse scientific ecosystem, there were many initiatives to support development of journal publishing. For instance, platforms for free online journals as

Bioline International[51], SciELO South Africa[52], African Journals Online (AJOL)[53], plus the quality evaluation system managed by the Academy of Science of South Africa (ASSAF)[54].

### *2.1.3.5. Europe*

Studies on Europe describe very diverse panoramas depending on the zone. UK, Germany and Netherlands constitute the scientific "center", with consolidated publishing industry, English language content, and low proportion of Open Access titles[55]. The European scientific periphery, such as Latin/Mediterranean countries, Eastern/Slavic Europe and Nordic countries has different realities, which will be described here.

With regard to Southern European countries, **Anglada** & **Abadal** (2010) reported on France, Greece, Italy, Spain and Turkey. They reported that these countries published 7,248 journals (world 10.5%), according to Ulrich's. France, Spain and Italy published 90% of all. A 39% of the journals were available online, and Turkey was the country with the higher proportion (75%) of electronic publications. Only 5% of all journals were included in JCR, and 15.4 in Scopus. France was the country with the highest relative proportion of indexations in JCR (10.1%) and the highest absolute one in Scopus (22% of all titles). Turkey had a 25% of its titles in Scopus, and Greece followed with 22.4%. Thus, there were significant differences regarding the indexation of journals published in these countries.

Over a 75% the journals were published in the country's official language, with a consequent low level of internationalization. Nonetheless, Greece and Turkey were publishing ¾ parts of is journals in English.

Main publishers where public institutions (universities, research centers and government agencies), and commercial publishers had a little presence. This was perhaps the most common aspect shared by these countries, and a distinctive feature of the Anglo-Saxon regions.

Regarding Slavic countries, some works on Croatia have been reviewed. **Vrana** (2011) analyzed 79 social sciences journals (a very small sample) and designed a survey that was answered only by 45-50 of them. From these, 91.1% were available in both print and online formats, and 8.9% was only in print. An 89.1% was free access, and national or domestic authors predominated. Open Access was popular, known by an 84.8% of the academics, and a 70.5% of the journals archived their articles on Croatian online repositories.

**Hebrang Grgić** (2011) confirmed the good shape of OA in all Croatian journals, not only in social sciences. In a more recent work (**Hebrang Grgić**, 2014), she reported that non-for-profit publishers were the most common (44% universities, 28% professional associations, 26%

[51] http://www.bioline.org.br/ (consulted May 2, 2016).
[52] http://www.scielo.org.za/ (consulted May 2, 2016)
[53] http://www.ajol.info/ (consulted May 2, 2016)
[54] http://www.assaf.org.za/ (consulted May 2, 2016)
[55] See 2.2.3.5.

research institutions), a 40% of the journals were in Croatian (mostly in social sciences) and a 30% in English (predominating in Science and Technology), and another 30% were bilingual.

According to a survey by **Suchá & Steinerová** (2015), there were over 600 scholarly journals in the Czech Republic. Only 11% was indexed in JCR. Universities publish a 33.6% of the titles, companies and government agencies account for the 16.5% each, and scientific societies are responsible for only an 11.4%. Unlike other "peripheral" countries as Spain[56], there were no specific predominant companies among the commercial publishers.

Half of the Scandinavian journals were available online, and commercial publishers dominated, except for Finland, where societies and associations were predominant. SSH are usually published in local languages, while English is used mostly for STM (**Hedlund & Rabow**, 2009).

#### *2.1.3.6. Spain*

There are a number of works on Spanish journals. One of the oldest reported the lack of titles in specific subject fields, a slow growth in global numbers, homogenous distribution by publishers, quality improvement of editorial practices, incorporation of English elements, irregularity of issues and a moderate diffusion of a 42% in international databases (**Ortega et al.**, 1992). They also found that foreign authors publishing in Spanish titles were mostly from France, United States and Argentina.

**Urdín** (2001) collected data from 2,223 journals included at the Spanish CINDOC directory[57] and found that the 61% talked about SSH, and the remaining 39% about STM. The most important publisher types were commercial (28%) and universities (27%), a 39% of all journals were published in Madrid region, and only a 4% were available in digital format.

With regard to indexation of Spanish journals in international databases, **Bordons** (2002) analyzed the only 30 titles that were indexed in JCR at that time. The 60% of them was on medicine and the 40% was issued by commercial publishers (60% within medicine).

More recently, **Osca-Lluch et al.** (2008) analyzed 3,000 Spanish journals from a variety of resources, which seems a number far above the actual. In any case, they found that the 57% of them was created after 1990s. A 42% of the total talked about social sciences, a 25% about humanities, and a 19% about health sciences. Most of the titles were supported by scientific, scholarly or professional institutions – a 27% of all was published by universities, a 22% by companies and a 20% by associations and foundations. They were published mostly in Spanish.

The mentioned work by **Anglada & Abadal** (2010) analyzed the situation in some Southern European countries, such as Spain. Only 300 of the 2,281 journals identified were peer-reviewed (13.2%). A 35% of the publishers were universities, while royal academies and professional associations accounted for a 24%, companies a 22%, government agencies a 12%, and research

[56] See 2.1.3.6.

[57] Currently, Bibliographic Databases of the High Center for Scientific Research (CSIC), available at http://bddoc.csic.es:8080/

institutions a 6%. Data on commercial publishers (22%) is lower than that provided by previous works. Regarding subject distribution, a 76% of the journals talked about SSH, and the remaining 24% about STM. 165 journals appeared in WoS on Jan. 2010, which represents a 70% increase from the previous year. 257 journals were indexed in Scopus.

The Spanish Federation for Science and Technology (FECYT)[58], which plays a central role in enhancing the quality of scientific publishing in the country, analyzed the presence of journals in JCR (**FECYT**, 2012a). There were 125 active titles in 2010 and 132 in 2011, which represents an annual increase of 6%. Those 132 journals positioned Spain as the country no. 10 in JCR, but of those journals only 25 had received FECYT's quality seal.

The same year, **FECYT** (2012b) issued a best practices manual, with opinions by some of the most prestigious Spanish publishers from all disciplines. Hot topics were editorial advice, business model, digital content management, strategies for enhancing impact, visibility and internationalization, publishing full texts in foreign languages (mostly English), importance of quality and originality of papers, metadata and DOI, improving workflow within editorial board and scientific committee, using functional and social websites for journals, etc.

Other interesting works do not include specific data but collect proposals for enhancing dissemination and impact of university journals (**Abadal & Rius**, 2008). **Rodríguez-Yunta & Giménez-Toledo** (2013) analyzed weaknesses of SSH and suggested that journals should merge or co-publish so that they can enhance their quality and performance.

Following the latter line, **Giménez-Toledo** (2013) reflected on the current state and the future of Spanish scientific journals, criticizing the overpopulation of titles on SSH, mentioning the difficulties of getting quality papers and publishing issues on time, and pointing out the necessity of Spanish researchers of publishing in foreign journals for internationalizing their CVs. What is more, when one of these journals reached a good position in impact indexes, it is usually absorbed by a big international publishing house (e.g. Elsevier and Springer). The author also denounced the influence of political and personal affinities, and the endogamy of editorial boards.

The most recent data on Spanish scholarly journals has been provided by Abadal and Rodrigues.

**Rodrigues & Abadal** (2014b) found that there were 300 Spanish journals indexed in WoS and Scopus in 2011. Universities published a 22% of them, associations a 26%, commercial companies a 28%, research institutions a 10%, government agencies a 6%, and others 8%. It is worth specifying that of the 28% of journals run by commercial publishers, a 17% are owned by associations. According to the study, online journals were available in a variety of platforms: 51% were self-made, 19% were based on OJS, 15% used Elsevier's, 8% SciELO's, 3% Springer's, and others'.

[58] http://www.fecyt.es/

The same authors (**Rodrigues & Abadal**, 2014a) informed that the number of Spanish journals indexed in WoS and Scopus had reached 313 the following year (2012), accounting for a 36% of all the titles from the Ibero-American region. Brazil was second with a 29%.

**Abadal et al.** (2015) carried out a study of Spanish titles indexed in WoS and Scopus and drew a concise picture of the number and growth, distributions by publisher type, discipline, language, access type and portals. They found an increasing indexation of journals in these databases: while **Bordons et al.** (2002) informed of 31 journals in JCR, this study identified 406 in both WoS and Scopus. Health sciences (33%) and social sciences (32%) predominated. Spanish-only titles accounted for a 52%, English-only for a 15% and bilingual for a 22%. The study also revealed important differences in data collected directly from journal's websites and data available at some sources as Ulrich's and DOAJ, justifying the necessity of having first-hand information and not relying on directories.

Works described so far provide evidences of growth of Spanish journals. Table 7 shows the evolution of the number of journals at CSIC and Dulcinea Spanish, Latindex and Ulrich's.

| Source | 2013[59] | 2015[60] | 2016[61] |
|---|---|---|---|
| CSIC | 2,488 | 2,530 | 2,542 |
| Dulcinea | 1,619 | 1,729 | 1,766 |
| Latindex | 1,791 | 2,052 | 2,090 |
| Ulrich's | 2,468 | 2,442 | 2,566 |

**Table 7 – Indexation of Spanish journals**

**Dulcinea**[62] is the more accurate and updated source, maintained by Acceso Abierto research group[63]. The current number of 1,766 active, scholarly, peer-reviewed journals is in line with that from Ulrich's (1,720), although the latter number is supposed to include all journals, not only peer-reviewed.

**CSIC** databases[64] (previously, Cindoc databases) seem not to be updated, because the number is excessive. It may include ceased, duplicated, not peer-reviewed and not scholarly titles. It is worth mentioning that a 79.9% of all those journals are on SSH.

Search queries for Latindex and Ulrich's are not optimal, but they have been used as in previous years in order to observe the growth, which seems slow but steady.

[59] Data from Abadal et al. (2015a).
[60] Date of consultation: Nov. 16, 2015.
[61] Date of consultation: May 8, 2016.
[62] To know the total number of journals in Dulcinea (which only includes active, scholarly, peer-reviewed and unique titles) a simple empty search works at http://www.accesoabierto.net/dulcinea/default.php?directorio=dulcinea&campo=REVISTA&texto=.
[63] http://www.accesoabierto.net/
[64] CSIC databases have been consulted at http://bddoc.csic.es:8080/inicioBuscarSimple.html?estado_formulario=show&bd=ICYT&tabla=revi, indicating "todas" (all) and "vivas" (active).

Data from **Latindex**[65] include titles that are not peer-reviewed or unique. If those were excluded, the number of journals would go down from 2,090 to 979.

With regard to Ulrich's, data include every version of a same journal, and not unique titles. Therefore, the number is much higher than the real. As already mentioned, there are 1,720 Spanish active scholarly journals, not 2,566.

Their indexation in international impact databases has also grown rapidly. Currently[66], 446 Spanish journals are in Scopus, representing a 25.8% of the Spanish total, following both Dulcinea and Ulrich's data. 467 titles are nowadays in SJR, meaning that there is a little growth of Spanish journals in Scopus-SJR, which, presumably, will be reflected in the next Scopus journal list. Only 100 titles were indexed in JCR (a 5.8% of the Spanish total).

According to Ulrich's, Spain is the country no. 10 in journal publishing in the world, which is good. Despite that, its journals account only for a 2.5% of the world total. Its presence in Scopus (world 2%, no. 8) is much better than in JCR (world 1.1%, no. 15).

[65] Advanced search was used at http://www.latindex.org/, selecting "directorio" ("catálogo" is only for quality-selected journals), and indicating "País: España", "Naturaleza de la publicación: revista de investigación científica" (scholarly journals only, excluding cultural and scientific divulgation and technical journals) and "Situación: vigente" ("current" status).

[66] See data for Spain in 2.1.2.

## 2.2. Open Access

### 2.2.1. OA in scholarly journals

#### *2.2.1.1. Concept*

Traditionally, the scientific communication process has been based in the publication of articles by researchers in scholarly journals, which usually were not free. Scientific community could have access to them by paying individually, or through their academic libraries (which, in turn, paid the subscriptions). This way, payment by public research institutions was double: first, for creating scientific outputs and findings that will be published later, and second, for having access to those publications. This may be the most common or popular point of view in the Academia, but not everybody shares the same opinion. For instance, **Walters** (2007) stated that such claim is false, because "most colleges and universities contribute relatively little to the scholarly literature, and the vast majority can be regarded chiefly as consumers rather than producers of research" (p. 118). In any case, scientific publishing has a cost and this fact is undeniable.

The "serials crisis", term coined by **Panitch & Michalak** (2005) deeply affected library budgets and, consequently, access to journals. According to data from the American Research Libraries (ARL), subscription prices increased by 215% during years 1986-2003, while the consumer price index (CPI) only rose by 68% for the same period. In 2007, serial expenditures had raised by 340% (**ARL**, 2008, Figure 12), and their annualized increase between 1986 and 2011 was 6.7% while US Consumer Prices rose by 2.9% per year for the same period (**ARL**, 2011). According to these authors, this crisis was only a symptom of a wider problem within the global scientific communication system.

As a matter of fact, the market "oligopoly" by largest publishers allowed them to "determine annually increasing subscription rates that make up a considerable amount of research spending, leaving academic libraries with no other choice but to cancel subscriptions" (**Larivière et al.**, 2015, p. 11).

This "serials crisis", the "oligopoly" and the advent of the Internet were key factors that dramatically affected the scientific publishing ecosystem. Open Access (OA) movement was a direct answer of the academic community in order to overcome financial problems and barriers. It was defined during the meetings in Budapest, Bethesda and Berlin – the "BBB definitions".

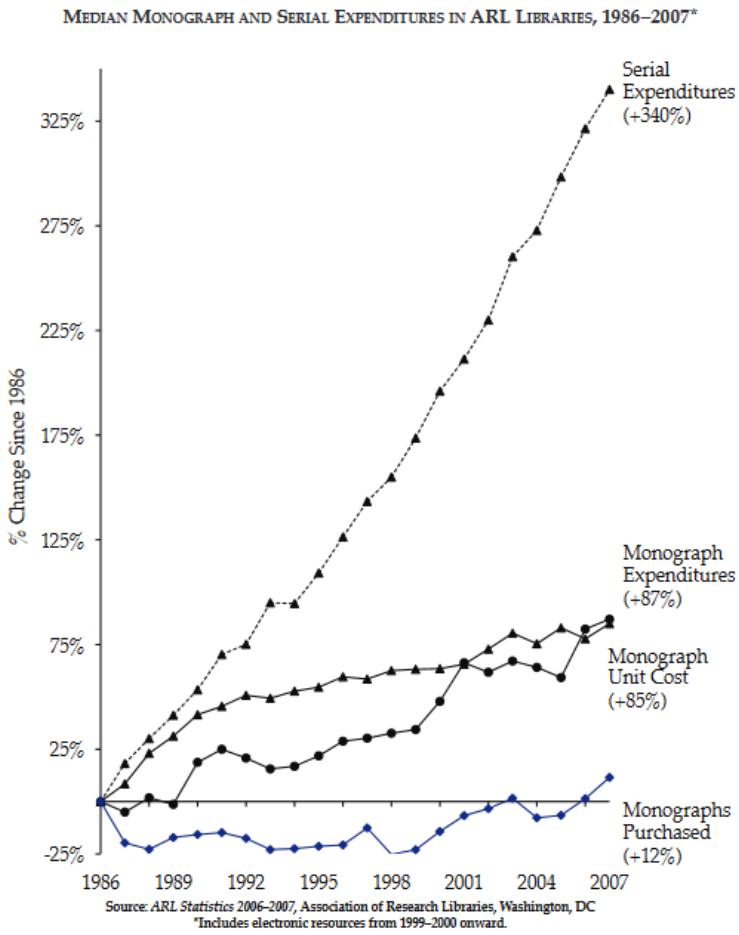


**Figure 12 – "Median monograph and serial expenditures in ARL libraries, 1986-2007"**
Source: **American Research Libraries** (2008), p. 11.

The **Budapest Open Access Initiative (BOAI)** (2002)[67] first used the term "open access" to define "free and unrestricted online availability" to "scholarly literature". It was based on the original "open" definition, which applies to "data or content" that "anyone can freely access, use, modify, and share for any purpose"[68]. BOAI recommended "two complementary strategies", that later would be known as Green Route[69] and Gold Route: the first for self-archiving refereed journal articles in repositories, and the latter, for publishing them in OA journals. Another type or route, Gray OA, consists in content published in other sources, such as personal websites (**Nicholas et al.**, 2012, p. 200) and social networks (**Borrego Huerta**,2016).

In the same year, the **Bethesda Statement on Open Access Publishing**[70] eliminated any mention to routes, and stated that the "work" had to be "deposited immediately upon initial publication", which apparently meant that it would be published first as a journal article and

[67] http://www.budapestopenaccessinitiative.org/read
[68] http://opendefinition.org/
[69] Green Route to OA, or simply Green OA, was also defined as "Open Access to subscription journals" (**Solomon**, 2013, p. 27)
[70] http://legacy.earlham.edu/~peters/fos/bethesda.htm#definition

then self-archived in a repository . It also introduced the possibility of fee payments for covering publishing costs[71]. Authors as **Harnad** (2015) believe that Bethesda statement was biasing towards Gold OA to the detriment of Green OA[72]. It also introduced reuse permissions[73].

Finally, the **Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities**[74] modified some aspects. Apart from some minor changes in wording, the definition of OA as "a property of individual works, not necessarily journals or publishers," was removed. It could have been done in order to satisfy publishers' interest. Also, "copyright holder" was substituted by "right holder", perhaps to use a wider term and to avoid specific legal connotations. Access still had to be "free, irrevocable, worldwide", but not anymore "perpetual" – probably because no one can guarantee an access "forever". The text "deposited immediately upon initial publication" was eliminated, thus allowing publishers to impose embargo periods that shall be respected before allowing for self-archiving.

As just described, the original BOAI concepts seem to have been turned towards the publishers' side.

**Suber** (2004) provided a definition that has been commonly used since then: "Open-access (OA) literature is digital, online, free of charge, and free of most copyright and licensing restrictions". Nevertheless, polemical arguments on OA's meaning have taken place ever since. Also, different names and degrees have been given to OA by both the academia and the market. Again **Suber** (2008) emulated Stallman's terminology for Open Source, and proposed using "gratis OA" (meaning zero price) and "libre OA" (without restrictions for the use of the content). The first was an absolute term (access can be free of charge, or not), but the second was a "range" of possibilities, related to the rights specified in the license. The point is that there was no need to use these terms, because they are equivalent to "free access" and "Open Access", respectively. In other words, according to BBB definitions, "Gratis OA" is not OA, because access cannot be called "open" unless it is free of "most copyright and licensing restrictions".

It is true, though, that there can be a wide range of "openness" according to the uses licensed. For instance, the Creative Commons Attribution-NonCommercial license (CC BY-NC) does not permit commercial use, and thus is not complying with full definition of OA (or Libre OA). Regarding journals, Public Library of Science (PLoS), Scholarly Publishing and Academic Resources Coalition (SPARC) and Open Access Scholarly Publishers Association (OASPA) published How Open Is It[75], a guide to assess the level of openness, using standardized

[71] "We realize that moving to open and free access, though probably decreasing total costs, may displace some costs to the individual researcher through page charges, or to publishers through decreased revenues, and we pledge to help defray these costs. To this end we agree to help fund the necessary expenses of publication under the open access model of individual papers in peer-reviewed journals (subject to reasonable limits based on market conditions and services provided)."

[72] Bethesda statement was "skewed toward only BOAI-II ('gold' open access publishing), virtually ignoring BOAI-I ('green' open access self-archiving)".

[73] "… a license to copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works (…) subject to proper attribution or authorship, as well as the right to make small numbers of printed copies for their personal use".

[74] https://openaccess.mpg.de/Berlin-Declaration

[75] http://sparcopen.org/our-work/howopenisit/

terminology for specifying reader's rights, reuse rights, copyright, author's posting rights, automatic posting and machine readability. According to a study by **Chen & Olijhoek** (2016), maximum openness (96%) was reached by only a 12.7% the journals from the sample, and almost all belonged to BioMed Central (Springer) and PLoS.

Open Access is not an isolated phenomenon. It is part of the Open Science[76] concept, which also includes Open Source, Open Data[77], Open Educational Resources, Open Peer-Review and Open Methodology.

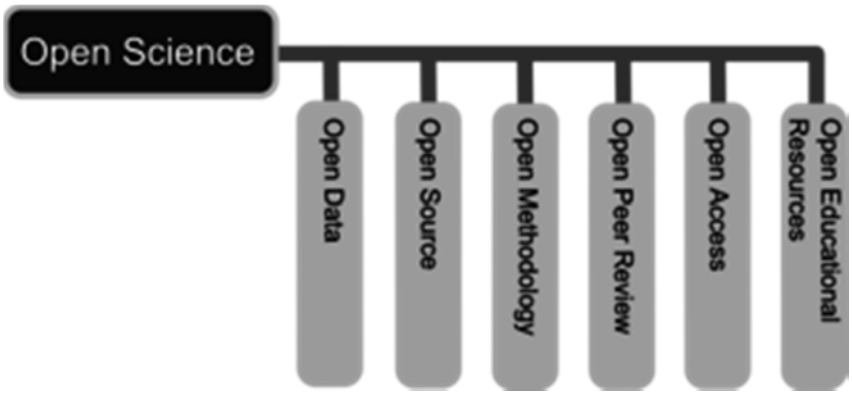


**Figure 13 – Open Science tree**
Source: Wikipedia[78].

Some of the latter are related to OA journals. Open Source is exemplified in journals using Open Journal Systems (OJS) software[79]. Research datasets used for writing an article are included online, together with the article itself. Open Peer-Review is an alternative to the classical "closed" peer-review for journal articles[80].

This study focuses on Open Access journals only. No further description or analysis regarding these other "open" concepts will be given.

### *2.2.1.2. Types of OA journals*

Limitations to OA configure different types of journals. As defined by **Melero & Abad** (2008), there is a scale of openness for journals, from the least to the most open: embargo, hybrid and full OA journals (which include two types: with publication fees, and without them). With this in mind, all journals can be categorized as follows:

[76] https://en.wikipedia.org/wiki/Open_science
[77] Open Data could refer to government or scientific information. For the latter, the best is to use Open Research Data or Open Scientific Data.
[78] https://en.wikipedia.org/wiki/Open_science
[79] https://pkp.sfu.ca/ojs/
[80] One of the most well-known advocates is Faculty of the 1,000 Research (http://f1000research.com/)

- Restricted or subscription-based journals: the classical, where readers pay and normally there is no re-use.

- Free access: freely available online. Readers do not pay, and re-use terms are normally not specified or re-use is not allowed.

- Embargo or delayed OA: subscription journals that free their issues after an embargo period, which typically varies from 6 up to 24 months. Readers may pay if they want to access the latest content. Re-use is normally allowed, and self-archiving is usually permitted after a period of embargo.

- Hybrid OA: subscription journals that offer the authors the possibility of paying a fee for making their articles OA – known as Article Processing Charges (APC) [81]. Readers may pay if they want to access all articles, not only the OA ones. Re-use is normally allowed, and self-archiving is permitted for OA articles, usually without any embargo period.

- Full OA journals: all content is freely accessible immediately, readers do not pay, and re-use and self-archiving is allowed. Authors may be asked to pay Article Processing Charges (APC). When they do, some call these journals "commercial OA". When they do not, they are known as Platinum, Diamond or Subsidized OA – meaning that economic resources do not come from fees but from the voluntary work or funding from academic, government or private institutions.

These definitions of Full Access journals have been used by authors as **Babini** (2014, 2015)[82], **Smart & Murray** (2014) and **Fecher & Wagner** (2016)[83]. Although these definitions are not accurate because they do not qualify access but funding (Harnad 2013), it makes sense to differentiate the two types because Platinum or non-commercial OA is major in some regions (e.g. LAC) while in others is just the other way round

Table 8 summarizes all these definitions and their correspondence with concepts. Note that while official BBB definitions exclude simple free access and hybrid journals, DOAJ excludes embargoed titles as well. Also, while approaches from LAC or peripheral countries mostly stay with BBB/DOAJ, Western and commercial authors tend to interpret "OA" with the widest possible meaning, which seems to be also the case for the common or popular use of the term.

[81] See 2.3.4.
[82] Author used "non-commercial OA" in titles, referring to the opposite case and thus defining the same concept.
[83] These authors stated that Diamond OA (also known as Platinum OA), that is, OA journals that do no charge publication fees, is different from Gold OA, when the first is included in the latter. They also stated that Gold OA is "a system supported by publication fees" (p. 1) which is not correct.

| Journal types | Reader pays | Author pays | Free immediate access | Free access to all articles | Re-use allowed | OA according to BBB | OA according to Suber | Qualifies for DOAJ |
|---|---|---|---|---|---|---|---|---|
| Restricted access | Yes | No | No | No | Yes/No | No | No | No |
| Free access | No | Yes/No | Yes | Yes | No | No | Gratis OA | No |
| Embargo | Yes/No | No | No | No | Yes/No | Yes | Gratis / Libre OA | No |
| Hybrid | Yes/No | Yes/No | OA articles only | OA articles only | OA articles only | No | Gratis / Libre OA | No |
| Full OA | No | Yes/No | Yes | Yes | Yes | Yes | Libre OA | Yes |
| No APCs | No | No | Yes | Yes | Yes | Yes | Libre OA | Yes |
| APCs | No | Yes | Yes | Yes | Yes | Yes | Libre OA | Yes |

**Table 8 – Types of OA journals**
Source: own creation. Green color: positive aspect. Blue color: negative aspect. Orange color: not categorized.

Sometimes people forget that "publishing in an Open Access journal is not the only way to make an article freely available" (**West, Bergstrom & Bergstrom**, 2014, p. 1,317). There are two options or routes, which are not mutually-exclusive:

- Publishing the paper in an OA journal (Gold route).
  - In full OA journals. Article will be available in OA just upon publication, without any delay.
  - In embargo or delayed OA journals. Article will be available only after the embargo period is complete.
  - In hybrid journals. Article will be made OA only if APC is paid.

- Self-archiving the paper in an institutional or subject repository (Green route). If it is published in an OA journal, the publisher version can be used. If it is published in a toll-access journal, probably a pre-print or post-print version may be posted, after an embargo period or not.

### *2.2.1.3. Types of OA publishers*

First OA journals were full OA with APCs published by non-for-profit institutions BioMed Central and PLoS. Soon, university presses and learned societies launched OA platforms or converted their low-priced journals to OA. They do not usually apply APCs, but sometimes used embargo and also received funding from other sources[84].

Despite commercial publishers opted for discrediting OA in the first place, soon decided to make a step forward and launched APC-funded journals. They also "opened" some of their subscription-based journals for creating the so-called hybrid journals. Commercial publishers have argued that these are necessary for a transition to OA[85], but many OA advocates from the academic world saw this as an attempt to increase their benefits and retain their market control.

[84] See 2.3.4.2.
[85] In the UK, they stated that hybrid journals are some of the best titles in every discipline and their higher price is justified by their higher IF (**Publishers Association (UK)**, 2016).

In any case, hybrid journals do not seem to succeed, since "uptake of the hybrid option has averaged only 1-2%" internationally (**Björk & Solomon**, 2015, p. 94).

There is a growing effort for flipping subscription-based model to OA: substituting subscription revenues by APCs[86].

Many journals created and managed by societies and associations are still published by commercial companies. **Steinberg** (2015) criticized geographical societies, which, taking advantage of Open Access model, could recover their role as independent providers of scholarly information. Quality content can be achieved without the participation of commercial publishers, because publication costs can be supported by membership fees.

Other authors are not that optimistic about OA. For instance, **Morrison** (2016a) interviewed publishers of "small scholar-led" OA journals and reported that most were worried about their survival.

As to specific publishers[87], a search in DOAJ[88] retrieves that Hindawi (539 titles, 6% of all), BioMed Central (300), DeGruyter Open (268), Elsevier (166) and Springer (165) are the world's largest OA publishers.

Thus, commercial companies have not lost presence in the scientific publishing arena because of OA – they have even strengthened their position. They have increased their margin of profits in around a 30% in the last years, phenomenon called the "oligopoly" of the "major publishers" by **Larivière et al.** (2015).

#### *2.2.1.4. Policies and mandates*

Governments and public administrations are becoming more and more aware that outputs from their research investments have to be publicly available. Thus, they started to dictate mandates for self-archiving publicly-funded research articles.

The European Commission (EC) began implementing policies and measures related to OA in 2006. Its OpenAIRE project[89] (Open Access Infrastructure for Research in Europe) has the goal of offering an integrated platform for accessing all the research publications funded by EC's programmes. The Seventh Framework Programme (FP7)[90] was active during 2007-2013 and was followed by Horizon 2020[91]. Researchers whose works are funded by these programs must publish their works in Open Access, either at journals or repositories. Publication costs for OA

[86] See 2.3.4.2.
[87] According to Ulrich's (2.1.2.6.), world largest OA publishers were Hindawi and the Chinese Scientific Research Publishing.
[88] June 23, 2016.
[89] https://www.openaire.eu/
[90] https://ec.europa.eu/research/fp7
[91] http://ec.europa.eu/programmes/horizon2020/

journals (APCs) will be eligible for reimbursement by the EC, and articles will be collected by OpenAIRE portal afterwards, together with research datasets and the author's information.

The EC, by means of the mentioned FP7, funded FOSTER[92], "an e-learning platform that brings together the best training resources for those who need to know more about Open Science, or who need to develop strategies and skills for implementing Open Science practices in their daily workflows". It covers Open Science, Open Access, Open Data, Research Data management, policies and repositories, and addresses researchers, librarians, funders and more. Its objective is to support EU researchers in optimizing their visibility and impact and following a correct adoption of EU policies on OA.

Still in the EU, Pasteur4OA[93] (Open Access Policy Alignment Strategies for European Union Research) supports national members to implement OA policies for their publicly-funded research.

In the UK, Research Councils (RCUK) required that all outputs from research funded by its institutional members had to be published in OA, and allotted funds for APC payments (**RCUK**, 2013)

Melibea[94] database, managed by the Acceso Abierto Spanish research group, collects more than 600 mandate policies around the globe. A 65% belongs to academic and research institutions, and a 35% to funders, which can be public or private. An 85% of all the policies requires self-archiving while the remaining 15% only recommends it. The allowed period for self-archiving varies – a 38% of all the policies do not specify it, a 28% requires it upon publication, and the remaining 34% indicates "as soon as possible" or "upon acceptance". Melibea also estimates a score and a fulfilment percentage of an indicators' set created by **Suber** (2009).

Spain is the third country in the world with more policies registered in Melibea (34), just after USA (148) and UK (102). **Borrego Huerta** (2016) reported that a 58% of the articles resulting from research funded by the Spanish Ministry of Economy and Competitiveness[95] were available in journals (gold OA, 24%), repositories (green OA 22%), and websites and social networks (gray OA, 13%).

#### *2.2.1.5. Advocacy and lobby*

This PhD thesis does not focus on advocacy or policies, and tries to avoid political discussions. It is worth mentioning, though, that different regions and scientific communication systems vary significantly in their approaches to OA policies.

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[92] https://www.fosteropenscience.eu/
[93] http://www.pasteur4oa.eu/
[94] http://www.accesoabierto.net/politicas/?idioma=en. Last database update: April 2016.
[95] http://www.idi.mineco.gob.es/portal/site/MICINN/menuitem.dbc68b34d11ccbd5d52ffeb801432ea0/?vgnextoid=4657c24ff480d210VgnVCM1000001d04140aRCRD

Initiatives from wealthy countries are oriented towards APCs funding, which is criticized by OA experts and advocates from Latin America. The latter defend an OA model based on the so-called Platinum road within the Gold road. This is the model used in their countries, where the vast majority of journals are OA but do not charge APCs. The costs are covered by universities and research centers, which undertake publishing as a task that cannot be transferred to private companies. They also try to boost institutional repositories, something that does not seem to be the object of Western countries' policies.

Due to their commercial interests, private publishers wish to retain their control over the market. They do so by lobbying for the funding of APCs rather than supporting academia, imposing embargoes and self-archiving, and developing expensive hybrid options. A report addressed to the Association of Learned, Professional and Society Publishers (ALPSP) and The Publishers Association in the US (**Bennett** 2012) used a survey to argue that making journals free after a six month embargo will cause important losses to publishers. On the other hand, **PEER**[96], a co-funded project by the European Commission, concluded that not only do journals' permissions for authors to self-archive in repositories not prejudice publishers, but also plays in their benefit.

With regards to Latin America, Open Access is possible thanks to the advocacy of SciELO and Redalyc[97], which develop and maintain important OA journal platforms, La Referencia[98], which manages a federated network of institutional repositories, and the Latin American Council of Social Sciences (CLACSO)[99].

There are other international initiatives related to platforms and directories, run by academic institutions, as the mentioned SPARC (Scholarly Publishing and Academic Resources Coalition), DOAJ (Directory of Open Access Journals)[100], COAR (Confederation of Open Access Repositories)[101], OpenDOAR (Directory of Open Access Repositories)[102], ROAR (Registry of Open Access Repositories)[103] and ROARMAP (Registry of Open Access Repository Mandates and Policies)[104].

The main international organizations related to libraries and education have endorsed statements on Open Access. IFLA did so on 2003[105] and 2011[106], stressing the importance of OA for reducing information gaps, and emphasizing its benefits and sustainability. UNESCO and

[96] http://www.peerproject.eu/
[97] http://www.redalyc.org/
[98] http://lareferencia.redclara.net
[99] http://www.clacso.org.ar/
[100] https://doaj.org/
[101] https://www.coar-repositories.org/
[102] http://www.opendoar.org/
[103] http://roar.eprints.org/
[104] http://roarmap.eprints.org/
[105] http://www.ifla.org/publications/ifla-statement-on-open-access-to-scholarly-literature-and-research-documentation
[106] http://www.ifla.org/files/assets/hq/news/documents/ifla-statement-on-open-access.pdf

COAR published a joint statement[107] in May 2016, claiming that switching a subscription-based model to a pay-to-publish model would harm institutions with smaller budgets and developing countries, as they would not be able to fund APCs. They also defended the need of avoiding even further concentration in the international publishing industry, something that could be done by transferring subscription costs to OA publishing costs (e.g. SCOAP3) and supporting initiatives on repositories.

At this stage, it is clear that Open Access advocacy/lobby is global, but approaches change depending on the points of view and interests of the advocates, and the policy and decision-makers.

#### *2.2.1.6. Current situation and future vision*

Currently, there is a lot of discussion on the future of Open Access publishing.

**Björk** (2004) identified the barriers that Open Access journals could help to overcome. Those consisted in legal framework, IT structure, business models, indexing services and standards, academic rewarding system, marketing, and critical mass. Almost ten years later, the same author (Björk 2013) reported that most of them were already left behind. The academic rewarding system is the biggest reamining obstacle – this is what **Odlyzko** (1997) called "perverse incentives" in scholarly publishing[108], referring to authors' tendency to publish in expensive journals. More marketing and critical mass is still needed, too.

According to the **Open Science Initiative Working Group** (2015, p. 1), "the scholarly publishing system has reached perhaps the most significant crossroads in its history". **Björk** (2016) also used the term "crossroad" to describe the present moment of Open Access publishing, with the opinion that big commercial publishers and academic social media, such as ResearchGate[109] and Academia[110], are "taking over". The former is on their way to monopolize journals market and the latter is becoming more and more important as a source for exchanging papers than repositories. **Laakso & Lindman** (2016) informed that, at least in the field of Information Systems, copyright restrictions do not seem to regulate self-diffusion by authors in academic social networks. What is more, papers posted to Academia.edu have 58% more citations than those published in other websites (namely personal and departmental pages) after five years (**Niyazov et al.**, 2016).

With regard to large international commercial publishers, it has been described so far[111] that they are predominant in the OA publishing market. According to **Larivière et al.** (2015), they exercise "oligopolistic control" in the subscription-based market, but there is a fear that they would do the same in the APC-payed model.

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[107] http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/news/coar_unesco_oa_statement.pdf
[108] See section on subscription prices, 2.3.3.
[109] https://www.researchgate.net/
[110] https://www.academia.edu/
[111] See section 2.2.1.3, on types of OA publishers.

Some experts think that OA is developing in a way that is different from the original purpose. According to **Schöpfel** (2015), it began as a community-driven model, but it has been conquered by commercial, institutional and political interests – and this is a risk because it may create new barriers and digital divides.

According to **Fecher & Wagner** (2016), academia is "once again" risking and losing control of its own content organization. In order to get rid of its "path of dependence" on commercial actors, Academia should innovate in scholarly publishing and research infrastructure.

There are also important discrepancies between approaches from the Global North and the Global South, wealth countries and emerging powers, the "center" and the "periphery", English-speaking countries and Latin America… Those aspects will be analyzed in next sections and chapters.

### 2.2.2. Global data

#### *2.2.2.1. OA journal publishing*

First free access journals appeared with the Internet, as "The Public-Access Computer Systems Review"[112] in 1990, "Surfaces"[113] and "Psycoloquy"[114] in 1991. These publications were directed by Bailey, Guédon and Harnad, who later became important researchers and advocates on OA.

During the 1990s, more and more free access journals were launched, and during the 2000s, on BBB's hand, re-use and self-archiving permissions were added to most of them. The development has been very different depending on the regions, and journals have adopted a diversity of OA types according to the nature of the publishers and their business models. Also, as mentioned in the previous section, sometimes "Open Access" is used as synonymous of just "free", or with different degrees of openness. For instance, DOAJ only includes full OA journals[115], having APCs or not, excluding free-access only, embargo and hybrid, which, precisely, are the favorite types of OA – if that is OA – by publishing companies. Embargo and hybrid OA are typical in developed countries, while more uncommon in LAC and Asia, for instance.

The work by **McVeigh** (2004), mentioned before, stated that Northern America and Western Europe accounted for a 90% of the journals indexed in ISI, but these were only a 40% of the OA journals in the world. Less than a 2% of those were OA, while a 15% belonged to the Asia-Pacific region and a 40% to the LAC region. Thus, one may say that OA grew more in the periphery and developing countries, perhaps because of the lack of an academic publishing industry. **Haider** (2005) reported that, according to Ulrich's, the world distribution of OA journals was as follows: 31% for Northern America, 28% for Western Europe, 15% for LAC, 13% for Eastern Asia/Pacific, 7% for Eastern Europe/Central Asia, 6% for South Asia, 2% for Africa/Middle East.

[112] https://journals.tdl.org/pacsr/
[113] http://www.pum.umontreal.ca/revues/surfaces/home.html
[114] http://www.cogsci.ecs.soton.ac.uk/cgi/psyc/newpsy
[115] **Olijhoek, Bjørnshauge & Mitchell** (2015)

Continuing with Ulrich's, **Abadal** (2012) reported the existence of 11,000 OA journals, 6,798 of which were peer-reviewed. Currently, there are 12,858 records of OA journals, but they represent only 8,202 titles, of which 5,631 are peer-reviewed.

DOAJ is a more reliable than Ulrich's for analyzing OA journals worldwide. It is publicly available online, and various studies use its data. **Walters** & **Linvill** (2010) examined the characteristics of 663 journals in DOAJ, both at journal and at article level, specialized in biology, computer science, economy, history, medicine and psychology. They included only active, peer-reviewed, English language content (at least partial). They found that there were important differences in size, because the biggest journals published 2,700 articles per year, while half of the journals published 25 articles or less. They concluded that the panorama of OA publishing is strongly influenced by some key publishers and journals – they do not specify which, but they refer to PLoS, BioMed Central and Oxford University Press. They recommended analyzing articles and not journals because articles are the scientific unit, what is read and used. Yet every journal has its own characteristics, publishing criteria, publisher type, business model, etc., and all these features will influence the selection of articles. For this reason, the present study focuses on journals examining them as the vehicles for scientific communication.

Regarding the total number of journals indexed in DOAJ, **Greco et al.** (2006) reported that there were 757 as for Feb. 2004, most of them created in the late 90s. One year later (May 2005), **Haider** (2005) informed twice that number (1,535). **Laakso et al.** (2011) studied a stratified sample of the approx. 5,000 titles that were indexed in DOAJ by then. They also informed of an annual increase of 18% for journals and 30% for articles. The authors identified three periods: pioneer years (1993-1999), innovation years (2000-2004), and consolidation years (2005-2009).

**Ware** & **Mabe** (2015) informed of 10,090 journals (7,245 published in English) listed in DOAJ. There are currently 11,604 OA journals indexed in DOAJ[116], and a lower number (10,908) in Ulrich's[117] . Comparing current data (table 10) with that from **Abadal** (2012, table 9 ), it is clear that "peripheral" countries are on the rise. Brazil has taken over position number one, which belonged to USA for a long period. The difference between them is little, though (9.7% for Brazil, 9.2% for USA).

[116] Doaj.org, consulted April 26, 2016. On May 11, 2016, DOAJ removed about 3,000 journals that failed to submit a valid re-application before a given deadline. Consequently, the number of journals went down to about 8,800. Nevertheless, there were over 5,000 submitted re-applications waiting to be assessed at that moment (https://doajournals.wordpress.com/2016/05/09/doaj-to-remove-approximately-3300-journals/).

[117] Ulrich's was consulted on March 26, 2016 (http://www.ulrichsweb.com/). Queries used: Active, Journal, Scholarly/Academic, Refereed/Peer-reviewed, Open Access, Primary Source.

| | Country | Titles |
|---|---|---|
| 1 | United States | 1362 |
| 2 | Brazil | 688 |
| 3 | United Kingdom | 534 |
| 4 | Spain | 409 |
| 5 | India | 388 |
| 6 | Germany | 244 |
| 7 | Canada | 235 |
| 8 | Romania | 223 |
| 9 | Italy | 197 |
| 10 | Turkey | 194 |

**Table 9 – DOAJ titles published by top countries**
Source: **Abadal** (2012).

The other important Ibero-American country is Spain, with a 5.5% of all the titles in this directory. The rest of LAC countries are not relevant, and the same applies for Western countries – except Germany, the rest is under the 3%. From BRICS, apart from Brazil, only India's case is significant (4.7%). According to **Schöpfel** (2015), these two countries (Brazil and India) publish about a 17% of all OA journals in the world, which seems to be in line with DOAJ data. Other important countries in DOAJ are Egypt, Poland, Indonesia and Iran.

The number of OA journals in both Ulrich's and DOAJ follow a very strong correlation (0.87 Pearson value). However, quantities are usually lower in Ulrich's than in DOAJ[118] for every country, except for USA (over a 25% more). Germany and India also have more journals in Ulrich's, but the difference is not significant. On the other hand, Egypt has much more titles in DOAJ – this is due to the publisher Hindawi, which has offices in many countries and appears in Ulrich's with other nationalities (i.e. USA). World percentages of OA journals are higher in Ulrich's, meaning that DOAJ coverage is wider or more comprehensive.

| | Ulrich's | | | | DOAJ | |
|---|---|---|---|---|---|---|
| **Country** | **n** | **%** | **OA** | **%** | **OA** | **%** |
| USA | 14,261 | 20.72% | 1,339 | 19.10% | 1,069 | 9.21% |
| UK | 7,955 | 11.56% | 786 | 11.21% | 812 | 7.00% |
| Germany | 3,907 | 5.68% | 430 | 6.13% | 414 | 3.57% |
| India | 3,066 | 4.46% | 574 | 8.19% | 542 | 4.67% |
| Spain | 1,720 | 2.50% | 591 | 8.43% | 635 | 5.47% |
| Brazil | 1,694 | 2.46% | 1,045 | 14.90% | 1,127 | 9.71% |
| Poland | 1,292 | 1.88% | 327 | 4.66% | 404 | 3.48% |
| Iran | 567 | 0.82% | 331 | 4.72% | 353 | 3.04% |
| Indonesia | 363 | 0.53% | 313 | 4.46% | 354 | 3.05% |
| Egypt | 147 | 0.21% | 24 | 0.34% | 564 | 4.86% |

**Table 10 – Journal and OA journal global production**
Source: Ulrich's, DOAJ, May 2016. Only 10 first countries for every category selected. Sorted by world position according to journals in Ulrich's.

[118] If filtering criteria "primary source" is not used, the number of OA journals in Ulrich's grows dramatically, sometime overcoming the corresponding one in DOAJ.

When comparing the percentages of world journals by country, the tendency changes after the three "scientific central" countries[119], and "peripheral" countries usually have higher world OA percentages than Ulrich's global (Figure 14).

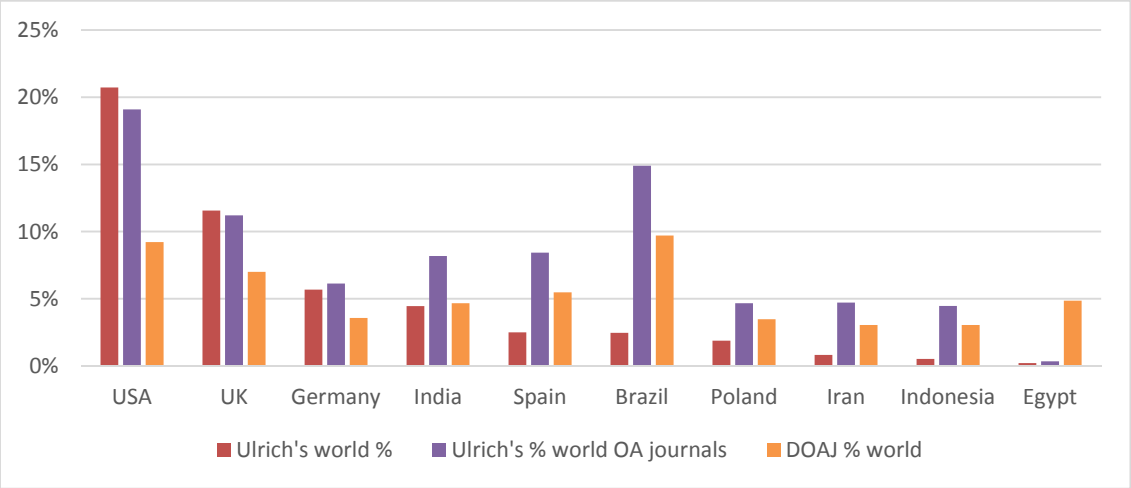
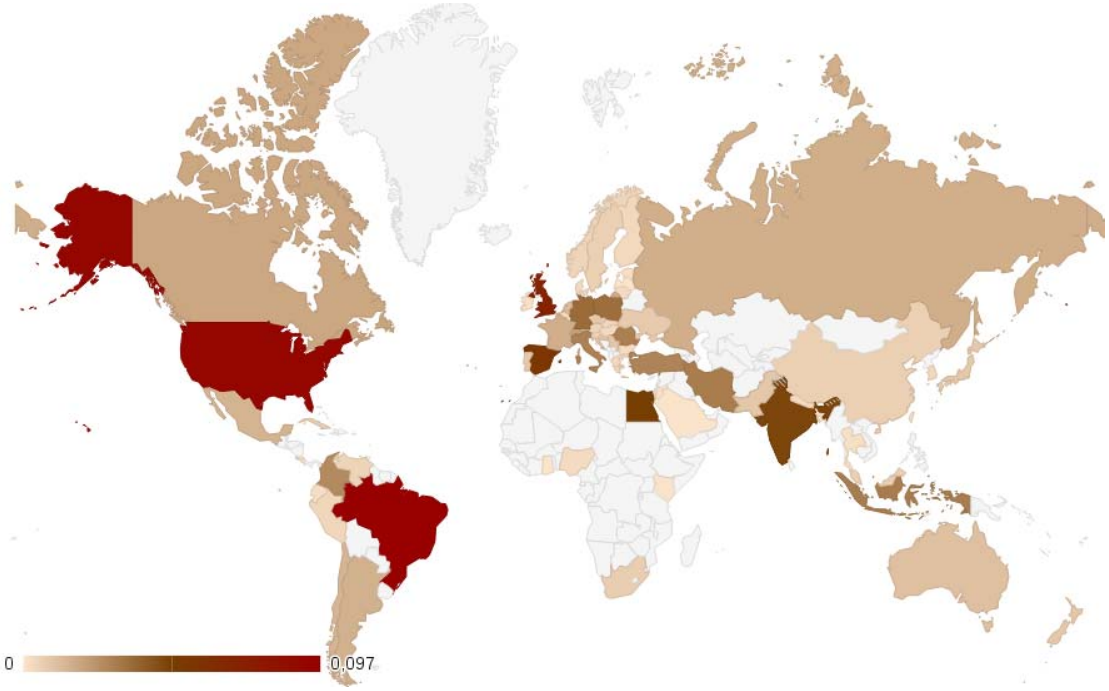



**Figure 14 – Percentage of world journals by country**
Data from Table 7. Only top 10 publishing countries from DOAJ selected. Countries sorted by their % of world journals in Ulrich's.

The world distribution of DOAJ journals shows that some of the Western countries have lost ground in favor of LAC countries (Brazil above all), Spain, India and Egypt. On the other hand, Russia and China still lag behind (Figure 14). The heat map produced by **Herb** (2014) reported similar results.




[119] The Netherlands are out of this analysis because of its low number of OA journals.

**Figure 15 – Country OA journal production**
Source: DOAJ.

Regarding publishers of DOAJ journals, the **Universitat Oberta de Catalunya** (2013)[120] published a world map showing them all (Figure 16). One can clearly see that their presence is mostly in the USA, Latin America, Europe, Middle East and Eastern Asia.


**Figure 16 – DOAJ publishers**
Source: UOC[121], March, 2014.

Currently[122], Hindawi is the largest publisher in DOAJ, with a 6% of OA journals. Almost all are published in Egypt. BioMed Central (3.3%), DeGruyter Open (2.9%), Springer (1.9%) and Elsevier (1.74%) follow.

**Solomon** (2013) studied the characteristics of the publishers of OA journals indexed in Scopus, and classified them into six categories: professional[123], society, university, research, government, and others. These categories will be used in this study[124]. The most important conclusions were that universities and associations produce a 50% of the journals and a 43% of the articles, and that commercial publishers accounted for one third of the journals and a 42% of the articles. Most of these journals flipped from subscription to OA, except those published by companies and research institutes. Titles on SSH were published mostly by associations and universities of the "periphery". Journals by commercial publishers were mainly on Biomedicine, Mathematics and Engineering. About ¼ of journals were hosted in national and international online platforms, especially in Latin America (i.e., SciELO and Redalyc), Eastern Europe and Asia,

[120] This electronic resource was no longer available at http://labs.biblioteca.uoc.edu/test/doaj/ by, at least, March 2016. According to UOC library, it will be published again, with new data (not yet available on Aug. 14, 2016).
[121] http://labs.biblioteca.uoc.edu/test/doaj/
[122] DOAJ.org, consulted May 16, 2016. DOAJ was experimenting cancelations and creations of new journals records by then (see https://doajournals.wordpress.com/2016/05/09/doaj-to-remove-approximately-3300-journals/)
[123] Meaning commercial or for-profit.
[124] See 3.3.1.

and were published by universities and associations that did not require APC payment. According to the author, this type of collaboration between governments, universities and societies can help expand Open Access.

According to Ulrich's[125], there were 7,263 active OA scholarly journals, of which the major publishers were Hindawi (576 journals, 7.9%), BioMed Central (264, 3.6%), Medknow (220, 3%) and SpringerOpen (136, 1.9%). Despite that, **Morrison** (2016) collected data from various publishers' sites and stated that in May 2016 Elsevier was the largest OA journal publisher. There were 511 full OA journals by Elsevier, while De Gruyter was second with 435 and Hindawi third with 405. This information is completely different from DOAJ's, maybe because DOAJ takes a long time to include/exclude titles or publishers are not sending their applications straight away.

#### *2.2.2.2. Adoption of Open Access publishing in scholarly journals*

Degree of adoption of OA varies very much depending on the region. **McVeigh** (2004) calculated that only 2.7% of all ISI journals were OA, ranging from 42.3% in LAC to 1.1% in Western Europe. Asia-Pacific region accounted for almost 15%, Middle East/Africa 9%, Eastern Europe 7% and North America 1.5%.

WoS does not provide data on % of OA adoption for regions or countries, neither does DOAJ. For that purpose, Ulrich's is, despite its limitations, a proper source.

The work by **Haider** (2005), already described in 2.1.2.1., included data from Ulrich's database and DOAJ. Her methodology is very interesting, because she was able not only to picture a world map distribution by countries, both for journals and OA journals, but also to obtain the proportion of OA journals for every country, information that Ulrich's provides.

**Haider** found, that, among the top 25 publishing countries for all journals, 7 were not high-income. Regarding the OA world journal publication, there were 11 in that category, including Brazil the in 3rd position and India in the 5th. Northern America and Western Europe accounted for the 59% of all OA journals published in the world.

The proportion of OA seems to grow in line with the lack of resources. High-income countries only published a 6% of its online journals in OA, low middle income countries published a 10% of its online journals in OA and low income countries a 34%. Upper middle income countries are the exception, with a 32% of OA journals. When assigning these data to the specific regions, the proportion of OA journals in Western Europe and Northern America is 6%, in Southern Asia is 7%, in Africa and Middle East is 8%, in all Asia/Pacific area is 15%, and in LAC, the clear leader, is 51%. LAC publishes the 18% of all world OA journals on health sciences, and the 26% on biology and life sciences. Brazil was the third world power in OA journal publishing, only after USA and UK, which were the first two in the total of journals published.

[125] Consulted May 16, 2016.

**Abadal** (2012) reported that OA journals were about a 12-13% of the total, according to Ulrich's. Searching by all journals or only peer-reviewed did not change the global proportions, but the adoption of this model varied much depending on the country (Table 11). Brazil was already leading (59% - 66%), followed by other "periperhal" or emerging countries (Romania, Turkey, Spain, India), while those countries where the commercial publishers were predominant had very little percentages (USA 9%, UK 4%).

| Country | Total journals | Open access | % | With peer review | Open access | % |
|---|---|---|---|---|---|---|
| Brazil | 1735 | 1024 | 59.02 | 568 | 374 | 65.85 |
| Romania | 782 | 387 | 49.49 | 408 | 175 | 42.89 |
| Turkey | 778 | 295 | 37.92 | 391 | 184 | 47.06 |
| Spain | 2280 | 600 | 26.32 | 559 | 191 | 34.17 |
| India | 3187 | 655 | 20.55 | 2102 | 489 | 23.26 |
| Canada | 1811 | 341 | 18.83 | 1241 | 255 | 20.55 |
| Italy | 2844 | 274 | 9.63 | 1667 | 195 | 11.7 |
| USA | 25050 | 1927 | 7.69 | 18057 | 1549 | 8.58 |
| Germany | 4805 | 331 | 6.89 | 2626 | 223 | 8.48 |
| United Kingdom | 13759 | 595 | 4.32 | 11263 | 476 | 4.23 |

**Table 11 – Country journal production and OA journal adoption**
Source: **Abadal** (2012), with Ulrich's data.

Current Ulrich's data show similar results. If top 10 countries from DOAJ are selected (Table 12[126]), countries with the highest relative adoption are Brazil (62%) and Spain (34%). India represents the 19% and Poland the 25%. Values for Indonesia (86%) and Iran (59%) are also remarkable, although they come from a lower index of journal production. On the other hand, adoption is still very low for Western countries but they are improving (figures from USA, UK and Germany range between 9 and 11%).

| | Ulrich's | | | | | DOAJ | |
|---|---|---|---|---|---|---|---|
| **Country** | **n** | **%** | **OA** | **%** | **Country %** | **OA** | **%** |
| USA | 14,261 | 20.72% | 1,339 | 19.10% | 9.39% | 1,069 | 9.21% |
| UK | 7,955 | 11.56% | 786 | 11.21% | 9.88% | 812 | 7.00% |
| Germany | 3,907 | 5.68% | 430 | 6.13% | 11.01% | 414 | 3.57% |
| India | 3,066 | 4.46% | 574 | 8.19% | 18.72% | 542 | 4.67% |
| Spain | 1,720 | 2.50% | 591 | 8.43% | 34.36% | 635 | 5.47% |
| Brazil | 1,694 | 2.46% | 1,045 | 14.90% | 61.69% | 1,127 | 9.71% |
| Poland | 1,292 | 1.88% | 327 | 4.66% | 25.31% | 404 | 3.48% |
| Iran | 567 | 0.82% | 331 | 4.72% | 58.38% | 353 | 3.04% |
| Indonesia | 363 | 0.53% | 313 | 4.46% | 86.23% | 354 | 3.05% |
| Egypt | 147 | 0.21% | 24 | 0.34% | 16.33% | 564 | 4.86% |

**Table 12 – Country journal production and OA adoption**
Source: Ulrich's, DOAJ. Only 10 first countries for every category selected. Sorted by world position according to journals in Ulrich's.

[126] It is equal to Table 10, but adding a column for % of national OA adoption.

This phenomenon is easier to observe in Figure 17.

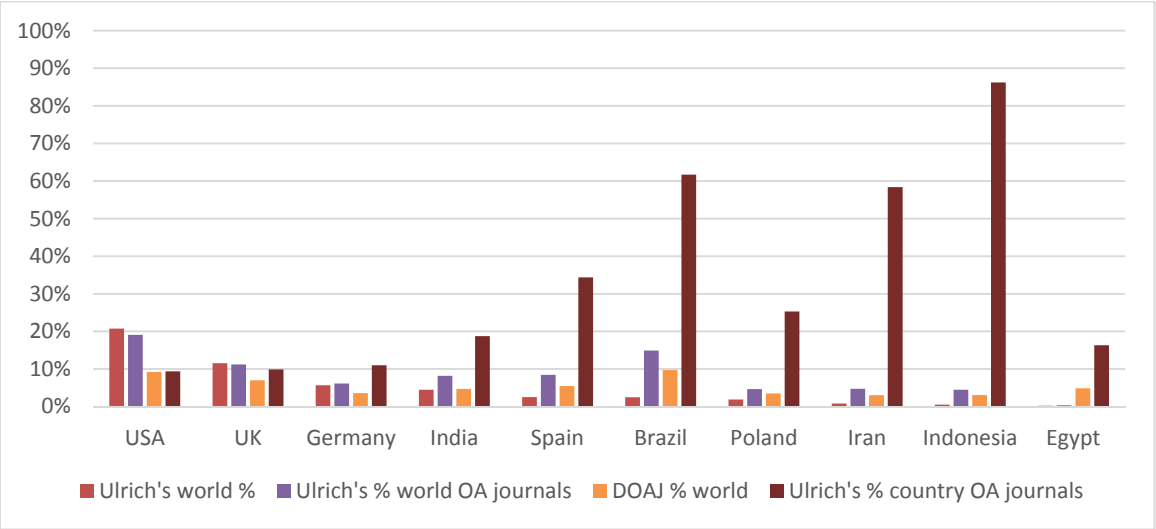



**Figure 17 – Country journal production and OA adoption**
Source: Ulrich's, DOAJ. Only 10 first countries for every category selected. Sorted by world position according to journals in Ulrich's.

Next world map (Figure 18) clearly shows which countries have the highest proportion of OA journals: Ibero-American and some Middle East and Southeast Asian countries. Not every BRICKS country reaches the same level of adoption. Brazil (62%), India (19%) and South Africa (22%) are doing well, but South Korea (8%), Russia (7%), and China (1%) perform very poorly.

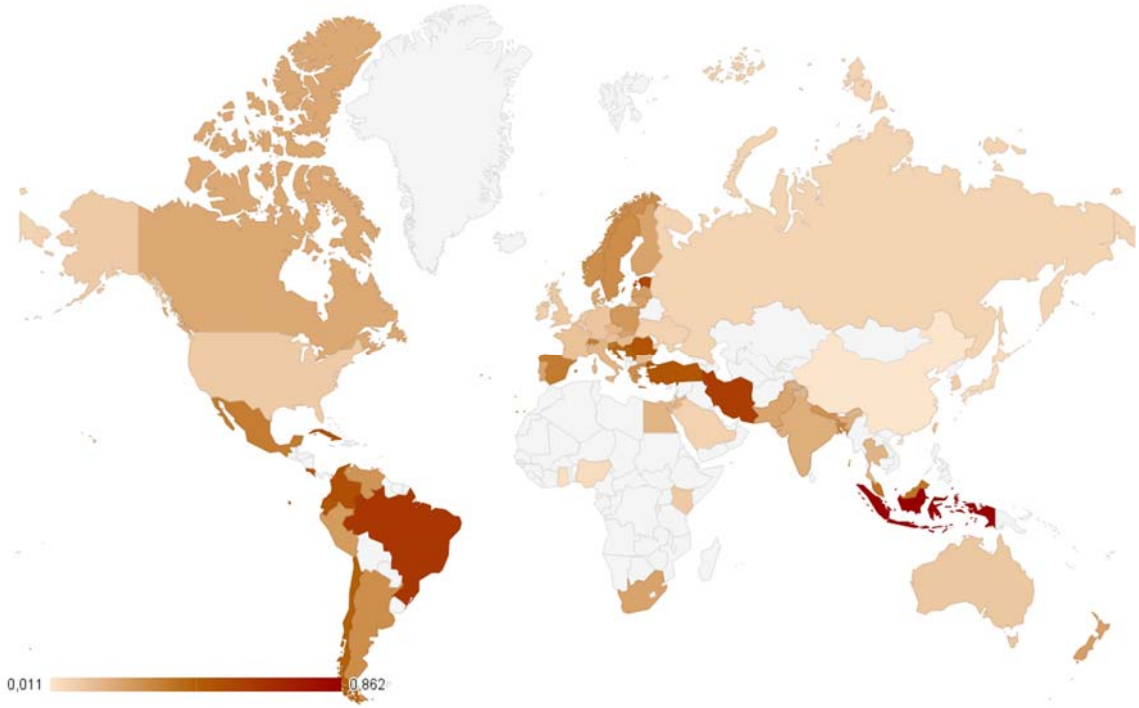



**Figure 18 – Country OA journal adoption**
Source: Ulrich's, May 14, 2016.

*2.2.2.3. OA article production*

Although this study focuses on journals and not articles, it is interesting to have a look at some recent "scientific production" or "research output" data.

In 2008, an 8.5% of the world journal articles was available in OA journal websites, and a 11.9% of the pre-prints in repositories (**Björk et al.**, 2010). Overall, earth sciences (33%) had the highest proportion (33%) and chemistry the lowest (13%). Regarding journal articles, the major subject areas were medicine, biochemistry and chemistry, while the rest was more frequently found in repositories.

In 2011, OA journal articles were estimated to reach the 12%, plus a 5% more if delayed or embargo access was considered. About a 10-12% was accessible via repositories (**Ware & Mabe,** 2015).

**Gargouri et al.** (2012) analyzed journal articles available at ISI (WoS), considering its 14 disciplines and DOAJ data. They found that OA reached a 14% in 1998, and raised to 18% in 2000, 22% in 2005, and 23% in 2010 – therefore, the increase has slowed down. OA penetration depended much on the subject area: mathematics (42%), and earth and space sciences (37%) were the disciplines where OA penetrated the most, while chemistry (9%) and biomedicine (12%) the least. This data seems to be in line with the findings by **Björk et al.** (2010), mentioned before. In any case, all subject fields have grown, except social sciences, which staid between the 37% and 38%, and A&H, from which there was no previous data.

**Archambault et al.** (2013) analyzed OA evolution in journal articles comparing data from Europe, Brazil, Canada, Japan and USA. According to this study (performed by Science-Metrix for the European Commission[127]), the proportion of OA articles was higher in comparison with previous estimations, exceeding the 50% in Brazil, Switzerland, Netherlands and USA, and especially in biomedicine, biology, mathematics and statistics. Gold OA (in journals) was advancing more than Green OA (in repositories). Figure 19 shows that the total of OA articles (blue color) is steadily growing, while articles from OA journals (red) are growing more than articles from repositories and hybrid journals (green). These data are quite in line with estimations of **Laakso et al.** (2011), who indicated that there was an annual increase of journals and articles in DOAJ.

[127] http://europa.eu/rapid/press-release_IP-13-786_en.htm [consulted May 2, 2016].

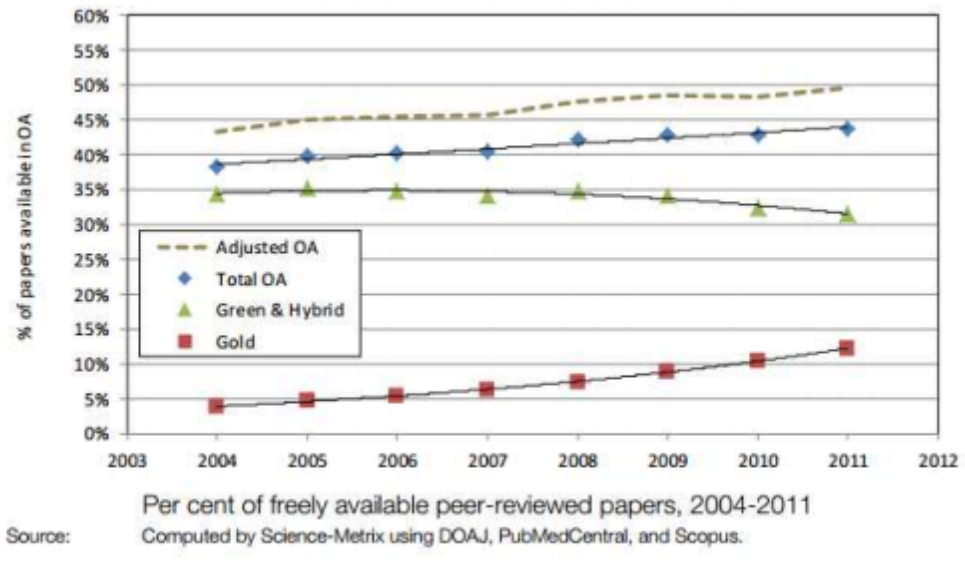



**Figure 19 – "Per cent of freely available peer-reviewed papers, 2004-2011"**
Source: **Archambault et al.** (2013)

### 2.2.3. Regional and country data

#### *2.2.3.1. Northern America*

There are big differences between USA and Canada at all publishing levels. Although USA is no. 1 in journal publishing (world 28.4% according to Ulrich's), JCR (39.4%) and Scopus (27.4%), and no. 2 in DOAJ (9.2%), its adoption of OA is low (only 8%, no. 51 in the world). Yet, a 21.8% of its DOAJ journals are indexed in JCR.

Canada is only no. 12 in Ulrich's (world 1.61%), and its importance in JCR and Scopus is much lower (less than a 1.4% in both). With regard to OA publishing, its presence in DOAJ is similar (1.8%), but its national adoption of OA is higher than in the US (15.6%).

#### *2.2.3.2. Latin America*

Latin American journals have widely adopted a full Open Access model. From the total of 8,413 journals in Latindex catalog[128], only 663 journals (7.9%) are active and OA, SciELO hosts 1,105 Ibero-American OA journals[129] and Redalyc 1,093[130]. The latter includes inactive titles, but does not include South African ones, while SciELO does.

SciELO OA journals do not distribute equally by country – or, at least, relative weight of countries is different from the general journal numbers in Latindex. Thus, from the total of 1,167 ongoing

[128] http://www.latindex.org/latindex/gCatalogo [consulted April 18, 2016]
[129] http://www.scielo.org/, [consulted April 18, 2016]. Total number of journals hosted is 1,249, but only 1,167 are active. From those, 62 belong to South Africa.
[130] http://www.redalyc.org/coleccionHome.oa [consulted April 18, 2016]

publications, Brazil accounts for a 24.2%, Colombia for a 17.8%, Mexico for a 12.5%, Argentina for a 10%, Chile for an 8.1%, South Africa for a 5.3% and Cuba for a 4.9%, followed by others. Spain has only 38 active OA journals in SciELO (3.2%). Even South Africa, which is not Latin or Ibero-American, has more titles in the platform. This is due to the fact that SciELO does not accept Spanish journals beyond the reduced group of titles on biomedicine from Carlos III Healh Institute (**Repiso,** 2014).

Redalyc follows a similar distribution by country, but Spain recovers a major position – Brazil accounts for a 19.4%, Mexico for an 18.8%, Colombia for a 17.5%, Spain for a 13%, Chile for a 7.7%, Argentina for a 6.7%, and others.

SciELO is based in Brazil and Redalyc in Mexico, and this fact may explain some of the biases towards or against these countries. In any case, both OA platforms are responsible for the proliferation and visibility of Ibero-American journals, although their international impact is yet low. Main languages are Spanish and Portuguese, with low but growing presence of English.

Apart from this regional information resources, Ulrichsweb and DOAJ also provide evidences of a great level of OA adoption in LAC. Thus, despite the fact that this region accounts for only a 2.9% of all the world journals, it is responsible for a 12.6% of the OA journals in Ulrichsweb and a 18.7% in DOAJ. Their average of national OA adoption is 62.1%, and they barely charge any APC. It means that they mostly follow the so-called "Platinum OA" or "non-commercial OA" – i.e., they are mainly publicly-funded or subsidized. To do so, they need to follow specific management strategies and optimize editorial policies and workflows (**Santillán-Aldana & Lima-Leite**, 2015). SciELO, Redalyc and OJS are helping much to this. Specially in Brazil, academic libraries usually undertake publishing tasks[131].

**Alperin** (2014) studied LAC journals crossing data from the "regional" sources SciELO, Redalyc and LATINDEX, and the "international" DOAJ, Ulrichsweb and WoS, and found that coverage by the latter was not proportional and was biased towards the "global North"[132]. There is a statement that has to be fully reproduced, because it summarizes what many Latin American researchers think on OA publishing: "Unlike the global North, developing regions have not ceded the responsibilities of communicating scholarship to for-profit commercial publishers. So, while in the United States and Europe debate between 'green OA and 'gold OA', and whether to adopt author-pays models, regions like Latin America are expanding their research production improving the quality of the publications and starting to produce alternative indicators of access, reach, and quality of scientific communications through non-for prof- it publicly funded models. Despite the noticeable contributions and the local and regional improvements, developing regions have been noticeably absent from the global conversation around OA." (**Alperin**, 2014, p. 68).

[131] For example, Portal de Periódicos UFSC (https://periodicos.ufsc.br/), which is managed by the UFSC Library in Florianópolis, Brazil.

[132] Quotation marks have been used for "regional" and "international" because all those sources are actually international.

Ibero-American journals indexed in WoS and Scopus (mostly Spanish and Brazilian) are Open Access in an 82% (**Rodrigues & Abadal,** 2014a). Nevertheless, differences among countries are important – for instance, the % of OA journals in Brazil is 97% while in Spain only 55% (**Rodrigues & Abadal,** 2014b). These proportions are much higher than those reported by other authors and provided by Ulrich's[133].

Following **Rodrigues & Abadal** (2014b), APCs were rare in Brazil (only 10% journals), and almost inexistent in Spain.

SciELO served as a common platform for the 78% of Brazilian journals, while the rest used OJS. There was no common platform in Spain – a 50% of the journals used their own, and the remaining half used OJS or commercial publishers' websites.

According to **Rodrigues & Abadal** (2014b JASIST), the high adoption of OA in Brazil (97%) is due to the contribution of six key stakeholders: SciELO, National Council for Scientific and Technological Development (CNPq), universities, CAPES Qualis quality system, Brazilian Institute for Science and Technology Information (IBICT), and Brazilian Association of Scientific Publishers (ABEC).

Regarding other countries, **Santillán-Aldana** (2013) reported that 69 Peruvian journals were indexed in LATINDEX and DOAJ at the same time. Most of them were published by universities in Lima and corresponded to medicine subjects.

#### *2.2.3.3. Asia*

"Open Access is of vital importance to developing countries which often do not have the capital necessary to access scholarly literature" (**Sharma**, 2014, p. 2). And so is for Asia. Nevertheless, its development is different among countries, depending on their own scientific publishing system specifications. For instance, India is a power in OA journal publishing, while China is not. OA awareness and popularity also varies from country to country – in general it is low, but it is growing.

More and more authors from Japan are publishing in OA journals, but there is no OA directive in the country and there is a lack of studies on journals. It is something strange for a country that has a 6-10% of the world scientific output in articles (**Sharma,** 2014) although this has decreased from 9% to 5% in 2013 (**Wang,** 2015). There are currently only 98 OA journals indexed in DOAJ[134], from which only 2 have APCs.

Regarding China, **Xian** (2006) reported that only a 5.7% of the journals was immediately OA and an 8.6% was embargoed. Later, **Cheng & Ren** (2008) found that the % of OA varied from 4% to 23%, depending much on the subject – higher proportions were for biology and chemistry. **Hu**

[133] See 2.2.2.2.
[134] Doaj.org, consulted April 22, 2016

(2012) analyzed the 2,960 journals indexed in the Chinese National Knowledge Information (CNKI) – only a 5% was Open Access, from which only 22.4% was immediately OA.

**Xiao-Jun et al.** (2012) testified to the low popularity of OA within researchers, and stated that corporations' private interests were hindering the progress of OA in China. The Plan for Innovation of the Scientific Publishing system imposed that all journals should be managed as companies and will be required to pay taxes, reaching a 30% of benefits. According to the authors, this caused that most journals should search for capital by means of publicity, APCs and royalties for author's rights cession – all these are bad news for OA. On the other hand, **Sun & Mao** (2012) described the same situation – the introduction of private funding and for-profit organizations – but from another point of view. According to them, this fact was accelerating and fostering the progress of Chinese scientific publishing industry.

**Cheng et al.** (2012) found that OA in core STM journals represented the 8.9% of the 1,608 journals in 2006, and 34.4% of the 1,868 journals in 2010. Universities were the largest OA publishers with a 41.6%, followed by associations and societies (26.5%) and research institutions (23.5%). OA journals published by companies were almost inexistent (0.3%). Most populated subject categories were "university journal" (a sort of multidisciplinary journals published by universities, 31.3%), medicine (20.2%) and technology (16.7%).

Regarding SSH journals, **Hu** (2012) reported that 147 (4.9%) of the 2.960 SSH journals indexed in the CNKI were OA. The number of journals by discipline was unequal – politics (27.2%) and economics (20.4%) accounted for almost half of all OA journals, while other disciplines such as philosophy & religion (4.1%) and arts (1.4%) were residual. The author highlighted the low popularity of OA in China, and the lack of online visibility and internationalization of Chinese scientific journals.

Continuing with SSH, **Guo et al.** (2014) analyzed 714 journals listed in 2012 in the Chinese Social Sciences Citation Index (CSSCI)[135]. Almost a half (45.1%) was published by universities, a 23.1% by research centers and an 11.3% by professional associations. Government agencies accounted for only a 3.4% and commercial companies for a 4.2%. The proportion of OA journals was of the 13.7%. It was quite balanced for publisher types, since, apart from government agencies that offered a 20.9% in OA, but only out of 24 titles, it was a 15.2% for titles published by universities, a 13.3% for commercial publishers, and an 11.5% for research institutions. Only professional associations had a very low proportion of OA journals (6.2%). However, the adoption of OA in Chinese SSH journals varied a lot across the different specific subject areas (e.g. there were no OA journals at all on archaeology, statistics, literature, art and philosophy).

Applying Hu's study (**Hu**, 2015) to CNKI data, OA journals on STM reached an 18.9% and on SSH reached an 11.2%. Globally, a 15.9% of these Chinese scientific journals were OA. These proportions are in line with **Guo**'s study, just described, which indicated that a 13.7% of Chinese journals listed in CSSCI were OA.

[135] Despite its name, it also includes Arts & Humanities.

Thus, the degree of OA adoption was very low in China, both in STM and SSH journals. An exception were STM journals published by the China Association for Science and Technology (CAST), sponsoring 1,003 journals – a 24% of them were OA, a much higher proportion than the global (**Shao et al.**, 2013). There was almost no use of the English language in OA journals, e.g. none in the 13.73% of OA journals on SSH analyzed by **Guo et al.** (2014) used English. More public effort, both in policies and funding, should be provided in order to support the transition to OA models and the internationalization of Chinese science.

As mentioned before, China was to overtake the USA and EU in terms of research output, and, according to some sources, it has already done so. **Sharma** (2014) connected that trend to the fact that Chinese researchers were choosing to publish in OA – but in foreign journals. Nevertheless, CAST and NSFC are developing OA mandates for self-archiving and a growing attention is paid to publishing Chinese OA journals.

From the peer-reviewed and internationally-indexed Indian journals studied by **Ghosh & Das** (2006), 100 were OA, the major part published by only six large publishers and belonging to STM fields. From the mentioned 178 Indian peer-reviewed journals studied by **Sawant** (2009), only 3 charged APCs. **Mukherjee** (2014) detected a remarkable increase of OA titles during the period 2003-2012 in India, reaching 462 journals. From those, a 90.2% were on STM, and only a 9.78% on SSH, a 43% of these OA journals charged APCs (from $10 to $400), and almost all were indexed in DOAJ. **Sawant** (2015) informed of 590 OA journals, a 43% of which charged APCs – the same proportion collected by Mukherjee.

Currently, DOAJ[136] indexes 542 journals[137], but only 14 (3%) charge APCs, which does not match with Mukherjee and Sawant information. Supposing that data collected by those authors is first hand and correct, DOAJ information might be really misleading. According to **Sawant** (2015) India was in the 9th position in the top DOAJ publishers in 2005 and reached no. 4 in 2015[138].

Open Access in India is a story of success. Apart from being one of the biggest publisher of OA journals, there are many repositories – 46 institutional, 5 of thesis and dissertations, and 3 of subjects (**Sawant**, 2015). Directives are in force, and every actor in the scientific publishing ecosystem is concerned with OA and takes it as the natural path. **Sharma** (2014) wrote that the Indian Academy of Sciences, established in 1934, and the current 300 universities have been key players for developing OA journal publishing in India, where a long tradition of English language also helps for internationalization.

[136] Doaj.org, consulted April 21, 2016.
[137] More than 600 according to **Sawant** (2015).
[138] India is DOAJ no. 6 publisher by April 23, 2016.

There are about 1,347 scholarly journals in South Korea, and the largest publisher type was learned societies. Over 50% of these journals are Open Access (**Sharma**, 2014). There are only 43 Korean OA journals listed in DOAJ[139], all of them without APCs.

#### *2.2.3.4. Africa*

**Ouya** & **Smart** (2006) surveyed a group of Sub-Saharan journal publishers and found a very limited knowledge of the OA movement. These publishers even showed a suspicious reaction in front of the possibility of OA publishing. **Nwagwu** (2013) also reported a low awareness on OA in African research and high education institutions, and the disinterest of governments.

The results from the survey by **Murray & Clobridge** (2014) were not much better. Two thirds of publishers indicated that their journals were OA, but they seemed a little confused with the concept – these publications may be online and available in free access, but they perhaps lack of specifications regarding re-use and licensing. The main problems for the development of OA journals were the loss of income comparing to previous subscription-based models and the lack of public funding.

**Smart & Murray** (2014) criticized the lack of attitude, public funding and support towards Open Access. African region is not following the steps of Asia and South America. Despite this, some initiatives and platforms[140] are helping to promote OA publishing and visibility. Those are Bioline International (18 journals, none South African), SciELO South Africa (63 ongoing journals) and AJOL (517 journals hosted, including 208 OA titles).

South Africa is the clear OA leader in the whole region (excluding Egypt, which sometimes is included in the Middle East region, like in SJR). **Raju et al.** (2015) reported the progress of OA in the country, both for repositories and journals. This was due to the improvement of IT infrastructure in research institutions, their substantial research output, and the participation of academic libraries in OA publishing processes. There is a number of universities providing OA platforms and services, such as the University of Cape Town, that hosts and provides OA to a 25% of its top journals (**Czerniewicz & Goodier**, 2014).

A current consultation in DOAJ[141] shows that, in fact, South Africa (84) and Nigeria (36) are the countries producing more OA journals in the continent; that, of course, excluding Egypt[142], with 564 journals (mostly by Hindawi, created after 2010 and published in English). The rest of the countries barely have any.

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[139] Doaj.org, consulted April 22, 2016.
[140] See 2.1.3.4.
[141] Doaj.org, consulted May 2, 2016.
[142] Egypt is sometimes not included in the African region, but in Middle East (e.g. in SJR, http://www.scimagojr.com/countryrank.php?area=0&category=0&region=Middle+East&year=all&order=it&min=0&min_type=it).

*2.2.3.5. Europe*

Regarding the penetration of OA, Europe can be clearly divided into three areas: the publishing world "center", Western and Mediterranean countries, and Eastern or Slavic ones.

UK, Netherlands and Germany are 3 of the 4 countries belonging to the scientific "center". They account for a 21% of all the world journal production, and benefit from good rates of indexation in WoS and Scopus[143]. Nevertheless, their long-time established publishing companies still manage most of the journals, and this fact may be hindering the penetration of OA, which ranges between a 9% and an 11% for all three (according to Ulrich's).

Western and Mediterranean countries behave very differently. Spain, that will be described later[144], is not a big scholarly publisher (it accounts for only a 2.5% of the world production), but it is the fourth DOAJ producer and has an adoption of a 34% of OA publications according to Ulrich's. It is the leader of this area. The other Ibero-American European country, Portugal, produces only a 0.6% of the world journals and only a 0.8% of DOAJ's, but has an OA adoption of 21%. France and Italy publish a similar number of journals than Spain, but lag much behind in DOAJ publication and OA adoption.

The study by **Anglada & Abadal** (2010) included some South European countries, such as France, Greece, Italy, Spain and Turkey, reporting a global proportion of a 9.4% of OA journals. Spain had the highest absolute proportion, but a low relative one (13.4%). These findings do not seem to match current data from Ulrich's, which indicate a national OA adoption of a 49%. Turkey and Portugal had the highest OA proportions (31% and 20%, respectively) and France and Italy the lowest (less than 5%).

Eastern European countries contribute very little to the world production of OA journals, except Russia (4%) and Poland (1.9%). Participation in DOAJ and adoption of OA are very different among these countries, though. Russia publishes only a 1.6% of DOAJ titles and has a national adoption of OA of only a 7%. On the other hand, Poland publishes a 3.5% of DOAJ's titles and its level of OA adoption is much higher (25%). Other small countries (in terms of scientific publishing) have little participation in DOAJ and publish a few titles, but an important part of them are OA. This is the case of Romania (48%), Serbia (44%) and Croatia (41%).

**Suchá & Steinerová** (2015) provided data on Czech Republic. Although only 78[145] Czech titles (19.5%) were indexed in DOAJ, full OA titles were supposed to account for a 43.4% (mostly published by universities) and hybrid journals accounted for a 9.7% (mostly published by public research institutes). Regarding the % of OA journals in disciplines, engineering sciences reached a 70%, natural sciences a 48%, military sciences a 38.5% and SSH a 37.3%. The few hybrid titles were distributed equitably. OA journals with IF reached the 54.2%, while hybrid journals with IF reached the 20.8%; OA percentages for Titles without IF were lower (42.5% and 8.6%, respectively). A 62.1% of the journals with all the peer-reviewed papers were OA and 48.5%

[143] See 2.2.2.2.
[144] See next section 2.2.3.6.
[145] 98 journals as per April 18, 2016.

hybrid. Main sources for funding both OA and non-OA journals was institutional budget, with very low proportion of APCs.

**Zemskov & Pavlov** (2015) provided a current insight on the progress of OA in Russia. They argued that socialism, before OA, was beginning to make knowledge public and share it. The point is that Russia is sixth in the world rank of journal publishing powers (according to Ulrich's) but they have poorly developed OA so far. Nevertheless, the long national history of grey literature published outside the commercial circuit is contributing to the understanding and improvement of Open Access. As a matter of fact, there is evidence of quick progress, since the authors reported the existence of 157 Russian OA journals in Ulrich's and 97 in DOAJ, and there were already 183 in the first source and 186 in the second by the time this report was being written.

Despite the lack of clear strategies and policies in force, OA publishing is a milestone in Poland. It is no. 13 in Ulrich's (a 1.9% of the world journals), and no. 8 in DOAJ (3.5%). Its OA adoption is high according to Ulrich's (25%). According to **Björk, Sylwestrzak & Szprot** (2014), the proportion is even higher (49.2%) for free access, but only a 1.35% of this was really OA[146]. This fact may demonstrate the will of publishing in OA, but a poor knowledge of its concept or the lack of regularization. OA level varied according to subject fields, being higher in agriculture (69%) and biology (64%), and lower in humanities (41%) and arts (37%).

#### *2.2.3.6. Spain*

The following data regarding the adoption of OA in Spain has been collected so far[147].

**Anglada & Abadal** (2010) informed that Ulrich's was indexing 271 Spanish OA titles, which was about 13.3% of all the national production. Of those, a 29.9% were peer-reviewed. DOAJ included 293 journals, a very similar number. A 46% of the latter were published by universities, a 22% by scientific societies, a 14% by research centers, a 9% by other actors and only an 8% by private companies. According to Dulcinea data, a 76% of all the journals allowed self-archiving (a 1% for pre-prints, an 82% for post-prints, and a 17% for both).

**Rodrigues & Abadal** (2014a) estimated that a 54% of the Spanish journals indexed in WoS or Scopus were OA. Later, **Abadal et al.** (2015) found that a 60% of the same population of journals were available in free access, but only a 48% was Open Access (gratis plus permission for self-archiving, or "libre OA").

Currently, the adoption of OA in Spanish journals reaches a 34% (world no. 16) according to Ulrich's, and represents a 5.5% of all DOAJ titles, where Spain was the fourth country with more journals, only after Brazil, USA and UK. It was also no. 4 in world OA production (8.4%), following Ulrich's.

[146] Authors used the terminology "gratis OA" and "libre OA".
[147] See 2.2.2 and 2.2.3.5.

According to **UOC** (2016), 111 of the 635 DOAJ Spanish journals were indexed in SJR. 45 of them were included in JCR as well, both from science and social science editions. All DOAJ-JCR titles were included also in SJR[148]. Thus, a 17.5% of DOAJ Spanish journals were indexed in SJR, while only a 7.1% of them were included in JCR. On the other hand, a 23.8% of all the Spanish titles in SJR were included in DOAJ, and a 36.9% of such titles in JCR appeared in DOAJ[149]. Since the proportion of JCR titles in DOAJ is larger than that of SJR, and, what is more, all journals from JCR are also in SJR, one could say that JCR is more selective with DOAJ titles (Figure 20). A deep study on the characteristics of these DOAJ journals would bring more light into this discussion.

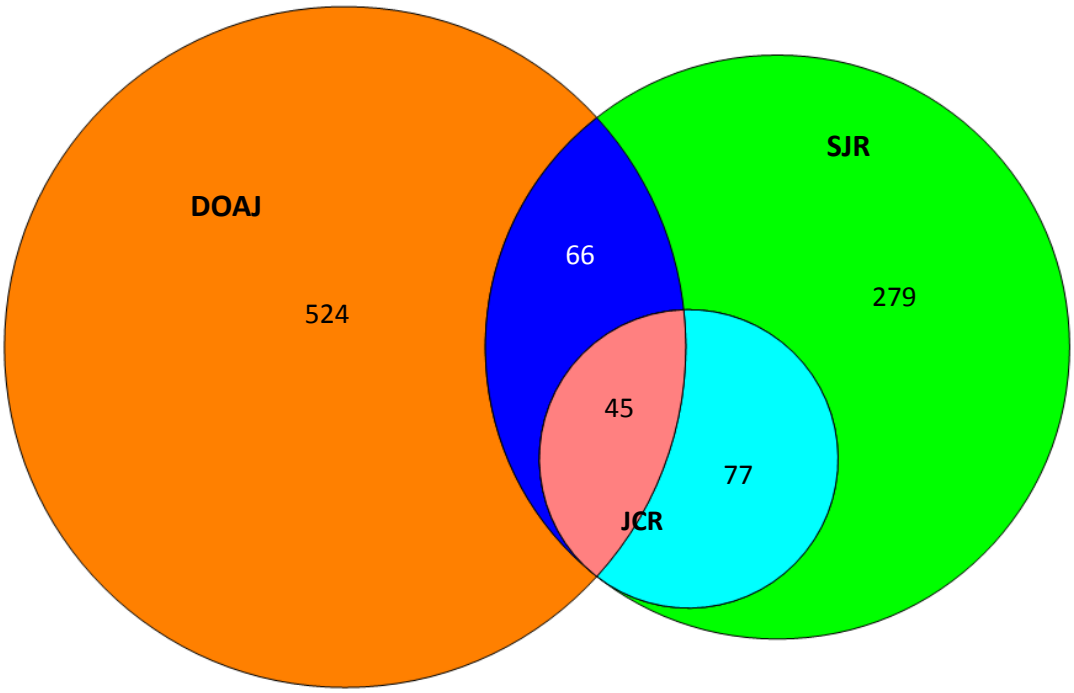


**Figure 20 – Spanish journals in DOAJ, SJR and JCR**
Source: DOAJ, **UOC** (2016), SJR, JCR. 77 journals indexed in JCR but not in DOAJ have been assumed to be indexed in SJR as well.

Spain is country no. 10 in the world rank of global scientific output[150], according to SJR. Since it is country no. 8 in journal production recorded in Scopus, one can say that the situation is balanced among journals and articles, or that Spanish authors tend to publish in national titles. A recent study with data from WoS for the period 2000-2011 (**González–Albo et al.**, 2016) revealed that this output was produced mainly by universities (66%), public research organizations (23%) and the health sector (18%). Associations and societies accounted for a 10% only, but had the highest impact values, regardless of the measure method. The highest impact,

[148] It has been done by crossing **UOC** (2016) tables.
[149] The total number of journals in JCR and SJR were not provided at **UOC** (2016) but they are available at their original sources.
[150] See 2.1.2.2.

though, was not obtained in subject areas in which producers were specialized. All these sectors tended to raise internationality in their publications.

Regarding Open Access, **Torres-Salinas et al.** (2016) qualified Spanish output as "big" but with "little impact". A 9% of its output in WoS was in OA journals, while the world average reached a 6%. Thus, Spain was country no. 4 in global output, and no. 2 in OA output (the first was Poland). Despite this, Category Normalized Citation Impact (CNCI) for Spanish OA journal output was 0.69, lower than the world average and one of the lowest in Europe. This is particularly bad, since CNCI for the global Spanish share was 1.15 (European medium-low class).

According to **Rodrigues & Abadal** (2014b), advocacy for OA in Spain had been mostly focused on IT development, training and recommendations, but without direct funding for journal publishing. Most significant initiatives have been aimed at developing legislative and regulatory frameworks, supporting FECYT, universities and research centers, and creating national indexes for journal quality evaluation, as an alternative to WoS and Scopus.

Section 37 of the Spanish Act 14/2011 on Science, Technology and Innovation[151] stipulates that all publications that financially supported by the national government must be self-archived in repositories. This is in line with the EC Horizon 2020, which allocates resources to sustain national R&D projects. There is a guide written by experts for implementing this section, including recommendations for decision makers, funders, universities and research centers, researchers and institutions subscribing to scientific journals (**FECYT**, 2014). Recently, this Act has been criticized for not being specific and clear enough; also at the same time it is insufficient as it is limited by the national intellectual property law in force (**Clabo Clemente**, 2015).

Apart from the Spanish central government, some regions and an increasing number of research institutions and universities have their own policies to rule over their authors[152].

There are a number of national initiatives on OA, such is the research group Acceso Abierto a la Ciencia. This group continuously analyzes the OA situation in Spain; manages and maintains Dulcinea, Melibea and BuscaRepositorios databases; and also offers the online tool How Open Is It, which serves to measure the spectrum of openness of journals.

It is also worth mentioning Datasea[153] and Maredata[154]. Datasea is a funded project for Open Research Data in Spain, which studies publishing models, data consumption and re-use, and maintains Odisea[155], an "international registry on research data", kept with the goal of building a site that helps increasing open data literacy of the Spanish-speaking community. It was supposed to be closed on Dec. 2015 but has been extended to Oct. 2016. Maredata, also funded by the Spanish Government, is a network formed by Spanish universities and the CSIC, with the

[151] https://www.boe.es/buscar/act.php?id=BOE-A-2011-9617
[152] MELIBEA (http://www.accesoabierto.net/politicas/?idioma=en), the "Directory and estimator policies for open access to scientific production", is an updated and ongoing compilation of them.
[153] www.datasea.es/
[154] http://maredata.net/
[155] http://odisea.ciepi.org/

main goal of consolidating research groups on Open Data, achieving greater participation in Horizon 2020 projects, and establishing relationships with the industry.

OA is a popular and common topic in the Spanish scientific arena. Researchers are experienced in it, and an 80% of them evaluated it as positive or very positive. The most common difficulties encountered for adopting OA have to do with financial constraints and organizational structures that hinder the change of paradigm (**Claudio-González & Villarroya**, 2015).

## 2.3. The quality and the price

### 2.3.1. Quality

#### *2.3.1.1. Concept*

The quality of a journal is a subjective and complex aspect. **Dewatripont et al.** (2006, p. 27) gave two definitions: the concept of "being better" (well-crafted papers, for readers; good-reputation journals, for authors), and the "diversity and value market" offered. The first is known as "vertical differentiation" and the latter as "horizontal differentiation" in the industrial organization field. In vertical differentiation, higher quality increases the cost of production (although "this is not necessarily pertinent for scientific publishing", p. 27), while in the horizontal this is not necessarily the case (unless there are "diseconomies of scale").

Quality is subjective and unmeasurable by nature, but it is necessary to use objective and measurable methods to assess the quality of scientific publications. It can be measured in many ways, with ad-hoc systems, methodological appraisals, specific discipline methods, experts' and users' surveys, data on specific aspects of journals, etc. Indicators based on bibliographic impact are a controversial issue, yet the largest providers (WoS and Scopus) use them to assess quality, consequently private funders recognized them and researches pursue them. The following sections describe several of these quality assessment approaches.

With regard to OA, commercial publishers first considered it a threat, and tried to discredit it. They argued that quality had a cost which Open Access journals would not be able to afford for being free. There are two incorrect assumptions in this statement. First, OA journals are free to access, but they are not free of costs, as mentioned in the previous section. Second, they may meet the same quality standards as the subscription-based journals[156].

Taking advantage of the explosion of OA journal publishing, predatory practices appeared. Some websites started to call themselves OA journals but they do not review papers and their editorial staff and policies are not transparent. It caused some conflict at first, but nowadays the academic community is aware of those predatory journals[157] and they are only problematic in a few countries "where the academic evaluation practices strongly favor international publication, but without further quality checks" (**Shen & Björk**, 2015).

Another complaint or fear was that OA journals would abolish peer-review practices and thus cause irreparable harm to content quality. This is also false, since OA journals have to follow the same publishing procedures as any other in order to be included in international impact indexes. In brief, Open Access is not indicative of high or low quality per se[158].

[156] See 2.3.3.
[157] Jeffrey Beall manages the list of "potential, possible, or probable predatory scholarly open-access publishers" (https://scholarlyoa.com/publishers/, last updated April 29, 2016; consulted May 1st, 2016).
[158] See 2.2.1.5.

*2.3.1.2. Indexation*

Inclusion in international indexes should not be taken as an absolute quality indicator per se, as it is usually considered, neither as a relative quality indicator that might be completed with some other. **Rozemblum et al.** (2015) studied editorial quality, content quality and visibility, and concluded that RedALyC, Latindex, SciELO, Scopus and WoS select journals not necessarily because of these criteria, but according to their own objectives and thinking on their respective audience. Thus, they state that "the presence or absence of a journal in these collections is not a sufficient parameter to determine neither the quality of the scholarly journals nor the quality of its contents"[159]. In spite of that, Acceso Abierto research group has carried out a series of studies on the Spanish journals indexed in WoS and Scopus. These databases are biased, but ensure a good level of quality.

**Gumpenberger et al.** (2012) analyzed correspondence among OA journal publishing and journals indexed in JCR in the world top 10 publishing countries according to Ulrich's (Figure 21).

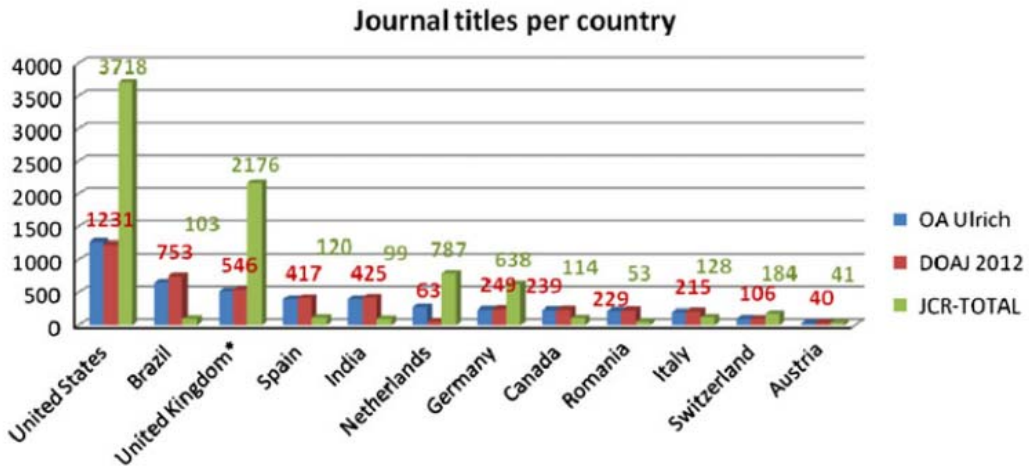


**Figure 21 – OA and JCR journals by country**
Source: **Gumpenberger et al.** (2012)

They found a correspondence in OA titles from Ulrich's and DOAJ for most countries, but the number of journals in JCR was very different for every one and kept no relationship at all with OA. USA, UK, Netherlands and Germany (the "scientific center") had many more journals in JCR than OA ones, while others as Brazil, Spain and India were just the opposite.

This type of analysis has also been done for this study, adding Scopus data (Figure 22). Results are quite the same.

[159] Trans. by the author.

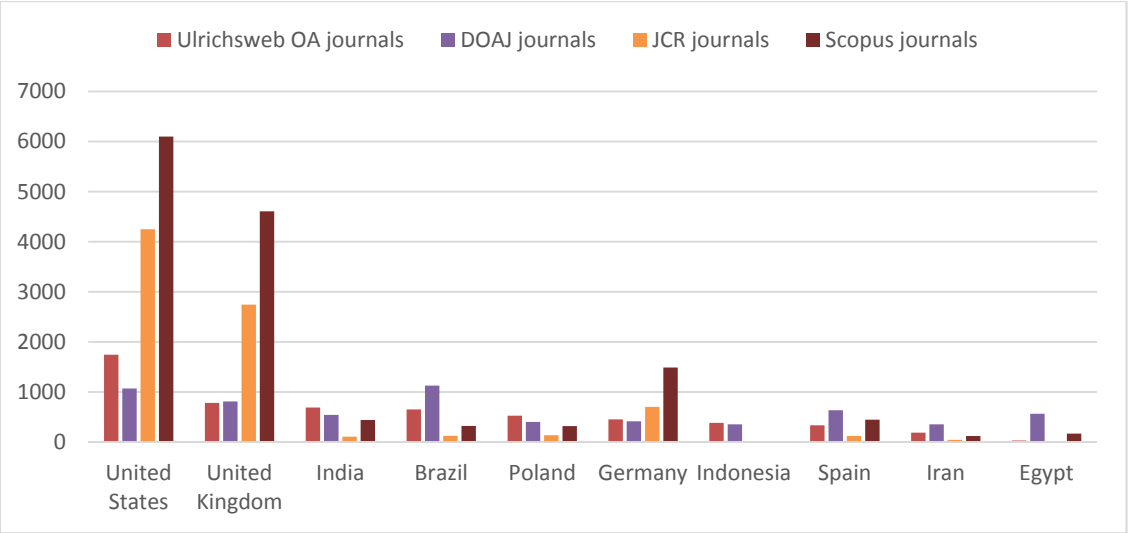


**Figure 22 – Country journal production**
Sources: Ulrich's, DOAJ, JCR and Scopus. Only top 10 countries from DOAJ selected. Sorted out by highest number in Ulrich's.

This analysis, though, does not report on either the proportion of OA journals that are indexed in international databases, or on the specific implications regarding quality or impact for OA journals. It is also important to bear in mind that JCR does not include A&H titles, only STM and social sciences.

**Ware** & **Mabe** (2015) wrote that there were 8,100 Open Access journals in the world, of which 1,800 (22.2%) were in Scopus. The **Universitat Oberta de Catalunya** (UOC) (2016) collected data from DOAJ, JCR (WoS) and SJR (Scopus), and crossed them[160]. 1,772 DOAJ titles (15.3% of the current[161] total) were on SJR, while only 166 (1.4%) were indexed in JCR's Science ed., and much more (915, 7.9%) in Social Sciences ed. – total DOAJ titles in JCR represented then a 9.3%.

Analyzing these UOC's data, one can obtain a clear picture of the number of DOAJ journals published by countries and the number of DOAJ journals indexed separately in SJR and JCR (Figure 23). Thus, for instance, UK has more SJR and JCR journals indexed in DOAJ than Brazil, even when the number of Brazilian journals in DOAJ is higher (1,127).

[160] Information available at http://biblioteca.uoc.edu/en/research/high-impact-open-access-journals. Updated on January 26, 2016.
[161] 11,604 titles. DOAJ consulted on April 26, 2016.

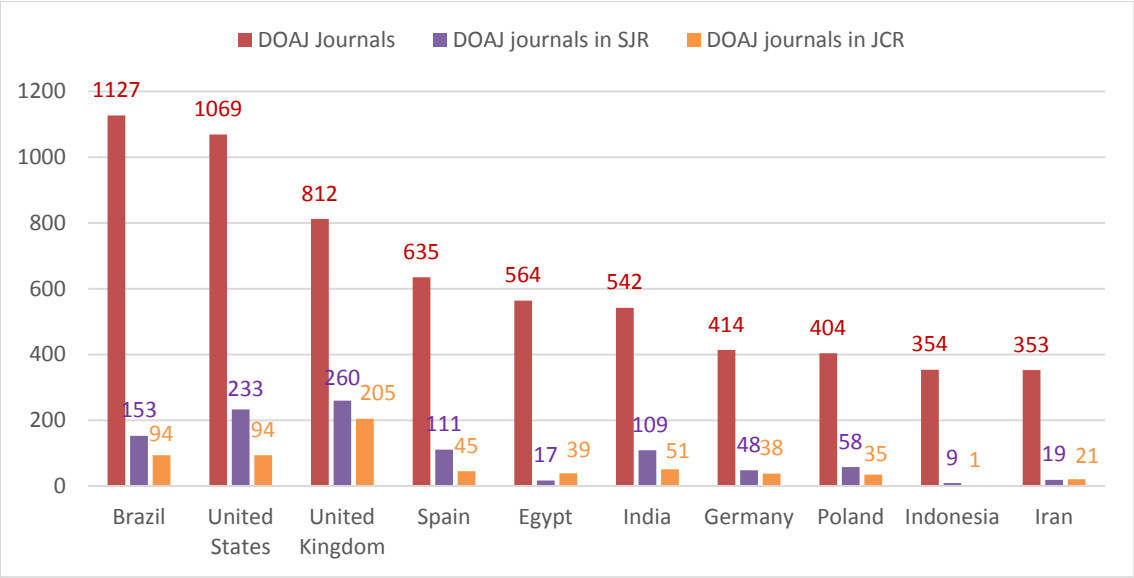


**Figure 23 – DOAJ journals indexed in SJR and JCR**
Source: **UOC** (2016) and DOAJ. Only top 10 publishing countries in DOAJ selected.

There is no direct relationship between the number of journals in DOAJ and the indexation of such journals in SJR or JCR. Table 13 gives an insight of levels of indexation of these OA journals.

| Pos. | Country | DOAJ | SJR | DOAJ in SJR | % of DOAJ | % of SJR | JCR | DOAJ in JCR | % of DOAJ | % of JCR |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | Brazil | 1,127 | 329 | **153** | 13.6% | 46.5% | 125 | **94** | 8.3% | 75.2% |
| **2** | USA | 1,069 | 6,046 | **233** | 21.8% | 3.9% | 4,250 | **94** | 8.8% | 2.2% |
| **3** | UK | 812 | 5,476 | **260** | 32.0% | 4.7% | 2,745 | **205** | 25.2% | 7.5% |
| **4** | Spain | 635 | 467 | **111** | 17.5% | 23.8% | 122 | **45** | 7.1% | 36.9% |
| **5** | Egypt | 564 | 61 | **17** | 3.0% | 27.9% | 41 | **39** | 6.9% | 95.1% |
| **6** | India | 542 | 452 | **109** | 20.1% | 24.1% | 108 | **51** | 9.4% | 47.2% |
| **7** | Germany | 414 | 1,341 | **48** | 11.6% | 3.6% | 702 | **38** | 9.2% | 5.4% |
| **8** | Poland | 404 | 325 | **58** | 14.4% | 17.8% | 136 | **35** | 8.7% | 25.7% |
| **9** | Indonesia | 354 | 16 | **9** | 2.5% | 56.3% | 1 | **1** | 0.3% | 100.0% |
| **10** | Iran | 353 | 135 | **19** | 5.4% | 14.1% | 45 | **21** | 5.9% | 46.7% |

**Table 13 – DOAJ journals indexed in SJR and JCR**
Source: **UOC** (2016), DOAJ, SJR and JCR. Only top 10 publishing countries in DOAJ selected. Sorted by number of journals in DOAJ.

Proportion of DOAJ titles indexed in SJR is the highest for UK (32%), USA and India (about 20%). Regarding DOAJ titles indexed in JCR, UK is preponderant (25%), while the rest stays between 7-9%. On the other hand, proportion of SJR and JCR titles that appear in DOAJ is much higher for the "peripheral" countries. For instance, almost half of the Brazilian SJR titles and ¾ from JCR are OA. Similar proportions, but lower, apply for Spain, India, Poland and Iran. Indonesia might be excluded since its performance in those indexes is really low (9 DOAJ titles in SJR, and only 1 in JCR). Almost all Egyptian JCR titles appear in DOAJ, mostly published by Hindawi.

This phenomenon can be clearly seen with two antagonist cases, Brazil and UK (Figure 24). Just a few DOAJ Brazilian journals are in SJR (153, 13.6%), but these are the 46.5% of all the Brazilian journals indexed in SJR. On the contrary, 32% of British DOAJ titles are indexed in SJR, but this means that only a 4.7% of all the journals published in the UK and indexed in SJR are in DOAJ at the same time. Something similar happens with JCR.

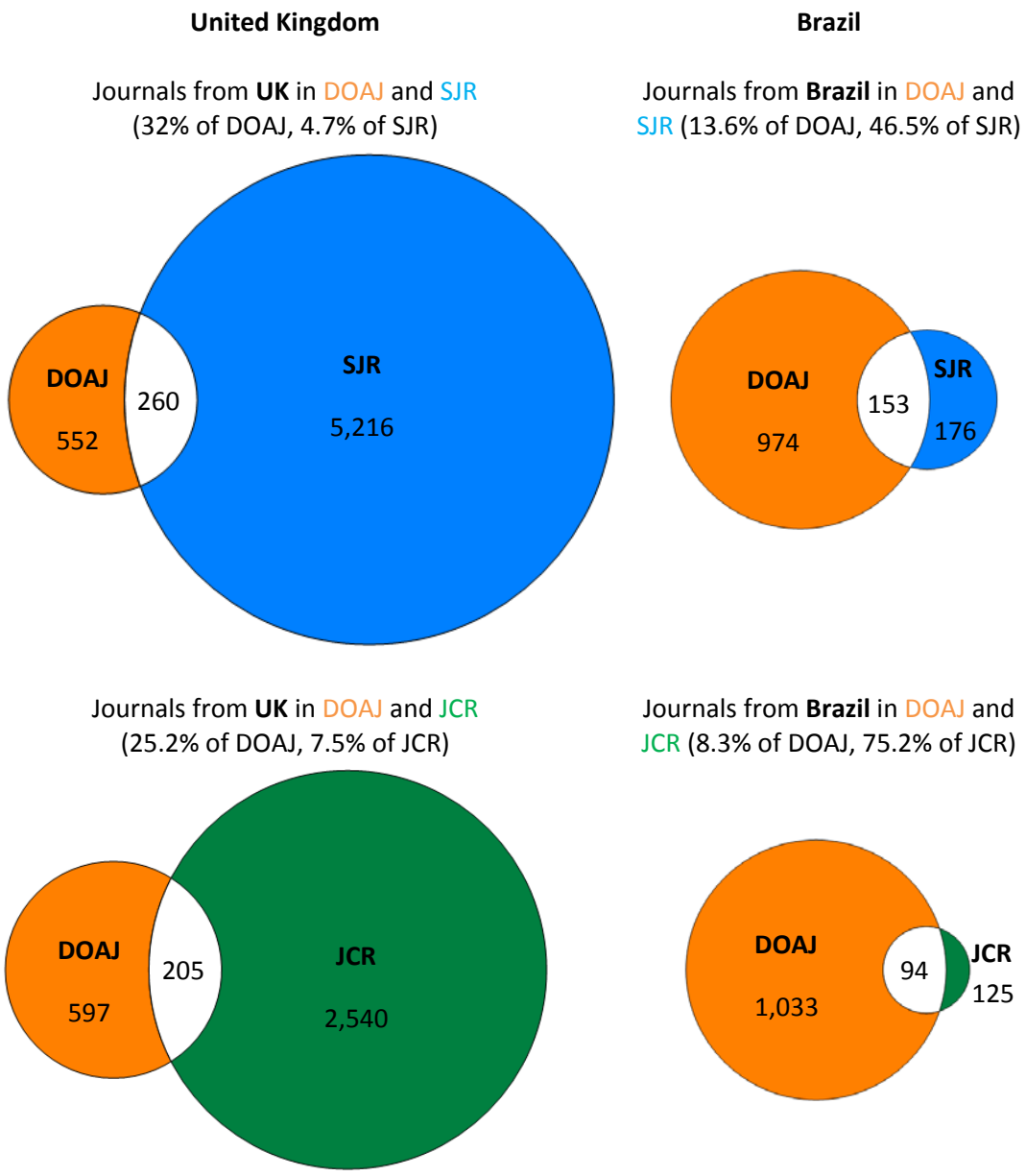


**Figure 24 – Journals from UK and Brazil indexed in DOAJ, SJR and JCR**
Proportion of circles size between columns is approximate.

Upon observing these data one can conclude that many of the quality journals published in some Ibero-American and peripheral countries are OA, but only a few meet quality standards – at least, according to JCR and SJR.

#### *2.3.1.3. Impact*

Impact indicators are based on the average number of citations received by the articles in a journal for a specific period of time. They have been criticized for not being adequate to assess scientific research in every field and in every circumstance, and they should not be used as a sole and ultimate universal indicator. In addition, as **Ware & Mabe** (2015) wrote, they are "often used as a proxy measure for quality for individual articles, although this is regarded as inappropriate and incorrect". That is so because every article in a specific journal may receive a wide range of citations.

IF from WoS' JCR is the most extended and prestigious one. It has gone through an inflation over time, due to the gradual increase of citations worldwide, and it varies much among disciplines because of the specific nature of citations in each field (**Althouse et al.**, 2009). For instance, **Walters** & **Linvill** (2010) found that biology and medicine OA journals had a higher IF.

In general, IF is increasingly criticized by the Academia because, although it has been proved not to be suitable for every case, it is used by agencies, funders and universities to assess the quality of research. There are, though, some authors that defend it, as **Saha et al.** (2003), who found a strong correlation (Pearson's $p = 0.82$) between IF values and expert ratings of journals quality – but this study only concerned medical journals.

WoS has other impact indicators, as the Category Normalized Citation Impact (CNCI)[162], which, unlike IF, can be compared across different subject areas.

With regard to Scopus, apart from the mentioned SJR (which can be compared to IF), there is the Source Normalized Impact per Paper (SNIP), which "correct differences between subject fields"[163], similarly to CNCI.

Open Access is supposed to have a citation advantage as investigated by **Gargouri et al.** (2010), **Wagner** (2010) and **Swan** (2010) – although most of the studies analyzed by the latter are checking green OA (journal articles deposited in repositories) and not only gold OA (articles published in journals). According to the bibliographic review by **Tennant et al.** (2016), 46 over 70 studies (66%) concluded that OA has a citation advantage. A recent study of more than 3 million papers published in WoS proved so, although it was especially true for those papers available through Green OA. Since articles may become OA after being published in any journal type (self-archived from a restricted-access journal, opened after an embargo or after paying an APC for hybrid, or published directly in a full OA title), this advantage, as is based on these premises, is not relevant for the purposes of this research.

[162] http://ipscience-help.thomsonreuters.com/inCites2Live/indicatorsGroup/aboutHandbook/usingCitationIndicatorsWisely/normalizedCitationImpact.html

[163] https://www.journalmetrics.com/snip.php

With regard to specific studies on the characteristics of OA journal's impact, **Solomon, Laakso** & **Björk** (2013) found that SNIP2[164] values of OA journals funded by APCs were equivalent to those of subscription journals, while, for instance, **Van Leeuwen** et al. (2015) found that OA journals' articles in Netherlands, Denmark and Switzerland had a lower citation impact than those in subscription-based titles.

**Björk & Solomon** (2012) collected data from DOAJ, Ulrich's, Scopus and WoS and found that the average citation rates were a 30% higher for subscription journals than for OA ones. Despite that, this difference almost disappeared within countries and subject fields of journals published after 1996. For example, OA journals on medicine and health launched during the last 10 years were already receiving as many citations as those subscription-based journals, although APC-funded titles were more cited.

In line with this findings, **Archambault et al.** (2014) indicated that Green OA (self-archiving of journal articles in repositories, publisher-permitting) increases citations. OA journals seem to have lower journal impact scores than non-OA ones, but this is in part due to their short lifespan, something that applies as well for newly-created subscription-based publications (**Leeuwen et al.**, 2015).

Nevertheless, **West, Bergstrom & Bergstrom** (2014) reported that the average Article Influence value for JCR-OA journals was 0.737, when that for subscription-based in JCR was 0.776 – meaning that when studying such population with this article-level indicator differences were not significant.

With regard to Spain, **Osca-Lluch et al.** (2008) compared the only 16, 15 and 18[165] journals that had IF and a Spanish ad-hoc impact factor at the same time, and found low values for 3 consecutive years (2001-2003): 0.611, 0.668 and 0.634. Later, **Bordons et al.** (2002) identified 31 Spanish journals with IF in JCR, mostly on medicine and biomedicine. They found that those had higher self-citation rates than most of the European ones.

**Torres-Salinas et al.** (2016) reported that Normalized Citation Impact (NCI[166]) for OA articles published by Spanish authors in WoS was 0.72, lower than the world average and one of the lowest in Europe, even when Spain was the second highest European country in the ranking of OA (a 9% of all the articles by Spanish authors were OA). As they discuss, it does not necessarily mean that OA is a disadvantage; other factors may contribute to the low impact – i.e. publisher type, discipline, national coverage, Spanish language and a low IF that attracts less researchers.

At this stage, it seems reasonable to say that OA is a potential advantage for impact, but it does not mean that OA articles have greater or lower impact "per se". **Swan** (2010) argued that OA

[164] Source-Normalized Impact per Paper Version 2 (SNIP2), citation averages during the period 1999–2010. Available at JournalMetrics.com.
[165] Almost all on health science.
[166] http://ipscience-help.thomsonreuters.com/incitesLive/institutionalProfilesGroup/dataCollectionGroup/biblioAnalysis/normalizedCitationImpactScoreCalc.html

content increases visibility, findability and accessibility, but impact may vary with subject field, with time and with the level of OA adoption.

Yet not every OA journal is the same. New-born OA journals do not behave the same way as subscription-based titles that later become OA, because the latter may already have scientific reputation and may not offer all their back issues in OA. According to the study by **McVeigh** (2004) on ISI journals, most OA titles ranked in the lower half of their subject category, but some of the highest ranked journals in physics, engineering & mathematics were OA. In any case, OA journals tended to rank higher by Immediacy Index than by IF.

With regard to specific OA journal types, **Laakso & Björk** (2013) reported that, in WoS, embargo journals have two times higher IFs than subscription-based ones and three times higher than full OA. Hybrid journals have "long-standing reputations in their subject areas" and they "typically have a higher journal IF"[167] (**Publishers Association**, 2016, p. 1) – this may be true, but it depends on a number of factors, including the subject area. Besides, to compare journals according to their IFs, journals need to be graded with this indicator, which is not the case for all OA journals.

#### *2.3.1.4. Assessment methods for SSH fields and the periphery*

The evaluation by citations received, such as IF or SJR, "should not be the only criteria for SSH articles quality assessment"[168] (**Rodríguez-Gairín et al.**, 2011, p. 590). Journals on SSH have a lesser impact in the short term, because research and findings are valid during longer periods of time than journals on STM. On the other hand, STM research and findings become obsolete faster and are more linked to market and economic output. Thus, international bibliographic databases using citation counting and bibliometric analysis are not adequate for "soft" sciences, which normally have national coverage and publish in domestic languages, other than English. Evaluations by citations "penalize publications in minority languages, or geographically or culturally bounded"[169] (p. 590).

**Borrego & Urbano** (2006, p. 14) also mentioned difficulties for applying bibliometric methods to those types of journal. They specifically refer to IF, criticizing its "unequal coverage of journals depending on the geographical and linguistic areas where they are published, with a clear over-representation of Anglo-Saxon titles, especially from USA. If this bias is important for STM disciplines, it has a dramatic impact on SSH because of the nature of such subject areas where there is a greater tendency to publish in journals available in national languages, which are not indexed in ISI".

It is true, though, that there are international databases that exclusively collect titles on SSH, as SSCI and A&HCI at WoS, but their coverage of "peripheral" countries is still little. **Giménez-Toledo** (2007) wrote that their limitations in assessing journals out of the Anglo-Saxon world are

[167] Comparing to full OA journals.
[168] Translated by the author.
[169] Translated by the author.

known and common in European and Latin American countries, which are developing alternative evaluation models.

One basic quality approach is indexation in regional directories or platforms. Overcoming their inclusion criteria is observed as a quality standard, for instance, those belonging to the OA platforms SciELO[170] and Redalyc[171]. There are others, as Latindex catalogue, which also require the adherence to specific quality criteria[172] and calculates the number of criteria accomplished by each journal[173]. There are also subject sources as the European Reference Index for the Humanities (ERIH), which requires specific inclusion norms[174].

In Spain, there are a number of evaluation systems, which use qualitative and quantitative approaches, sometimes both at the same time. FECYT quality seal (Spanish Federation for Science and Technology) grants best journals awards to those publications that follow a specific methodology[175], including editorial and scientific quality criteria such as listing of all editorial board members and their internationality, instructions to authors, abstracts and keywords and their availability in English, regular periodicity, external peer-review, internationality of advisory council and authors, research articles, exogamy, indexation in databases, impact (quartiles and citations) and formal aspects.

The rest of systems is focused on evaluation systems for SSH, most of which have been abandoned because of lack of funding support.

EC3[176] research group at the University of Granada is responsible for several online products based on citations – the IN-RECS-RECJ-RECH family, CIRC and Journal Scholar Metrics.

IN-RECS[177] (Impact Index of Spanish Journals on Social Sciences), IN-RECJ[178] (on Legal Sciences) e IN-RECH[179] (on Humanities) are a series of products for Spanish journals on social sciences, law and humanities, respectively. They calculate a special impact index for every title. Citations are taken from WoS, but methodology seems unclear. They were abandoned in 2014, because the creators did not found support to face the huge amount of work to be done in order to manage citations and update the products. The latest impact factors calculated belong to citations from 2011.

CIRC (Integrated Classification for Scientific Journals)[180] was created because "bibliometric indicators and usual information sources are inadequate for evaluating social sciences and humanities" (**Torres-Salinas et al.**, 2010)[181]. It classifies SSH journals all around the globe, not

[170] http://www.scielo.br/criteria/scielo_brasil_en.html
[171] http://www.redalyc.org/HomeEditores.oa
[172] For print journals: http://www.latindex.org/latindex/revistasimp. For online journals: http://www.latindex.org/latindex/revistaselec
[173] E.g. http://www.latindex.org/latindex/ficha?folio=8048.
[174] https://dbh.nsd.uib.no/publiseringskanaler/erihplus/about/criteria_for_inclusion
[175] Last edition: http://evaluacionarce.fecyt.es/doc/2015GuiaEval5Conv.pdf (Spanish language)
[176] http://ec3.ugr.es
[177] http://ec3.ugr.es/in-recs/
[178] http://ec3.ugr.es/in-recj/
[179] http://ec3.ugr.es/in-rech/
[180] http://www.clasificacioncirc.es/. Spanish language. Latest edition (beta) launched in 2016.
[181] Translated by the author.

only from Spain, in five quality categories (A+ to D), depending on their indexation in other sources (JCR, Scopus, FECYT seal, ERIH and Latindex catalogue). This might be called "indexation assessing" or "secondary indexation", rather than "quality assessment", but the fact is that CIRC is the only Spanish product for evaluation of SSH journals that remains active because its maintenance is too expensive.

EC3 is also responsible for a number of online bibliometric tools that collect citations from Google Scholar and use H indexes to rank journals within SSH subject areas. Journal Scholar Metrics[182] is their latest product, launched in early 2016, covering thousands of titles from all over the world, searchable by country. The rest of EC3 products deal with Spanish journal on specific disciplines[183] only.

The Spanish Center for Advanced Scientific Research (CSIC), with the collaboration of the omnipresent EC3, launched RESH (Spanish Journals on Social Sciences and Humanities) [184], which integrated editorial quality criteria described by both CNEAI and ANECA Spanish agencies, and Latindex. It calculates an own impact factor and a quality indicator assessed by experts. It evaluates indexation in databases and citations received, both nationally and internationally. This product stopped working on 2011, after losing government funding.

CSIC also created DICE (Dissemination and Editorial Quality of Spanish Journals on Social Sciences and Humanities)[185], which includes several indicators. Most relevant are "dissemination evaluation" (journal assessment according to its indexation in national and international databases, both generic and specific) and "internationality of contributions". It was used by ANECA to assess quality of publications by Spanish academics, and was latest updated in 2010.

MIAR[186] is an excellent but underrated tool. It calculates the ICDS (Secondary Composite Index Broadcasting), a mixed quantitative/qualitative indicator that measures international indexation for journals. The last edition was launched in 2016, containing more than 28,000 journals. Its potential is huge, since it is able to retrieve an ICDS value to any journal with an ISSN. Nevertheless, Spanish titles are overrepresented, while other as Brazilian and Chinese are underrepresented, and international use of this secondary quality indicator is still limited.

CARHUS Plus+[187] was developed by the Catalan government and AGAUR (Agency for the Management of University and Research Grants). The last edition was launched in 2014, including journals on SSH from all over the world. There are four categories (A/D), and they are assigned to journals depending on their presence in WoS indexes and Scopus, along with ICDS, accomplishment of some editorial aspects (periodicity, authors' information, abstract, keywords, etc.), along with the presence of a valid review system and editorial committee. Catalan journals and journals on Catalonia are specially considered.

[182] www.journal-scholar-metrics.infoec3.es/
[183] http://www.journal-scholar-metrics.infoec3.es/layout.php?id=others
[184] http://epuc.cchs.csic.es/resh/
[185] http://dice.cindoc.csic.es/
[186] http://miar.ub.edu/idioma/en
[187] http://agaur.gencat.cat/es/avaluacio/carhus/carhus-plus-2014/index.html

#### *2.3.1.5. Compound qualitative assessment methods*

There are methods to assess value using qualitative indicators, and not quantitative as indexation in databases and bibliometric impact.

For example, **Delgado López-Cózar et al.** (2006) published a guide that included criteria as editorial quality, prestige of publisher and editorial board, content quality, number of papers received and rejection rate, proportion of original research articles, geographical and institutional origin of authors, funding received by public and private bodies, and circulation, indexation and visibility. These criteria are laid out in an evaluation form to be filled in by experts, with a set of pre-defined statistics.

#### *2.3.1.6. Collective and social assessment methods*

At an international level, one interesting tool is Quality Open Access Journals (QOAJ)[188], which includes more than 24,000 titles. It addresses researchers looking for a journal to submit their papers. The system uses two types of "journal score cards". "Base score card" is a questionnaire on the transparency of the journal. It is filled in by the authors participating in the publishing process of that particular journal. It includes aspects related to four categories: editorial information, peer-review, governance and workflow. The other one is "valuation score card", a checklist on the experience of working for the journal as an author, editor or peer reviewer. As a result of that collective assessment, every journal has a "base score" and a "valuation score". With those scores, journals are assigned to one of the four squares of a SWOT matrix that evaluates its suitability for submitting a paper. QOAJ includes APC prices, but, due to its targeted audience, does not offer the possibility of searching by country, journal type or publisher type – aspects that are relevant for this study.

### 2.3.2. Publishing costs

Publishing costs, subscription prices, quality and surplus or profit are controversial issues. To begin with, as **Galyani-Moghaddam** (2009, p. 2) pointed out, it is necessary to avoid the ambiguity in the term "journal costs" and differentiate production costs sustained by the publisher and price paid by libraries or readers. Surplus is related to non-for-profit publishers (societies and universities, basically) while profit is obviously related to private companies seeking benefit.

But, who pays the costs? Academic institutions and libraries pay subscriptions to get access to content and also pay APCs on behalf of their researches, and support indirect expenses of OA

[188] https://www.qoam.eu/

publishing and mandates implementation[189]. Governments also pay the costs of supporting OA publishing. And last, but not least, publishers spend money for publishing journals.

For universities and research institutions, the full process of scholarly journal publishing involves costs related to research funding, writing, publishing and paper acquiring (**Morris**, 2005). Traditional acquisition costs via institutional and individual subscriptions do not apply for OA journals, but there are costs related to APC funding or "platinum" publishing.

Another economic aspect relates to the costs that governments and universities have to pay in order to make research output available in OA. These costs may refer to the implementation and compliance with mandates[190]. For instance, total cost to UK research organizations for the period 2013/14 was of £20m, including £11m for APC funding and £9m for management, advocacy, and infrastructure development (**RCUK**, 2014).

In this study, only the cost supported directly by the publisher will be considered.

Type of publishing costs could be divided according to different criteria. **Bergstrom** (2001) divided them into "first copy" (those costs independent from the number of subscribers, including costs of managing an editorial office, copy-editing and typesetting) and "marginal" (including printing, shipping and postage, and managing subscriptions). **King** (2007) categorized them as "fixed" (manuscript processing, editing, reviewing, etc.), "variable" (printing, maintenance, etc.) and "marginal" (additional subscriptions). The UK report commissioned by **RIN** (2008) used "first copy" (including non-cash peer review and direct fixed costs), "variable", "indirect" and "surplus", thus including a part of profit in consideration of the publishing effort. According to **Tenopir & King** (2000), a 20% of the costs of producing an article depend on quality.

**Dewatripont et al.** (2006) emphasized the importance of the "first copy" cost, and showed that, for a constant level of quality, the cost per subscription of an article decreases steeply when the number of subscriptions increases. **King** (2007) collected average costs per no. of subscriptions that supported this theory (table 14).

| No. of subs-criptions | Print-only cost ($) | Electronic-only cost ($) | Print + electronic cost ($) |
|---|---|---|---|
| 500 | 950 | 1,012.50 | 1,050 |
| 5,000 | 140 | 112.50 | 150 |
| 50,000 | 59 | 22.50 | 60 |

**Table 14 - Average article cost**
Source: **Galyani-Moghaddam** (2009, p. 3), with information from **King** (2007)

[189] See 2.2.1.3.
[190] See 2.2.1.6.

Total average costs per article estimated at **RIN** report (2008) showed large differences according to journal type, being higher for major discipline titles (£4,661) than for niche ones (£3,733), and higher for journals with high rejection rate (£6,058) than with low ones (£3,281). It was also supposed to be the highest for commercial publishers (£4,279) and the lowest for university presses (£3,934) and society publishers (£3,695). In line with **King**'s data (2007)[191], the cost for print and electronic versions was higher (£4,105) than electronic-only (£3,745), although, rather surprisingly, print-only was the cheapest (£3,608). **Ware & Mabe** (2015) estimated that in 2010 the cost per journal article (for print plus electronic versions) was £3,095, while profits per published paper were £642 for companies, in 2011 the surplus was £315 for society publishers. In spite of those calculations, **Morrison** (2016) recently stated that it is not possible to establish the average cost for the production of an article because "journal articles can be brief or monograph length, technically simple or complex".

It has been frequenly argued that electronic journal publishing is cheaper than print. **Regier** (1997) wrote that, despite it has been repeated as a mantra, it looks "more and more like a conditional conclusion" (p. 2). Electronic publishing may be cheaper than print, because its access is faster and ensures more visibility and ease of use, but according to the author there are some disadvantages, as new costs for preparing the first copy and higher expenditures for launching a new journal. In addition, income will only be produced at a mid-term period, if the journal is succesful. **Odlyzko** (1997) claimed that electronic journals involved lower costs than print journals, and the former can be free or at least much cheaper than the latter. As a matter of fact, the **RIN** report (2008) estimated that about £1 billion could be saved by eliminating print editions (basically for library budgets).

With regard to Open Access publishing, it was never intended to avoid paying publishing costs. BOAI used the original meaning of "open", which applies to "data or content" that "anyone can freely access, use, modify, and share for any purpose"[192], but not free of costs. **Suber** (2004) claimed that OA was not "Napster for science" – meaning that, unlike potential illegal access to popular or cultural contents (music, films, novels, etc.), OA is legal and optional. Budapest manifesto stated that OA is "without cost to readers" but it "is not costless to produce". They added that the costs for OA publishing were "far lower" than those of "traditional forms of dissemination" (subscription-based)[193].

A number of studies have proved that, indeed, OA publishing can be cheaper. In the UK, where the approach to OA funding is mainly based on paying APCs, a report by **Jubb** (2011) for the Research Information Network (RIN) encouraged policymakers to facilitate a transition from subscription-based journals to Gold OA, avoiding pushing for reductions in embargo periods and ensuring that APC fees do not exceed about £2,000.

**Van Noorden** (2013) reported that costs of OA publishing were $2,289, lower than online subscription models ($3,509) and print plus online subscription models ($4,871). This cost reduction was due to the cuts of typesetting and printing, and the simplification of sales

[191] See table 14.
[192] http://opendefinition.org/
[193] http://www.budapestopenaccessinitiative.org/read

administration and user management. Later, **Ware & Mabe** (2015) estimated that electronic-only publishing saves around a 10-20% of the total costs, and a full transition to Open Access publishing can save a 10-12% of the subscription-based costs. They also reported that pure OA journal publishers have very different average article cost, ranging from $290 (Hindawi) to $1088 (PLOS). From another point of view, **Walters** (2007) highlighted that the shift from a subscription model to an OA model (referring to author-pays models) would imply huge reductions in costs reductions for most universities and research centers, except for the top ones, because the former contribute very little to scholarly literature while the latter contribute a lot, yet those contributions (scientific output and journals published) also have a cost.

APCs are becoming important sources of income (for publishers)[194] and imply a cost for funders and academic libraries. From the point of view of the latter, they are part of the total cost of publication, involving subscription and administrative costs as well. In the UK, APCs constituted an average of the 10% of the cost, excluding administrative ones (**Pinfield et al.**, 2016). Non-OA APCs (i.e. submission charges, page and color fees, etc.) might also be included, since they caused a rise of about an 18% over the total cost of journal subscriptions in the British academic sector in the period 2013/14 (**Gray**, 2015).

### 2.3.3. Subscription prices

There are a number of factors that are supposed to affect costs and therefore pricing.

**Tenopir & King** (2000) pointed out that new journals only begin generating benefits after the first six years. Therefore, a journal may need to charge a higher price when it is new, depending on the publisher type. They also reported that it has been often argued that one of the main causes for a price increase was the decrease of subscriptions, and commercial journals may have higher costs than the rest because they have lower circulation. This could, until some extent, justify their higher prices.

**Dewatripont et al.** (2006) highlighted that there are differences in pricing according to the publisher type, discipline, language and format. Commercial publishers have often argued that their journals are globally more expensive than the rest. For instance, “they produce more journals serving ‘niche’ audiences and fewer journals dedicated to a larger community of scientists” (p. 27). On the other hand, “besides the higher income from subscription, they may charge for advertisement and sell more back issues and reprints. These additional incomes may be nontrivial” (p. 28). There are also large differences in prices among disciplines, something that seems more related to the potential profit than to the costs. In their study, titles on Law were much cheaper than those on Physics, which were the most expensive on average. They also found that journals published in English were a 55% more expensive than the rest. With regard to format, they found that subscriptions to individual online-only journals are priced as a 90% of their print-only subscriptions.

[194] See 2.3.4.

**Odlyzko** (1997) described two major journal publishing issues that are still in the spotlight. First of them was the "lack of price competition" since top journals in specific disciplines are hard to replace in the market. The second issue was the "perverse incentives" in scholarly publishing – researchers choose expensive journals to publish their papers in, and the cost affects society, according to author's opinion. He also pointed out that these "perverse incentives", together with the "inertia" of the business, could complicate the transition to free or much less expensive journals – and still today some authors hold the same opinion.

In the same line, and as mentioned before, due to their oligopolistic control, major publishers price without fair competition (**Larivière et al.**, 2015), thus breaking the supply-demand market principle and not necessarily meeting quality standards. This leads to a dysfunctional market, where "authors provide their goods without financial compensation", "consumers are isolated from the purchase", "academic libraries, contributing 68% to 75% of journal publishing revenues, are atypical buyers because their purchases are mainly controlled by budgets", and, last but not least, "in scholarly publishing each product represents a unique value and cannot be replaced" (p. 11).

The subscription prices increased much more than library budgets, which produced the so-called "serials crisis" and propitiated the birth of Open Access[195]. Prices of academic journals doubled in the period 1986-1998, while library budgets rose only about a 50% and the number of titles increased a 60% for the same period (**Bergstrom**, 2001). Although the transition to electronic publishing has costs (as well as savings), it cannot be held responsible for such an enormous increase of prices, which began much earlier (**Tenopir & King**, 2000). According to **Dewatripont et al.** (2006), very large price increases are observed over the last 30 years, and they are not due to evolution of costs but to the "ability of publishers to take advantage of the relative price insensitivity of buyers, and especially for their most popular journals" (p. 41). On the other hand, the last 10 years have been more favorable for consumers, since prices have risen less fast (but still grown high) and, this time, the transition to digital have involved high costs.

### 2.3.4. APCs

#### *2.3.4.1. Use*[196]

Only an 11.6%[197] of journals indexed in DOAJ charge APCs. Nonetheless, DOAJ information on journals that charge APCs and their prices is not supposed to be very accurate[198]. DOAJ

[195] See 2.2.1.1.
[196] For specific use of APCs in regions and countries, see 2.2.3.
[197] DOAJ consulted on May 2016.
[198] The blog "Sustaining the Knowledge Commons" (https://sustainingknowledgecommons.org/) continuously publishes posts by researchers that collect data from publishers' sites. These data shows that DOAJ records are not updated (and it could mainly be publishers' fault since they are responsible for updating records). For instance, **Wheatley** (2016) analyzed BioMed Central's journals and found that only 14% of them have their APC recorded in DOAJ.

acknowledged that deficiency[199] and added "no information" as a third indicator[200]. In a consultation on a later time[201], it was found that journals charging APCs were a 17%, without APCs a 31%, and the rest (52%) had not provided this information.

Upon studying DOAJ it can be found that APCs are charged by a higher proportion of journals. **Walters** & **Linvill** (2010) found that a 29% of journals charged APCs, and this represented the 50% of all the articles in their sample. Journals on Biology and Medicine were more likely to charge APCs. Similar results were reported by **Morrison et al.** (2015) and **Crawford** (2016) – 26% and 29%, respectively.

In any case, proportion varies very much depending on the country (Table 15 and Figure 25). For instance, the two European countries of the "scientific publishing center" (UK and Netherlands) have some of the higher proportions (33% and 43%, respectively), while the two North-American (USA and Canada) have much lower ones (9.15% and 1.4%). APCs are rare in Ibero-America. The proportion of APC-charging journals is low in Slavic countries (Poland, Russia, Croatia, Serbia), but the rest of the European countries are not homogeneous (e.g. Romania and Italy around 40-42%, Germany 20.8%, France and Switzerland 1-2%). Egypt, with a surprising 32.1% (mostly by Hindawi), and the Asian countries have very different proportions as well (Indonesia 22.3% and Iran 17%, but India and Turkey are below 3%).

Upon analyzing OA journal proportions at world and country level, together with country proportion of OA journals charging APCs (Figure 25), it was found no correlation between the variables. Taking data from the top 25 countries in DOAJ, Pearson values resulted close to zero. Still, some of the countries with higher OA adoption have the lowest proportions of APC-charging titles (e.g. Brazil, Spain) while some with the lower are just the opposite (e.g. Germany). Therefore, the use of APCs in OA journals is dependent on aspects that are not necessarily bound to the country of the journal – that is, type of publishers and disciplines, mainly. APC prices depend very much on publisher types and disciplines[202].

[199] https://doajournals.wordpress.com/2015/05/11/historical-apc-data-from-before-the-april-upgrade/
[200] https://doajournals.wordpress.com/2016/05/24/new-continuations-improved-tables-of-contents-feedback-on-a-journal-apc-granularity-and-more/
[201] June 22, 2016.
[202] See 4.4.2.

| Pos. | Country | DOAJ Journals | % total | % with APC |
|---|---|---|---|---|
| 1 | Brazil | 1,127 | 9.71% | 1.09% |
| 2 | USA | 1,069 | 9.21% | 9.15% |
| 3 | UK | 812 | 7.00% | 33.12% |
| 4 | Spain | 635 | 5.47% | 0.94% |
| 5 | Egypt | 564 | 4.86% | 32.09% |
| 6 | India | 542 | 4.67% | 2.58% |
| 7 | Germany | 414 | 3.57% | 20.80% |
| 8 | Poland | 404 | 3.48% | 8.91% |
| 9 | Indonesia | 354 | 3.05% | 22.30% |
| 10 | Iran | 353 | 3.04% | 16.99% |
| 11 | Romania | 344 | 2.96% | 40.69% |
| 12 | Italy | 335 | 2.89% | 41.79% |
| 13 | Turkey | 328 | 2.83% | 2.13% |
| 14 | Colombia | 306 | 2.64% | 0.00% |
| 15 | Switzerland | 239 | 2.06% | 27.19% |
| 16 | Canada | 210 | 1.81% | 1.42% |
| 17 | Russian Fed. | 186 | 1.60% | 5.91% |
| 18 | France | 184 | 1.59% | 1.63% |
| 19 | Argentina | 179 | 1.54% | 0.56% |
| 20 | Mexico | 167 | 1.44% | 1.20% |
| 21 | Chile | 159 | 1.37% | 0.00% |
| 22 | Netherlands | 142 | 1.22% | 42.96% |
| 23 | Australia | 125 | 1.08% | 4.80% |
| 24 | Croatia | 109 | 0.94% | 0.92% |
| 25 | Serbia | 106 | 0.91% | 1.89% |

**Table 15 – Country classification by number of DOAJ journals**
Source: DOAJ, May 2016. Only top 25 countries included.

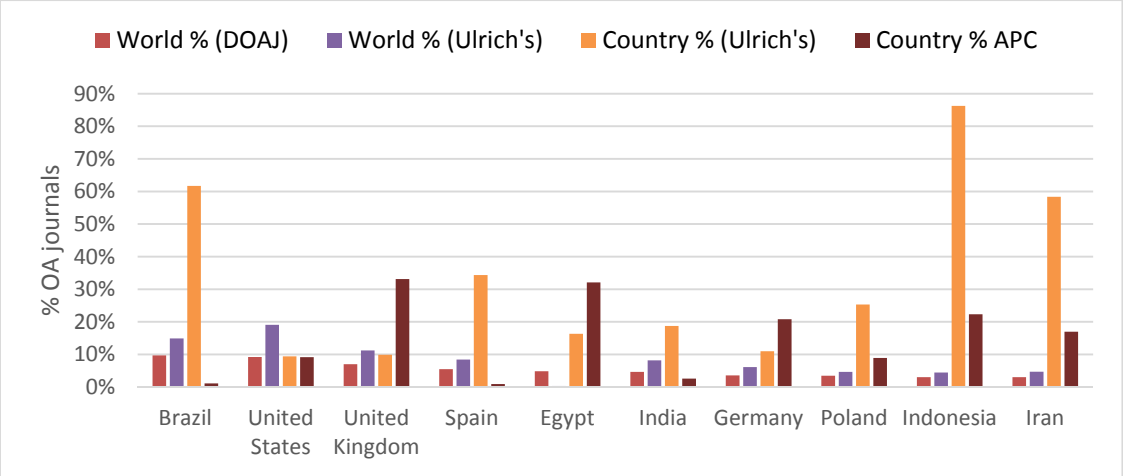


**Figure 25 – Journals and OA journals production, and OA and APC adoption by country**
Source: DOAJ, Ulrich's (May 2016). Selection and sorting: top 10 countries in DOAJ.

A world heat map (see figure 26) is useful to display the adoption of APCs by countries. Netherlands, UK, Italy and Romania, together with Egypt, have the highest proportion of APC-charging journals in OA, followed by developed and emerging countries as USA, Germany, Russia, India, etc., and Spanish and Portuguese speaking regions are almost clean. Please note that the regions in white color stand for those regions for which there is no information available. Of course, a high proportion of APC-charging journals may not to be expected in Africa and most of Asian and South American nations, but if there were any, it would not probably represent a high number.

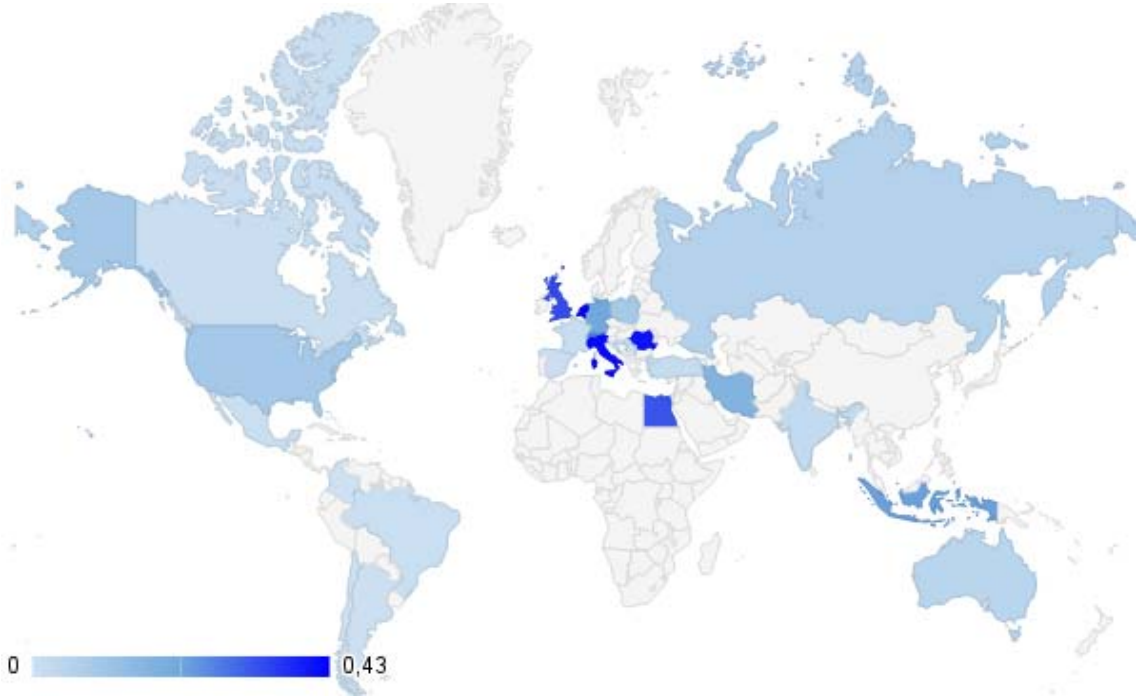


**Figure 26 – Country % of OA journals charging APCs**
Source: DOAJ (May 2016).

APCs are a major income source for publishers, both for full OA and hybrid journals. **Björk** & **Solomon** (2014) found that benefits from APCs were $182 million in 2012, and they grew about a 34% in a year. Open Access has not abolished the commercial scientific publishing market, it has just created another niche market to develop and profit from. Nonetheless, it does not mean that all journals published by companies have APCs. As a matter of fact, Elsevier is currently the largest OA journal publisher and 63% of its titles do not charge APCs (**Morrison**, 2016)[203].

With regard to predatory journals, a 72% of them, as defined and listed by Jeffrey Beall[204], charge APCs, which, of course, are above DOAJ's average (**Xia**,2015).

[203] Data for this analysis has been collected from publishers' websites, and differs from DOAJ or Ulrich's.
[204] https://scholarlyoa.com/individual-journals/

*2.3.4.2. Funding*

As described before[205], some policies and mandates oblige authors to self-archive or publish their papers in OA journals when these come from publicly-funded research. At the same time, if they pay APCs, they are eligible for reimbursement. This is the case under Horizon 2020, RCUK mandates, and many other government and academic institutions' directives.

In the UK, the controversial Finch Report (**Research Information Network**, 2012) defined Gold OA as a system "where publishers receive their revenues from authors rather than readers". Other Northern American and Western European official sources consider that Open Access just switched the reader-pays model for the author-pays one. This is completely false, first, because Open Access applies to both journals and repositories, not only journals, and second, because OA journals may be funded by APCs or not. Indeed, as described in the previous section, currently in DOAJ, there are more journals that do not charge APCs (31%) than journals that charge APCs (17%).

Authors usually don't pay from their own budgets. According to **Suber** (2012), in the 90% of the cases it is funders that pay. The SOAP study (**Dallmeier et al.**, 2011) found something similar: only 12% authors pay their article's APC from their own budgets. **Solomon & Björk** (2012a) reported that personal funds are much more used by authors from developing countries and for APCs below $1,000. The possibility of getting funding also depends on subject field and journal type – it is more common in STM (specifically in biology and physical sciences) than in SSH.

Funders also use to exclude hybrid journals, since payment is optional and APCs are more expensive on average (e.g. in UK and Germany, according to **Jahn & Tullney**, 2016).

OA journals can also be funded without APCs, though. This Gold OA type is known as Diamond OA or subsidized OA, and is typical from Latin America and some emerging powers and peripheral countries. Globally, "most OA journals and half of the OA articles published are currently funded by other means" (**Solomon**, 2013). Universities have introduced OA publishing in their presses, and some societies are using online platforms, alone or in collaboration with others. Collective OA platforms and international initiatives[206] do not fund journals directly, but help publishers to save money.

A classification of funding channels for OA journals has been made after reviewing works by **Crow & Goldstein** (2003), **Crow** (2009), **Villarroya et al.** (2012), **Swan** (2012, p. 30-35) and **Suber** (2012)[207]. These are divided into internal and external:

- Internal (generated by the publisher's or journal activity)
    - APCs.
    - Community publishing. This is "a model under which journals are produced entirely within the academy as a result of voluntary efforts by researchers who provide editing, peer review and production services" (**Swan**, 2012, p. 32). This

[205] See 2.2.1.3.
[206] See next section, 2.2.1.5.
[207] This classification was already published in **Navas-Fernández** (2014).

type is common in humanities fields, and is related to the so-called Platinum OA, where neither the reader nor the author pays.
    - Off print sales
    - Introducing advertising from commercial companies
    - Sponsorship by public bodies
    - Other: organizing events with scientific societies, sells to aggregators or information distributors, and service and product selling

- External (not generated by the publisher's or journal activity)
    - Membership fees: common in scientific societies
    - Institutional member schemes: free or price-reduced subscriptions for institutions, as a compensation for APCs paying on behalf of their researchers.
    - Discounts for APCs. The opposite case to the latter: these discounts are offered by publishers to researchers from institutions that pay large subscriptions.
    - Public funding from research institutions and government agencies. It is usually related to SSH. There can be policies and mandates[208] that require researchers to publish their works in OA.
    - Users' consortia or collaborative purchasing models: redirecting money from subscriptions to APC payment (e.g. SCOAP3[209]).

There is a growing effort in switching subscription access to OA. Some authors argue that this change is necessary, possible and sustainable for all parts (e.g. **Schimmer et al.**, 2015).

**SCOAP3**[210], a partnership led by CERN and composed by more than 3,000 libraries, funding agencies and research centers from all over the world, converts subscription-based journals on high-energy physics into Open Access, by centrally paying the publishers the costs related to provide OA. Thus, researchers belonging to the institutions in the partnership can publish at no cost.

It is not the only initiative to convert subscription-based journals into OA. **Suber** (2007) described methodologies and procedures to achieve this, and edited a report written by **Solomon, Laakso** & **Björk** (2016) that came from an online collaborative platform called "Journal-Flipping Public Consultation". It is also interesting to mention the brand new **OA 2020** Initiative for the Large-Scale Transition to Open Access[211], which will try to do this "by converting resources currently spent on journal subscriptions into funds to support sustainable OA business models". Similarly, the Pay-It-Forward project driven by the University of California Davis for North American universities[212] recommended to cover publication expenses by funded-APCs rather than subscription costs (University of California Libraries 2016).

[208] See 2.2.1.6.
[209] See 2.2.1.6.
[210] https://scoap3.org/
[211] http://oa2020.org/
[212] http://icis.ucdavis.edu/?page_id=286

Not all conversions have to be done into an APC-funded scenario, though. **Laakso, Solomon & Björk** (2016) described other means, as society subsidy, low cost infrastructure and volunteer effort, joining regional journal platforms, joining consortia or library subsidies, and others.

#### *2.3.4.3. Pricing*

**Solomon** & **Björk** (2012) studied 1,370 APC-charging journals in DOAJ[213]. The average APC was $906, but it depended much on the country of publishing (from $8 in developing countries to the highest $3,900 in countries with high impact factors from major publishers), discipline (biomedicine represented a 59% of all the journals and had the most expensive prices) and publisher type (commercial companies had higher APCs than societies and universities). That was only for full OA journals (DOAJ does not include hybrid ones), but concluded that APCs in the latter type were much higher in general.

Following with DOAJ, the mentioned study by **Morrison et al.** (2015) reported an average APC price of $964, but it varied much depending on the subject field. A 61% of the publishers using APC were commercial.

Other studies have been carried out with data obtained from different sources. **West, Bergstrom & Bergstrom** (2014) studied all OA journals in JCR and found that 71% of them requested no APC. **Björk** & **Solomon** (2014a) calculated that the average price for full OA journals was $1,418 for non-commercial publishers and $2,097 for commercial[214]), while it was $2,727 for hybrid. Later, they reported that, in Northern America and Western Europe, the average APC was $2,000 for full OA journals and $3,000 for hybrid (**Solomon & Björk**, 2016).

According to the analysis by **Schimmer et al.** (2015), the average APC price for full OA journals was €1,258 for the Max Planck Society, €1,239 in German universities, €1,282 in Austria and €2,495 for the British Welcome Trust. The latter price is higher because includes the APCs charged to publish hybrid journals, which are "not only much higher than most pure open access costs but are also widely considered not to reflect a true market value" (p. 6.).

Other recent works led to similar findings. **Morrison** and **Salhab** (2015) analyzed a sample of 1,999 journals, obtaining an average price of $998 out of a sample of 1,999 titles. **Crawford** (2015) studied more than 9,000 titles, finding an average of $1,108 that, again, varied very much depending on the subject area.

When analyzing pricing, it is also worth mentioning price variations. **Morrison et al.** (2015) informed that an 80% of APC-charging DOAJ journals offered significant price variations (e.g. waivers, discounts, etc.). **Lawson** (2015) found that a 69% of the largest publishers of full and OA journals offered fee waivers, but only for low and middle-income countries in most of the cases.

[213] DOAJ does not include hybrid journals. Therefore, all DOAJ APC prices stand for full OA journals.
[214] They called them "non-subscription publishers" and "subscription publishers".

With regard to specific pricing, the charges for publishing in the seven journals at the Public Library of Science (PLoS) vary from $1,495 to $2,900[215]. Elsevier prices range widely from $300 to $5,000[216], and the average price of BioMedCentral is €1,778 with a range from €600 to €2,420 but with an 89.7% of journals between €1,700 and €2,000[217].

**Pinfield et al.** (2016) reported that APCs for hybrid journals were higher than full OA journals in UK. **Jahn & Tullney** (2016) also reported the same findings for Germany, where APC average was €1,298 – in line with findings by **Schimmer et al.** (2015). Predatory journals, not surprisingly, charge higher APCs than the DOAJ average (**Xia**, 2015).

Apart from the pricing, full OA and hybrid publications markets are different basically because hybrid may or may not charge twice for accessing the same article, since there is one payment for the APC and another one for the subscription or purchase. This phenomenon is known as "double dipping".

Regarding Spain, **Abadal** (2013, p. 202) wrote that the "author-pays model is rarely used, although some journals offer the option of freeing articles", with no further data.

### 2.3.5. Relation between price and impact

"Price", rather than "cost", is the appropriate term when referring to paying. Also, as we are dealing with bibliographic impact, not quality, "price and impact" are being used here instead of "cost and quality".

It is often believed that most expensive products or services are of better quality. Is that so for scholarly journals, when quality is measured by impact? This issue may be approached from two points of view. First, the classical, subscribers pay for a journal and want to access high quality content. Second, associated with the new paradigm, researchers, or their funders, pay APCs[218] and want their articles to have impact.

Another approach to price and impact is cost-effectiveness. It is a relative measure, useful to rank and compare journals.

#### *2.3.5.1. Subscription prices and impact*

**Bergstrom** (2001) analyzed the most cited journals on economics in SSCI, and used both the prices from the annual library subscriptions and the individual subscriptions. To begin with, the six most-cited were non-for-profit, and their library annual subscription price was on average

[215] https://www.plos.org/publications/publication-fees/
[216] https://www.elsevier.com/books-and-journals/journal-pricing/apc-pricelist
[217] http://www.biomedcentral.com/submissions/article-processing-charges/how-much-is-biomed-central-charging-
[218] See 2.2.1.4.

about $180, while only five of the most cited 20 were published by companies and their average price was about $1,660. When calculating cost-effectiveness with citations, subscriptions to journals published by companies[219] consume more than 80% of the library's budget but would supply only a third of all citations. When considering individual subscriptions prices, the average price for non-for-profit journals was about $60, and $360 for commercial publishers. He also found that the ''price per cite'' was $0.15 for journals published by non-for-profit organizations and $2.48 for companies. Although the study focuses in economics journals only, the author argues that similar differences have been found for chemistry[220], agriculture, mathematics, physics and medicine[221].

**Dewatripont et al.** (2006) conducted a study on 2,700 journals indexed in ISI (currently, WoS), using 22 discipline domains – and they did so arguing that, until then, most studies had been carried out in specific subject areas only. They retrieved IFs from JCR and prices from commercial provider SWETS – thus, A&H titles were not included. The results showed that commercial publishers were pricing higher than non-commercial in all disciplines, even though they were less cited. When analyzing by article instead of by journal, results were similar. When comparing for-profit and non-for-profit publishers with same subject domain, age and citations, the first where pricing three times higher than the latter. For-profit publishers charged more in absolute terms, more per cite, and more for similar IF and SJR values. Nevertheless, prices increase with citation counts for each discipline (correlation is stronger for commercial journals). This fact confirms a relation of price and quality (or impact at least), but also confirms that pricing is value-based and not cost-based, which "is again indicative of publishers' ability to exercise discretion in price setting" (p. 40). Although this fact is not contradictory with the possibility of for-profit journals having higher costs, evidences from this study support the theory that prices are not based on costs.

Journalprices.com is an interesting online resource (**Bergstrom & McAfee**, 2014) that assesses cost-effectiveness for specific single journals. It collects 10,100 titles, "all journals from which the ISI WoS publishes citation counts and for which we were able to find prices"[222]. Prices were collected from publisher's sites, choosing online institutional subscription when possible. When there is no online version, and there is no specific price for online only, print subscription price is recorded. When subscription price from the publisher varies according to the size and nature of the institution to which it is sold, the value selected is the one charged "to large universities located on a single campus".

They used a few basic fields (title, ISSN, publisher name, publisher type, subject and year) and displayed neither citations nor prices, but calculated some indicators of their own – Price per Article, Price per Citation, Composite Price Index and Value. Price per Article is the price of a journal's annual subscription divided by the average number of articles published per year. Price

[219] Excluding Blackwell, which is considered neither for-profit nor non-for-profit in that study (something in between).
[220] Wilder, Stanley J. (1998). "Comparing value and estimated revenue of SciTech journals". *ARL Report*, October, p. 200.
[221] Case, Mary M. (1999). "Measuring cost effectiveness of journals: the Wisconsin experience." *ARL Newsletter,* August.
[222] http://journalprices.com/explanation2013.html

per Citation is such annual price divided by the recent citation rate, which is the "number of times that volumes of a journal published in the years 2004-2009 were cited in 2009 by ISI-listed journals, divided by 5[223]". The Composite Price Index is the geometric mean of the last two indicators, and it determines the Value of the journal, which is "good" if it results in less than 1.15, "medium" if it results in a figure between 1.15 and 1.75, and "bad" if it is higher than 1.75 is "bad".

It includes also free journals, which of course are always retrieved as "good". For instance, "Revista española de enfermedades digestivas" has a zero value for Relative Price index, because prices per article, per citation and composite price are zero. Perhaps free access journals should not be included, because all of them will have the same grading and distort global results.

Journalprices.com is useful for assessing the cost-effectiveness for a specific journal, determined by articles, price and citations, but it does not allow to determine if there is a relationship between price and impact, global or specific, and measure it. Nevertheless, there is a full summary spreadsheet[224], where some information can be analyzed. Using median rather than mean values of Relative Price Index indicator (because it comes from a mix of continuous and discrete variables), it is possible to know which subject fields and publisher types are more cost-effective (Figure 27).

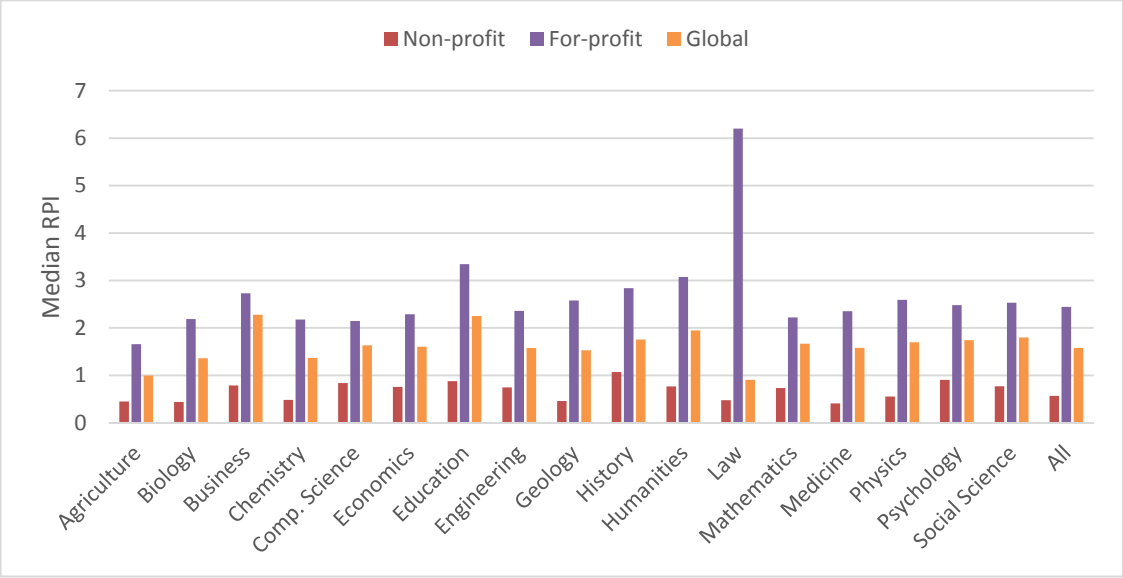


**Figure 27 – JCR journals by median Relative Price Index, subject field and publisher status**
Source: journalprices.com, June 20, 2016.

Globally, non-for-profit journals are better (0.57) than for-profit (2.44). With regard to subject areas, law is the best globally (0.90) but the worst by for-profit publishers (6.20) – meaning that

[223] This definition might be wrong. It seems that proceeds from previous versions of journalprices.com. Actually, in http://journalprices.com/SummaryData.xls it can be read "Statistics are calculated using subscription prices for 2013 and citation and page counts for the years 2004-2011 — calculation date is 9/29/2013", which seems the correct one, although, in that case, perhaps Price per Citation should be divided by 7 and not by 5.
[224] http://journalprices.com/SummaryData.xls

commercial companies are over-pricing these. Globally, agriculture (0.99) and biology (1.36) follow.

Within the journals published by non-for-profit, most cost-effective titles are by average on medicine, biology, agriculture, geology, chemistry and law, in this order, but with very little differences (values between 0.4 and 0.5). Least cost-effective journals are on history, psychology and education.

With regard to for-profit journals, best fields are agriculture (1.66), followed by computer science, chemistry and biology (between 2.14 and 2.19), while worst are law (mentioned before, 6.20) followed at a distance by education (3.35).

Differences among for-profit journals by fields (red color in table) are much larger than among non-for-profit (blue color), and this phenomenon is due to the fact that there are free journals among the latter, zero price distortions of which result by equalizing averages. Still, it is interesting to see that, within the journals published by companies, expensive fields as medicine, physics, biology and IT-related fields are not less cost-effective than most SSH, or are even sometimes better in this aspect.

Finally, it is necessary to bear in mind that, apart from the mentioned inadequacy including free journals, this tool has other limitations or weaknesses, namely: it only works with WoS titles. Besides, using subscription prices is always problematic. Also, they use self-made indicators based on a mixture of number of articles, citations and years, which might not be the best approach for a universal analysis since every subject field behave in a specific way.

In Spain, **Mañana Rodríguez** and **Giménez-Toledo** (2015) conducted a study on "bibliometric performance" for international education journals indexed in WoS, based on subscription prices (taken from journalprices.com), number of articles, cites and other factors. They found that more expensive journals were not necessarily better in content.

So far, it is clear that subscription prices are not necessarily related to impact, and commercial publishers charge systematically higher prices than societies and universities. **Shieber** (2009) compared academic publishing and medical care – consumers do not follow price incentives because they do not directly pay for what they consume.

#### *2.3.5.2. APC prices and impact*

**Solomon & Björk** (2012a) reported that journals with IF charged higher APCs. The same applies to journals with abundant funding. The same authors (**Björk & Solomon**, 2015) found a moderate correlation (0.40) between prices for DOAJ journals with Scopus and Source Normalized Impact per Paper (SNIP), which was higher (0.60) for article volumes.

**West, Bergstrom & Bergstrom** (2014)[225], cited before, developed Eigenfactor Index of Open Access Fees[226], an online tool that assesses "value provided by Open Access journals". Although the work mentioned 1,357 OA journals from JCR[227] (a 75% of them in DOAJ and the rest listed at journalprices.com), there currently[228] are 1,113 OA titles (a 31% JCR fee-based, a 38% JCR no-fee, a 31% non-JCR). They used Article Influence impact indicator and APC prices for determining the relationship among them and for calculating cost-effectiveness (the formula they used is: 1,000 x Article Influence / APC). Thus, when matching Article Influence values with APC prices, they found a "linear regression [that] indicates that more prestigious journals tend to have higher APCs" (p. 1319). Their figure is showed here (Figure 28), and, indeed, it displays a moderate positive correlation – which, regretfully, had not been calculated in the study[229]. On the other hand, cost-effectiveness values allow ranking journals globally and by subject area – it is possible to do that by using the online tool, but there are no further results in their paper.

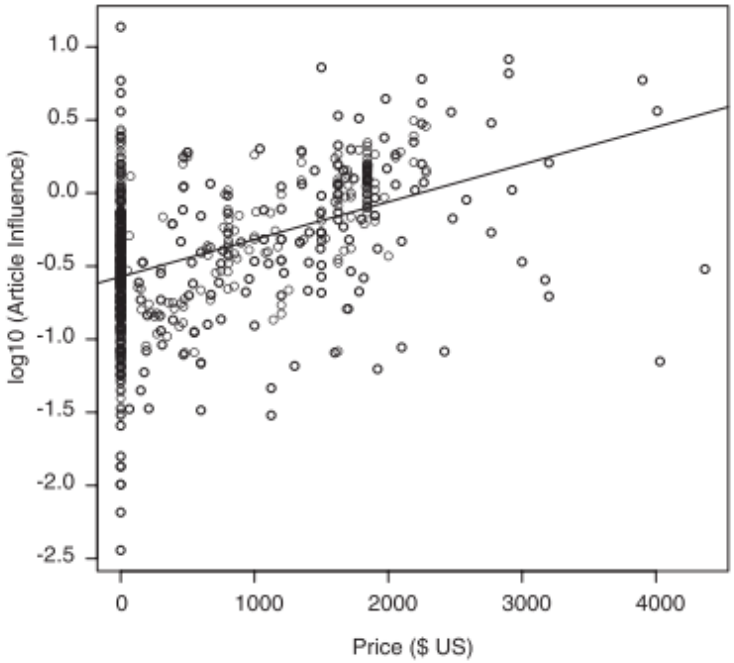


**Figure 28 – Article Influence score versus Article Processing Charges**
(**West, Bergstrom & Bergstrom**, 2014, p. 1319). Only JCR journals are included.

[225] These authors are the founders of the Eigenfactor Project (http://eigenfactor.org/), which develops Eigenfactor and Article Influence impact indicators. Eigenfactor measures global importance of JCR titles, using relevance algorithms such as Google PageRank, applying iterative calculation to citations received according to the quality of the source. Article Influence uses the same algorithm, but measures the mean influence of a journal taking into account its number of articles. Both indicators appear in JCR titles. Ted Bergstrom is also one of the creators of JournalPrices.com.

[226] http://eigenfactor.org/openaccess/

[227] According to the authors, it meant that a 13% of all JCR titles were OA.

[228] Consulted June 6, 2016.

[229] After contacting the author, Jevin West, he provided Pearson (0.44) and Spearman (0.45) values. These values confirm a moderate positive correlation.

Evidence is enough to demonstrate that there is a relationship between APC prices and impact. Apart from that moderate correlation (ρ = 0.44 and 0.45) between JCR-APC titles and the mean Article Influence, **Björk & Solomon** (2015) found a similar correlation (Pearson's ρ = 0.40) between DOAJ-APC journals and SNIP. A higher value ($r^2$ = 0.90[230]) has been reported in UK between APC prices and Field Weighted Citation Index[231], although it does not specify what journal type is referring to, and the number of journals might be too small for such a measurement[232].

Subscription and APC markets behave very differently nowadays. Nonetheless, the "author-pays" model could have the potential for creating a similar scenario to the "reader-pays" one, something that **Shieber** (2009) dismissed but **West, Bergstrom & Bergstrom** (2014) worried about. In the opinion of the latter, funders should subsidize only a part of the APC price, in order to "ensure that authors remain sensitive to price differences" and the "price elasticity of demand" remains high (p. 1320).

[230] $R^2$: Coefficient of Determination

[231] Article-level impact indicator by Elsevier-Scopus.

[232] This information has been consulted at **Publishers Association** (2016, p. 3). Such report focuses on hybrid journals and takes the analysis from another source that could not be found. It seems, though, that correlation is taking only 11 hybrid journals.

## 2.4. Internationality

### 2.4.1. Concept

Currently, there are two main factors affecting the internationalization of science: the English language and globalization. English became the scientific "lingua franca" after World War II, as Latin was in the past. Globalization is an economic, technological, social and cultural phenomenon that impacts in the ways of generating and sharing knowledge. Scholarly publishing "is constantly receiving more attention in a world that tends to globalization of ideas" (**Buela-Casal et al.,** 2006. p.1).

In scientific publishing, the concept of internationality can be applied to a variety of entities (journals, articles[233], authors, subjects, countries) and from multiple points of view (from a specific country or region, or from a global perspective). According to **Malalana Ureña et al.** (2007), internationality may be observed as a phenomenon of two faces: import (collaboration from and use of journals from foreign countries) and export (publication of articles by Spanish authors in foreign journals).

Internationality is often mentioned along with quality, mixed with it or absorbed by it. **Ortega et al.** (1992) considered internationality as a "further indicator of the quality", and **Rodríguez Yunta** (2015) included indicators for internationality assessment within a quality system for Spanish SSH journals.

Quality and internationality are complementary, but different concepts. For example, a domestic journal may publish high quality articles in spite of not having foreign participation or impact outside the country borders. Following this line, **Buela-Casal et al.** (2006, p. 46) pointed out that "it should be made clear that internationality per se is not to be equated with quality". **Malalana Ureña et al.** (2007) provided a definition that seems to be followed in Spain and other "peripheral" countries – internationality is "something related to the ability that [a journal] has to interest outside the cultural boundaries where it has been conceived"[234]. It seems that the concept is different in other countries or when it is approached from a different perspective – authors as **Kao** (2009) and **Bonnevie-Nebelong** (2013) referred to it as the variety of countries represented and not only as the ability of a journal to impact outside its country.

### 2.4.2. Internationalization in Spain

In non-English-speaking and "peripheral" countries, such as Spain, internationality is a major concern of institutions who wishes to have their quality assessed. In 1989 the Spanish public administration established that only articles indexed in sources such as SCI will qualify for research evaluation (**Rey-Rocha** & **Martín-Sempere**, 1999, p. 204). The current criteria of the Spanish Committee for Evaluation of Research Activity (**CNEAI**, 2014) specifies that "appearing in [international] indexes is a warranty for quality content", which implies that indexation of a

[233] See 2.1.2.7 and 2.2.2.3.
[234] Translated by the author.

journal in such sources is enough to prove the quality of an article, without the need of further assessment. The National Agency for Evaluation of the Academic Career (ANECA) also mentioned international indexation as a quality criterion for journal articles[235]. **FECYT** (2015) stated that, in order to qualify for its seal, at least a 10% of the authors[236] or a 10% of the foreign members must belong to foreign institutions. This percentage is low, and, as it has been claimed so far, the proportion of foreign experts usually is higher than that of authors.

Some of the best STM journals are indexed in international multidisciplinary databases and recognize bibliometric impact indicators (such as IF). To balance this, the Spanish academia has been building quality assessment systems, initially for SSH journals only[237]. Some of them include internationality aspects. Among the systems no longer used, IN-RECS/IN-RECH/IN-RECJ identified international citations, DICE collected foreign authorships, and RESH analyzed advisory councils. Among the systems currently in force, CIRC uses indexation in international databases to categorize or classify journals, while MIAR uses the same concept but for assigning a numeric value for its ICDS. Note that discontinued systems included Spanish SSH journals and analyzed complex information, while the systems currently in force are comprehensive (cover journals from all over the world on any subject), and use easy-to-process data.

In Spain, attempts to separate degree of internationalization from quality fail to the extent that evaluation agencies assign quality to articles only when they belong to journals indexed in databases or directories with international prestige. According to **Rey-Rocha & Martín-Sempere** (1999, p. 204), "this policy implies a tacit recognition that the academic quality of local journals is suspicious. In fact, it is leading some domestic journals to face serious problems, even to be discontinued".

First studies on Spanish journals' internationality were carried out during the 90s, and analyzed mainly indexation and dissemination in databases and repertoires.

**Amat & Cueva** (1990) created a Dissemination Index (DI)[238], applicable to journals belonging to a specific area, calculated as the proportion of articles published in biomedical journals and indexed in international subject databases (MEDLARS, EMBASE, BIOSIS and SCISEARCH) during the period 1980-86. They found that the average DI was very low (19%, only one article in five), decreasing throughout that period, and unevenly distributed (with high deviation). Relying on these data, authors state that the mere inclusion of a journal in such sources does not guarantee the international dissemination of its articles, while DI is a much objective indicator.

**Ortega et al.** (1992) studied 357 titles on STM in ICYT[239] database, analyzing their discipline and publisher type distribution, as well as their quantitative evolution and internationality, assessed by measuring journals indexation in worldwide databases and repertoires. They reached the

[235] In the links herein, the reader can consult the decisions of the Spanish Ministry of Education and Science, published in 2005 (https://www.boe.es/diario_boe/txt.php?id=BOE-A-2005-3650) and in 2007 (http://www.boe.es/diario_boe/txt.php?id=BOE-A-2007-17492) in Spanish language.
[236] That guides mentions literally authors, not articles. Thus, in theory, authors of all the articles in the period assessed should be added – something that does not seem logical.
[237] See 2.3.1.4.
[238] Wrongly translated as "Circulation Index" in the English abstract of that study.
[239] https://bddoc.csic.es:8180/inicioBuscarSimple.html?tabla=revi&bd=ICYT&estado_formulario=show

conclusion that 42% of journals were included in those, depending much on the subject area. A 41% of the titles appeared in Ulrich's, and a 30% in EBSCO. As to articles, only 7.3% were indexed in WoS' Science Citation Index for the period 1980-89. According to the authors, "the low rate of Spanish science and technology journals in international directories and databases has a negative influence in their visibility" (p. 33).

They also analyzed foreign authors' contributions and "cooperative research" at article level on Spanish STM journals. An 80% of the articles indicated affiliations, and an 88% were written exclusively by Spanish authors. A 10% belonged to foreign authors, and only a 2% were the result of international collaboration. Articles proceeded from 71 countries, but an 81% of the articles came from only 14 countries – mainly France, USA, Argentina, Germany, Italy, Latin American countries and UK. Foreign authorship and international collaboration were related to specific subject areas. For instance, contributions coming from LAC were mostly on agriculture and earth sciences, while those from European countries and USA used to be on technology, life sciences and mathematics.

Other indicators based on articles, journals, affiliations and databases have been created, although they have been little used afterwards. This is the case of the International Dissemination Index (IDI) and the Trend to Public Abroad (TPA), by **Álvarez-Ossorio et al.** (1997), applicable to specific subject areas. The IDI is calculated by the proportion of articles published in Spanish journals by Spanish authors, indexed in international databases. As explained by **Román-Román** & **Giménez-Toledo** (2010), these indicators define "international dissemination of the national output in a specific subject area as the percentage of articles on this topic in a specific period of time and indexed in a national database, which are also indexed in an international special database". The TPA is the proportion of articles published by Spanish authors in foreign journals over the total articles published by Spanish authors in both foreign and national journals. With those indicators, **Álvarez-Ossorio et al.** (1997) analyzed journals on physics and chemistry, using ICYT[240], INSPEC and Chemical Abstracts. Findings reported that the IDI reached a 33% in physics and a 46% in chemistry, while the TPA represented a 55% and a 74%, respectively. These results seem to indicate that there is a relationship between the two indicators – the higher the international dissemination, the higher the trend to public abroad. In any case, these indicators apply to subject areas and countries; however the key aspect of this thesis is the assessment of available journal's internationality indicators.

**García-Marín & Román-Román** (1998) analyzed international dissemination of Spanish journals on Ancient History, Pre-History and archeology, using international databases and library catalogues.

**Rey-Rocha & Martín-Sempere** (1999) retrieved articles published by Spanish authors on earth sciences and indexed in ICYT, SCI and GeoRef. They found that a 69% of them were published in Spanish journals, a 26% in SCI journals (none Spanish), and only a 5% in foreign journals, not included in SCI. Different to the TPA, described above, they introduced the TPH (Trend to Publish Home), which applied to institutional sectors. It was lower for authors whose research

[240] https://bddoc.csic.es:8180/inicioBuscarSimple.html?tabla=revi&bd=ICYT&estado_formulario=show

production is subject to evaluation, such as those from universities (68%) and CSIC (51%). They used the IDI (also from **Álvarez-Ossorio et al.**, 1997) but applied it to journals (not to subject areas), calculating its value as the percentage of journals' papers indexed in subject-specific databases. The IDI values for all journals resulted in less than a 50%. According to their analysis, Spanish research output was increasing in internationalization, but it varied significantly across disciplines, since some as Earth Sciences are geographically-oriented.

The authors (**Rey-Rocha & Martín-Sempere,** 2004) continued with their research on earth sciences, and analyzed six journals published in different countries on that subject. They created two brand new indexes, Degree of International Openness (DIO) and Degree of International Collaboration (DIC), which were applicable to journals. DIO values correspond to the proportion of articles with at least one foreign author, which was useful to categorize journals into domestic, interregional and international. The DIC indicated the proportion of coauthorships within the previous group of journals, which, paradoxically, was higher in domestic titles. As a matter of fact, those "foreign collaborative papers" were "signed by local scientists in collaboration mainly with colleagues from countries closely linked by geographic, cultural, geopolitical, economic and/or linguistic bonds" (p. 111). On the other hand, "articles signed by only one foreign author are, in general, by authors from countries that speak the language of the publisher of the journal. In the case of Spanish journals, the majority of foreign authors are mostly from Latin-America, and in French journals from Tunisia and Morocco (p. 9). As to the editorial teams, they wrote that the "presence of foreign scientists in the editorial board can result in an increase in the number of contributions by foreign authors" (p. 103). The results of their work seem to support that theory.

**Gutiérrez Puebla** (1999) studied 19 Spanish journals on geography indexed in SSCI, and informed of authors' distribution by country. Internationalization degree was assessed according to the diversity of countries, and countries with relative presence in each journal. The "most international" journal in the sample was the most multidisciplinary, and the average of the total population was low – author theorizes that it is due to the scientific community fragmentation by regions and languages. In addition, more than 2/3 of international participation came from USA and UK, and the same occurred with editorial boards, while non-Anglo-Saxon countries with important geographical communities, as Germany and France, have little representation. It was not the case in Spain only, because an 85% of all articles in the most prestigious international (not Spanish) journals came from USA and UK. Therefore, we could talk about openness to the Anglo-Saxon community, but not about internationality as global representation.

From the 2000s onwards there was a tendency to apply multiple indicators analysis. **Delgado López-Cózar et al.** (2006) defined aspects that compose "international representation": nature of the supporting institution, country of institutional affiliation of editorial team members and authors, bibliographic references cited in the articles, and dissemination in international databases.

**Buela-Casal et al.** (2006, p. 45) defended the need of a composite Internationality Index, because "no single criterion alone is sufficient" for measuring internationality unambiguously. In addition, internationality should reflect global perspective, and this "suggests the need for a quantitative index to evaluate the degree of internationality". They defined a methodology for

that index, including a variety of value-weighted criteria: language, Internet access, country, publishing norms, indexation in JCR and other sources, editorial board, Impact Factor, authorship, and the presence of the word "international" in the title. This composite index was applied to Spanish journals on psychology, by means of a set of indicators which experts had value-weighted. It was also used by **Zych & Buela-Casal** (2007, 2009, 2010) and **Zych** (2009) for assessing internationality of Spanish and Latin American journals on Psychology.

In the same line, **Malalana Ureña et al.** (2007) claimed that the importance of the internationalization process demands a system of complementary indicators to measure it. They carried out a complete study on Spanish history journals, in which they assessed international dissemination, foreign authorships, and scientific committee members, among other aspects.

As to international dissemination, they measured journal indexation in foreign libraries catalogues, international databases and journal directories. Journals were indexed in a wide range from 20 to 376 catalogues, and from 2 to 19 points valuating their presence in databases.

Articles with foreign authors averaged only a 21%, and journals on Spanish ancient and medieval history were the ones with the lowest rates – this seems to indicate that foreign participation depends, among other aspects, on the subject. Most of the contributions came from France, Italy, Argentina and UK.

Editorial boards had almost no foreign member, so only advisory councils were analyzed, the results being as follows: foreign experts averaged a 47%[241], more than twice the number of foreign authors, and this varied much depending on the subject area. The results for countries of origin were similar to those for authors (France, UK, USA and Italy). This relationship could mean that experts recruit authors from their countries, and/or the scholars on this discipline are geographically concentrated. Nevertheless, authors stated that international advisory councils do not always attract foreign contributions; their function seems to merely add prestige to the journal, being "just a nice wrapper" in some cases. However, although having some degree of internationality, editorial boards mostly lack global representativeness or multi-nationality, because collaborations come from a few countries that, in addition, belong to a particular region (the "Global North" or the "West"). Another aspect under consideration was the internationality of the subject.

Despite analyzing only Spanish journals on history, the paper provided interesting conclusions: the proportion of foreign authors varies widely, internationality is low in editorial boards and varies in advisory councils. The countries of editorial board members are not necessarily the same as authors', but there are obvious linkages between countries and specific subjects. The main researcher, **Malalana Ureña,** extended his methodology to sets of specific Spanish journals on modern history (2007c), contemporary history (2007a) and medieval history (2007b), obtaining similar results.

[241] The percentage was not available in that study; it has been calculated for this thesis.

**Román-Román, Sorli-Rojo & Giménez-Toledo** conducted three studies between 2007 and 2010[242] on Latin American studies, psychology and humanities. They assessed visibility in databases and the Internet (using MIAR's ICDS indicator), foreign authorships and editorial team composition. The results indicated that journals on Latin American studies and humanities had good levels of internationality, while those on psychology must improve.

Spanish journals on humanities and indexed in ERIH were studied by **Román-Román & Giménez-Toledo** (2010) for the ten-year period of 1997-2007. They analyzed internationality by designing indicators to assess the composition of scientific committees, the number of foreign-authored papers and the degree of dissemination in databases. For the first two, the percentages were multiplied by the number of foreign countries represented, and an ad-hoc punctuation system was applied to indexation. The results showed that scientific committees had in average a 59% of foreign experts. In a half of those journals, these foreign experts came all from only 6 to 9 countries. Two thirds of the journals included less than 1/3 of articles signed by foreign authors and these authors came from less than 5 countries on average. Finally, a composite index was made up of the previous three, called EPUC[243], showing many discrepancies with ERIH categories[244]. In spite of the concentration of countries of origin, Giménez-Toledo stated that 1/3 of the journals had good level of internationality.

**Sorli-Rojo** (2013) carried out a study on Spanish journals on architecture, construction sciences and town planning, and analyzed international dissemination ("visibility"), geographical distribution of authors, and foreign members in full editorial teams. Sorli-Rojo complained about the lack of affiliation information in such journals, as well as their deficient international indexation and lack of foreign participation. The same author completed a bibliometric analysis of a specific journal on architecture, observing foreign participation in editorial team and authorships, but this time adding international diversity assessment (**Sorli-Rojo & Mochón-Bezares**, 2014).

**Rodríguez Yunta** (2015) defined a methodology for assessing quality to SSH journals indexed in ISOC database. Three ad-hoc internationality indicators were created. The Compensated Index of Linguistic Internationality considers languages from different regions, other than the journal's main language (except when it is English), and assigns them a weighted value (English is always the one with higher punctuation). The compensated Index of Authorship Internationality calculates the percentage of authors not belonging to institutions from the two main countries in the journal. And the Dissemination in International Databases scores journals according to their indexation in WoS, Scopus and sources included in Latindex – MIAR was not used. This

[242] **Román-Román, Sorli-Rojo & Giménez-Toledo** (2007) on Spanish journals on Latin American studies, **Giménez-Toledo, Rodríguez-García & Moneda Corrochano** (2009) on psychology, and **Román-Román & Giménez-Toledo** (2010) on Humanities.

[243] EPUC is the name of the CSIC working group on scientific publishing evaluation (http://humanidades.cchs.csic.es/cchs/epuc/).

[244] See next section.

methodology was previously applied to a number of works on specific subject areas[245], and was used to rank journals within them.

There are not many studies on dissemination of Spanish journals on health and medical sciences, since they are "more indexed" than those in SSH. **Abad-García et al.** (2015) analyzed the presence of Health journals in multidisciplinary and biomedical databases and found that print-only journals had almost disappeared, there were some titles published only in English, Spanish-English bilingual versions were increasing, and free-access was also growing. **Jiménez Hernández** (2015) assessed "visibility and dissemination" of nursing journals, using their presence in catalogues, databases, etc., including MIAR's ICDS and other national and regional sources.

In summary, internationalization of research output has been a major topic of study in Spain since the 90s. During the 80s, journals began to incorporate foreign languages, especially English, and reached a moderate international dissemination (**Ortega et al.**, 1992). During late 2000s, international indexation have been growing in all subjects, and specially in Scopus (**Osca-Lluch et al.**, 2008). Nevertheless, there is no consensus on the improvement of this process as it is difficult to quantify.

A number of studies focused on internationality degree assessment, since being indexed in prestigious directories and databases does not guarantee quality (**Gutiérrez Puebla**, 1999). These studies, described above, have analyzed different elements (separately or jointly) for different periods of time and in journals from specific disciplines or areas, not globally. As internationality cannot be measured by an isolated element or indicator, a diversity of indexes (DI, IDI, TPA, TPH, DIO, DIC) have been created, but none of them were further developed. Even if they had been further developed and applied to the analysis of internationality, there is still the problem that the phenomenon cannot be measured through the same means in all disciplines, as the authors stated.

Despite all those efforts, Spanish agencies continue to consider indexes produced by core publishers (WoS & Scopus) and not other international sources that are friendlier with LAC publications (e.g., Latindex, SciELO). As a result, Spanish researchers are much more oriented towards publishing in journals that are indexed in WoS or Scopus.

Most works focus on journal sets from specific disciplines or subject areas, with particular ad-hoc methodologies, and intend to classify, categorize or rank journals. Very little studies analyze universal populations of journals or try to discover the relations among existing elements, how these elements behave and why. As a result, it is very risky to state which journal is international and which is not based on the findings of these works.

Also, there are cultural, regional and language differences which have to be approached. Geographer **Capel** (2004) criticized Anglo-Saxon domination and claimed that Spanish journals

[245] Working papers are available at http://digital.csic.es/browse?type=author&authority=rp02062&sort_by=2&order=DESC&rpp=20&etal=10&submit_browse=Actualizar. Each document analyzes journals on a specific area: linguistics, archeology and prehistory, library and information science, geography, anthropology, and history. There are also two recent works on journals with FECYT quality seal, and journals indexed in WoS and Scopus.

have to be directed towards Latin America and published in Spanish, Portuguese, Italian and other Latin official languages in Spain (Catalan and Galician). This author recognized that English is the dominant language in science, but it is due to the "imperialistic power of the USA" and it is favoring Anglo-Saxon academia in detriment of other cultures and scientific communities as the Hispanic one.

### 2.4.3. Internationalization outside Spain

The scholars in USA, UK, Canada, etc. seems to assume that their journals are already international when perhaps they are not so. According to **Malalana Ureña** (2007 cuadernos) and **Gutiérrez Puebla** (1999), their editorial boards and advisory councils are not multinational, topics treated are approached from an Anglo-Saxon perspective, authors are mostly Anglo-Saxon, and bibliography is Anglo-Saxon. Therefore, these journals are Anglo-Saxon, but not necessarily international. These criticisms usually come more frequently from SSH scholars (these two are researchers on history and geography, respectively) than from STM scholars, and obviously from non-Anglo-Saxon communities.

There are not many studies on internationality of British or American journals, perhaps because it is (wrongly) understood that those are already international, or because there is no need to wonder whether they are international or not.

Precisely, **Torrado-Morales & Giménez-Toledo** (2012) apply this methodology to UK journals and analyzed 16 British titles on film studies. The indicators used were indexation, composition of editorial board and advisory council, authorship, and peer-review (perhaps this is unnecessary if journals are not scientific). For internationality assessment of members and authors, both the number of occurrences and countries represented were considered.

As to experts at boards and councils, many countries were represented, but mostly English-speaking ones. Surprisingly, editorial boards were more diverse than advisory councils. Journals focusing on film studies in specific countries or regions (e.g. studies in European films, studies in Hispanic films) have members from related countries, either in the editorial board or in the scientific committee. Almost a half of the members of the editorial board in all the 16 journals were affiliated to non-British institutions, and the average for journals was of a 43%, but there were many variations among publications (some did not even have a single foreign member). Internationality rate for advisory councils was a little higher (55%).

A 58% of the authors[246] were foreign, although the proportion varied a lot among journals and the ones with the highest proportions were associated to publications on specific geographical areas (again). The proportion of foreign authors from non-Anglo-Saxon countries only reached a 13%, though.

Global studies or studies on other regions analyze similar elements to those seen so far. **Zitt & Bassecoulard** (1998) designed a complex methodology based on the distribution of journals'

[246] Note that authors mentioned authors, not foreign-authored papers.

authors and quotes across countries, compared with the average profile of specific subject areas. In particular, they analyzed earth & space and applied biology journals indexed in SCI. The findings revealed that internationalization of authors and citations are strongly linked, while internationalization indexes and journal impact are only moderately associated. They added that assessment within the established indexes would lead to extreme statements, since, for instance, "even a journal with 100% U.S. authors is strongly international because of the high position of the U.S. in world science". Because of this, diversity of countries, as opposite to concentration, should be further considered.

**Kortelainen** (2001) studied a specific Finnish journal by measuring dissemination, citations, and national distribution of contributors. The author reported that the journal was firstly national, and became international by covering more topics and publishing in English language. Nevertheless, the journal captured global attention but remained relatively unknown in the local level, since the parameters showed lower values in Baltic countries, Germany and Russia.

Studies on journals internationality, both at national or international level, usually take only a limited number of journals on a specific subject area, so that it is possible to analyze their characteristics in depth. When large numbers of journals are studied, data are not deep or first-hand, due to the time-consuming effort to manage them. In spite of these limitations, **Gazni** (2015) and **Gazni & Ghaseminik** (2016) collected data from thousands of journals in any subject area and from any region.

In the first study, foreign authorships and bibliographic references were analyzed in 4,200 journals from more than 3,500 national[247] publishers from 1990 to 2013. The findings reported were that foreign authorship increased from a 36% to a 62%, while interregional authorship only grew from a 77% to an 82%. These increases depended on subject areas and regions. For instance, agricultural sciences, psychology and economics had the lowest proportion of foreign authors, while titles on earth & space, mathematics and physics had the highest. Journals published in Latin America and the Middle East had a greater tendency to publish national-authored papers, while North American journals have increased internationality in this aspect. It is interesting to point out that journals published in Russia, China and Brazil (three of the BRICKS) accounted for the lowest proportions of papers by foreign authors, while Swiss titles were the ones with the highest. As to foreign bibliography cited in papers, clinical medicine was the subject area with the lowest rates.

For the second study, the same concepts (foreign authorships and foreign bibliographical references) were observed. Almost 1,400 journals from WoS and over 2.5 million papers published from 1991 to 2014 were analyzed. Results showed that both concepts grew international ("globalized", according to the authors) over time. Older journals are "more international" than newer ones, and multinational publishers[248] issue more international journals than national ones, but the latter have internationalized faster. STM journals have the most internationalized papers, while agricultural sciences have the least – those on humanities

[247] Those publishers were considered "national" because they have offices in only one country. Gazni excluded big international publishers, assuming that their journals are already international, which may be a too risky assumption.
[248] As opposed to "national" publishers, multinational ones have offices in more than one country.

lag behind, but have the highest increase rate. Agricultural sciences papers (just mentioned as the area with the smallest proportion of international papers) quoted a wider range of papers from other countries than the average.

**Aman** (2016) has just presented a very interesting work on how to measure internationality without biases against the "periphery". Following old demand by **Buela-Casal et al.** (2006), this author constructed an internationality index based on the Gini-Simpson Index[249]. It has included countries of origin of authors and citations that can be retrieved according to the following values: 0 (national journal) and 1 (international journal). This system assigns more value to the quantity of countries than to the quantity of participations, reflecting a true international representation.

Upon collecting data from WoS and using OECD discipline groups, it was found that natural sciences and engineering & technology have the highest scores, while social sciences and humanities have the lowest. In part, this difference is explained by the fact that the fewer articles per year you produce, the fewer will your chances be of becoming international – and SSH journals have on average fewer articles than STM.

As to countries, Spain ranks 10 among the 20 top-publishing countries according to the average internationality score in all OECD fields. Netherlands is the leader (perhaps because of Elsevier) and UK stays fourth, while United States ranks in the position no. 16. Among the surprising cases, Taiwan ranks second, probably because there are no national scientific publishers there. Iran, a rather peripheral country, is no. 5, reaching the highest global scores for humanities and social sciences, perhaps because Iranian authors tend to publish in other countries' journals. Other peripheral countries (e.g. Brazil and Russia) stay at a rather national level.

Aman recognizes the limitation of the study, since it depends on WoS coverage, which is biased towards the countries from the "center" – but this internationality index causes much less damage to "peripheral" countries than other indexes as the one produced by **Buela-Casal et al.** (2005). Finally, the author considers that other internationality elements as language and composition of editorial boards could be included in further developments.

These studies are brilliant and provide remarkable findings, but it is also true that the journals studied are indexed in WoS and thus do not represent the whole world equally. It would be interesting to check if journals outside WoS actually have lower internationality levels.

The journals that wish to become international are using English instead of their national languages, or combining both in bilingual or multilingual versions. More than a 90% of the research output by non-English speaking countries and indexed in WoS is published in English, and English articles in SciELO Brazil have surpassed those in Portuguese (Packer 2016). The figure is lower for SSH titles published in the Spanish-speaking region. The use of English helps journals to be indexed in WoS, but does not necessarily mean that they are more international, just more open to the Anglo-Saxon community as mentioned before.

[249] https://en.wikipedia.org/wiki/Diversity_index#Gini.E2.80.93Simpson_index

As in Spain, there are some systems for internationality assessment of SSH journals, both at national and international levels. Listes de revues SHS de l'AERES in France[250] is an example of the first type, and ERIH of the second. **Román-Román & Giménez-Toledo** (2010) described the three categories (A, B and C) that ERIH had[251] – international journals could be categorize A or B, depending on a series of concepts and including foreign participation in authorship and advisory council, dissemination and citations received. Currently, ERIH Plus analyzes authorship internationality of the journals applying for inclusion, and requires that at least 1/3 of the authors (not papers) from the last 2 volumes should be from different countries to the publisher's[252]. If this requirement is satisfied, the journal is "international"; if it is not, the journal is classified as "national", or even "local" when more than 2/3 of the authors belong to the same institution.

Citations, and not impact factors, can be useful to assess internationality. For instance, **Bonnevie-Nebelong** (2013) studied three major journals on LIS (Journal of Documentation, JASIST and Journal of Information Science), and found that the Journal of Documentation received citations from a wider diversity of countries and had higher rate of journal diversity in the references than the other two. Most of those participations came only from Western European institutions, though.

As to the relation of citations with the other elements, **Kao** (2009) found that there was no significant relationship between the IF and internationality (understood as a variety of countries represented), at least for industrial engineering journals. On the other hand, **Wang et al.** (2015) reported that internationally collaborated papers have higher citation impact than domestic ones in the field of sport sciences.

Foreign authorship and international collaboration are studied frequently. **Wang et al.** (2015), mentioned before, found a rapid increase of international collaboration during 2000-2011, as well as of cultural, political and geographical factors that contribute to co-authoring.

Journals from developing and emerging countries encounter serious problems to become international. There is lack of interest from local researchers, who try to publish in foreign journals. For instance, as described before[253], although China is currently no. 2 in world scientific articles production[254], Chinese journals have limited regional authorship because most national researchers are publishing abroad (**Feng-Nian** 2012b).

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[250] http://www.aeres-evaluation.fr/Publications/Methodologie-de-l-evaluation/Listes-de-revues-SHS-sciences-humaines-et-sociales

[251] ERIH was maintained the by European Science Foundation (ESF) and the Norwegian Social Science Data Services (NSD), and hosted by the first. At least since 2009, when the authors collected the data, there were these three categories. The file linked in that study is not accessible by the time this thesis is being written, but it has been found available at www.oai.uzh.ch/old/images/stories/eingabe_in.../kombinierte_liste_2008_05.pdf. From 2014, ERIH was moved from ESF to NSD site (see notice at http://www.esf.org/index.php?id=4813). Current version (ERIH Plus) is available at https://dbh.nsd.uib.no/publiseringskanaler/erihplus/

[252] https://dbh.nsd.uib.no/publiseringskanaler/erihplus/about/approval_procedures

[253] See 2.1.3.3.

[254] http://www.scimagojr.com/countryrank.php

There is also little funding, and scarcity of good editors in such small academic communities, and they need the participation of foreign institutions and multinational publishers to achieve internationality (**Donovan**, 2012).

Other studies focus on internationality of scientific output[255], which is usually measured by analyzing international collaboration. **UNESCO** science report (2015), with data from WoS, provided the percentage of international collaborations on the total number of papers by country, and they vary very much – in general, it is more than twice in low-income economies (an 86%, while the rest range between a 34% and a 38%), but there are other significant differences among countries - e.g., UK's is quite higher (62%) than USA's (40%). **Santin et al.** (2016) criticized the lack of other elements in internationality studies and added an analysis of references and citations for their study on Brazilian scientific output on evolutionary biology.

Specific international collaboration networks have been thoroughly analyzed. For instance, BRICS collaborations with other countries are stable in time and heterogeneous across subject areas (**Finardi** 2014), while relatively strong with respect to the surrounding network (**Finardi & Buratti**, 2016) but collaborations are mostly with G-7 countries and those among BRICS are very few (**Bouabid et al.**, 2015). **Zhou & Lv** (2015) found that co-authoring papers with German physicists improved Chinese researchers' citation impact and capability of publishing in higher-quality journals. With regard to global analysis, **Leydesdorff et al.** (2013) reported that, although co-authorship relations have been dominated by Western European countries and USA, they are rapidly expanding throughout the world – except some isolated communities as Islamic countries, which use to collaborate only among themselves (**Sarwar & Hassan**, 2015). North African countries, mainly Egypt, are undergoing a sustained process of internationalization, but its degree keeps very low for intra-regional collaborations (**Landini et al.**, 2015).

As to linkages with impact, **Li et al.** (2013) found that co-authoring with prolific scholars or authors with longer publishing tenure benefited citation among information systems journals in SSCI.

### 2.4.4. Elements of internationality

The following specific elements that contribute to the internationality of a journal have been identified so far.

#### *2.4.4.1. Language*

Language means audience, and it could be measured according to three concepts: "the percentage of the world population speaking each language, the number of countries where the language is official, and, the academic impact of the language or languages used" (**Buela-Casal et al.**, 2006, p. 48). According to current data[256], Mandarin Chinese is the most widely spoken language (world 13.7%), followed by Spanish (6.5%), English (5.2%), Arabic (4.1%), Hindi (3.9%),

[255] See also 2.1.2.7 and 2.1.3.
[256] https://www.ethnologue.com/

Portuguese (3.1%), Russian (2.7%), Japanese (1.9%) and French (1.2%). If the number of countries where the language is official is considered, the results are remarkably different. English comes first (106), followed by Arabic (58), French (53) and Spanish (31). As to the academic impact, English is the scientific "lingua franca" without any doubt, despite the importance of Latin American community. If languages are to be measured according to their potential audience, there are different ways to do so.

Some consider all foreign languages or non-Spanish languages as "international", giving the same or a different value (e.g. English is more important than French), and considering the number of different languages or not. **Buela-Casal et al.** (2006) and **Rodríguez Yunta** (2015), for instance, assigned a weighted value to languages, giving more importance to English.

#### *2.4.4.2. Authorship*

Since "internationality"[257] means more than one nation, in respect to scholarly journals it can be applied as foreign participation and international collaboration. Thus, for instance in Spanish journals, an article written by two English authors is a foreign article, not an international article – but it helps the journal to qualify as international. An article written by Spanish and English researchers is a product of international collaboration, but it is not a full foreign article, while an article written by English and French authors is both international and foreign. Similarly, **Buela-Casal et al.** (2006), who defined authorship as the most commonly used criteria, divided articles into domestic (only national authors), foreign (only foreign authors) and international (authors from more than one country).

Internationality of authorship can be measured by papers written by foreign authors, foreign authors, international collaborations, and foreign countries. Here, "foreign" means from countries different from the journal's main publisher.

An article can be considered foreign-authored when one author or a specific proportion of authors belongs to institutions from countries different from the journal's publisher. Most of reviewed studies includes articles authored by at least one foreign author, and calculate the proportion of foreign authorship on the total of articles. DICE system follows this method as well. **Álvarez-Ossorio et al.** (1997) assigned values from dividing the number of foreign authors by the total of authors in the article.

**Buela-Casal et al** (2006) proposed using proportion of authors on the total authors participating in the journal during analyzed period of time. **Rodríguez Yunta** (2015) followed that method too, but considered only countries different to the two main ones in the journal, not different to the publisher. ERIH Plus is an example as well, by requiring 1/3 of them to consider the journal "international".

[257] See definitions from Random House and Collins dictionaries at http://www.wordreference.com/definition/internationality

International collaborations are not always analyzed, and when they are, different methodologies appear. For instance, **Rey-Rocha & Martín-Sempere** (2004) followed Buela-Casal's definitions and considered that an international collaboration was that among at least one Spanish author and one foreign author – therefore, an article signed by foreigners from different countries will be considered foreign, not international. Nevertheless, this is not common – usually, an international collaboration is an article written by authors from at least two different countries, independently from the publisher's country.

Number of countries represented, and their concentration (few countries provide most of the participations) or openness (participations are provided by many countries from a diversity of regions) can also be analyzed in order to assess multinational representation ("multinationality"). That analysis can also be done according to dominating countries in a subject area or journal, instead the publisher's country.

Gini coefficient[258] is useful to measure inequality, by statistical dispersion, for both authors and members. It has been used by **Buela-Casal et al.** (2006), **Kao** (2009), **Bhattacharya & Kaul** (2015), **Gazni & Ghaseminik** (2016). As seen before, the Gini–Simpson index has been used by **Aman** (2016) to develop an ad-hoc internationality index based on country distribution.

In any case, origin of foreign authors seems to be related, until certain extent, to the journal main language, and international collaboration linkages seem to follow specific sociological, geographical and ideological parameters (**Rey-Rocha & Martín-Sempere**, 2004). There also are specific international collaboration networks[259]. **Malalana Ureña et al.** (2007) indicated that foreign participation may depend on subject treated as well.

#### *2.4.4.3. Editorial team*

Scholarly journals use to have a diversity of organs or bodies to conduct its activity. The editorial board is perhaps the core, as they decide and execute editorial policy. Advisory council or scientific committee is, as its own name indicates, responsible for the scientific activity, such as looking for contributors, choosing topics, etc. Editorial board is supposed to be more internal, and some of its members use to belong to the journal publisher or association/society. They manage the composition of the scientific committee, trying to dessignate experts outside the publishing institutions and, ideally, from other countries.

Other bodies appear sometimes: board of directors (including director/s, executive roles, assistants, secretary, etc.), associate editors, and yearly list or board of peer-reviewers. Board of directors and associate editors are usually included in editorial board. Peer-reviewers are not included either in editorial board or advisory council – that list is independent and every time appears more in scientific journals, as a recognition to their work.

[258] https://en.wikipedia.org/wiki/Gini_coefficient
[259] See 2.4.3.

Composition of the editiorial or scientific team is frequently analyzed for internationalization assessment, but approaches differ much since some of them study scientific committees only, other just editorial boards, and yet some other the complete editorial team.

Role of advisory council members is also criticized globally. **Kao** (2009, p. 126) denounced that "in order to create an image of internationalization and prestige, many journals invite famous scholars from all over the world to serve as editorial board members. Their names are listed in the journal, although they often have no responsibilities, nor duties, regarding journal publishing. The distribution of editorial board members in such cases merely distorts the real degree of internationality". There is still more: "the 'international' editorial boards attributed to some academic journals are no more than an adornment since the actual reviewing of articles is performed by editorial members from the host nation of the journal" (**Buela-Casal et al.,** 2006, p. 51). The latter work also downplayed associate editors' role, which is "a secondary one with them reviewing articles selected by the editorial boards", and might be assimilated to the scientific committee members.

A more comprehensive approach was provided by **Delgado López-Cózar et al.** (2006), who considered that object of internationality analysis should be the complete "scientific team", including all members in editorial board and advisory council. This approach was followed in Spain in previously described works by **Buela-Casal et al.** (2006), **Román-Román, Sorli-Rojo & Giménez-Toledo** (2007), **Giménez-Toledo, Rodríguez-García & Moneda Corrochano** (2009), **Zych & Buela-Casal** (2010), **Sorli-Rojo** (2013) and **Sorli-Rojo & Mochón-Bezares** (2014). **Torrado-Morales & Giménez-Toledo** (2012) followed that too in their UK study.

**Buela-Casal et al.** (2006) proposed a separate analysis, assigning greater importance to the scientific committee. They considered that internationality values have to be based on the diversity of countries as well, and not only on the number of foreign members.

**Giménez-Toledo et al.** (2009, p. 302) wrote that only the editorial board should be taken into account, since it "performs the majority of the work on a journal and is responsible for the most of the journal's functions, in close collaboration with the executive editor. Insofar as the editorial board takes on consultative or advisory functions, and given the lack of activity by scientific/advisory committees, the former could replace the latter. From this point of view, if the editorial board is the engine driving the publication, indicators relating to institutional openness and internationalization need to be applied to this entity and not to scientific committees". In spite of this, authors indicated that the number and international diversity of the editorial board members depended on disciplines, and studying them and not scientific commitees could result in biased results. For instance, editorial boards in genetics journals are much larger and more international than in political sciences journals.

Perhaps surprisingly, the same author did the opposite thing than **Román-Román & Giménez-Toledo** (2010), analyzing only scientific committees. This may be due to data collection period of this study, finished in 2009. They may have realized upon collecting data that most of the work was carried out by the editorial board.

Despite these recommendations and objections, many studies on editorial teams are performed by scientific committees only (e.g. **Malalana Ureña et al.**, 2007; **Román-Román & Giménez-Toledo**, 2010). This is also the case for RESH and FECYT's quality seal. Other studies, as the many led by Rodríguez Yunta on SSH with the most sophisticated and comprehensive methodologies, excluded both the editorial board and the scientific committees – supposedly because their participation in the journal is not meaningful, dubious or difficult to measure.

In any case, results suggest that there might be a relation between the proportion of foreign authors and foreign editorial team members, according to findings by **Gutiérrez Puebla** (1999) and **Uzun** (2004). **Rey-Rocha & Martín-Sempere** (2004) thought that the proportion of foreign authors can result in an increase of the number of the foreign editorial team members, although it is not clear if this is due to a cause and effect relationship.

#### *2.4.4.4. Indexation*

There have been many approaches to assess the degree of international dissemination of scientific journals, especially in non-English-speaking and "peripheral" countries. During the 90s, the first Spanish studies on internationality focused on dissemination in databases, both for journals and for articles (**Amat & Cueva**, 1990; **Ortega et al.**, 1992; **Álvarez-Ossorio et al.**, 1997; **García-Marín & Román-Román**, 1998, and **Rey-Rocha & Martín-Sempere**, 1999). From the 2000s onwards, studies incorporated other indicators (**Buela-Casal et al.**, 2006; **Malalana Ureña et al.**, 2007; **Osca-Lluch et al.**, 2008; and **Rodríguez Yunta**, 2015), or even considered indexation in databases as "visibility", a concept apart from internationality (**Sorli-Rojo**, 2013). In recent years, the interest has been driven towards indexation, and specific studies on health journals have been carried out accordingly (**Abad-García et al.**, 2015; and **Jiménez Hernández**, 2015).

As described in previous pages, quality agencies (CNEAI, ANECA) and systems for journals' evaluation (IN-RECJ/RECS/RECH, CIRC, MIAR) consider dissemination or indexation in international databases for evaluating purposes.

#### *2.4.4.5. Citations*

International citations are a very important indicator for measuring true impact of a journal. What is more, one can say that the rest were characteristics indicators, or indicators for potential internationality, when international bibliometric impact measures the use, or even the "real" internationality. For instance, a Spanish journal with articles in English could be considered "more international" than another journal in Spanish, but, what if the latter receives many citations from Latin America and the first only a few from USA?

IN-RECS, IN-RECH and IN-RECJ product family identified international citations from WoS for every journal, and there have been very few, especially concentrated in law sciences journals,

and also for the rest of SSH. Indeed, more than 2/3 of all journals had no international impact at all, and most of the citations were concentrated in a few titles [260].

The origin of citations seems to be related to authors. **Zitt & Bassecoulard** (1998) found that the internationality of authorship was strongly linked with the internationality of the citations received by the journal, which, against the general belief, are only moderately associated with impact factors. This finding was also endorsed by **Kao** (2009), but refuted by **Li et al.** (2013) and **Wang et al.** (2015).

Citations can also be influenced by language – for instance, a German journal adopting the English language significantly increased citations received by articles published by foreign authors (**Dinkel et al.**, 2004).

#### *2.4.4.6. Other aspects*

Other internationality elements have been identified in the literature, but they are secondary or less important. The following enumeration describes these less relevant elements:

- Users (**Zitt & Bassecoulard**, 1998). The distribution of subscribers and readers is not a fully meaningful aspect, and it is very difficult to measure.
- Subject nature (**Ureña**, 2007). Identifying an "international" subject depends on the point of view and interests of the analyst, which is why it is impossible to measure it with perspective and objectivity and find reasonable points of comparison.
- Bibliographic references (**Delgado López-Cózar et al.**, 2006). This element is very expensive to measure, as it is time-consuming to collect data and process it.

**Buela-Casal et al.** (2006) introduced other indicators, qualified as of low importance by their surveyed experts, which indeed cannot be taken as internationality aspects:

- Country of publication. However, a journal published in another country makes it foreign, not international.
- Inclusion of the word "international" in the journal title. This is aspect is not meaningful.
- Impact Factor. Yet, it measures bibliometric impact, not internationality.
- Published or owned by an international institution, with headquarters or branches in various countries. This could be an element that enables the inclusion of a variety of languages, authorships and experts, but it is hardly an indicator of internationality by itself.

[260] http://ec3.ugr.es/in-recs/informacion/como1.htm. Translated by the author.

# 3. Objectives and methodology

## 3.1. Objectives

The main objective is to analyze the current situation of Spanish scholarly journals that have an internationally-recognized quality level, in order to determine their structure and characteristics, the degree of Open Access adoption, the relationship between price and bibliometric impact, and the internationality elements and internationalization process.

The specific objectives of this research are:

1. To analyze the structure and basic characteristics of Spanish journals – journal type, publisher's name and importance, and distribution by subject areas.

This analysis will show journal distribution by subject field, and may reveal significant differences in sizes. It shall also study publishers to calculate which types and institutions publish the greater number of journals. An important issue arises here – how are publisher types related to subject areas?

Further analysis will focus on the distributions by formats available, showing their relations with publisher types and subject areas.

2. To analyze the impact of Open Access in Spanish journals, and its degree of adoption among the different types of journals.

Open Access journals will be identified according to their format and restrictions of price and use, as defined. After that, the study will observe how this impacts across subject area and publisher types.

Also, the study will analyze the degree of OA adoption in the studied Spanish journals.

3. To study the relation between subscription prices and APC fees with bibliometric impact for every journal category.

Subscription-based journals and journals requiring fee payment for OA publishing will be identified, and prices for both concepts will be disclosed and analyzed among journal categories.

Bibliometric impact indicators will be averaged for every journal category, and differences will be observed.

Relations between price (subscription or APC) and bibliometric impact will be explored carefully, taking into account every journal category. Open Access citation advantage will be approached as well.

4. To analyze internationality

The study will elaborate a definition of Internationality in the first place. After that, elements of internationality will be identified and measured in order to know how it differs across journal categories, and what relations can be find among these and with other specific journal indicators.

## 3.2. Methodology

### 3.2.1. Research methods

This study uses evaluation research, common in social sciences and LIS. It is based on a set of indicators, designed after reviewing literature and data already available. These indicators measure both qualitative and quantitative aspects.

With regard to descriptive statistics, both univariate and bivariate statistics have been conducted, using histograms, cross-tabulations and contingency tables.

Inferential statistics have been used for hypothesis contrast, including parametric tests (Pearson's product-moment correlation coefficient, ρ) and non-parametric tests (Spearman's rho rank correlation, Pearson's Chi-square and Kruskal-Wallis' H test).

The confidence interval used is of a 95%, which is typical in applied practice on social sciences.

For graphical data visualization, the following figure types have been developed:

- Tables
- Bar charts
- Histograms
- Scatterplots
- World heat maps
- Venn diagrams
- Conceptual maps

The software used has been the following:

- MS Excel
- SPSS
- Google Spreadsheets

- Venn Diagram Plotter[261]
- Venn Diagram Maker Online[262]
- CMapTools

### 3.2.2. Object

The object of this study is analyzing those Spanish journals that are scholarly, active and with a recognized quality level. A journal will be considered Spanish when it is published by a Spanish institution, or it is owned by an institution based in a Spanish city. For instance, a journal published by a commercial company not based in the Spanish territory but belonging to a Spanish society or association will be treated as Spanish. An additional criterion is that they have to be active and be scholar, thus excluding magazines and general or cultural divulgation titles. Last but not least, the quality level will be guaranteed by the journal inclusion in WoS or Scopus databases.

The analysis focuses on journals, not articles. Journals are individual entities that serve as vehicles for scientific communication. They have particular components, and these components will be the focus of this study. Other types of works concentrate on articles as the production unit, but it is not the case here. Articles have been analyzed, but only in order to measure specific indicators for each journal.

### 3.2.3. Selection of journals

Journals have been selected from lists available at the beginning of 2015 in Web of Science[263] and Scopus[264]. The titles have not been directly included in the study, though – a previous check has been carried out, identifying mistakes and irregularities. The refinement process has implied additions and deletions to the list.

WoS' list contained only four mistaken journals. The country of publication was wrong in three of them, and the fourth journal was missing in the list but found in the database:

- *Educación XX1*. It did not appear in the list, but it appeared in the database, indicating a current coverage[265]. It was then included in the study.
- *European Journal for Philosophy of Science*. It is published in the Netherlands, not in Spain. Excluded.

[261] https://omics.pnl.gov/software/venn-diagram-plotter
[262] https://www.meta-chart.com/venn
[263] http://ip-science.thomsonreuters.com/mjl/ ("source publication documents": Arts and Humanities Citation Index Source Publication (Aug. 2014), Science Citation Index Expanded Source Publication (Jan. 2015), and Social Science Citation Index Source Publication (Jan. 2015). Latest versions available on 8th Aug. 2016 were Aug. 2015.
[264] http://www.elsevier.com/__data/assets/excel_doc/0005/226742/title_list.xlsx (Sep. 2014 version). Latest version available on 8th Aug. 2016 was May 2016.
[265] http://ip-science.thomsonreuters.com/cgi-bin/jrnlst/jlresults.cgi?PC=MASTER&Full=educacion%20xx1

- *Cultura y Educación / Culture & Education, Estudios de Psicología / Studies in Psychology*, *Infancia y Aprendizaje* and *Revista de Psicología Social*: they appear in the list as Spanish, but as British in JCR. This is due to the fact that they were published by the Fundación Infancia y Aprendizaje before, and later by Taylor & Francis. They were included in this study since they belong to that foundation and thus are considered Spanish.
- *SERIEs: Journal of the Spanish Economic Association*. Similarly to the previous case, it is published by Springer and appears in JCR as German, but it is Spanish since it belongs to Asociación Española de Economía.

The list resulting from these actions had the same number of journals that the initial one.

Unlike WoS' lists, Scopus' list has been very problematic. 47 incidents were encountered, including mistaken publication country, journal status (active/inactive or ceased), indexations discontinued, journals that were not strictly scientific, etc.

Journals listed that were not published in Spain (21 titles subtracted):

- *Archives of Polish Fisheries* (UK)
- *Ciencia e Tecnologia dos Materiais* (Portugal)
- *Digital Evidence and Electronic Signature Law Review* (UK)
- *Egyptian Liver Journal* (Egypt)
- *Estudios de Historia Moderna Contemporanea de México* (Mexico)
- *Gaceta Mexicana de Oncologia* (Mexico)
- *Geoingegneria Ambientale e Mineraria* (Italy)
- *International Journal of River Basin Management*. Its nationality is uncertain, because it has headquarters in Madrid and China and publishes in collaboration with Taylor & Francis and Elsevier. It has not been considered Spanish, because there are not enough evidences for that.
- *Journal of Hydraulic Research / De Recherches Hydrauliques.* Same as previous one.
- *Lexis. Poetica. Retorica e Comunicazione nella Tradizione Classica* (Italy)
- *Medicina Cutánea Ibero-Latino-Americana.* (Venezuela, Argentina)
- *Medicina Veterinaria* (Brazil). There is a Spanish journal with the same title, but different ISSN that is inactive – Scopus made a mistake here.
- *Neurologia Argentina* (Argentina)
- *Reproducao e Climaterio* (Portugal or Brazil, not clear).
- *Revista Argentina de Microbiologia (Argentina)* (Argentina)
- *Revista MVZ Córdoba* (Colombia)
- *Revista Portuguesa de Estomatologia. Medicina Dentaria e Cirurgia Maxilofacial* (Portugal)
- *Revista Portuguesa de Saude Publica* (Portugal)
- *Revue d'Anthropologie des Connaissances* (Francia)
- *Tópicos. Revista de filosofía* (México)
- *Translational Biomedicine* (UK)

Journals listed as Dutch, but actually published in Spain (2 titles added):

- *Cardiocore*
- *Cirugía Cardiovascular*

Journals listed as inactive or ceased, but which were actually active (8 titles added):

- *Anales de la Real Academia Nacional de Farmacia* (title appeared without "nacional" in the original list)
- *Anales de la Real Academia Nacional de Medicina*[266]
- *Ars Longa*
- *EGA. Revista de Expresión Gráfica Arquitectónica*
- *Exemplaria Classica*
- *Revista de derecho y genoma humano / Law and the human genome review*
- *Studia Monastica*
- *Suhayl. Journal for the History of the Exact and Natural Sciences in Islamic Civilisation*

Journals listed as active, but which were actually ceased (6 titles subtracted):

1. *Boletín de AELFA: cesada en 2012 (Elsevier).* Ceased in 2012 (Elsevier).
2. *Electronic Journal of Environmental. Agricultural and Food Chemistry.* Ceased in 2011 (Universidade de Vigo).
3. *Ingeniería Química*. Ceased in 2012 (Ingeniería Química editorial).
4. *Journal of Physical Agents*. Ceased in 2013 (ed. Red de Agentes Físicos).
5. *Seminarios de la Fundación Española de Reumatología.* Ceased in 2014 (Elsevier).
6. *Trastornos Adictivos.* Ceased in 2013 (Elsevier).

Journals listed that ceased their activity or disappeared from Scopus coverage during the period of the data analysis (4 titles kept):

- *Inmunología*. Elsevier ceased its publication in 2014 and Sociedad Española de Inmunología continued it from 2015 onwards.
- *Diagnóstico Prenatal*. Ceased by Elsevier in 2015.
- *Teoría de la Educación. Revista Interuniversitaria*. Scopus ceased its coverage with last issue from vol. 2014.
- *Trauma*. Ceased in 2015 by Mapfre Salud.

Journals listed that have been considered not strictly scientific (4 titles subtracted):

- *Anales de la Real Academia Nacional de Medicina*. The contents are conference communications, and it does not give information neither on the evaluation process nor on the editorial board.
- *Cuadernos Hispanoamericanos*. It is a cultural magazine, not a scientific journal.
- *Revista de Obras Públicas*. It is a professional journal, and it is not peer-reviewed.
- *Revista de Occidente*. It is a cultural divulgation periodical.

[266] This journal will be later considered "not scientific".

Journals discontinued in Scopus (2 titles subtracted)[267]:

- *Aula Orientalis*. Coverage ends in 2013.
- *Convivium*. Coverage ends in 2012.

After solving these initial problems, the final list reached 445 journals:

- Scopus and WoS: 158
- Scopus only: 278
- WoS only: 9

There has been a significant number of new additions and deletions of journals included in previous editions, especially in Scopus – 52 new journals included and only 3 discontinued, while in WoS there have been only 2 additions and 6 titles discontinued.

The final number of journals is 445. A search in Dulcinea database retrieves 1748 titles[268]. Therefore, this study is analyzing a 25.9% of all Spanish journals.

### 3.2.4. Selection of articles

The contents to be analyzed are original research articles. Not every work or article published in a scholarly journal is a piece of research – this is the case of editorials or issue presentations, news, literature reviews, letters to the editor, and, in general, articles without a methodological analysis, bibliographic review, findings and conclusions.

Scientific articles are usually for editorial purposes – for instance, Elsevier categorizes them as "original research articles". Although most of the articles included for the analysis are coincidental with those labels, the reason for the inclusion has been the nature of the article, not the definition given by the publisher. As this study interprets research article in a wider sense, it also includes short pieces (of at least 4 pages) and revision articles (which do not provide new research), but excludes clinical case studies and contents referring to the description of professional practice (typical in medicine and health journals).

The articles analyzed have been extracted from the last complete volume of each journal, which corresponds to 2014 in most of the cases, since data has been collected on Sep. 2015, except for the following cases:

- 2013, or even 2012, for some annual periodicals that had not published any issue for vol. 2014 yet. A check has been made in order to discard ceased titles. This applies to the following journals and volumes:

[267] Finally, they were not excluded from the global list because they were indexed in WoS.
[268] http://www.accesoabierto.net/dulcinea/default.php?directorio=dulcinea&campo=REVISTA&texto (accessed on Dec. 4, 2015)

- *Ars Longa* (2013). The volume refers to the year when author send their manuscripts and not to the publication year.
- *Convivium* (2012). During the data collection period, the 2013 issue was expected to be published shortly.
- *Educación Médica* (2012). It was not published during 2013 and 2014, but it has been published again in 2015.
- *Revista de Filología Románica* (2013).

- Different issues from vols. 2013 and 2014, when some of the last issues in vol. 2014 were not yet available or accessible:
  - *Reales Sitios*
  - *Boletín de la Real Academia Española*. The issue no. 2 from Vol. 2014 contains articles already published in previous years, and for this reason volumes analyzed are 2013:1 and 2014:2).
  - *Revista de Derecho y Genoma Humano / Law and the Human Genome Review*
  - *Revista Española de Antropología Americana*

- Vol. 2015 for biannual publications without 2014 volume.

Sources as DOAJ[269] exclude journals that do not publish a specific minimum number of articles per year. Some of the journals selected had less than five articles in the last volume, but they have been included because they serve for the purpose of this work – studying a concrete population of Spanish journals. What is more, since they have not been excluded from WoS and Scopus for that reason, there is no point in doing so here. This is the list of journals:

- *Cybermetrics*. Only one article, and last volume was 2013[270].
- *Revista de Estudios Norteamericanos*. 3 articles, vol. 2014.
- *Revista Electrónica Complutense de Investigación en Educación Musical*. 1 article, vol. 2014[271].
- *Revista Médica Internacional sobre el Síndrome de Down (SD) / International Medical Review on Down Syndrome*. 4 articles. vol. 2014.
- *Tethys*. 4 articles. vol. 2014.

[269] "A journal must publish at least 5 articles per year to stay in the DOAJ" (https://doaj.org/application/new)

[270] It is a particular journal in the Library and Information Science field in Spain. During the data collection period in 2015, last published volume was 2013, with only one article. On Aug. 11, 2016, next issue published was 2015, with only one article too. With only these two articles (both focusing on Twitter) published during the last 3 years, this journal has got the highest SJR in LIS field in Spain, and it is in the first quartile of the subject. See http://www.cybermetrics.info/.

[271] By Nov. 2015, vol. 2014 had 2 articles and vol. 2015 had been published with 6. At the moment of the collection of data, last vol. was 2014 and it contained only one article. It could be a mistake by the publisher or it may mean that articles are posted continuously as a portal and not at once by number.

### 3.2.5. Data collection

All data have been collected from Jan. 2015 until Sep. 2015. As explained before, values refer to last complete year/volume (usually 2014, but there are some exceptions). For instance, a small number of the journals had not published yet the volume for "2014", so previous years have been analyzed instead. Also, subscription costs normally refer to the current year at the moment of the analysis (2015), or sometimes to the following year or volume (2015/2016), so they do not exactly represent the cost of the contents analyzed here.

The sources for the collection of data are those enumerated in the indicators system. Basically, a first dataset has been extracted from Dulcinea, refined and enriched manually with information from the journals websites.

## 3.3. Indicators

An indicator is a measuring instrument that reflects a qualitative or quantitative value of a concept. The indicators for this study have been defined according to the objectives and are based on the review of the literature.

This section will explain the methods followed to define them.

### 3.3.1. Basic characteristics

The basic characteristics of a journal are the name, the year of its first issue, the ISSNs, the name of the publisher and other collaborating institutions, and their types, platforms and software, and indexation in WoS and/or Scopus. The number of articles has been included as well.

Most of these data were available in Dulcinea fields, but their accuracy has been checked in journals' websites. The year, publisher type, number of articles, platforms, software and indexation were not available in Dulcinea.

For the purposes of this study, the commercial publisher type has been assigned to journals owned by other institution type (usually by medical societies or associations) but published by companies. This is a usual practice (e.g. **Abadal et al.**, 2015), although it may depend on the purpose of the analysis[272].

A language category has been assigned to each journal. Only the languages used in at least a 20% of the articles were considered.

[272] For example, **Dewatripont et al.** (2006) considered that "a journal published by a for profit publisher on behalf of a not-for-profit organization is not-for-profit" (p. 29) but "journals published by a for-profit firm on account of a not-for-profit firm is included under the name of the for-profit firm" (p. 36).

### 3.3.2. Access

Access types are sometimes difficult to compare across works from different authors, because of the different terminologies and approaches. Free (meaning free of charge or gratis), embargo, hybrid and restricted will be used here, as described in section 2.2.1.2.

Free-access journals that charge publication fees have been identified and differentiated from those without APCs. Although OA, as its name indicates, refers access (by readers or users) and does not qualify funding sources (as APCs), the academic community is using the term "Platinum" or "Diamond" OA to differentiate these two types of access. Sometimes they even consider that Platinum/Diamond OA is different from Gold OA, assuming that Gold OA means with APCs. This is becoming more usual in North America and West Europe.

In any case, the total data related to "free access" can be easily obtained by adding both "without APCs" and "with APCs" values.

Free access is not the same as Open Access (OA)[273]. To determine which journals are OA, the same procedure by **Abadal et al.** (2015a) has been followed: selecting only titles that offer free access and provide some self-archiving permission. The colors defining permission for self-archiving are yellow (pre-print), blue (post-print) and green (both versions).

Embargo or embargoed journals, also known as delayed OA, allow access to past issues but forbid it for the last ones – they argue that they recover investment or cover expenses by doing so. Clearly, it is not the same to ban access for the last three months than for the last two years, and this is why the embargo period will be collected as well.

Hybrid journals are restricted access titles that offer authors the possibility of paying for the publication of their article in Open Access. Examples of this OA model are Springer's "open choice"[274] and OA options at Elsevier[275]. This study collects APCs for this type of journals.

Restricted access means that there is a subscription to pay, as in the case of embargo and hybrid journals. Therefore, subscription information, including prices, has been collected.

### 3.3.3. Price and impact

Subscription prices have been collected according to existing subscriber types (individual or institutional) and subscription types (online and/or print), and both for annual volumes and articles. APCs only apply to articles.

SNIP is the only bibliometric impact indicator that could be used for all (or almost all) the journals, since it is available for most of the journals indexed in Scopus and it is category-

[273] See 2.2.1.1.
[274] https://www.springer.com/gp/open-access/springer-open-choice
[275] https://www.elsevier.com/about/open-science/open-access

normalized. Nevertheless, SJR and also the well-known IF will be collected for comparison purposes.

### 3.3.4. Internationality

The works reviewed included indicators based mostly on languages, authors, editorial teams, dissemination and citations.

The indicators used in this study aim to measure internationality aspects and to observe how they behave across journal categories, but not to classify or rank journals.

In the case of this study, the only interest is to observe the presence of languages, including Spanish, and this will be carried out by measuring them at the article level[276]. Journals will be categorized according to main languages in their full-text, in order to see how they distribute and relate to other characteristics. No "multilingual" label will be used a priori, since it tends to obscure the mentioning of specific languages.

The presence of foreign authors, or authors affiliated in foreign institutions, is a constant concern for publishers. For smaller journal sets, it would be possible to differentiate among countries in order to know the relationship between the subject and the region, but it represents a huge and time-consuming effort in this case. Most approaches consider an article as "international" when there is at least one foreign author, and this has been the principle followed in this study. There are other ways, for example, establishing a minimum proportion of foreign authors (e.g. 1/3 in ERIH) in order to avoid cases where there are many national authors and only one foreign one. Nonetheless, these situations are rare in this study[277].

An article can also be considered as an "international cooperation" when there are authors from two different countries at least, as defined by **Ortega et al.** (1992). It does not matter if one of these countries is Spain, the article is international anyway.

With regard to the ccomposition of the editorial team, some authors analyze only the advisory council or scientific committee, excluding the editorial board. It is true that most of foreign experts are in the first one, but it is also true that journal managers may invite them just for appearing and not participating much, thus "inflating" the foreign presence.

In addition, the diversity in boards is a constraint for equity, because not all journals have both an editorial board and an advisory council. Some have an editorial board with all the members together, other display an "international scientific committee" as opposed to a national editorial board, etc.

[276] See 3.4.6.
[277] Only a few cases in clinical medicine journals.

To avoid that and to obtain a more proportional value, it has been decided to analyze the whole editorial or scientific team as defined by **Delgado López-Cózar et al.** (2006), excluding the roles related to administration, composition and lay-out, translation, design, usability, etc.

As to international indexation, ad-hoc quantitative and qualitative systems have been described before. The only system that could serve our purposes is MIAR's ICDS, because it is universal, international, yearly-updated, and takes into consideration both general and disciplinary databases. Since the population of journals studied is already indexed in WoS or Scopus, ICDS would not be adding much value to the analysis. Yet, it will be collected to know how it behaves.

International bibliometric impact is beyond the scope of this study, but, even if it was within, it would be very difficult to establish a methodology to assess it. The impact of SSH journals cannot be compared with that of STM journals. Also, citations within WoS are supposed to have quality and internationality just because they come from WoS journals – but most of the journals in this study are not indexed in WoS.

**Malalana Ureña et al**. (2007) stated that it is necessary to use an indicator system (as the one they defined) to assess internationality more objectively, but a single methodology cannot be used for measuring internationality in all subject areas, and most of the works reviewed here take a set of few journals on a specific area only. There are also many indexes used once, but not followed by other researchers afterwards. It is also very expensive and time-consuming to collect and process the necessary data.

In addition, most of the studies try to rank or classify journals. This study does not pretend to state that one journal is "more international" than another, just to radiograph aspects that may constitute internationality in Spanish journals and analyze how they change among journal types and how they relate with other journal aspects.

Because of that, no composite index or ranking system will be used, only percentages.

### 3.3.5. Complete indicators system

Table 16 summarizes, categorizes and describes indicators.

| Indicator | M | R | Values | Sources |
|---|---|---|---|---|
| **Basic characteristics** | | | | |
| *Title* | M | NR | Title | Dulcinea, journal's website |
| *ISSN* | M | NR | ISSN | Dulcinea, journal's website |
| *e-ISSN* | NM | NR | e-ISSN | Dulcinea, journal's website |
| *Year* | M | NR | Year of first issue | Journal's website |
| *URL* | M | R | Main URL, other URLs | Dulcinea, journal's website |
| *Subject Area* | M | NR | • Arts & Humanities<br>• Social Sciences<br>• Health Sciences<br>• Life Sciences<br>• Experimental Sciences<br>• Engineering<br>• Mathematics & Physics | Dulcinea |
| *Publisher* | M | NR | Name of main publisher | Dulcinea, journal's website |
| *Publisher type* | M | NR | • Private non-profit: professional associations, scientific societies, royal academies and foundations<br>• Academic: universities and research centers<br>• Government agencies: organizations depending on public administration, except the previous<br>• Commercial: publishing companies | Journal's website, as defined by Abadal et al. (2015, p. 83) |
| *Other publishing bodies* | NM | R | Name of the other commercial publishers, associations, societies or bodies responsible for the journal, which cede the publication to the publisher | Dulcinea, journal's website |
| *Other publishing bodies type* | NM | R | Equal to "publisher type" | Equal to "publisher type" |
| *Articles* | M | NR | Number of research articles upon last complete year. Articles that have not been peer-reviewed are excluded. | Journal's website |
| *Platforms* | M | R | o Name of platform (e.g. Elsevier, CSIC, RACO) | Journal's website, platforms' websites. |
| *Software* | M | R | o Name of software (e.g. OJS, Elsevier, own) | |
| *Indexation* | M | NR | • Scopus<br>• WoS<br>• Scopus & WoS | From original Scopus and WoS sources and after depurating lists. |
| **Access** | | | | |
| *Format* | M | NR | • Online only<br>• Print only<br>• Online + print | Journal's website. |
| *Access type* | M | NR | • Free without APCs (also known as Platinum OA)<br>• Free with APCs<br>• Embargo (also known as Delayed OA)<br>• Hybrid (restricted access journals that offer authors an OA payment option),<br>• Restricted | Dulcinea and journal's website (Dulcinea does not specify if there are APCs or not). APCs include mandatory fees paid by the author. A hybrid journal may have an embargo period as well, but it will be still considered hybrid in the first place. |

| | | | | |
|---|---|---|---|---|
| *Embargo period* | NM | NR | Number of months of delay for accessing (only for embargo access journals). | Dulcinea, journal's website. |
| *OA articles* | NM | NR | % of OA articles in hybrid journals upon last complete volume. | Journal's website. |
| RoMEO color | M | NR | • White<br>• Yellow<br>• Blue<br>• Green<br>• Unknown | From Dulcinea and not from Sherpa-RoMEO[278], because the first is more updated and complete than the latter. |
| Creative Commons License | NM | NR | • CC BY<br>• CC BY-NC<br>• CC BY-NC-ND<br>• CC BY-NC-SA<br>• CC BY-SA | Dulcinea, journal's website. |
| **Price and impact** | | | | |
| *Subscriber type* | NM | R | • Individual<br>• Institutional<br>• Not indicated | Journal's website or email. There can be more than one subscriber type, along with their subscription type and price. |
| *Subscription type* | NM | R | • Online only<br>• Online + print<br>• Print only | Journal's website or email. There can be more than one subscription type, along with their subscriber type and price. Print version is excluded when it is available only for a specific community (e.g. associates, members, etc.), when there are only a limited number of copies, or when copies are only distributed by interchange. |
| *Annual subscription price* | NM | NR | €, or converted to € from other currencies. Includes Spanish VAT and transportation when applicable. | Journal's website or email. When it is available in more than one subscription type (format), the cheapest online will be selected – if there is online access. |
| *Price per article* | NM | NR | € per article | Calculated by dividing annual subscription price and number of articles[279]. Original prices per article offered by publisher have been excluded. |
| APC | NM | NR | € (only for free access with APC, and hybrid journals), | Journal's website. Prices are original € or converted, When there was a tax for publishing, for both OA and not OA articles, has been added to the APC price, |
| IF | NM | NR | Impact Factor | WoS, values for 2014. Only available for some of the journals in WoS. |
| SJR | NM | NR | Scimago Journal Rank | Scopus, values for 2014. For most of the journals in Scopus. |
| SNIP | NM | NR | Source Normalized Impact per Paper | Scopus, values for 2014. For most of the journals in Scopus. |
| **Internationality** | | | | |
| Language | M | NR | Languages (e.g. Spanish, English, Spanish & English, Catalan, etc.) | Journal's website. Languages have been considered only when they have been available in the full text |

[278] http://www.sherpa.ac.uk/romeo/index.php

[279] Prices per article offered by publishers have not been considered – only in the case that there was no annual price, thus keeping the article price and using it to calculate the subscription cost according to the number of articles.

| | | | | |
|---|---|---|---|---|
| | | | | of at least the 20% of the articles upon last complete volume. |
| Language % | M | NR | % articles upon last complete volume available in every specific language. | Journal's website, direct consultation on print version or copies received via Interlibrary Loan. |
| Foreign articles | M | NR | % articles upon last complete volume where there is at least one author with foreign affiliation. | |
| International collaboration | M | NR | % articles upon last complete volume where there are authors affiliated to two different countries at least. | JournalMetrics.com for almost all Scopus titles. This information has been checked, corrected and completed manually with data from journal's website, when necessary. |
| Foreign experts | M | NR | % of members with foreign affiliation at the complete editorial team (including editorial board and scientific/advisory committee). | Journal's website, direct consultation on print version or copies received via Interlibrary Loan. |
| International indexation | M | NR | ICDS value | MIAR (miar.ub.edu). 2015 version. |

**Table 16 – Indicators system**

M: mandatory; NM: not mandatory. QLT: qualitative; QNT: quantitative. R: repeatable; NR: not repeatable

# 4. Analysis and discussion

## 4.1. Spanish journals indexed in WoS and Scopus

As seen before, according to our methodology there are 445 journals indexed in WoS and Scopus. **Rodrigues & Abadal** (2014a and 2014b) reported the existence of 313 and 300 journals indexed in 2011 and 2012, and **Abadal et al.** (2015) found 406 in 2013. Thus, indexation of Spanish titles in WoS and Scopus is growing.

Figure 29[280] shows the demographics according to the years when journals were launched. Titles begin to grow from the 40s after the Spanish Civil War and exploded from the 80s with the beginning of the democracy and the freedom of speech in the country, a process which is similarly to China's (**Ren et al.**, 2013).

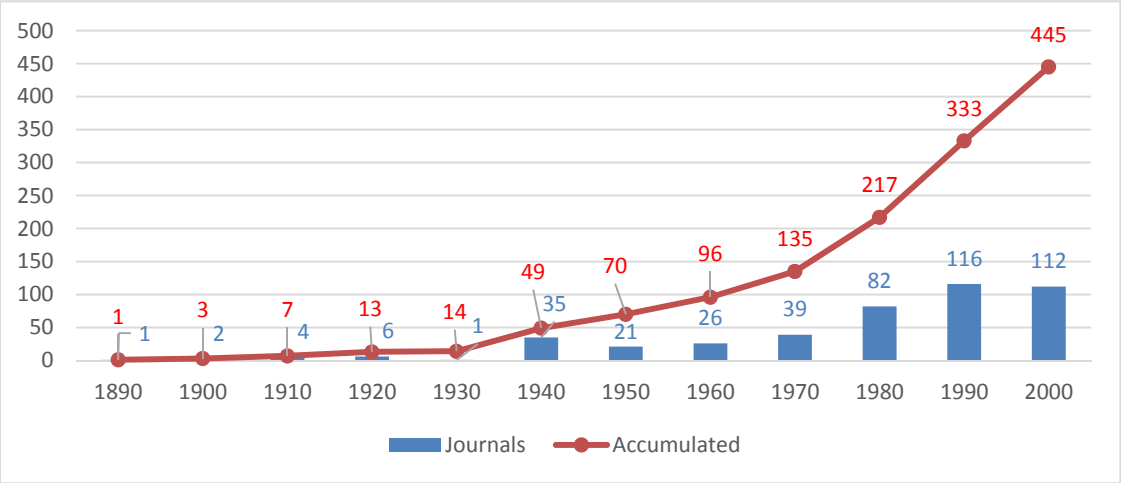


**Figure 29 – Evolution of Spanish journals indexed in WoS and Scopus**

The number of journals indexed in Scopus is very different from that in WoS. As mentioned before, 436 of the studied journals (97.8%) appear in Scopus, but only 167 (37.5%) in WoS. Only one third of the journals (158 titles, 35.5%) are indexed in both sources at the same time, while 278 (62.5%) appear only in Scopus. Therefore, almost all journals in Scopus are in WoS as well, except for 9 journals (Figure 30).

[280] From this point onwards, term "journals" in titles of figures stands for Spanish journals indexed in WoS and Scopus.

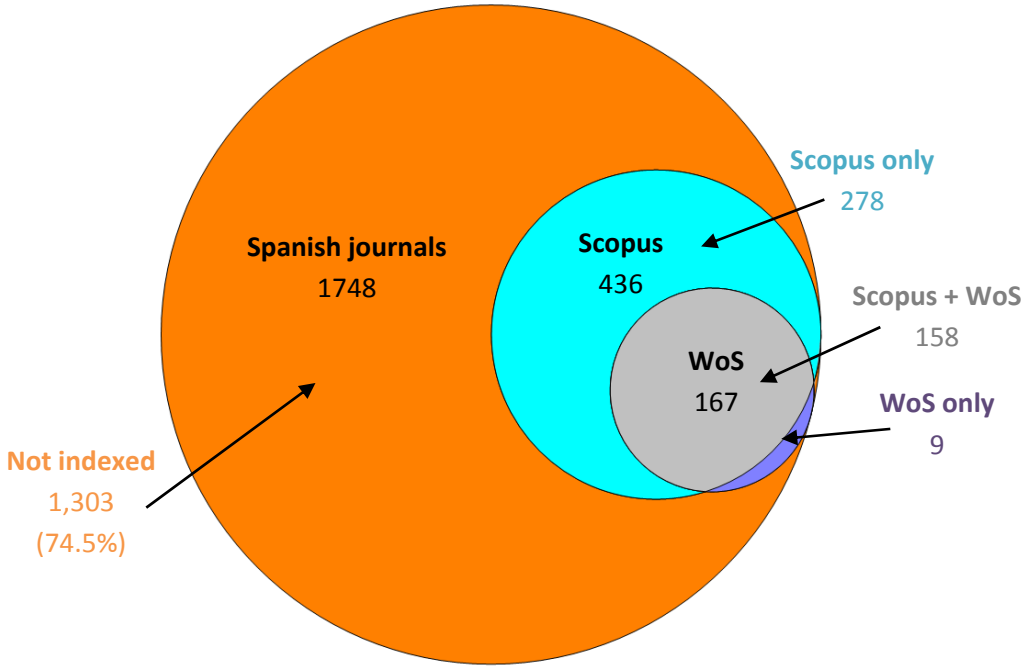


**Figure 30 – Indexation of Spanish journals in WoS and Scopus**
Source: WoS, Scopus, Dulcinea (March 2016)

Yet, how is the indexation of Spanish titles in WoS and Scopus? Are all the disciplines, publishers and access types equally represented? Table 17 shows that STM fields are overrepresented, while SSH journals appear less. For instance, social sciences journals represent a 45.6% of the total, while only a 19.4% in the population selected. On the other hand, health sciences represent only an 18.1% of the total, while only a 44.2% in WoS and Scopus. It means that STM journals are more likely to be indexed in these sources.

| Subject area | Journals | % total | In WoS & Scopus | % indexed journals in WoS & Scopus |
|---|---|---|---|---|
| Arts & Humanities | 448 | 25.6% | 80 | 17.9% |
| Social Sciences | 797 | 45.6% | 155 | 19.4% |
| Health Sciences | 317 | 18.1% | 140 | 44.2% |
| Life Sciences | 69 | 3.9% | 23 | 33.3% |
| Experimental Sciences | 42 | 2.4% | 14 | 33.3% |
| Engineering | 43 | 2.5% | 18 | 41.9% |
| Mathematics & Physics | 32 | 1.8% | 15 | 46.9% |
| | **1748** | **100.0%** | **445** | **25.5%** |

**Table 17 – Journals distributed by subject areas**
Sources: Dulcinea, WoS, Scopus (March 2016)

## 4.2. Subject areas and publishers

### 4.2.1. Subject areas

Although the distribution between SSH (53%) and STM (47%) are close to halves, there are huge differences among subject areas. Social Sciences (35%) and Health Sciences (31%) are by far the most populated. Arts & Humanities follow (18%), and the rest of the groups range from a 3% to a 5% only. Thus, subject distribution is very uneven (Table 18, Figure 31).

| Subject areas | Journals | % |
|---|---|---|
| Arts & Humanities | 80 | 18.0% |
| Social Sciences | 155 | 34.8% |
| *Total SSH* | *235* | *52.8%* |
| Health Sciences | 140 | 31.5% |
| Life Sciences | 23 | 5.2% |
| Experimental Sciences | 14 | 3.1% |
| Engineering | 18 | 4.0% |
| Mathematics and Physics | 15 | 3.4% |
| *Total STM* | *210* | *47.1%* |
| **Total** | **445** | **100.0%** |

Table 18 – Subject areas

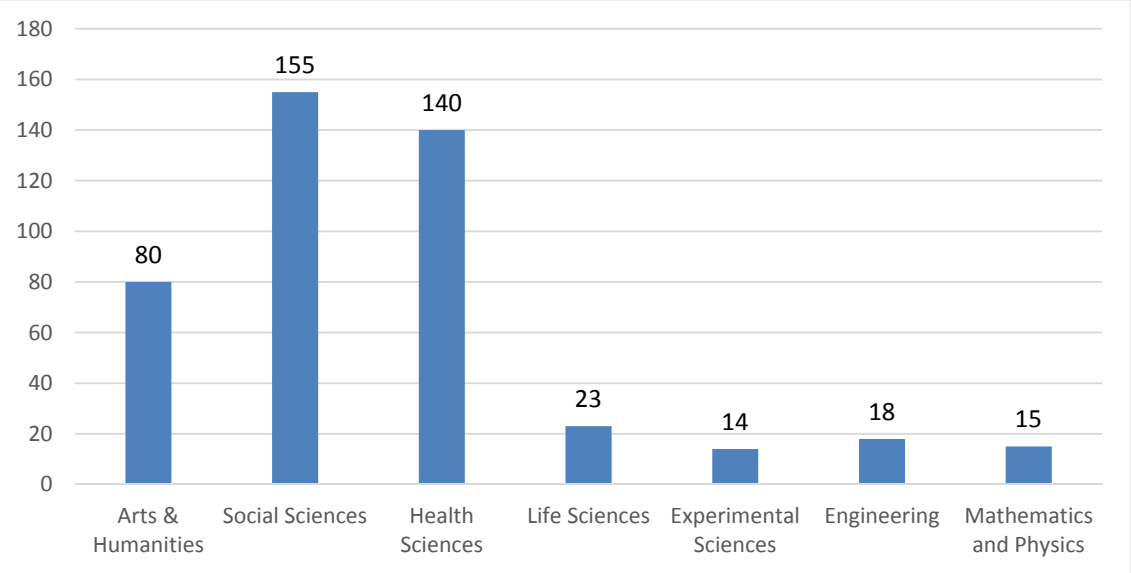


Figure 31 – Subject areas

A 36% of the Ibero-American journals indexed in WoS or Scopus were from Spain (**Rodrigues** & **Abadal,** 2014a), and yet distribution of population studied differs from the global Ibero-American. Medicine (29%) is in line with health here (31%), but agriculture and biology (15%) have very little presence in Spain, where social sciences area is much more important (35%) than in the regional global (11%).

This population of indexed journals could also be carefully compared to the full populations of other regions and countries, and to the global landscape. Thus, subject distribution is quite in

line in general terms with that obtained from Ulrich's at the world level (49% on STM and 51% on SSH, close to fifty-fifty). Health sciences, social sciences and humanities were also the most populated, but the world total for journals in those areas account for a 49% while they cover an 84% in this study.

SSH areas are especially prolific in Spain, perhaps too much, in the opinion of **Giménez-Toledo**, (2013). In any case, proportion of SSH journals is similar to other LAC countries as Mexico (54%, according to **Sánchez Hernández et al.**, 2008). It is not a common phenomenon among "peripheral" countries, though. For instance, predominant areas in Czech Republic are engineering sciences and natural sciences (**Suchá & Steinerová**, 2015), while in Southern European countries the proportion average is 76%, even higher than in Spain (**Anglada & Abadal**, 2010).

Some countries are very productive in specific areas. For instance, Brazil on agricultural sciences (**Rodrigues & Abadal**, 2014b). Spain does not seem to be one of these.

### 4.2.2. Publishers, publisher types and platforms

The most common publisher is academic (universities and research centers, 43.4%), followed by commercial (31.5%) and private non-profit (associations and societies, 21.3%). The presence of government agencies is residual (only 3.8%). This information is displayed in Figure 33 and on table 19 ("total as publisher" column).

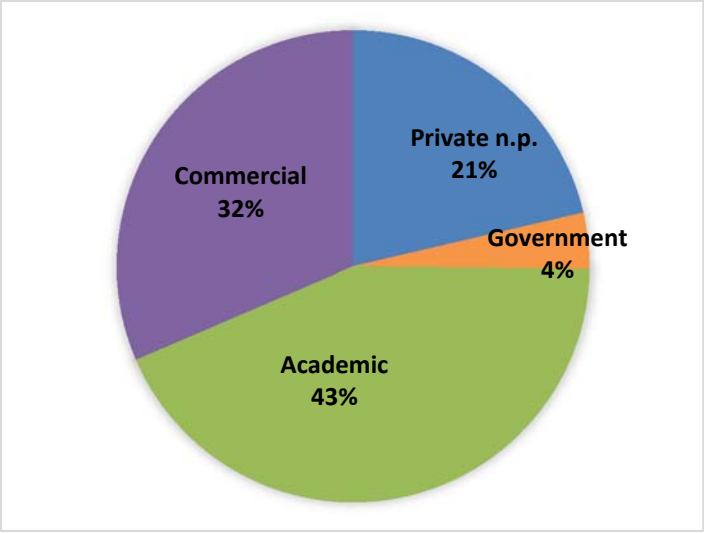


Figure 32 – Publisher types

This count, however, relates to publishers, when only one publisher can be assigned to a journal. It does not consider institutions that co-publish, own, edit or manage the journal, or collaborate in the editorial and publishing process.

If those types of participation were considered, global landscape would not change much except for private non-profit bodies, which would account for 108 journals more, resulting in 203 titles (a 45% of the total, see table 18).

| | Collaborating institution | | | | | | | | | | Total as publisher | | Total as collaborator | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | None | | Private n.p. | | Govern-ment | | Acade-mic | | Com-mercial | | | | | | | |
| **Publisher** | **n** | **%** | **N** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** |
| Private n.p. | 89 | 20.0% | 3 | 0.7% | - | - - | 3 | 0.7% | - | - - | **95** | **21.3%** | 108 | 24.3% | 203 | 45.6% |
| Gov. | 16 | 3.6% | - - | - - | - | - - | 1 | 0.2% | - | - - | **17** | **3.8%** | 3 | 0.7% | 20 | 4.5% |
| Academic | 180 | 40.4% | 8 | 1.8% | - | - - | 5 | 1.1% | - | - - | **193** | **43.4%** | 18 | 4.0% | 211 | 47.4% |
| Com. | 31 | 7.0% | 97 | 21.8% | 3 | 0.7% | 9 | 2.0% | - | - - | **140** | **31.5%** | 0 | 0.0% | 140 | 31.5% |
| | | | | | | | | | | | **445** | **100.0%** | | | | |

**Table 19 – Institutions as publishers and collaborators**
All percentages are on the total 445 journals.

A 71% of the journals is published by a publisher alone, while a 21.8% is published by companies on behalf of societies and associations. The remaining 7.2% applies for other collaborations, almost all with the intervention of private non-profit publishers and academic institutions.

Associations and societies play a fundamental role in the academic publishing arena in Spain, participating in a 45.6% of all the journals, outnumbering those by commercial publishers (31.5%) and almost reaching the number of titles in which universities and research centers (47%) have a share. The magnitude of their importance can be easily appreciated in figure 33, while the presence of other publishers as collaborators is minor or inexistent.

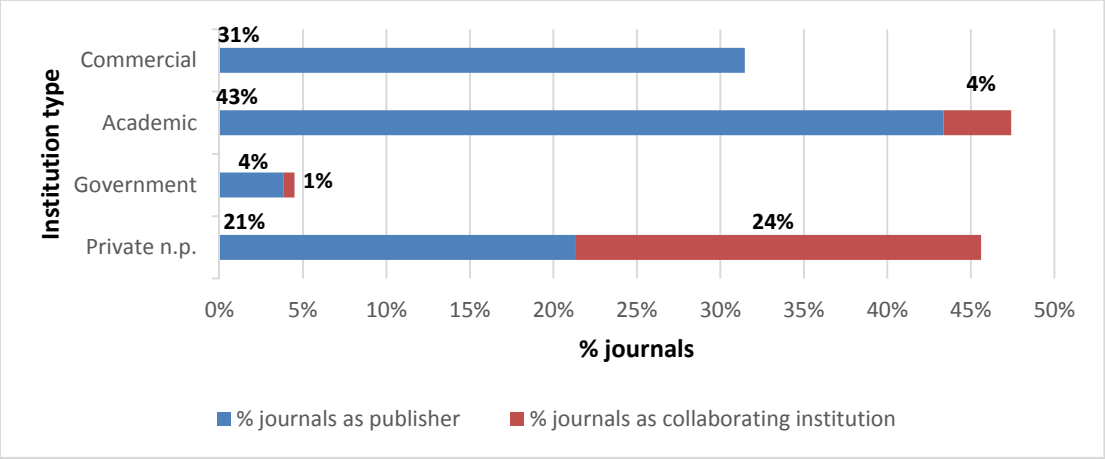


**Figure 33 – Institution types as publishers and collaborating institutions**
Percentages are on the total 445 journals.

Yet, what type of institution publishes journals owned by associations and societies? Table 18 shows that private non-for-profit institutions are responsible for 97 of the 140 (69%) journals published by commercial institutions. That is a 22% of all the journals, when journals published just by one company alone stand for 7% only. This is just the case of scientific societies and professional associations that hand over publishing tasks to private enterprises – namely, health

sciences journals published by Elsevier (69 journals, 15.5% of the total population). This phenomenon can be easily appreciated in figure 32.

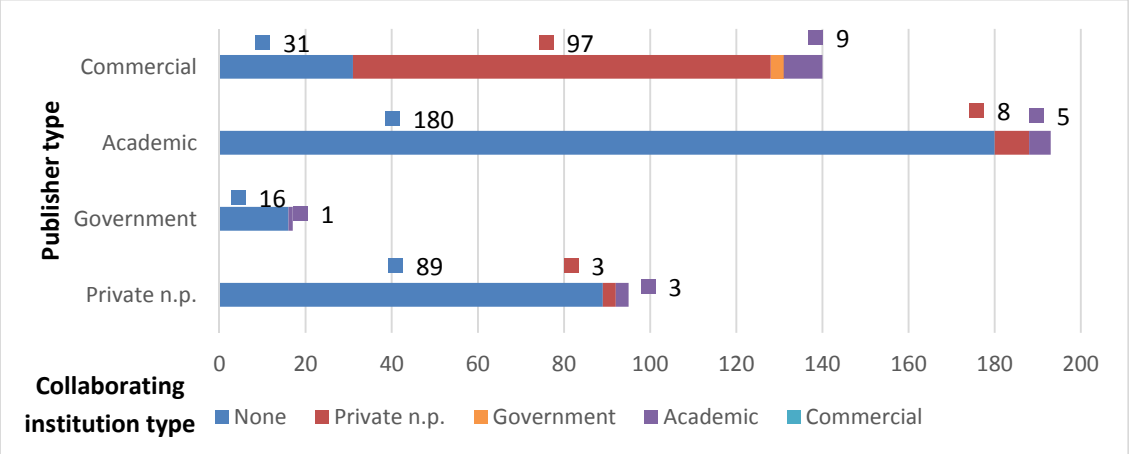


Figure 34 – Publisher types and their collaborating institutions

As to specific publishers, Elsevier is the largest one, with a 17.3% of all the titles. CSIC plays an important role with an 8.3%, along with Complutense University of Madrid (5.8%), University of Murcia (2.5%) and University of Barcelona (2.2%). Springer accounts for a 2.5% and the rest of the publishers do not surpass the 2%.

| Publisher | Type | Journals | % |
|---|---|---|---|
| Elsevier | Commercial | 77 | 17.3% |
| CSIC | Academic | 37 | 8.3% |
| Universidad Complutense de Madrid (UCM) | Academic | 26 | 5.8% |
| Universidad de Murcia (UM) | Academic | 11 | 2.5% |
| Springer | Commercial | 11 | 2.5% |
| Universitat de Barcelona (UB) | Academic | 10 | 2.2% |
| Universidad de Navarra (UNav) | Academic | 9 | 2.0% |
| Universitat Autònoma de Barcelona (UAB) | Academic | 9 | 2.0% |
| Universidad de Granada (UGr) | Academic | 8 | 1.8% |
| Taylor & Francis | Commercial | 6 | 1.3% |
| Universidad de Sevilla | Academic | 5 | 1.1% |
| Universidad del País Vasco | Academic | 5 | 1.1% |
| Universidad Nacional de Educación a Distancia (UNED) | Academic | 5 | 1.1% |
| Centro de Estudios Políticos y Constitucionales (CEPC) | Government | 5 | 1.1% |

Table 20 - Largest publishers

The case of Elsevier is special because it accounts for 77 journals, but 70 of them are published on behalf of non-commercial institutions. 60 of these titles belong to Spanish medical associations and societies.

OJS[281] is by far the most used platform. Excluding a 4.3% of paper-only journals, 204 journals (47.9% of all titles) are hosted in one or more OJS-based sites[282]. For the rest, 99 (23.2%) are available in professional companies' platforms[283], and 151 (35.4%) are available in non-OJS ad-hoc platforms and other sources[284]. Journals rarely appear in more than one platform simultaneously (a 6.6% of the cases).

Figure 35 shows the distribution of journals by these three types of platforms. Not surprisingly, journals hosted in professional companies' platforms (e.g. Elsevier, Taylor and Francis, Springer, etc.) hardly appear in other sources (only 1 in an OJS site, and only 3 in another). On the other hand, a reduced number of journals (24) are available both in an OJS site and in a single-journal, or collective government or academic platform.

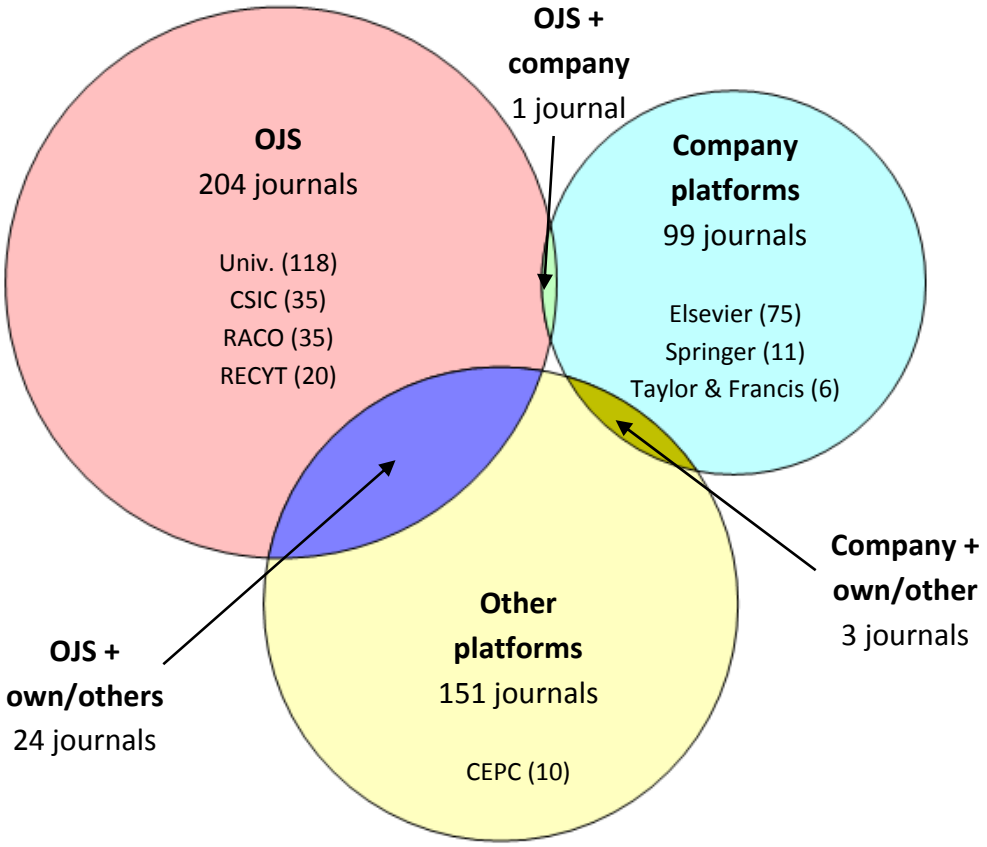


Figure 35 – Online platforms

[281] Most of the journals used OJS version 2.0, with different designs and functionalities. Version 3.0 has been released on Aug. 31, 2016 (https://pkp.sfu.ca/ojs/, Sep. 11, 2016).
[282] Many journals appear in more than one OJS-based platform. For instance, they can be available in their own website and various collective sites.
[283] This excludes commercial journals that are available in single-journal sites, usually ad-hoc platforms hosted by publishers themselves. These are included in "own / other" category.
[284] Single-journal platforms not based in an OJS system are considered here.

As mentioned before, 47.9% of all journals are available in OJS platforms. However, this system is not equally used by all non-for-profit publishers. Figure 36 reveals that OJS is used by an 83% of the journals published by academic institutions and only by a 35% of the journals published by associations and societies. This is due to the fact that universities and some research centers (mostly CSIC) run their own collective OJS-platforms, while associations and societies tend to hand over their journals to commercial publishers or build their own (poor) sites.

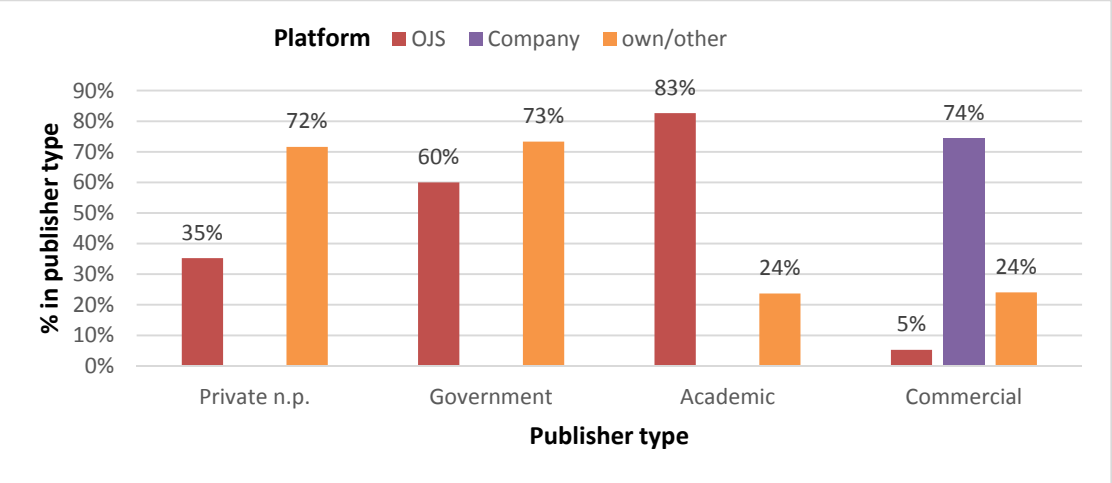


**Figure 36 – Journals by publisher type and platform**
Percentages sums exceed 100% in every category because journals may appear in more than one platform at a time.

Specifically, universities publish 149 titles, 118 at an OJS system (79.1%), most of them at e-journal platforms managed by their publication or library services. Research centers are responsible for 44 journals – 37 of them are published by CSIC, and only 2 of them are not at its large OJS-based e-journal website[285].

Regarding associations, societies and other private non-profit institutions, only 31 of the 88 online journals directly published by them (32.6%) are at an OJS platform. 21 of these titles are published in a platform owned by the organization, while the other 10 are at collective platforms that will be mentioned later. Associations and societies lack the networking services that the universities and research centers have – that could be one of the reasons why they transfer the publishing management of a 52.7% of their titles to third parties, usually commercial publishers.

Government agencies publish 17 journals, 9 of them in OJS platforms. 5 of those are available at the governmental Center for Political and Constitutional Studies (CEPC), which does not use OJS.

The role played here by OJS platforms RECYT and RACO is important, because they offer a website for many journals which do not have their own one. RECYT[286] (Spanish Repository for Science and Technology) lists 60 journals. Despite its name, most of the journals are on SSH, and all except 11 appear in this study. They offer the journals the possibility of publishing the full

[285] http://revistas.csic.es/
[286] RECYT (Spanish Repository for Science and Technology), funded by the Ministry of Economy (http://recyt.fecyt.es/index.php/)

text of the articles and using the platform also as a main website. Nevertheless, some do not take advantage of that because they have their own OJS or commercial website. Thus, only 20 journals use RECYT as such: 7 private non-for-profit, 7 small or medium-size universities, 4 government agencies, 1 commercial company and 1 research center. RACO[287] works only for Catalan journals and includes 449 titles. 35 of the journals of this study have their full text there, mostly universities (27). RACO works as both primary platform for small non-commercial publishers and secondary platform for university journals that already have their own one.

Although OJS is intended for Open Access, not all OJS journals are so. An 11.1% are embargoed, 1 title is hybrid and 1 is restricted. Only 8 of those 207 journals are published by commercial companies, and 6 of the 11 free access APC-paid titles run on OJS systems.

Elsevier is the major commercial publisher in Spain. It uses 3 platforms: Elsevier.es[288], customized websites[289], and ScienceDirect[290]. 75 journals[291] appeared in one or more of these platforms. The other commercial companies, i.e.: Springer (11 journals) and Taylor & Francis (6), use their own platform.

OA platforms as SciELO and Redalyc are very important for Latin American journals, but marginal for the group studied here. Only 3 journals appear in SciELO Spain and just 1 in Redalyc. It may be due to the fact that they are not actually Ibero-American, but Latin American, and/or because most of their Spanish titles are not indexed in Scopus or WoS.

### 4.2.3. Subject area and publisher type

A frequency analysis has been carried out, double-sided and with total percentages (table 21).

Commercial companies publish 101 journals on health sciences. That is a 72% both within this subject area and publisher type, and a 23% of the total – namely, 1/4 of all Spanish journals indexed in WoS and Scopus are on health sciences and published by commercial companies. Their presence in the rest of STM fields is almost insignificant. On the other hand, a 61% of Social Sciences and a 74% of arts & humanities titles are published by universities and research centers (Figure 37).

[287] RACO (Catalan Open Access Journals), funded and managed by the Catalan Consortia for Universities (CSUC).
[288] For example, http://www.elsevier.es/es-revista-revista-espanola-medicina-legal-285
[289] For example, http://www.revclinesp.es/. This platform is the same, but with different lay-outs, for a diversity of journals owned by specific medical associations and societies. Elsevier brand name appears at the bottom of the page.
[290] For example, http://www.sciencedirect.com/science/journal/00142565. Most of the journals in this study appear there.
[291] "Nefrología" only appeared in an Elsevier platform (namely ScienceDirect) from 2015 onwards.

| | Private not-for-profit | | | | Government | | | | Academic | | | | Commercial | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Subject Area** | **n** | **%S** | **%P** | **%T** | **n** | **%S** | **%P** | **%T** | **n** | **%S** | **%P** | **%T** | **n** | **%S** | **%P** | **%T** | **n** | **%T** |
| A&H | 13 | 16% | 14% | 3% | 1 | 1% | 6% | 0% | 59 | 74% | 31% | 13% | 7 | 9% | 5% | 2% | **80** | **18%** |
| Social S. | 31 | 20% | 33% | 7% | 9 | 6% | 53% | 2% | 94 | 61% | 49% | 21% | 21 | 14% | 15% | 5% | **155** | **35%** |
| *total SSH* | *44* | *19%* | *46%* | *10%* | *10* | *4%* | *59%* | *2%* | *153* | *65%* | *79%* | *34%* | *28* | 12% | *20%* | *6%* | ***235*** | ***53%*** |
| Health S. | 29 | 21% | 31% | 7% | 3 | 2% | 18% | 1% | 7 | 5% | 4% | 2% | 101 | 72% | 72% | 23% | **140** | **31%** |
| Life S. | 9 | 39% | 9% | 2% | 2 | 9% | 12% | 0% | 12 | 52% | 6% | 3% | 0 | 0% | 0% | 0% | **23** | **5%** |
| Exp. S. | 3 | 21% | 3% | 1% | 1 | 7% | 6% | 0% | 10 | 71% | 5% | 2% | 0 | 0% | 0% | 0% | **14** | **3%** |
| Engineering | 5 | 28% | 5% | 1% | 0 | 0% | 0% | 0% | 8 | 44% | 4% | 2% | 5 | 28% | 4% | 1% | **18** | **4%** |
| Maths. & Ph. | 5 | 33% | 5% | 1% | 1 | 7% | 6% | 0% | 3 | 20% | 2% | 1% | 6 | 40% | 4% | 1% | **15** | **3%** |
| *total SMT* | *51* | *24%* | *54%* | *11%* | *7* | *3%* | *41%* | *2%* | *40* | *19%* | *21%* | *9%* | *112* | 53% | *80%* | *25%* | ***210*** | ***47%*** |
| **Total** | **95** | | | **21%** | **17** | | | **4%** | **193** | | | **43%** | **140** | | | **31%** | **445** | **100%** |

**Table 21 – Subject areas and publisher types**
%S: percentage within subject area. %P: percentage within publisher type. %T: percentage within total. Decimals are not displayed.

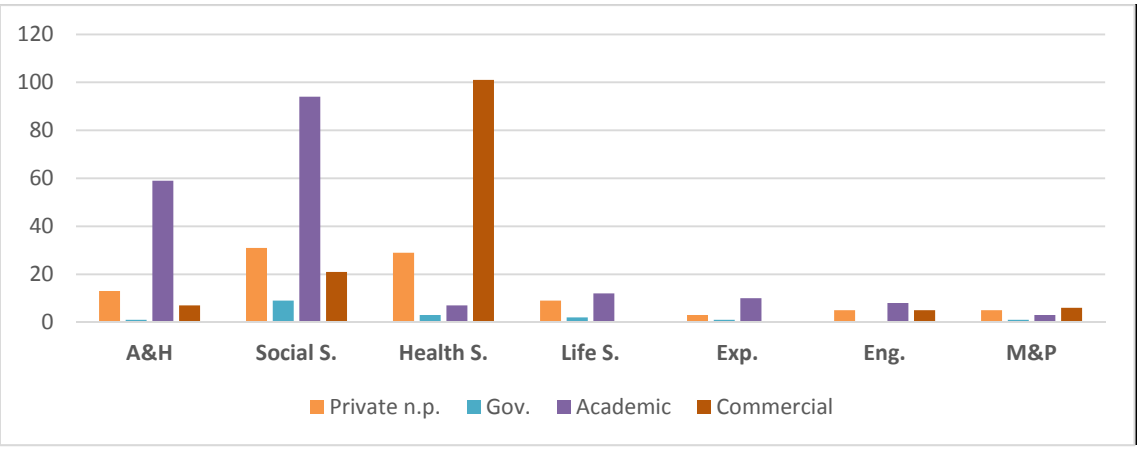


**Figure 37 – Journals by subject area and publisher type**

With regards to the remaining and less populated subject areas, there are no journals on life sciences published by commercial journal type – academic institutions are responsible for half of them, while a 39% are published by associations and societies, and the rest by government agencies. The case is similar for experimental sciences, where titles by commercial publishers cannot be found. Participation is more balanced in mathematics & physics and engineering, although journals in those categories only represent a 7% of the total.

A look at the distribution by publisher type brings more light on the issue (see Figure 38). As mentioned before, commercial companies publish mostly health sciences journals, and have no or very little importance in other areas. Academic publishers focus in social sciences (49%), but also in A&H (31%); they publish little journals in the rest of the subjects. Government agencies are responsible for only 17 journals (4% of the total), and these are mostly on social sciences

(53%). Associations and societies publish in all subjects, but mostly in social s. (33%) and health s. (31%) – please notice, though, that they publish a 21% of the total, but adding the journals they own, the percentage reaches a 45%. That is, almost half of the journals studied here are owned, edited or published by learned societies, professional associations, royal academies, foundations, etc.

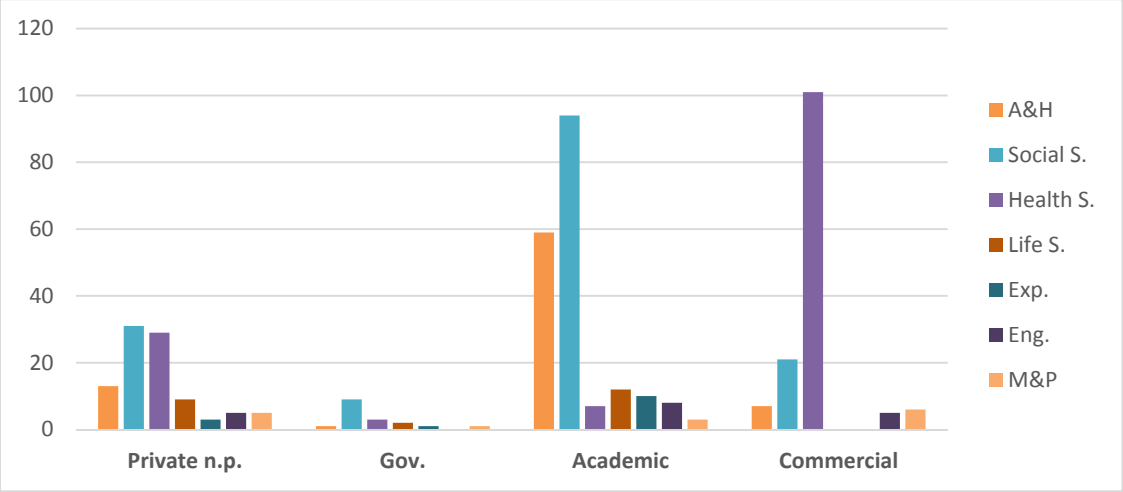


Figure 38 – Journals by publisher type and subject area

The chi-squared test shows that there is a significant association ($\rho < 0.05$) between subject area and publisher type[292]. Specifically, academic publishers are associated with A&H and social sciences, while commercial publishers are associated with health sciences. These relationships are reciprocal – finding journals on health published by universities and research centers, and titles on A&H and social s. issued by companies is a remote possibility.

## 4.3. Access

### 4.3.1. Format types

A 55% of journals has both online and print versions, and a 41% is available online only. Just 19 journals (4.3%) do not provide their full text online – most of them (67%) are on religion and philosophy.

[292] There was a 39% of table cells with values smaller than 5. This fact may invalid the Chi-squared test, since the maximum % allowed is a 20%. Nevertheless, results just support what has been described so far.

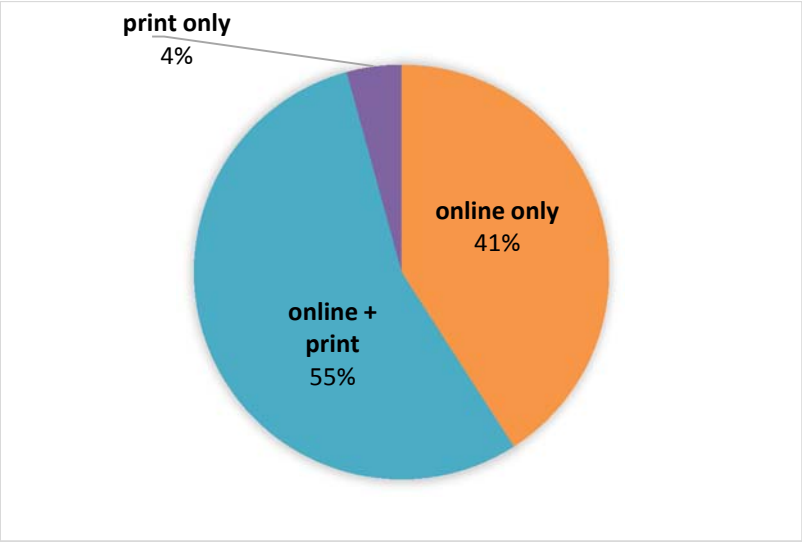


Figure 39 – Journals by format type

The average age of print-only journals is 43 years, online + print is 31, and online-only is 28. This fact clearly proves that more modern journals are more likely to have online versions, or to discard the print.

### 4.3.2. Publisher and format types

A 76% of all titles published by companies have both online and paper editions, while the rest are quite balanced with online-only (table 22). This is due to the fact that commercial publishers tend to retain their print versions because it is perceived by the consumer as a sign of quality/reputation. As to the residual 4.3% available only in print versions, most of those journals (14 of 19) are published equally by private non-profit and commercial publishers, and only a 1.6% of the titles are published by academic institutions.

| | Online only | | Online + print | | Print only | | Total | |
|---|---|---|---|---|---|---|---|---|
| **Subject area** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** |
| Private n.p. | 44 | 46.3% | 44 | 46.3% | 7 | 7.4% | 95 | 21.3% |
| Government | 6 | 35.3% | 9 | 52.9% | 2 | 11.8% | 17 | 3.8% |
| Academic | 105 | 54.4% | 85 | 44.0% | 3 | 1.6% | 193 | 43.4% |
| Commercial | 27 | 19.3% | 106 | 75.7% | 7 | 5.0% | 140 | 31.5% |
| **Total** | **182** | **40.9%** | **244** | **54.8%** | **19** | **4.3%** | **445** | **100%** |

Table 22 – Publisher and format types

Figure 40 displays the quantitative distribution, which clearly shows that all categories are quite evenly distributed except for the commercial one. Companies publish 106 titles in both versions and just 27 online-only titles, while the academic sector publishes 105 titles (almost the same number as companies) in online-only format.

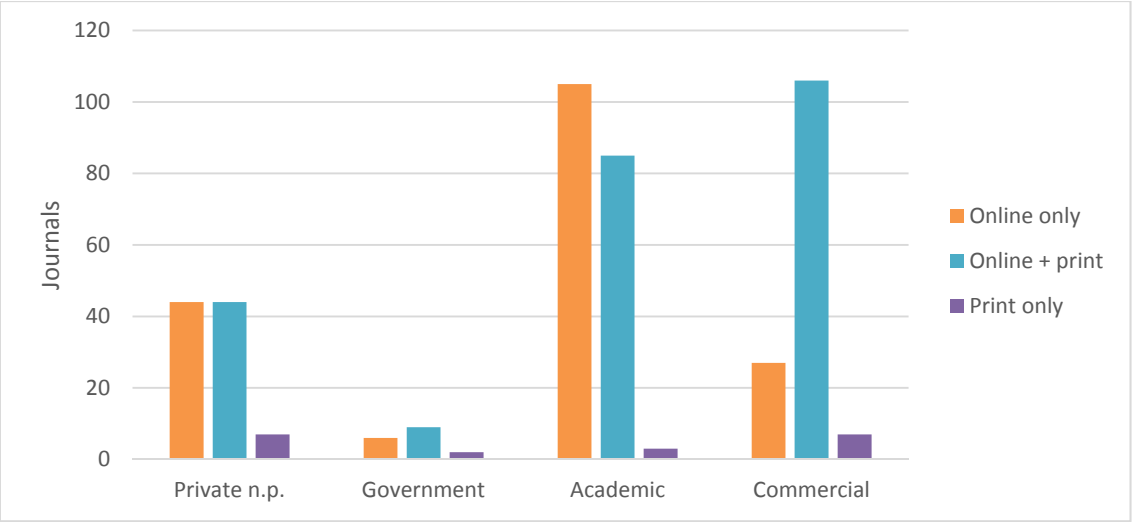


Figure 40 – Publisher and format types

The publisher type and the format type are associated variables ($p < 0.05$). The academic publisher is associated with the online-only version, and the commercial publisher with the online + print. Print-only journals are not related to any specific publisher type, but they are associated with arts & humanities, since a 67% of this type correspond to that area.

### 4.3.3. Access types and OA degree

Free access is predominant, reaching almost to 2/3 of all journals (64.5%). Most of free-access journals do not charge APCs – only 2.5% of the total population do so. The remaining 35.5% consists of restricted (16.6%), embargo (14.4%), and hybrid access journals (4.5%, only 20 titles).

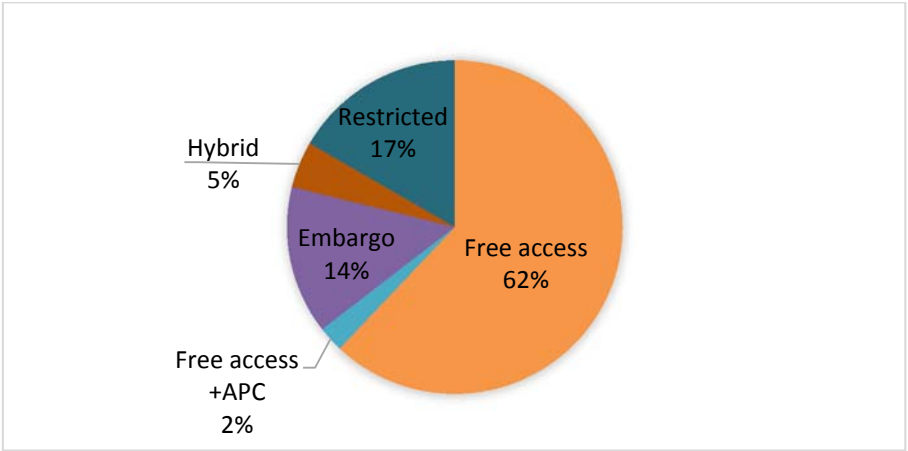


Figure 41 – Access types

Nevertheless, free access is not equal to Open Access (OA) according to BBB definitions, and self-archiving rights will be used to determine which free access journals are OA as well.

A 52% of journals in this study is blue RoMEO color, a 31% green, a 15% white, a 2% unknown and a 0% yellow. **Melero et al.** (2014) analyzed all Spanish journals existing at the time of

publication (1,615), and found exactly the same proportion of blue and white color, while only a 12% green and a 21% unknown. These findings suggest that most of the journals that were not indicating rights at that time are green color now, or, at least, that publishers are becoming more aware of re-use connotations.

Open Access journals have been identified according to the definition given in this study, that is, free-access journals that are blue or green RoMEO color. As shown in Table 23, there are 253 of such journals (56.9%), when the total for free access accounts for a 62.5%. This means that 34 of the 287 free-access journals are not open, mainly because they do not want to be OA on purpose (30 titles are white color, and only 4 are unknown). A 77.5% of all free access journals are at DOAJ (196 titles), but the proportion is much higher for APC-funded journals (91%) than for the rest (67%). Maybe surprisingly, there are 14 DOAJ journals with white or unknown RoMEO color, and therefore should not be considered OA. Other 20 journals without blue or green color are not indexed in DOAJ, so it seems that the inclusion in this repertory does not guarantee that self-archiving permissions are specifically mentioned and defined at journals websites – always according to Dulcinea data.

| Access type | Journals | % total | OA | %OA / total | DOAJ | % at DOAJ |
|---|---|---|---|---|---|---|
| Free access | 276 | 62.0% | 244 | 54.8% | 186 | 67.4% |
| Free access +APC | 11 | 2.5% | 9 | 2.0% | 10 | 90.9% |
| Embargo | 64 | 14.4% | -- | -- | -- | -- |
| Hybrid | 20 | 4.5% | -- | -- | -- | -- |
| Restricted | 74 | 16.6% | -- | -- | -- | -- |
| **Total** | **445** | **100.0%** | **253** | **56.9%** | **196** | **77.5%** |

**Table 23 - Spanish journals in WoS and Scopus by access type, OA and DOAJ indexation**

The results are similar to those found by **Abadal et al.** (2015a), but there is an increase in the number of journals indexed (from 406 to 445), in free-access titles (from a 54.2% to a 64.5%) and in the degree of OA adoption (from a 48.5% to a 56.9%). APC-funded journals (free-access and hybrid) appear for the first time in this study.

Only 64 journals (14.4%) have embargoed or delayed access. Half of them (51.6%) impose 12 months, which is the maximum period of time allowed for mandatory Open Access publishing of works funded by the Spanish government[293]. Such period (12 months) is also the median and the mode in that distribution, and an 81.3% of all embargo journals are in that range (3-12 months). When arriving to 24 months, the accumulated percentage is a 92.2%, and there are still 5 journals imposing from 36 to 60 months – a "de facto" restricted access.

[293] Spanish Act 14/2011 for Science, Technology and Innovation (https://www.boe.es/buscar/act.php?id=BOE-A-2011-9617)

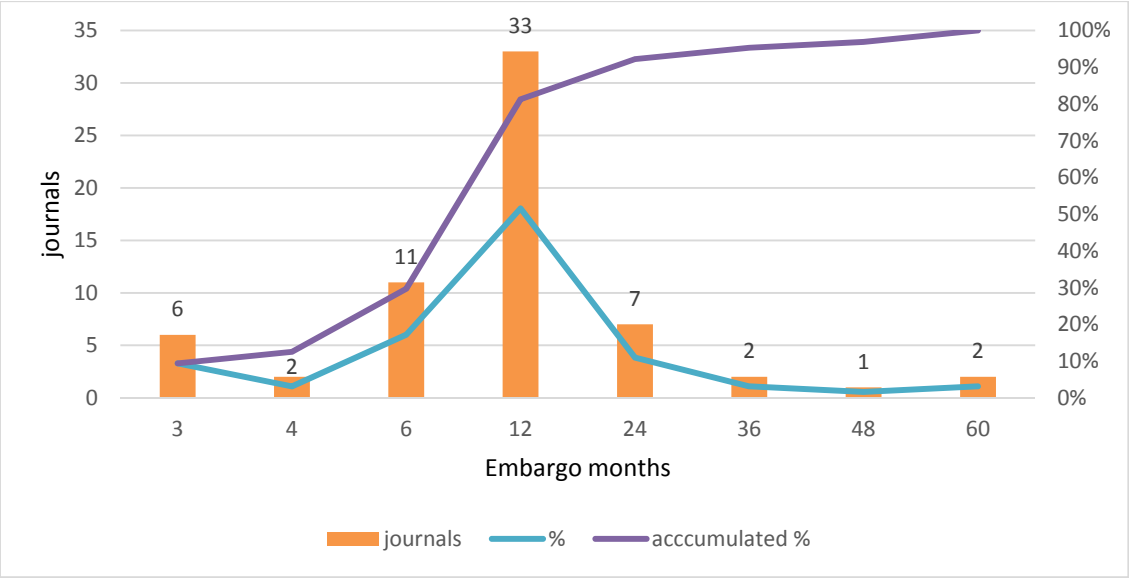


Figure 42 – Embargo journals and periods

These findings are in line with **Laakso & Björk** (2013), who collected data from 492 embargo journals from all over the world on all subjects, and found that a 77.8% of their articles became OA within 12 months from publication, and a 85.4% was available within 24 months.

There are 20 hybrid journals – restricted-access publications that have recently decided to offer an "OA choice". Restricted-access journals themselves represent a 16.6% of all. These categories will be further explored in the following sections.

### 4.3.4. Access and format types

A 44% of the free-access journals without APCs also have a print version[294], while free-access APC-paid journals tend to be online-only in greater proportion (only 27% have the paper edition). The proportion rises for online restricted-access (66%), embargo (83%) and hybrid (90%). All print-only titles are restricted-access, obviously (table 24).

| | Online only | | Online + print | | Print only | | Total | |
|---|---|---|---|---|---|---|---|---|
| **Access type** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** |
| Free no APC | 155 | 56.2% | 121 | 43.8% | -- | -- | 276 | 62.0% |
| Free +APC | 8 | 72.7% | 3 | 27.3% | -- | -- | 11 | 2.5% |
| Embargo | 11 | 17.2% | 53 | 82.8% | -- | -- | 64 | 14.4% |
| Hybrid | 2 | 10.0% | 18 | 90.0% | -- | -- | 20 | 4.5% |
| Restricted | 6 | 8.1% | 49 | 66.2% | 19 | 25.7% | 74 | 16.6% |
| **Total** | **182** | **40.9%** | **244** | **54.8%** | **19** | **4.3%** | **445** | **100%** |

[294] The remaining 56% does not have a print version. Obviously, there are no free-access journals in the print-only category.

Table 24 – Access and format types

That distribution is easier to understand in Figure 43, where subscription journals (embargo, hybrid and restricted access) are more present in the online + print than in the online-only version.

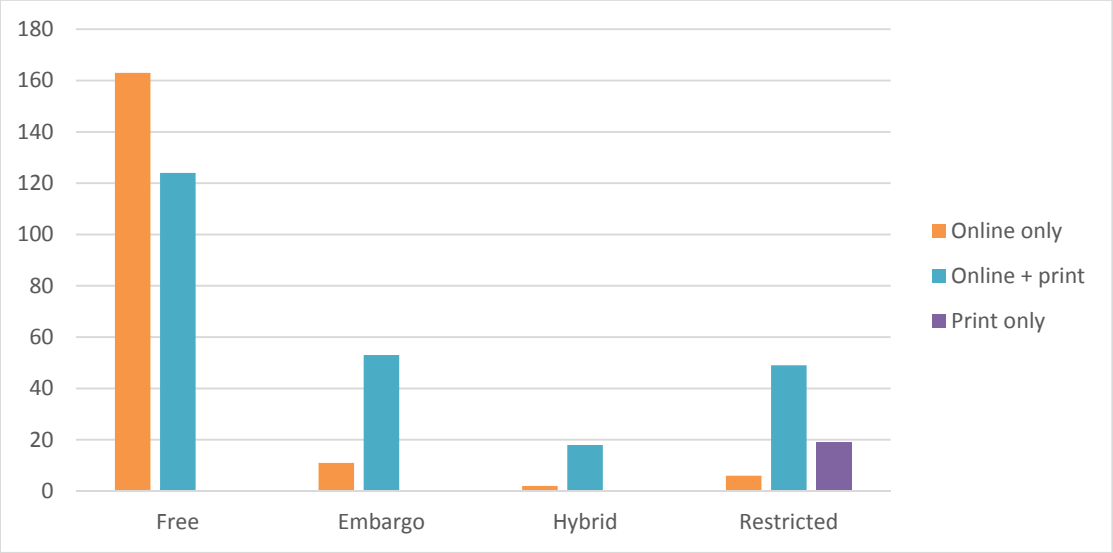


Figure 43 – Access and format types

Chi-squared test confirms positive dependence between online-only format and free access, while online + print is associated with embargoed and hybrid journals. Print-only format is, obviously, limited to restricted-access.

### 4.3.5. Subject areas and access types

The access type varies among subject areas (Table 25). Mathematics & physics (40%) and health sciences (47%) have the lowest proportion of free-access journals, while experimental sciences (93%) and life sciences (87%) have the highest. Except health sciences, the rest were little populated areas, though. The remaining important areas have almost identical degree of OA penetration (69% in A&H, 68% in social sciences). As to free-access APC-funded journals, almost all (10 out of 11) are distributed between the two most populated areas (social sciences and health sciences), which indicates that they seem to follow similar thematic distribution than those in "Diamond OA".

Embargo journals (14% of population studied) are only used in the three most populated areas (arts & humanities, social sciences and health sciences). The rest of the areas represent only a 15.7% of the total and have one or none. Most journals have embargo periods ranging between 6 to 12 months, but there is only one journal (in mathematics & physics) that requires 48 months (4 years), which might be assimilated to a restricted-access one.

Hybrid journals are only noticeable in mathematics & physics, with 6 of them (a 40% within the area).

Only a 17% of all Spanish journals indexed in WoS or Scopus are restricted-access. A 72% of them deal with STM, and the area with the highest proportion of restricted-access titles is health sciences (31%). A 22% of the few titles on engineering are restricted-access as well, but the rest of the areas, including the most populated, range between a 7% and a 13%.

| | Free | | Free +APC | | Embargo | | | Hybrid | | Restricted | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Subject Area** | **n** | **%** | **n** | **%** | **n** | **m** | **%** | **n** | **%** | **n** | **%** | **n** | **%** |
| Arts & Hum. | 55 | 68.8% | | | 15 | 16 | 18.8% | | | 10 | 12.5% | **80** | **18.0%** |
| Social S. | 106 | 68.4% | 4 | 2.6% | 25 | 12 | 16.1% | 9 | 5.8% | 11 | 7.1% | **155** | **34.8%** |
| *total SSH* | *161* | *68.5%* | *4* | *1.7%* | *40* | *14* | *17.0%* | *9* | *3.8%* | *21* | *8.9%* | ***235*** | **52.8%** |
| Health S. | 65 | 46.4% | 6 | 4.3% | 22 | 13 | 15.7% | 3 | 2.1% | 44 | 31.4% | **140** | **31.5%** |
| Life S. | 20 | 87.0% | - | - | - | - | - | 1 | 4.3% | 2 | 8.7% | **23** | **5.2%** |
| Experim. S. | 13 | 92.9% | | | | | | | | 1 | 7.1% | **14** | **3.1%** |
| Engineering | 11 | 61.1% | 1 | 5.6% | 1 | 12 | 5.6% | 1 | 5.6% | 4 | 22.2% | **18** | **4.0%** |
| Maths. & Ph. | 6 | 40.0% | | | 1 | 48 | 6.7% | 6 | 40.0% | 2 | 13.3% | **15** | **3.4%** |
| *total SMT* | *115* | *54.8%* | *7* | *3.3%* | *24* | *15* | *11.4%* | *11* | *5.2%* | *53* | *25.2%* | ***210*** | **47.2%** |
| **Total** | **276** | **62.0%** | **11** | **2.5%** | **64** | **14** | **14.4%** | **20** | **4.5%** | **74** | **16.6%** | **445** | **100.0%** |

**Table 25 – Subject area, publisher type and access type**
m: embargo months

The distribution is displayed graphically in Figure 44, where free-access without APCs (also known as Diamond or Platinum OA) dominates in all categories except in mathematics and physics, where both free-access and hybrid journals reach the 40%. It is also clear that restricted access is more frequent in health sciences, while embargo only appears in the most populated areas and free-access with APCs titles are insignificant.

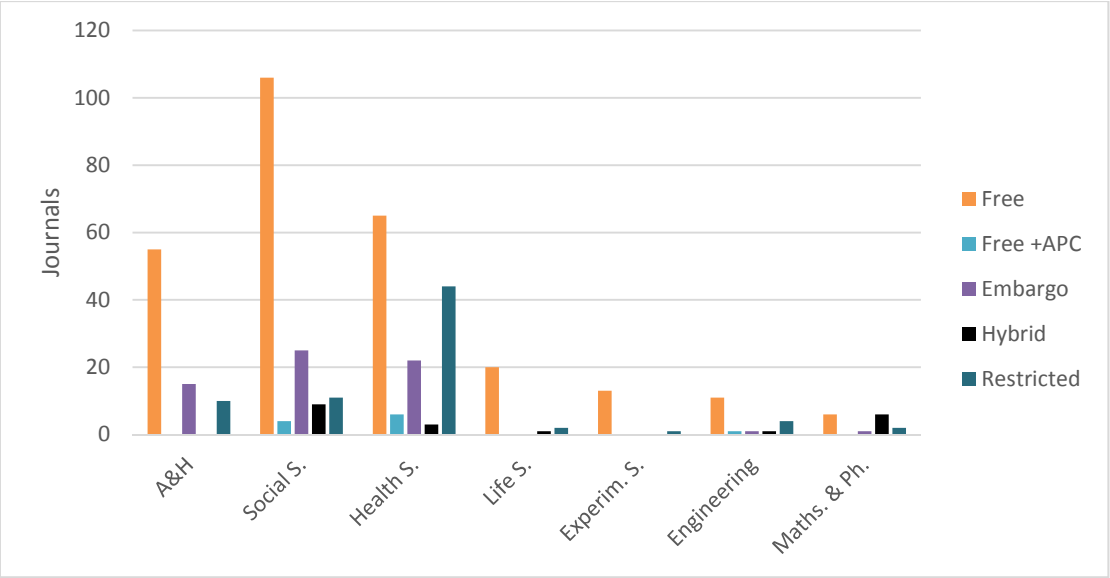


Figure 44 – Subject area and access type

Chi-square test, although there were few frequencies in too many cells, confirms relations of association or dependence between free access and social sciences, hybrid journals and mathematics & physics, and restricted access with health sciences.

### 4.3.6. Publisher and access types

Commercial publishers are key to understand the studied journals (table 26). The journals published by them have the lowest free-access proportion (30%), and they are responsible for most of the free-access APC-paid titles (7 out of 11). Companies share an 80% of all embargo titles with universities and research institutions, although the period of delay is higher in the former (24 months). This does not seem to be in line with global results by **Laakso & Björk** (2013), who found that a half of the OA articles from journals published by societies and associations were delayed and not immediately accessible – and here there are only 8 journals (12.5% of all embargoed) in the private non-profit publisher category.

Commercial publishers are also responsible for almost all the hybrid journals (18 out of 20) and all the restricted-access ones (66%). The restricted-access type is the highest within the commercial publisher category as well (35%).

As for the rest, free-access is predominant in all areas (especially in the academic sector with an 81%), government agencies use embargo in online versions to compensate the cost of print in almost a 30% of the cases, and restricted access is residual (again especially in the academic sector, with only a 3%).

| Publisher type | Free | | Free +APC | | Embargo | | | Hybrid | | Restricted | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | m | % | n | % | n | % | n | % |
| Private n.p. | 67 | 70.5% | 1 | 1.1% | 8 | 19 | 8.4% | 1 | 1.1% | 18 | 18.9% | **95** | **21.3%** |
| Government | 10 | 58.8% | - | - | 5 | 12 | 29.4% | - | - | 2 | 11.8% | **17** | **3.8%** |
| Academic | 157 | 81.3% | 3 | 1.6% | 27 | 16 | 14.0% | 1 | 0.5% | 5 | 2.6% | **193** | **43.4%** |
| Commercial | 42 | 30.0% | 7 | 5.0% | 24 | 24 | 17.1% | 18 | 12.9% | 49 | 35.0% | **140** | **31.5%** |
| **Total** | **276** | **62.0%** | **11** | **2.5%** | **64** | **14** | **14.4%** | **20** | **4.5%** | **74** | **16.6%** | **445** | **100.0%** |

m: embargo months

Table 26 – Publisher type and access type

Figure 45 displays a clear predominance of free access across all publisher types, except commercial, where other access formulas appear.

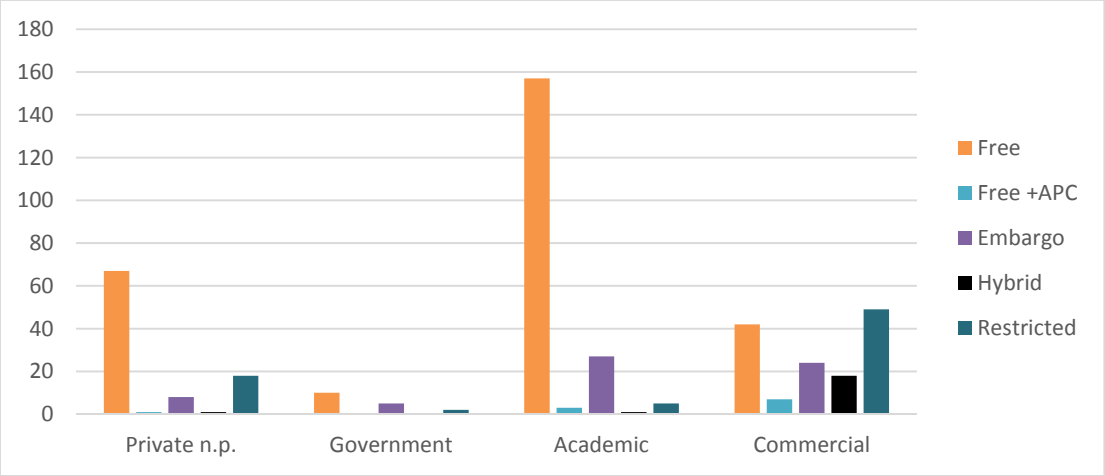


Figure 45 – Publisher type and access type

Chi-square test, again with too many cells with few values, confirms an association between academic publishers and free access, and an association between commercial publishers and free access with APCs, hybrid and restricted access.

## 4.4. Price and impact

### 4.4.1. Subscription prices

Subscriptions apply to embargo, hybrid and restricted access journals.

It is difficult to compare journal prices since every journal offered different combinations of subscription (format) and subscriber types (individual, institutional and more). Some of them only charge one price, no matter if it is for individuals or institutions. In addition, "these ambiguities are made worse by the prevalence of Big Deals; these make identifying a price for a specific journal very difficult if not impossible" (**Galyani-Moghaddam**, 2009, p. 2).

For comparison purposes, it was decided that only one price can be considered and it has to be for the same subscriber type. Since many of the commercial journals did not publicly offered a specific institutional price (mostly Elsevier, arguing that the price depends on the size or users of the institution or library), but only a few of them did not offer the individual one[295], only the individual subscriber price has been considered.

The author of this study admits the limitations of the findings based on subscription prices. It is difficult, or even impossible, to assess a universal and unique price for a journal since they are accessed mostly by members of academic communities. These communities pay subscriptions, many of them included in packages or "big deals", and they could vary since publishers negotiate with different parties and reach different agreements. The price could be then calculated according to users or uses, and by part of the money paid by libraries for the package, but still it is a rather difficult work and there is no real good output. That is why only individual subscriber price has been taken into account. It is true that this method does not reflect all the possibilities of pricing and benefits commercial publishers in this study, because they may price according to the subscription institution size or resources, while non-commercial ones normally do not charge institutional prices, not even when subscribers are libraries.

| | Individual / Not indicated | | Individual & Institutional | | Institutional only | | Total | |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % |
| **Private n.p.** | 20 | 74.1% | 7 | 25.9% | - | - | 27 | 17.1% |
| **Government** | 7 | 100.0% | - | - | - | - | 7 | 4.4% |
| **Academic** | 28 | 84.8% | 5 | 15.2% | - | - | 33 | 20.9% |
| **Commercial** | 16 | 17.6% | 72 | 79.1% | 3 | 3.3% | 91 | 57.6% |
| **Total** | **71** | **44.9%** | **84** | **53.2%** | **3** | **1.9%** | **158** | **100.0%** |

Table 27 – Publisher and subscriber types

[295] Only 3 journals did not offer subscription price for individual subscribers. All of them were commercial and written in English, 2 were restricted-access on health sciences, and 1 was hybrid on social sciences. As explained later, an individual price will be calculated for them.

Almost a half (45%) of the journals did not state a subscriber type or it was understood that it was individual. Most of the titles published by non-commercial bodies are in this group, while a 79% of those published by commercial companies offered both individual and institutional options.

84 journals (53% of restricted-access titles) offered different subscribing options according to the subscriber type (individual or institutional), but only 38 provided both prices: all those published by non-commercial bodies (12), 22 by commercial companies different from Elsevier, and 4 by Elsevier. From these 38, 31 had both prices for the same subscription type (online-only, online + print, print-only). Therefore, only those 31 were selected for calculating the proportion between individual and institutional prices:

| | Journals | Individual subscriber cost | Institutional subscriber cost | ISC / PSC |
|---|---|---|---|---|
| **Commercial** | 20 | €1,450.59 | €5,387.04 | 3.71 |
| **Non-commercial** | 11 | €929.87 | €2,317.21 | 2.49 |

**Table 28 - Publisher types, average subscription price and price proportion by subscriber type**

The proportion of the price is higher for journals published by commercial companies (3.71) than by non-commercial (2.49)[296], even though the difference was expected to be higher. Nevertheless, these are just the journals that disclosed the institutional price, and we have to keep in mind that 46 of 84 (55%) of the journals offering both options did not disclosed it. This was the case of Elsevier, which did not provide the institutional price of 46 out of the 50 journals in this category (individual and institutional price). All the remaining commercial titles here (22) did provide it.

Not providing the institutional subscription price to individuals is not a crime, but it takes part of a policy of non-transparency for pricing in order to be able to negotiate different rates, and helps to raise benefits by charging higher prices to bigger institutions.

As mentioned before, three journals did not offer individual price. Nevertheless, an individual price has been calculated for them according to the latter proportion. A limitation for this calculation is that this proportion does not consider existing differences among disciplines, but these 3 prices will not cause any distortion in the global data analysis and will allow us to complete table 29 and keep the integrity of the study of all 445 journals.

[296] Description of these journals is as follows. 20 commercial: 4 social sciences (all hybrid, 3 by Taylor & Francis and 1 by El Profesional de la Información), 11 health sciences (8 restricted, 2 embargo, 1 hybrid), 1 engineering (hybrid, Springer), 4 mathematics & physics (all hybrid and by T&F). 11 non-commercial: by universities, societies and associations; 3 social sciences and 8 STM; 6 embargo, 3 restricted, 2 hybrid.

Bearing in mind the limitations mentioned regarding the calculation of the subscription price, it is possible to analyze results across categories. Table 29 only includes access-paid journals, thus excluding free access (with and without APCs).

| | Embargo | | | | | Hybrid | | | | Restricted | | | | Total subscription-based | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | m | €/vol | €/art | % | n | €/vol | €/art | % | n | €/vol | €/art | % | n | €/vol | €/art | % |
| **Subject Area** | | | | | | | | | | | | | | | | | |
| Arts & Hum. | 15 | 16 | €37 | €2.26 | 19% | - | - | - | - | 10 | €46 | €3.10 | 13% | 25 | €40 | €2.59 | **31%** |
| Social S. | 25 | 12 | €45 | €2.78 | 16% | 9 | €110 | €4.13 | 6% | 11 | €63 | €3.12 | 7% | 45 | €62 | €3.13 | **29%** |
| *total SSH* | *40* | *14* | *€42* | *€2.58* | *17%* | *9* | *€110* | *€4.13* | *4%* | *21* | *€55* | *€3.11* | *9%* | *70* | *€55* | *€2.94* | ***30%*** |
| Health S. | 22 | 13 | €93 | €3.02 | 16% | 3 | €102 | €4.00 | 2% | 44 | €162 | €4.91 | 31% | 69 | €137 | €4.27 | **49%** |
| Life S. | - | - | - | - | - | 1 | €205 | €2.07 | 4% | 2 | €73 | €3.09 | 9% | 3 | €117 | €2.75 | **13%** |
| Experim. S. | - | - | - | - | - | - | - | - | - | 1 | €15 | €1.50 | 7% | 1 | €15 | €1.50 | **7%** |
| Engineering | 1 | 12 | €20 | €0.51 | 6% | 1 | €78 | €5.58 | 6% | 4 | €129 | €3.31 | 22% | 6 | €102 | €3.22 | **33%** |
| Math. & Ph. | 1 | 48 | €96 | €7.38 | 7% | 6 | €78 | €2.45 | 40% | 2 | €289 | €10.57 | 13% | 9 | €127 | €4.81 | **60%** |
| *total STM* | *24* | *15* | *€90* | *€3.10* | *11%* | *11* | *€96* | *€3.12* | *5%* | *53* | *€158* | *€4.87* | *25%* | *88* | *€132* | *€4.17* | ***42%*** |
| **Publisher type** | | | | | | | | | | | | | | | | | |
| Private n.p. | 8 | 19 | €61 | €3.34 | 8% | 1 | €60 | €2.14 | 1% | 18 | €93 | €3.51 | 19% | 27 | €82 | €3.41 | **28%** |
| Government | 5 | 12 | €19 | €4.48 | 29% | - | - | - | - | 2 | €20 | €1.58 | 12% | 7 | €20 | €1.09 | **41%** |
| Academic | 27 | 16 | €37 | €2.18 | 14% | 1 | €205 | €2.07 | 1% | 5 | €69 | €4.25 | 3% | 33 | €47 | €2.49 | **17%** |
| Commercial | 24 | 24 | €93 | €3.65 | 17% | 18 | €99 | €3.74 | 13% | 49 | €152 | €4.81 | 35% | 91 | €126 | €4.30 | **65%** |
| **Language** | | | | | | | | | | | | | | | | | |
| Spa. | 37 | 13 | €45 | €2.38 | 18% | 1 | €79 | €1.36 | 0% | 42 | €85 | €3.13 | 20% | 80 | €67 | €2.76 | **38%** |
| Spa. & Eng. | 17 | 14 | €84 | €3.16 | 14% | 7 | €107 | €4.91 | 6% | 19 | €109 | €3.58 | 16% | 43 | €99 | €3.63 | **36%** |
| Eng. | 8 | 17 | €79 | €3.66 | 10% | 12 | €101 | €2.99 | 15% | 12 | €316 | €8.95 | 15% | 32 | €176 | €5.39 | **39%** |
| Oth. & Mult. | 2 | 18 | €53 | €3.45 | 6% | - | - | - | - | 1 | €67 | €16.74 | 3% | 3 | €58 | €7.88 | **9%** |
| **Total** | **64** | **14** | **60** | **2.78** | **14%** | **20** | **102** | **3.58** | | **74** | **129** | **4.37** | | **158** | **97** | **3.63** | |

Table 29 – Average prices per volume and article

Kruskal-Wallis H test shows that prices per volume and per article depend on every single distribution (by subject area, publisher type and language).

Subscription-based or paid-access journals (including embargo, hybrid and restricted) have a global average of €97 per volume and €3.63 per article, but prices depend on access types. Embargo journals are the cheapest (€60, €2.78), followed by hybrid (€102, €3.58). Restricted-access titles are the most expensive (€129, €4.37), even doubling the volume price of the embargo type.

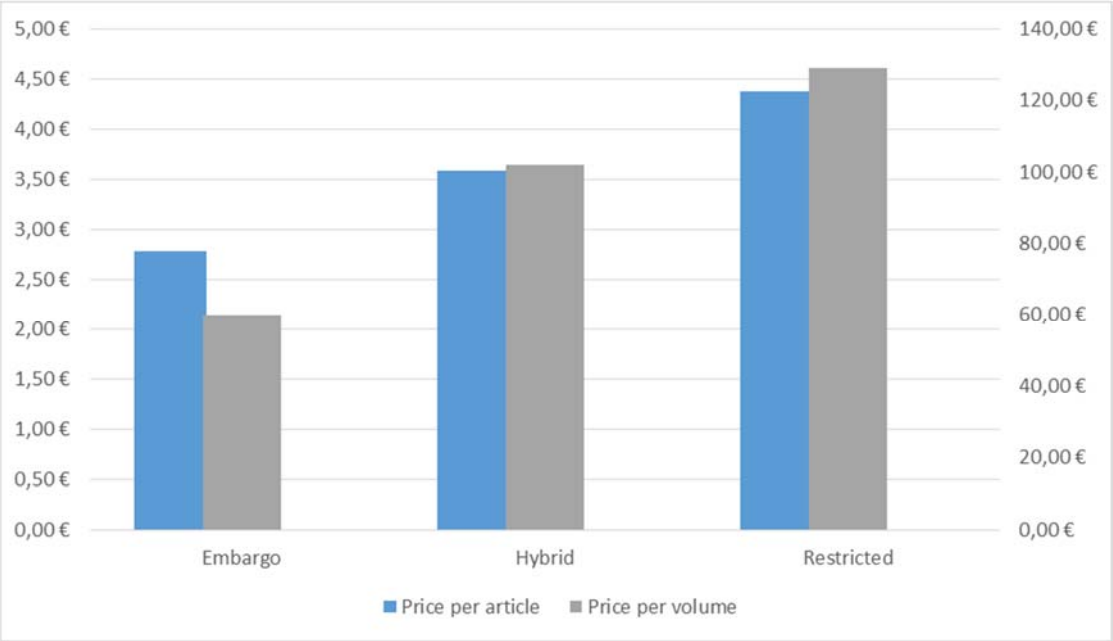


**Figure 46 – Price per article and volume by access type**

Total prices per volume are, as expected, much higher for STM journals (€131.55) than for SSH ones (€54.62). The proportion here is 2.4. Nevertheless, the difference between prices per article is smaller (€4.17 and €2.94, respectively; proportion 1.41), and in part this is due to the fact that STM journals have almost doubled the average of number of articles (41 to 23).

The ratio between STM and SSH in embargoed journals is similar (2.14 for volume prices, 1.20 for articles), and the same applies to restricted-access titles (2.87 and 1.41), but hybrid journals on SSH are more expensive than STM. This fact is explained because 8 out of those 9 journals are published by private companies (6 of which are published by Taylor and Francis, that charges prices above the average).

As for the average price per article by areas (Figure 47), mathematics & physics and health sciences are on average the most expensive, while experimental sciences and arts & humanities are the cheapest.

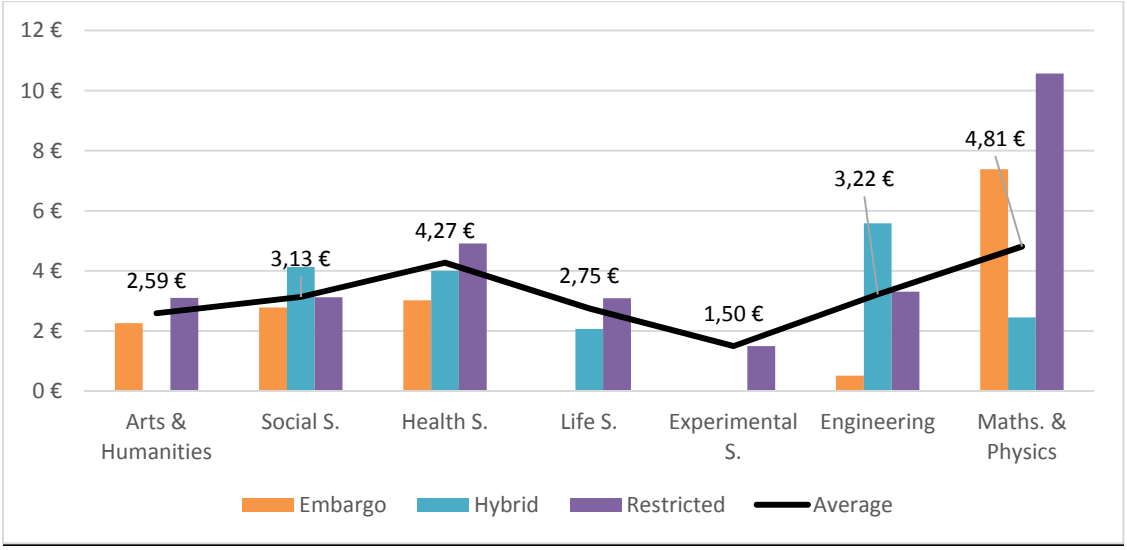


Figure 47 – Price per article, subject areas and access types

The differences across publisher types are significant (Figure 48). The total price per volume for commercial companies is €126.21, while for academic institutions is €47.14 and for government agencies is only €19.59. It is evident that associations and societies are pricing too high, since €82.27 is almost twice the price fixed by universities and research centers. Prices per article follow the same pattern with smaller differences.

Prices for embargoed titles are a bit surprising, because government agencies are charging a much higher price per article (€4.48) than the rest (including commercial). The subscriptions cost for hybrid journals by academic institutions is one of the highest at the table (€205.00), but there is only one journal in this category and the resulting article price is within the average. Journals with restricted access published by commercial companies charge twice the price fixed by academic bodies (€152.27 and €68.66, respectively), but price per article results similar (€4.8 and €4.25). It is important to point out that the mean number of articles per issue is between 23 and 25, except for commercial companies which publish twice that scientific content (45 articles). That explains, or even justifies, the price.

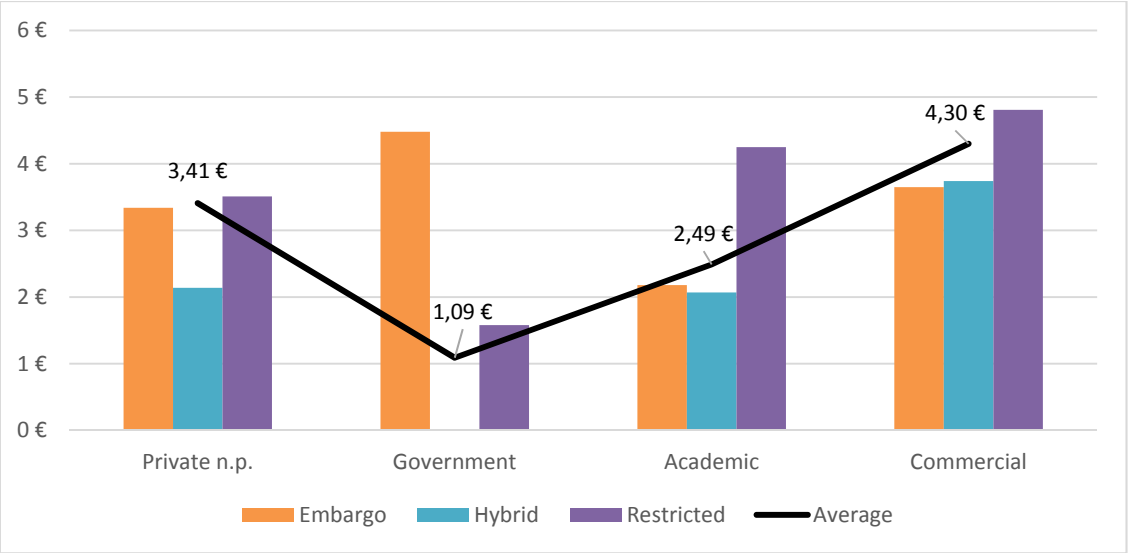


Figure 48 – Price per article by access type

Regarding language[297], it is clear that the presence of English boosts prices per volume and per article, except for the volume price in embargoed journals. The number of articles does not differ as much as in the other categories.

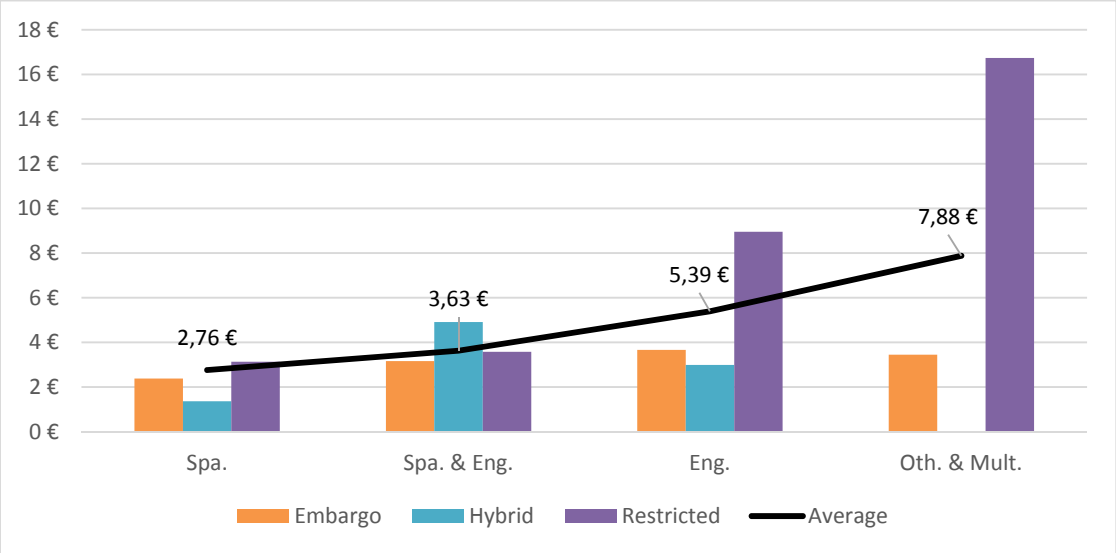


Figure 49 – Price per article by language

[297] Language is discussed in depth in 4.5.1 and 4.5.2, as an internationality element.

If the only restricted-access journal published in a language different to Spanish and English is ignored[298], English language and restricted-access journals reach €8.95, which is only exceeded by €10.57 for mathematics & physics restricted-access titles at the whole table.

### 4.4.2. APC prices

As shown in Table 29, the average APC for free access journals is €214 while for hybrid ones is €2,141 - that is exactly 10 times more. This gives a clear picture: hybrid journals are for profit (a 90% of them are published by commercial enterprises) while free-access journals strive for covering their expenses.

10 out of the 11 free access journals with APCs in this study are on health sciences (6) and social sciences (4). Those are the most populated disciplines of the studied journals; therefore APC-paid free access journals distribute the same way as the rest. Regarding publisher type, both academic and commercial publishers have a similar average price (€200 and €246, respectively) and cover 10 of the titles, while the remaining one is published by a foundation (publisher type included in "private non-profit") and costs only €30. Language does not seem determinant in the price, because the average APC for Spanish-only and Spanish and English journals is €280 and €281, respectively. Maybe surprisingly, the average APC for English- journals is lower (€127) and the average APC for other languages or for multi-language journals is in between (€145). Again, these data come from a small number of journals (11), but it is worth to see how the market is behaving in Spain.

Among the only 20 Spanish hybrid journals (see Table 30), 10 are all by Springer and cost the same: €2,200. The percentage of OA articles[299] is very low there (average 4.9%), except for Spanish research articles on pharmacoeconomics (42.9%). These journals are on a variety of STM disciplines: health sciences (3), mathematics and physics (6, which represents the totality of all the hybrid journals in this area and a 40% of the total of journals in it) and engineering (1). For the rest of the journals, 6 are published by Taylor & Francis and deal with Social Sciences, and the APC price is almost the same (€2,150). The percentage of OA articles is a little higher, from a 0% to a 21% with a mean of 12.1%. The remaining 4 are published by Cambridge University Press (social sciences, €2,380.58[300]), University of the Bask Country (life sciences, €1.500), El Profesional de la Información (commercial publisher of the homonymous journal on LIS, only €400) and Asociación de Análisis del Comportamiento (social sciences, €81[301]).

[298] Article price is €16.74.
[299] It is assumed that every OA article is open because an APC has been paid. It may not be always the case, but at least most of the times it is. There is no way of verifying it, though.
[300] The original price was available only in USD and GBP.
[301] The APC price was available only for the number of pages. An average price for article has been calculated according to the number of pages and articles on vol. 2014.

Only 4 journals[302] applied author charges different from the APC[303]. They covered processing costs but not OA publishing. These prices have been added to APC when both coincided in the same journal.

They are well distributed between SSH and STM subject groups, almost 50%-50%. The APC price is a bit higher for STM (€2,141) than for SSH (€1,751), though. There are no hybrid journals on arts & humanities and experimental sciences. Almost all journals (18/20) are published by commercial companies, with an average APC price of €2,093. There is only one by an academic publisher (€1,500) and another one by a private non-profit type (€81). All hybrid journals except one are written in English, and the average APC price varies from €1,854 to €2,157. The remaining one costs just €200 and it's published only in Spanish.

| Publisher name | Publisher type | Journals | Subject areas | APC prices | %OA arts. |
|---|---|---|---|---|---|
| Asociación de Análisis del Comportamiento | Private n.p. | 1 | Social Sciences | €81.00 | 22.2% |
| El Profesional de la Información | Commercial | 1 | Social Sciences | €400.00 | 41.4% |
| University of Bask Country | Academic | 1 | Life Sciences | €1.500.00 | 9.9% |
| Taylor & Francis | Commercial | 6 | Social Sciences | €2.150.00 | 12.1% |
| Springer | Commercial | 10 | 6 Mathematics and Physics. 3 Health Sciences. 1 Engineering | €2.200.00 | 4.9% |
| Cambridge University Press | Commercial[304] | 1 | Social Sciences | €2.380.58 | 0.0% |
| **Total / average** | | **20** | | **€2.141.00** | **8.3%** |

**Table 30 – Hybrid journals**

In any case, the number of OA articles published in hybrid journals is very low. For the 2014 volume, the proportion varies from a 0% to a 41.4%, with a mean of 8.3%. **Björk** (2012) described hybrid journals as a "failed experiment" because of the low percentage of OA articles in them, and later **Björk** and **Solomon** (2015, p. 94) discovered that authors' "uptake of the hybrid option has averaged only 1–2%" internationally. Nevertheless, in a very recent study, **Laakso & Björk** (2016) found a sustained growth in the number of hybrid OA articles published during the years 2007-2013 and an authors' uptake average of 3.8%. Thus, uptake in Spain is higher, although there are too few journals and articles as to make an ultimate statement on this matter.

At this stage, another question arises. Researchers (or their funders) cannot decide to pay or not in full OA journals because it is mandatory, but they can when journals are hybrid. Therefore, do

[302] Aids Reviews (Permanyer, €200), Applied Econometrics and International Development, and Regional and Sectoral Economic Studies (Euro-American Association of Economic Development Studies, €45) and El Profesional de la Información (EPI, €200).
[303] Optional costs as color print or copies distribution are not taken into consideration.
[304] Cambridge University Press has been considered a "commercial" publisher type for this study, because of its magnitude, benefit-seeking pricing. It's not comparable to the rest of the Spanish universities, and it only publishes 2 of the journals analyzed here, not enough to create a new type.

they choose journals with cheaper APC prices? It does not seem so, since Pearson value is -0.55, showing a medium negative correlation. The reason is that APC prices vary very little while the percentage of paid articles varies significantly (Figure 50).

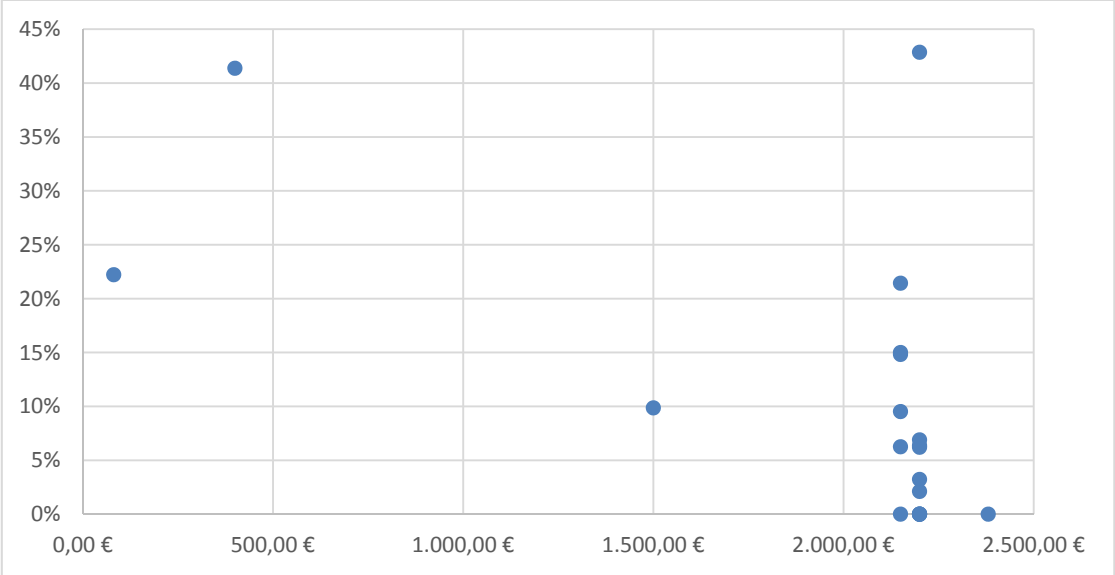


**Figure 50 – APC prices and %OA articles for hybrid journals**

It is necessary to bear in mind that, as mentioned before, researchers usually do not pay their APCs and their capacity to choose a journal can be limited or interfered by the funder. Also, funders may exclude hybrid APCs from their policies[305], since paying APCs is not mandatory for full OA journals while it is so for hybrid, and the manuscript or a version of the article could be self-archived somewhere else online[306]. And, last but not least, authors bear in mind other factors when selecting a journal to send the manuscript to. **Solomon & Björk** (2012) informed that most bear in mind adequacy, quality, and speed of publication. In addition, a survey to North-American researchers revealed that the least important factor among the eight possible choices was precisely OA (**Tenopir et al.** , 2016).

Presumably, the number of restricted access journals offering APC-paying options will grow in the short-term[307], but a greater uptake of OA articles is not expected.

[305] For instance, in Norway (**RCUK**, 2015, p. 8), and "in Germany and many other countries" (**Schimmer, Geschuhn, Vogler**, 2015, p. 6). In Spain, the University of Barcelona does not cover them (http://crai.ub.edu/en/crai-services/open-access-ub/gold-route#model-hibrid)

[306] "Full OA journals charge an APC as a compulsory prerequisite for publishing; in hybrid journals the OA is an extra luxury, since the article is published in any event. In the case of most hybrid journals the author can also achieve almost the same OA effect for free by uploading a legal manuscript copy to an institutional or subject-based repository" (Björk 2012b).

[307] Surprisingly, no Elsevier hybrid journal was found. The publisher was contacted in Sep. 2015 in that matter and answered that yes, there were. We checked again and discovered none. Elsevier replied that there were some but APC information was not correctly displayed at author pages, and more and more of their restricted access titles will

### 4.4.3. Impact

IF from WoS, and SJR and SNIP from Scopus have been collected and aggregated to analyze subject area, access type, publisher type and language, as shown in Table 31.

| | Total journals | | In WoS | | With IF | | | IF | SJR | SNIP |
|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % WoS | % total | average | average | average |
| **Subject Area** | | | | | | | | | | |
| Arts & Hum. | 80 | 18% | 33 | 41% | 5 | 15% | 6% | 0.210 | 0.120 | 0.187 |
| Social S. | 155 | 35% | 53 | 34% | 40 | 75% | 26% | 0.322 | 0.185 | 0.342 |
| *total SSH* | *235* | *53%* | *86* | *37%* | *45* | 52% | *19%* | *0.310* | *0.163* | *0.291* |
| Health S. | 140 | 31% | 45 | 32% | 42 | 93% | 30% | 1.345 | 0.215 | 0.290 |
| Life S. | 23 | 5% | 11 | 48% | 10 | 91% | 43% | 0.830 | 0.303 | 0.496 |
| Experim. S. | 14 | 3% | 7 | 50% | 7 | 100% | 50% | 0.850 | 0.265 | 0.396 |
| Engineering | 18 | 4% | 10 | 56% | 8 | 80% | 44% | 0.361 | 0.389 | 0.606 |
| Math. & Ph. | 15 | 3% | 8 | 53% | 8 | 100% | 53% | 0.869 | 0.518 | 0.684 |
| *total STM* | *210* | *47%* | *81* | *39%* | *75* | 93% | *36%* | *1.074* | *0.265* | *0.375* |
| **Access type** | | | | | | | | | | |
| Free no APC | 276 | 62% | 91 | 33% | 65 | 71% | 24% | 0.719 | 0.193 | 0.323 |
| Free +APC | 11 | 2% | 4 | 36% | 4 | 100% | 36% | 1.165 | 0.246 | 0.474 |
| Embargo | 64 | 14% | 34 | 53% | 20 | 59% | 31% | 0.940 | 0.208 | 0.314 |
| Hybrid | 20 | 4% | 15 | 75% | 15 | 100% | 75% | 0.825 | 0.550 | 0.766 |
| Restricted | 74 | 17% | 23 | 31% | 16 | 70% | 22% | 0.746 | 0.187 | 0.236 |
| **Publisher type** | | | | | | | | | | |
| Private n.p. | 95 | 21% | 27 | 28% | 21 | 78% | 22% | 0.690 | 0.195 | 0.625 |
| Government | 17 | 4% | 10 | 59% | 10 | 100% | 59% | 0.402 | 0.153 | 0.315 |
| Academic | 193 | 43% | 71 | 37% | 36 | 51% | 19% | 0.584 | 0.194 | 0.334 |
| Commercial | 140 | 31% | 59 | 42% | 53 | 90% | 38% | 1.037 | 0.256 | 0.375 |
| **Language** | | | | | | | | | | |
| Spanish | 211 | 47% | 64 | 30% | 32 | 50% | 15% | 0.583 | 0.147 | 0.227 |
| Spa. & Eng. | 118 | 27% | 52 | 44% | 44 | 85% | 37% | 0.709 | 0.207 | 0.348 |
| English | 82 | 18% | 48 | 59% | 43 | 90% | 52% | 1.033 | 0.408 | 0.641 |
| Other & Multi. | 34 | 8% | 3 | 9% | 1 | 33% | 3% | 0.195 | 0.133 | 0.182 |
| **Total** | **445** | **100%** | **167** | **14%** | **120** | **72%** | **27%** | **0.788** | **0.212** | **0.330** |

**Table 31 – Bibliometric impact indicators**
All % are on the total of journals by category.

The first thing that calls the attention is the fact that only a 27% of the journals studied have IF, and it covers categories with very different proportions. Thus, only a 26% of social sciences and a 30% of health sciences have an IF, while it is much higher (43%-53%) for the rest of the subjects.

be offering this possibility in the future. It was too late to pursue the search for this study, but it is expected that some of these titles will be effectively converted into hybrid and future studies will reflect it.

Moreover, not every WoS journal has an IF – only a 72% does, a 52% on SSH and a 93% on STM. Arts & humanities titles are not supposed to be included in JCR[308] (where IF appears), and yet the proportion of WoS journals with IF depends on the category. For instance, 75% of social sciences journals have it, while the rest (except engineering) ranges from 91% to 100%. It also depends on access type, where the few journals with APCs (both free-access and hybrid) reach a 100% and the rest range from a 60% to a 70% approximately. As to publisher type, all the 10 indexed titles published by government departments and agencies have IF, while only half of the academic ones have IF (51%) and commercially published journals have a high proportion (90%). As to language, it is clear that the presence of English is related not only to a higher indexation in WoS, but to a higher proportion of IF (50% Spanish-only, 85 bilingual, 90% English-only).

At this point, it seems that there is some positive correlation between the proportion of IF journals in WoS and the IF value itself within categories, as can be observed in Figure 51 (every dot is a journal category, with 20 total categories, e.g. arts & humanities, embargo, academic, Spanish, etc.)[309]. Indeed, there is a high positive correlation (ρ = 0.62), which varies much depending on the category. In language distribution it is close to the total (0.92), while it is still high in subject distribution (0.69) and, perhaps surprisingly, there is almost no correlation at all between publisher types and IF (0.04).

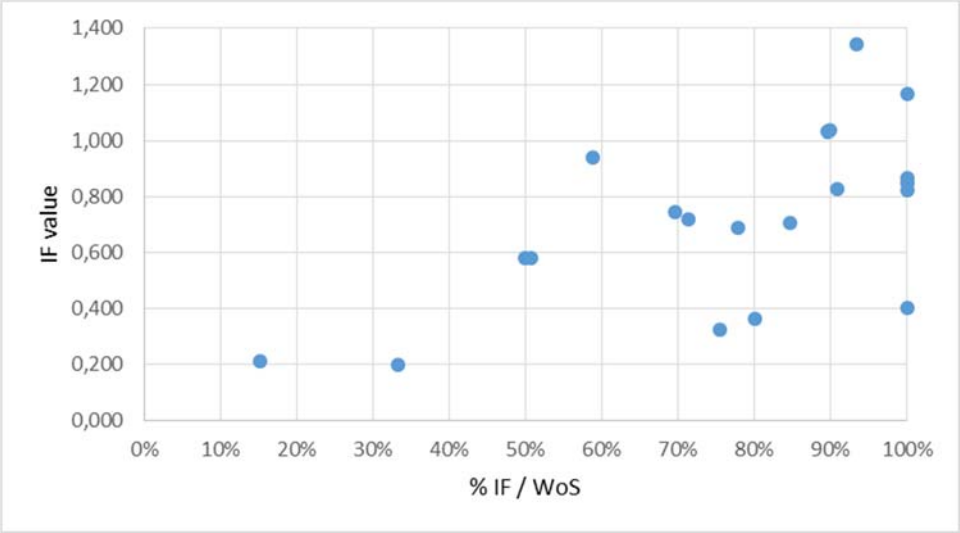


Figure 51 – Categories of WoS journals with IF and IF values

As for Scopus values, almost every journal has an SJR and a SNIP value, and that's why columns for the % of SJR at Scopus and the % of SNIP at category and at Scopus do not appear in Table

[308] 5 journals in that area have IF, because they have been included in WoS as social sciences.
[309] The correlation has been calculated with very few data – only averages (pairs of values) for every variable. That is, 7 in subject area, 5 in access type, etc. These are too few as to asseverate that such correlation is meaningful, but results only confirm what descriptive statistics show.

31 – only 2 Scopus journals do not have SJR, and all Scopus journals have SNIP. Finally, a 98% of all journals in this population have SJR and SNIP, ranging from a 94% to a 100% depending on the category.

The distribution of subject areas are susceptible to change with all impact indicators – in other words, Kruskal-Wallis H test reveals that all three impact indicators are associated with subject area variable.

All indicators seem to follow similar patterns among subject areas (Figure 52) – low for SSH, high for STM. It is noticeable the enormous difference of IF in health sciences with respect to other areas and Scopus indicators, and the low IFs in Engineering together with high average SNIP in the latter discipline and also in Mathematics & Physics.

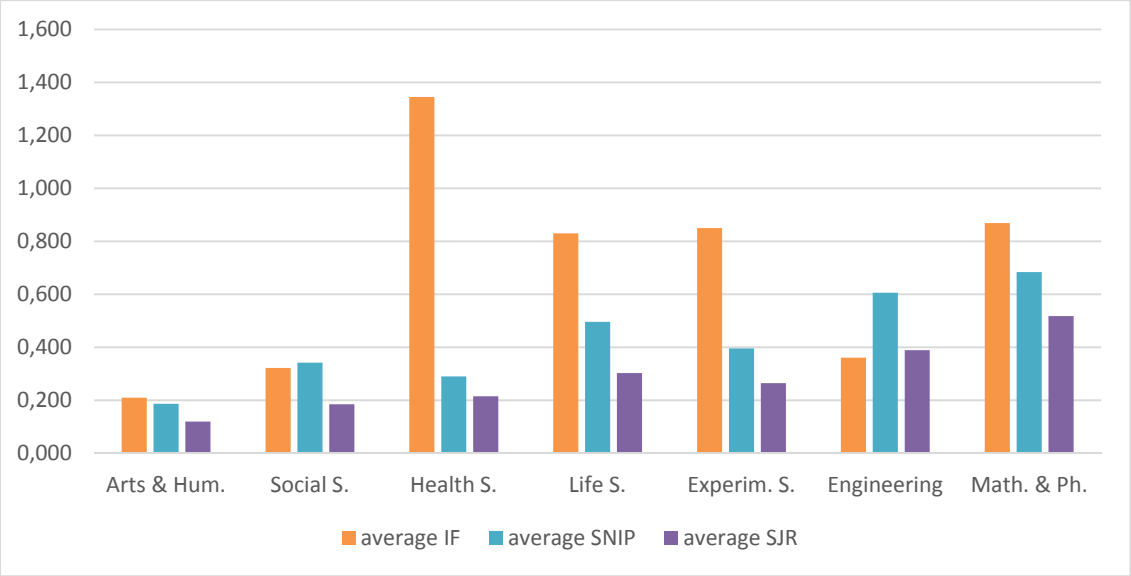


**Figure 52 – Subject areas and impact**

As to access types (figure 53), journals with APCs (both free-access and hybrid) have some of the highest indicators, especially the free access journals. Those averages are calculated on the basis of only a few journals (11 within the former category, 20 within the latter), though. Nevertheless, Kruskal-Wallis H test indicates that access type is related to SNIP and SJR, but not to IF – this is due to the fact that free-access with APCs and hybrid journals are poorly represented within this population.

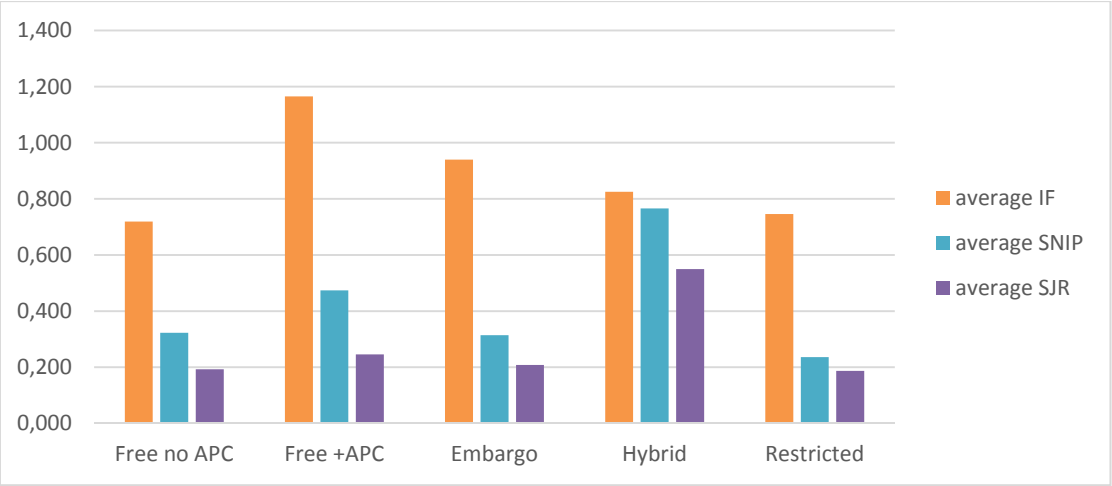


Figure 53 – Access types and impact

**Laakso & Björk** (2013, p. 1,323) found that WoS embargo OA journals received twice the amount of citations than restricted access and three times more than free-access ("immediate OA"). Taking into account that they include OA journals with and without APCs, their findings at a global level are not far from the Spanish situation. The average IF for embargo journals is the 2nd highest among all access types, only surpassed by free access with APCs – and if it that type was included within a single free access category, average IF for embargoed titles would be probably the highest.

SNIPs and SJRs follow similar patterns, and only tend to equalize with IF within the hybrid category.

All averages are similar for every publisher type (Figure 54), except that highest IF and SJR averages are in commercial category (especially for IF), while the highest SNIP average is found in journals published by societies and associations. This reveals that IF is clearly biased towards commercial publishers, and that the relation between areas and publisher types has something to do with the subject-normalized algorithm that gives the name to SNIP. Publisher type variable is associated with all impact indicators according to Kruskal-Wallis H test.

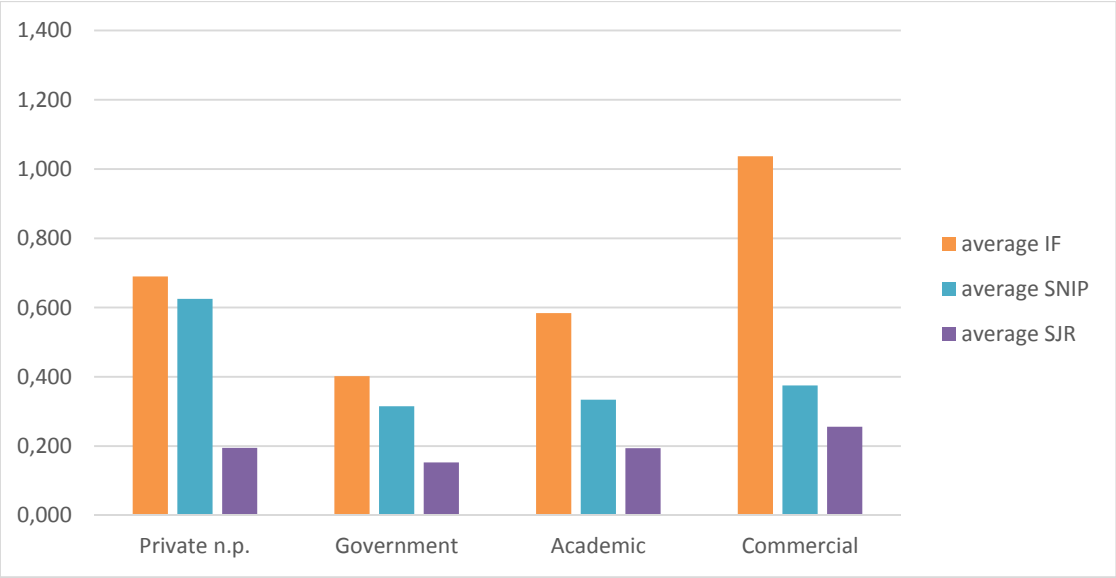


Figure 54 – Publisher types and impact

The English language has an absolute influence in bibliometric impact – the higher its presence, the higher the impact for every indicator (Figure 55). Impact difference between English-only and Spanish-only journals is higher for SNIP and SJR (2.8 ratio) than for IF (ratio 1.8). The impact of other languages is low for all indicators, but is almost the same as Spanish-only measured by SJR.

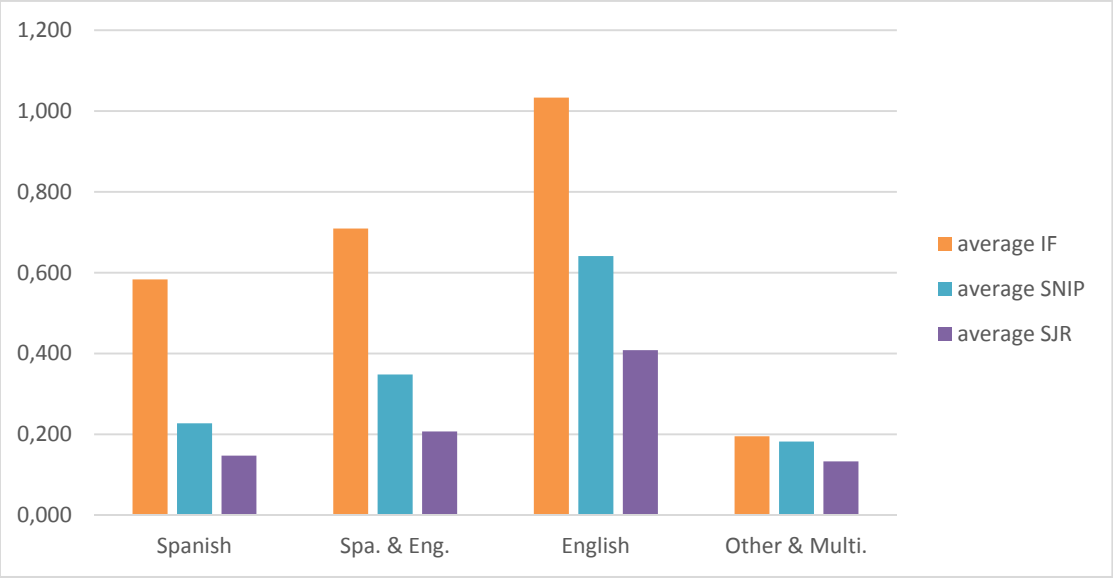


Figure 55 – Languages and impact

In brief, there are few differences among the three indicators, despite their different nature and scope. **Pislyakov** (2009) and **Sicilia et al.** (2011) reported a strong correlation between IF and SJR. The first author studied 20 economic journals that had 0.93 (Pearson), and the second

author studied computer science journals. Our results show a discrete correlation between IF and SJR (0.59), and a weaker one between IF and SNIP (0.36). SJR and SNIP have the strongest correlation (0.71), meaning that, after all, using SNIP (which considers subject areas) would not be much different than using SJR (which does not).

### 4.4.4. Relation between price and impact

#### *4.4.4.1. Subscription prices and impact*

Regarding the cost-effectiveness of subscription prices, the first thing to do is see how they correlate with the indicators collected. Only subscription-based journals have been included. Although SNIP is the only indicator that should be used for transversal analysis across disciplines, and IF is available only for a 27% of the journals studied, all indicators have been included in order to be able to observe what differences exist (table 32).

| | SNIP | | SJR | | IF | |
|---|---|---|---|---|---|---|
| | **vol.** | **art.** | **vol.** | **art.** | **vol.** | **art.** |
| **embargo** | 0.04 | 0.00 | 0.15 | 0.15 | 0.00 | -0.08 |
| **hybrid** | 0.04 | 0.01 | 0.15 | 0.09 | -0.01 | -0.12 |
| **restricted** | 0.04 | 0.00 | 0.14 | 0.08 | 0.15 | -0.07 |
| **all** | **0.04** | **0.00** | **0.14** | **0.08** | **-0.06** | **-0.06** |

Table 32 – Correlation between subscription prices and indicators

Pearson values show that there is no correlation whatsoever between subscription prices, both for volumes and articles, and SNIP, SJR and IF values. Pearson values (ρ) are even negative for the correlation between IFs, which is still more surprising, bearing in mind that only journals with IF values have been selected for this comparison, and IF is the indicator that quality journals exhibit the most.

Figure 56 shows the distribution of journals by article price and SNIP value, showing that most titles stay in the left-inferior part of the chart, and do not grow more expensive because of having higher SNIPs. More figures could be extracted from other combinations of indicator values and volume or article prices, but the distributions are similar.

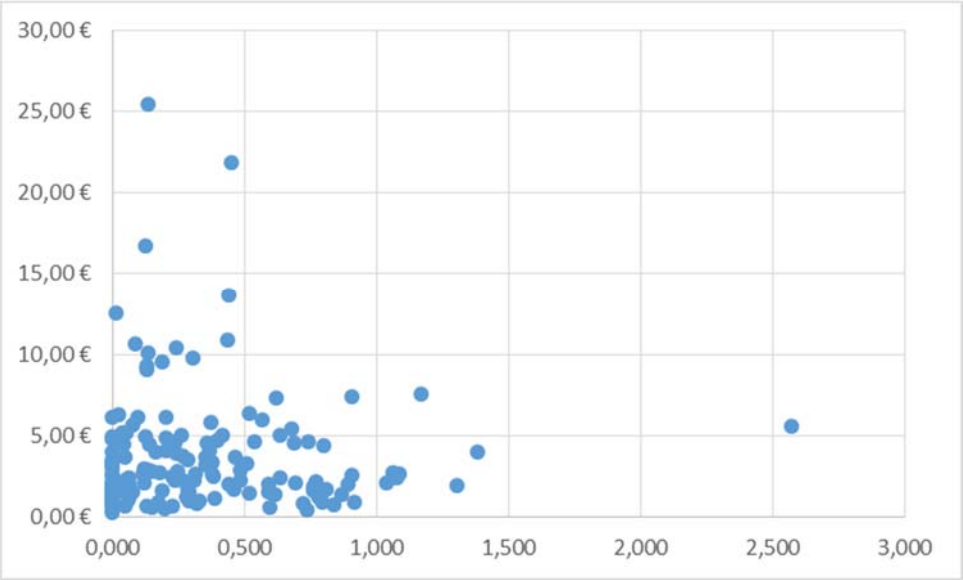


Figure 56 – Subscription journals by article price and SNIP value

No category analysis has been executed for APC prices, since there were only 20 hybrid journals and 11 free access APC-paid journals. Nevertheless, in the case of subscription costs, it is worth doing this per disciplines.

Table 33 shows big differences in percentages of subscription-based journals across subject areas (which are higher in STM) and few differences in percentages of journals with IF, and how they are distributed. All Pearson values[310] for IF, SJR and SNIP, for both volume and article prices, reveal that there is no correlation for any subject area (all values are very close to 0). Upon analyzing specific combinations with volume prices and IF values, the results continue to show no correlation whatsoever, even for STM restricted access journals (0.01) and health sciences subscription journals (-0.00).

[310] These are not applied (N/A) to numbers of journals lower than 4. Almost all subscription-based journals have SJR and SNIP values and that is why the exact number is not displayed in the relevant columns.

| Subscription-based journals | | | IF | | | | SJR | | SNIP | |
|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | ρ €/vol | ρ €/art | ρ €/vol | ρ €/art | ρ €/vol | ρ €/art |
| **Subject Area** | | | | | | | | | | |
| Arts & Hum. | 25 | 31.3% | 1 | 20.0% | N/A | N/A | 0.15 | 0.08 | 0.03 | 0.00 |
| Social S. | 45 | 29.0% | 17 | 42.5% | 0.00 | -0.10 | 0.15 | 0.08 | 0.00 | 0.00 |
| *total SSH* | *70* | 29.8% | *18* | 40.0% | *0.00* | *-0.10* | *0.08* | *0.08* | 0.03 | 0.00 |
| Health S. | 69 | 49.3% | 21 | 50.0% | 0.00 | -0.10 | 0.14 | 0.08 | 0.04 | 0.00 |
| Life S. | 3 | 13.0% | 3 | 30.0% | N/A | N/A | N/A | N/A | N/A | N/A |
| Experimen. S. | 1 | 7.1% | 0 | 0.0% | N/A | N/A | N/A | N/A | N/A | N/A |
| Engineering | 6 | 33.3% | 2 | 25.0% | N/A | N/A | 0.08 | 0.06 | 0.01 | 0.01 |
| Maths & Ph. | 9 | 60.0% | 7 | 87.5% | -0.01 | -0.1 | 0.15 | 0.06 | 0.03 | -0.01 |
| *total STM* | *88* | 41.9% | *33* | 44.0% | *0.02* | *-0.1* | *0.14* | *0.08* | 0.04 | 0.00 |
| **Publisher type** | | | | | | | | | | |
| Private n.p. | 27 | 6.1% | 6 | 28.6% | 0.00 | -0.10 | 0.15 | 0.09 | 0.03 | 0.01 |
| Government | 7 | 41.2% | 3 | 30.0% | N/A | N/A | 0.08 | 0.06 | 0.00 | 0.00 |
| Academic | 33 | 17.1% | 6 | 16.7% | 0.16 | -0.18 | 0.14 | 0.08 | 0.03 | 0.01 |
| Commercial | 91 | 65.0% | 36 | 67.9% | 0.02 | -0.06 | 0.14 | 0.08 | 0.04 | 0.00 |
| **Total** | **158** | **35.5%** | **51** | **42.5%** | **0.02** | **-0.06** | **0.14** | **0.08** | **0.04** | **0.00** |

**Table 33 – Correlation between price and impact**
N/A: not applicable.

Figure 57 shows the distribution of subscription journals by average article price and SNIP value, for every subject area. No discipline in particular follows any correlation, as stated before.

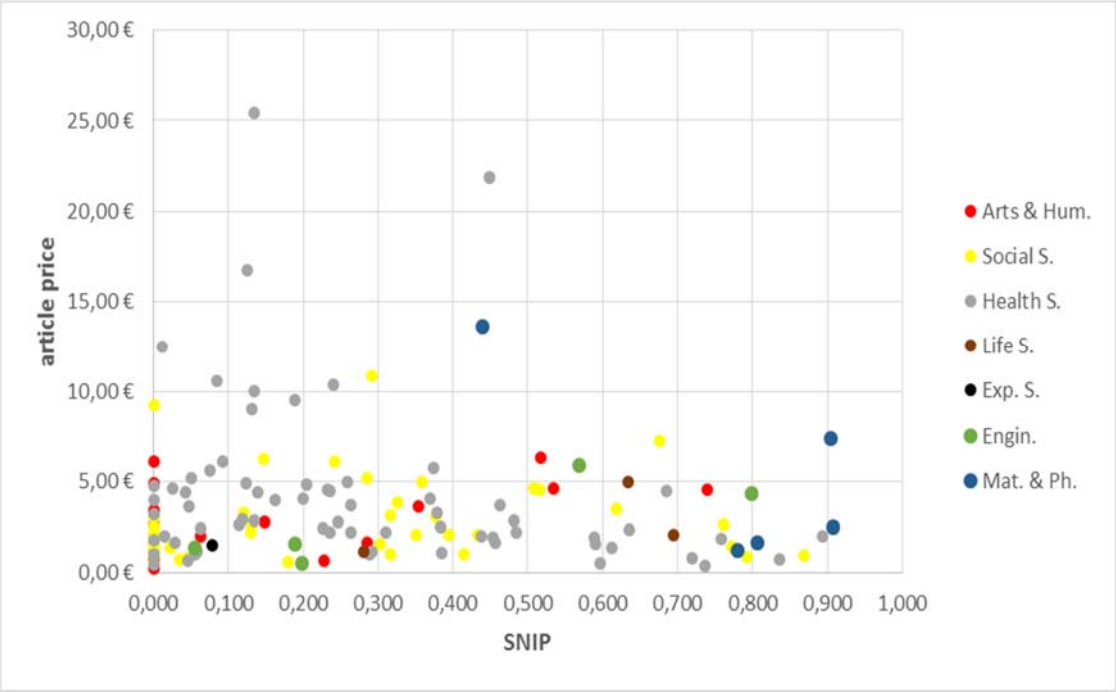


**Figure 57 – Subscription-based journals by article price and SNIP values by discipline**

The fact that the percentage of access-paid journals is absolutely different depending on the publisher type does not change the panorama. Even journals published by commercial companies (a 65% of which are subscription-based) do not have any correlation between their subscription price (per volume or article) and the IF.

#### *4.4.4.2. APC prices and impact*

Pearson values between APC prices and bibliometric indicators show low positive correlations for SNIP and SJR, but none for IF.

| | SNIP | SJR | IF |
|---|---|---|---|
| Free access APC prices | 0.28 | 0.39 | -0.03 |
| Hybrid APC prices | 0.24 | 0.35 | -0.23 |
| **all** | **0.25** | **0.36** | **-0.15** |

**Table 34 – Correlation between APCs and indicators**

These results might be surprising since IF is supposed to be the most important quality indicator for a journal. Its correlation with the 3 groups (free access with APCs, hybrid, and all) is small and negative, meaning that paying higher APC prices not only does not guarantee a higher IF, but also the IF can even be lower. Nevertheless, not all journals here have IF (4/11 in free access with APCs, and 15/20 in hybrid ones).

It is also important to note that free access APC-paid journals have higher IFs than hybrid ones, but it is just the opposite for SJR or SNIP values. This is slightly reflected in the table, since correlation for free access APC-paid titles is a little more positive (at least approaches zero from negative) than that for hybrid.

Regarding the Scopus indicators, Pearson values for correlation are much higher. With SJR it is between 0.36 and 0.39 depending on the type of journal, and for SNIP it is between 0.25 and 0.28. This is lower than the moderated correlation (0.40) between SNIPs and APCs for free access journals found by **Björk & Solomon** (2015) – correlation was 0.67, "significantly higher" for article volumes. Researchers willing to publish in Spanish journals may take this data into consideration: paying higher APCs does not provide higher IF journals, but does provide higher SNIP and SJR journals to a limited extent.

The data from the table is displayed in Figure 58 as well, showing no correlation. Nevertheless, it is important to state that these analyses have been carried out only with the existing 20 hybrid journals and 11 free access APC-paid ones – too few journals as to predict that the incipient market in Spain is going to grow like this. Should a higher number of APC-paid journals exist in Spain, a separate analysis for every discipline shall be needed.

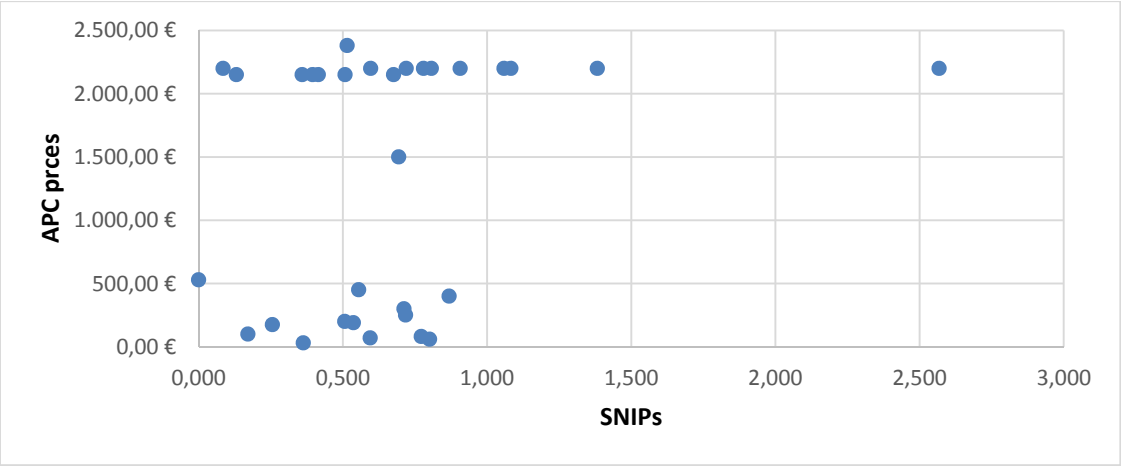


Figure 58 – Free access and hybrid journals by APC prices and SNIP values

## 4.5. Internationality

Internationality has been analyzed using the indicators that have been described so far: language, foreign authors, international collaboration, foreign experts and international indexation.

### 4.5.1. Languages

Almost half of the journals are available only in Spanish. A 26.5% is published in both Spanish and English, and an 18.4% of them is published only in English. The remaining 7.6% belongs to other language categories, including some 1% published in Catalan (Table 35).

| Language | Journals | % |
|---|---|---|
| Spanish | 211 | 47.4% |
| Spanish & English | 118 | 26.5% |
| English | 82 | 18.4% |
| Catalan | 4 | 0.9% |
| Other multilingual | 30 | 6.7% |
| | **445** | **100.0%** |

Table 35 – Language categories

| Language | % Articles | % Journals |
|---|---|---|
| Spanish | 68.68% | 80.2% |
| English | 41.01% | 47.0% |
| Catalan | 1.65% | 2.0% |
| Portuguese | 1.49% | 3.1% |
| French | 0.42% | 0.7% |
| Galician | 0.27% | 0.4% |
| Italian | 0.19% | 0.2% |
| German | 0.10% | 0.2% |
| Basque | 0.01% | 0.2% |

Table 36 – Languages

With regard to the presence of individual languages (Table 36), Spanish appears in a 69% of all the articles and in an 80% of all the journals, while a 41% of all the articles are available in English and a 47% of the journals have English as their main language[311]. The presence of other languages is absolutely residual.

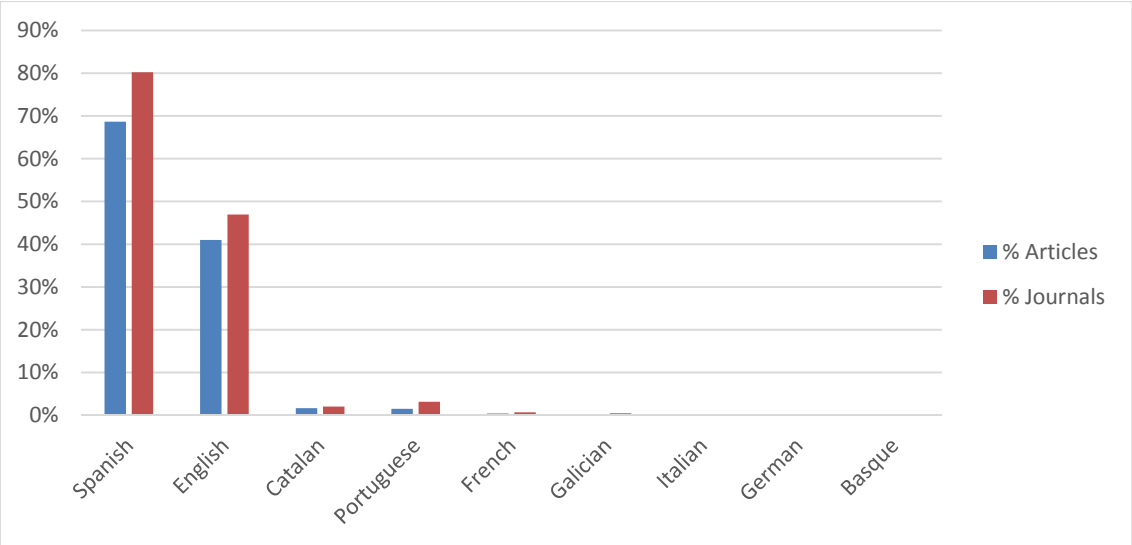


Figure 59 – Languages at article and journal level

[311] Please note that only languages appearing in at least a 20% of all the issues analyzed are considered.

Journals distribute very differently according to specified language categories (Table 37).

| | Spanish | | Spanish & English | | English | | Other % Multi. | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % | n | % |
| **Subject Area** | | | | | | | | | | |
| Arts & Humanities | 49 | 61.2% | 13 | 16.3% | 11 | 13.8% | 7 | 8.8% | **80** | 18.0% |
| Social Sciences | 82 | 52.9% | 44 | 28.4% | 15 | 9.7% | 14 | 9.0% | **155** | 34.8% |
| *total SSH* | *131* | *55.7%* | *57* | *24.3%* | *26* | *11.1%* | *21* | *8.9%* | ***235*** | 52.8% |
| Health Sciences | 68 | 48.5% | 43 | 30.7% | 20 | 14.3% | 9 | 6.4% | **140** | 31.5% |
| Life Sciences | 3 | 13.0% | 7 | 30.4% | 11 | 47.8% | 2 | 8.7% | **23** | 5.2% |
| Experimental S. | 2 | 14.3% | 5 | 35.7% | 6 | 42.9% | 1 | 7.1% | **14** | 3.1% |
| Engineering | 6 | 33.3% | 6 | 33.3% | 6 | 33.3% | - - | - - | **18** | 4.0% |
| Maths. & Ph. | 1 | 6.7% | - - | - - | 13 | 86.7% | 1 | 6.7% | **15** | 3.4% |
| *total SMT* | *80* | *38.1%* | *61* | *29.0%* | *56* | *26.7%* | *13* | *6.2%* | ***210*** | 47.2% |
| **Publisher Type** | | | | | | | | | | |
| Private non-profit | 41 | 43.2% | 26 | 27.4% | 15 | 15.8% | 13 | 13.7% | **95** | 21.3% |
| Government | 8 | 47.1% | 5 | 29.4% | 2 | 11.8% | 2 | 11.8% | **17** | 3.8% |
| Academic | 102 | 52.9% | 43 | 22.3% | 33 | 17.1% | 15 | 7.8% | **193** | 43.4% |
| Commercial | 60 | 42.9% | 44 | 31.4% | 32 | 22.9% | 4 | 2.9% | **140** | 31.5% |
| **Access Type** | | | | | | | | | | |
| Free (no APC) | 129 | 46.7% | 71 | 25,7% | 47 | 17,0% | 29 | 10,5% | **276** | 62.0% |
| Free (APC) | 2 | 18.2% | 4 | 36,4% | 3 | 27,3% | 2 | 18,2% | **11** | 2.5% |
| Embargo | 37 | 57.8% | 17 | 26,6% | 8 | 12,5% | 2 | 3,1% | **64** | 14.4% |
| Hybrid | 1 | 5.0% | 7 | 35,0% | 12 | 60,0% | - - | - - | **20** | 4.5% |
| Restricted | 42 | 56.8% | 19 | 25,7% | 12 | 16,2% | 1 | 1,4% | **74** | 16.6% |
| **Total** | **211** | **47.4%** | **118** | **26.5%** | **82** | **18.4%** | **34** | **7.6%** | **445** | 100.0% |

**Table 37 – Languages, subject areas, publisher types and access types**

Spanish is prominent in arts & humanities (61%), social sciences (53%) and health sciences (49%). In those categories, Spanish & English (from a 16% to a 31%) and English-only (from a 10% to a14%) are present as well.

On the other hand, there is a very low proportion of Spanish in the remaining STM disciplines (which represents only a 16% of the journal population). That proportion ranges from a 7% to a 14%, except in engineering (33%). English dominates in these areas – most of all in mathematics & physics, with 87%. The categories other languages and multi-language distribute quite evenly among areas, always with low percentages (from 6% to 9%, although there is none for engineering).

Figure 60 shows these distributions.

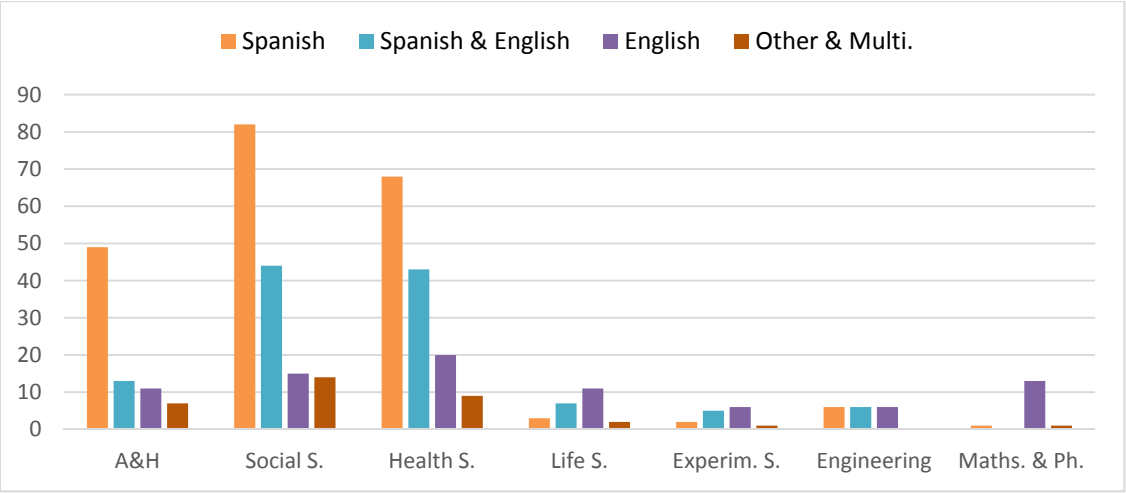


Figure 60 – Subject areas and languages

Chi-squared test, again limited by the sparsity of cells, shows that there is association ($p < 0.05$) between subject areas and languages, although there are more than a 20% of the events with frequencies lower than 5, and, in theory, this invalidates the test. Nevertheless, the test confirms what has already been described – associations are strong between Spanish-only and A&H, and English-only with life sciences, experimental sciences and mathematics & physics.

The distribution of language categories across publisher types is balanced. As shown in table 37 and Figure 61, Spanish-only is the main language (43-53%) for all publisher types, followed by bilingual (22-31%), English-only (12-23%) and other (3-14%) in descending scale. Differences between Spanish and English are smaller in the categories of private non-profit and commercial. English language has its higher proportion in the latter publisher category.

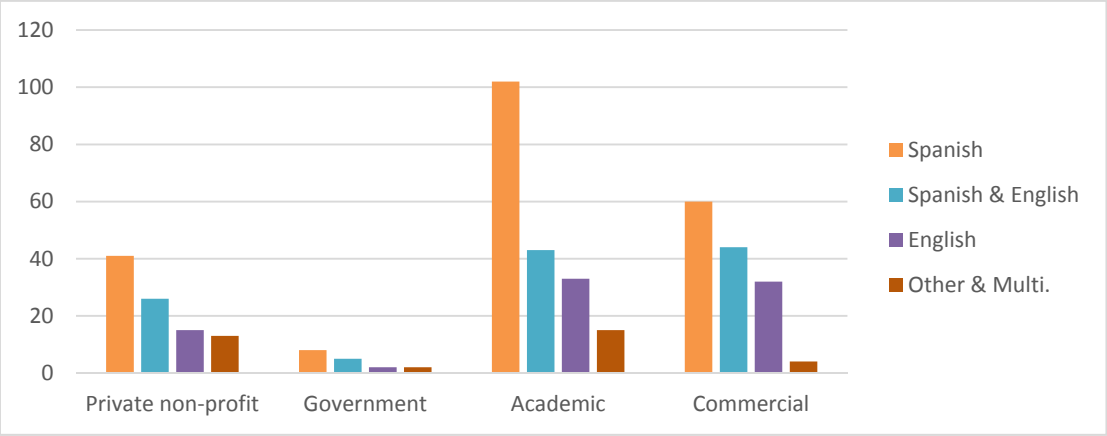


Figure 61 – Publisher types and languages

There is no dependence between publisher type and language variables ($p = 0.059 > 0.055$), and this time Chi-squared test is fully valid.

With regard to access types, Figure 62 shows similar descending magnitudes in the main categories: free, embargo and restricted access. Free-access journals that charge APCs distribute differently, with more presence of English. Hybrid journals behave very differently – a 60% of them are published in English, and just a 5% in Spanish. Although the number of "Platinum OA" and hybrid journals is too low[312] to draw ultimate conclusions, they prove to be different from free without APCs and restricted-access journals, respectively.

Although chi-squared test is not completely trustworthy, because of the very low frequencies in the table cells, the result is $p < 0.05$ and thus it should be interpreted as dependence. As a matter of fact, the test reveals a special positive association between English language and hybrid access, and a negative relation between Spanish-only and free-access with APCs and hybrid titles as well.

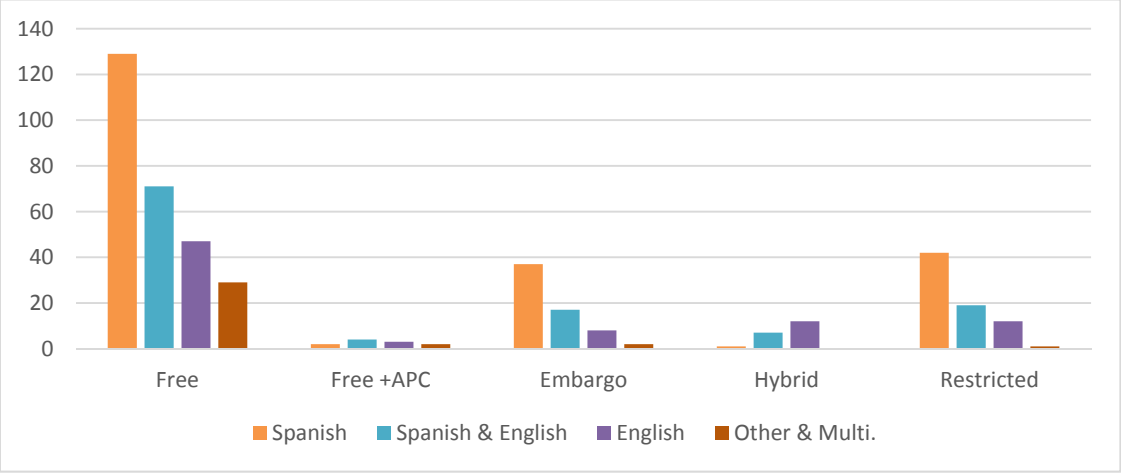


Figure 62 – Access types and languages

### 4.5.2. English language

The results clearly show that the only language that can be considered as an element of internationality is English. As a matter of fact, it has been given more value in composite indexes and ranking systems[313], and for instance **Rodríguez Yunta** (2015) explained that the presence of other foreign languages could be ignored and only English may be considered, as an alternative to his composite value-weighted system.

[312] 11 free-access with APCs and 20 hybrid journals, representing together only a 7% of the population.
[313] See 2.4.4.1.

| Subject area | English language | Foreign articles | International collaboration | Foreign experts | Total | Indexation (ICDS) | n | % |
|---|---|---|---|---|---|---|---|---|
| Arts & Hum. | 23.3% | 35.5% | 2.5% | 37.5% | 24.7% | 88.4% | 80 | 18.0% |
| Social S. | 29.3% | 30.8% | 7.2% | 33.9% | 25.3% | 87.7% | 155 | 34.8% |
| Health S. | 35.2% | 27.6% | 5.9% | 24.6% | 23.3% | 71.5% | 140 | 31.5% |
| Life S. | 60.3% | 59.9% | 26.4% | 33.4% | 45.0% | 75.1% | 23 | 5.2% |
| Experim. S. | 57.9% | 50.8% | 20.8% | 24.6% | 38.5% | 76.2% | 14 | 3.1% |
| Engineering | 50.1% | 49.1% | 12.7% | 46.4% | 39.6% | 78.4% | 18 | 4.0% |
| Maths. & Ph. | 86.7% | 63.4% | 20.7% | 46.4% | 54.3% | 77.9% | 15 | 3.4% |
| **Publisher type** | | | | | | | | |
| Private n.p. | 33.4% | 32.4% | 7.9% | 29.6% | 25.8% | 77.3% | 95 | 21.3% |
| Government | 28.6% | 21.8% | 5.7% | 15.5% | 17.9% | 82.5% | 17 | 3.8% |
| Academic | 29.9% | 37.7% | 8.5% | 36.7% | 28.2% | 86.5% | 193 | 43.4% |
| Commercial | 44.9% | 33.5% | 7.9% | 29.8% | 29.0% | 75.8% | 140 | 31.5% |
| **Access type** | | | | | | | | |
| Free no APC | 33.3% | 35.1% | 8.4% | 31.8% | 27.2% | 81.7% | 276 | 62.0% |
| Free +APC | 47.5% | 48.9% | 11.5% | 32.3% | 35.1% | 83.6% | 11 | 2.5% |
| Embargo | 29.9% | 29.6% | 4.6% | 31.6% | 23.9% | 80.8% | 64 | 14.4% |
| Hybrid | 82.4% | 62.1% | 20.4% | 51.7% | 54.2% | 82.9% | 20 | 4.5% |
| Restricted | 33.1% | 29.7% | 5.9% | 29.0% | 24.4% | 77.7% | 74 | 16.6% |
| **Total** | **35.3%** | **34.6%** | **8.1%** | **32.2%** | **34.0%** | **81.0%** | **445** | **100%** |

Table 38 – Internationality indicators

About 1/3 of all the articles (35.3%) are available in English. Nevertheless, this proportion depends on the journal type (table 38, Figure 63).

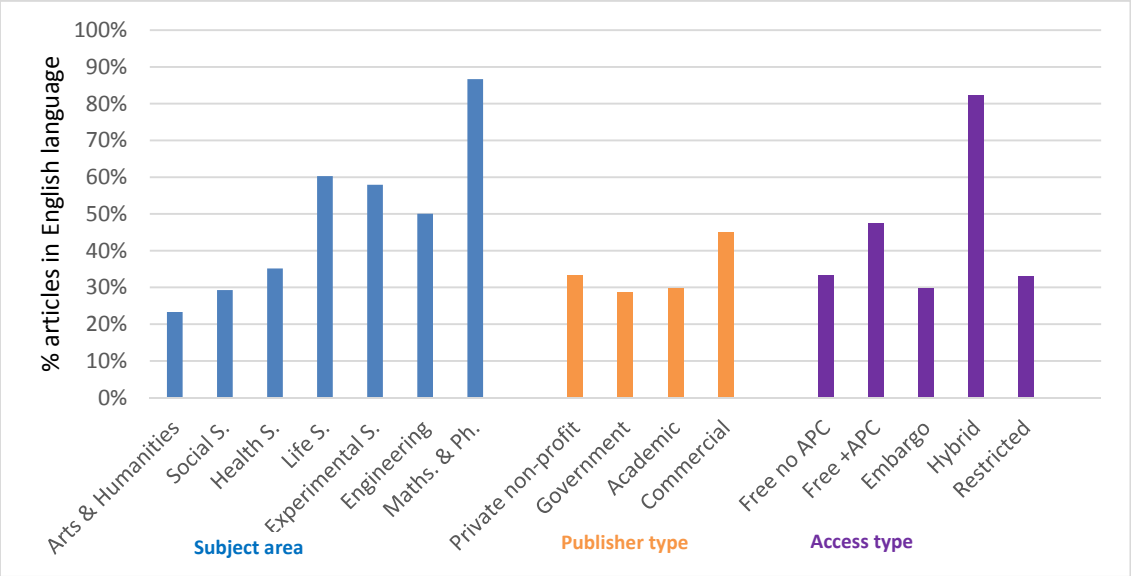


Figure 63 – English language

The differences are dramatic across subject areas. English is much more present in STM fields (44%) than in SSH (27%), considering that the average for mathematics & physics (87%) doubles the global average (35%). The rest of the little populated areas (life sciences, experimental sciences and engineering) have between a 50% and a 60%, while the most populated (A&H, social sciences and health sciences) range from a 23% to a 35%. Actually, these two variables (percentage of subject area on the total, and percentage of English-language article) are negatively correlated ($\rho = -0.75$). Thus, the more populated a subject area is, the lower English language proportion has. It is not a cause and effect relation, it has to do with the nature of the subject itself, but it is a noticeable fact.

As to publisher types, differences are smoother. Commercial type has the highest average (45%), while the rest lag behind (29% - 33%). It is worth highlighting that average is higher in journals published by societies and associations (33%) than in those published by universities and research centers (30%). It is also worth reminding that the presence of English is not at odds with that of Spanish, because journals can be bilingual.

Presence of English language by access types is really interesting. It is absolutely predominant in hybrid journals (82%). For the rest, it is also important in another APC-paid type (free-access) with a 48%, when the rest ranks between a 29% and a 33%.

### 4.5.3. Foreign authors

Upon analyzing authorships, it is possible to stablish the proportion of foreign-authored articles and the proportion of international collaborations (Table 38, Figure 64). Logically, the latter is always lower, because articles signed by one or more authors are not international collaborations.

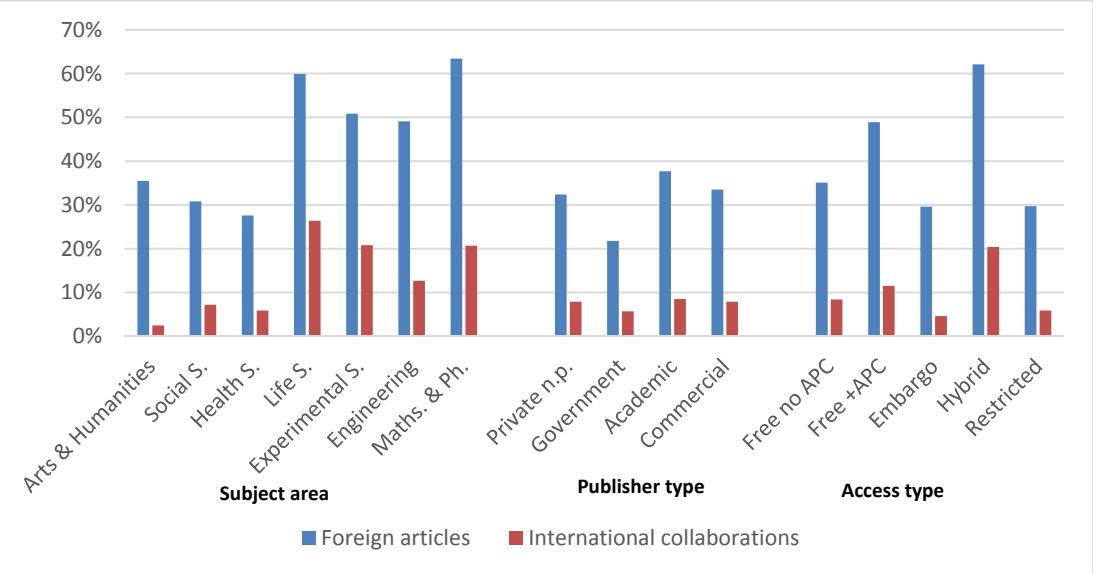


Figure 64 – Foreign articles and international collaborations

Similarly to the English language, less populated fields have greater proportions of internationality, this time measured as a percentage of foreign-authored articles. Thus, life sciences, experimental sciences, engineering and mathematics & physics range from a 51% to a 63%, while arts & humanities, social sciences and health sciences remain between 28% and 36%.

International collaborations follow similar behavior in the least populated areas (those with higher averages of English language and foreign articles), but not in the rest.

The differences between foreign authorships and international collaborations can be measured by ratios. In general, those ratios range between a 16% and a 41%, depending on the journal category, except for arts & humanities, where it is just a 7%. This is because a 35.5% of articles in journals belonging to that area are foreign-authored, but only a 2.5% of the total is international collaboration. This is extreme and unusual, and must be explained by the high rate of single authorships in arts & humanities (a single authorship can be foreign, but not international since more than one country is needed). For the remaining subject areas, ratios for life sciences and experimental sciences are the highest (44% and 41%, respectively), meaning that near the half of all their foreign participations as counted by articles are signed internationally.

These ratios are very even within the publisher types (23% to 26%), and as to access types, embargo journals have the highest (33%).

Among publisher types, academic is the one with highest average for both foreign-authored articles and international collaborations, but all averages are close to the mean value. The type of publisher does not seem to influence much on these internationality elements, only the few journals published by the government are notably low. Also, ratio for foreign articles/international collaborations is balanced among all types (23% to 26%).

Hybrid is again the access type with highest average, and it is so in both indicators, followed by free access with APCs. Embargo and restricted-access journals are especially deficient in international collaboration.

### 4.5.4. Foreign experts

Distribution of foreign members in the entire scientific or editorial teams shows similarities with that of foreign authors (table 38, figure 65). It is necessary to bear in mind that, as with all the other indicators, proportions assigned to every category are journal averages, not proportions on the total of experts among all journals within a category.

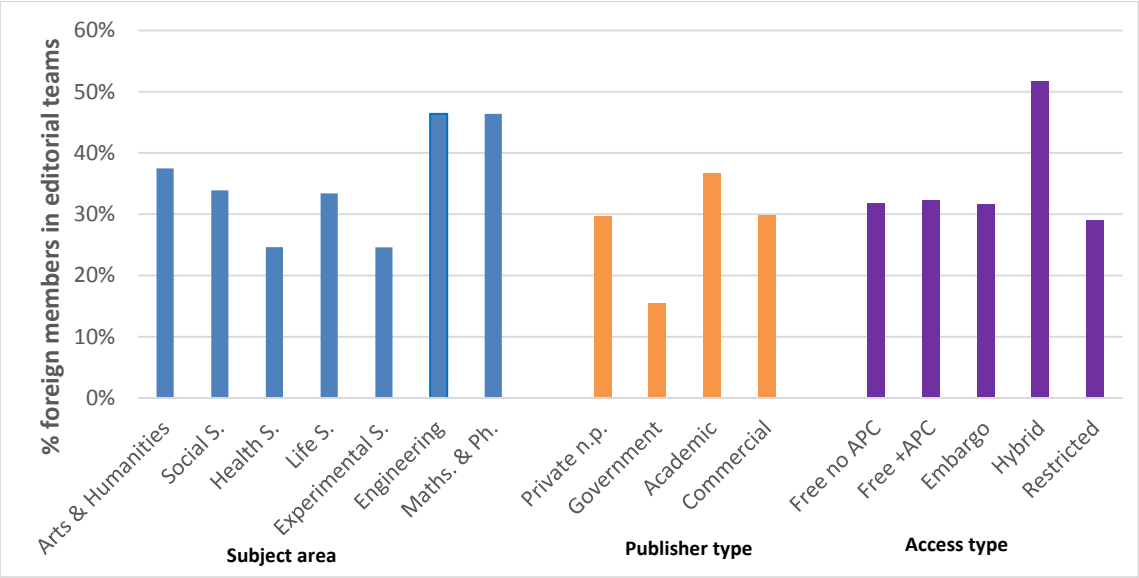


Figure 65 – Foreign experts

The highest averages of foreign members appear in engineering and mathematics & physics. Those two subject areas represent only 7.4% of all the journals, though. Arts & humanities and social sciences, which account for great part of the population (18% and 34.8%, respectively), reach this time good levels of internationality (37.5% and 33.9%, respectively). However, these data should be taken carefully and be analyzed together with other indicators, since contributions by foreign members at editorial teams could be suspicious.

The academic type is again leading the average (37%), commercial and private non-profit publishers follow (30%), and government publications lag much behind (16%).

As to access types, only the average for hybrid journals is extraordinarily high (52%), while the rest is quite even (between 29% and 32%).

### 4.5.5. International indexation

ICDS 2015 value has been collected for every journal. Although, as mentioned, it was decided not to include such value in the internationality analysis because all journals in this study are already well disseminated; the distribution in table 38 shows that it is biased towards SSH fields. Thus, arts & humanities average an 88% and social sciences average an 87%, while STM fields range from a 71% to a 78%[314]. This is due to the fact that MIAR, the system that generates ICDS annually, was created originally for SSH titles only.

[314] ICDS original values are not percentages but numbers from 1 to 10. They have been converted to % in order to have all elements with the same scale. ICDS 2016 values range from 1 to 11 (http://miar.ub.edu/about-icds, Sep. 9, 2016).

Another relevant information is that ICDS values do not correlate with the rest of internationality elements (perhaps because international indexation has nothing to do with "real" internationality?), but do correlate with journals age (rho = 0.422). That is because its logarithm includes a survival rate, calculated on the years of life of the journal.

In any case, inclusion of ICDS would not be adding any value to the analysis of this particular population.

### 4.5.6. Global data and relations

Spanish journals in WoS or Scopus are international in about 1/3 or 33-34% degree (Figure 66), if the main elements are considered (English language, foreign-authored articles and foreign experts). When adding international collaborations, total average goes down to 27.6%. Nevertheless, such value is not meaningful alone and per se. What is important is that the main elements have very similar averages (between 32.2% and 35.3%), and therefore the degree of internationalization seems to be advancing evenly.

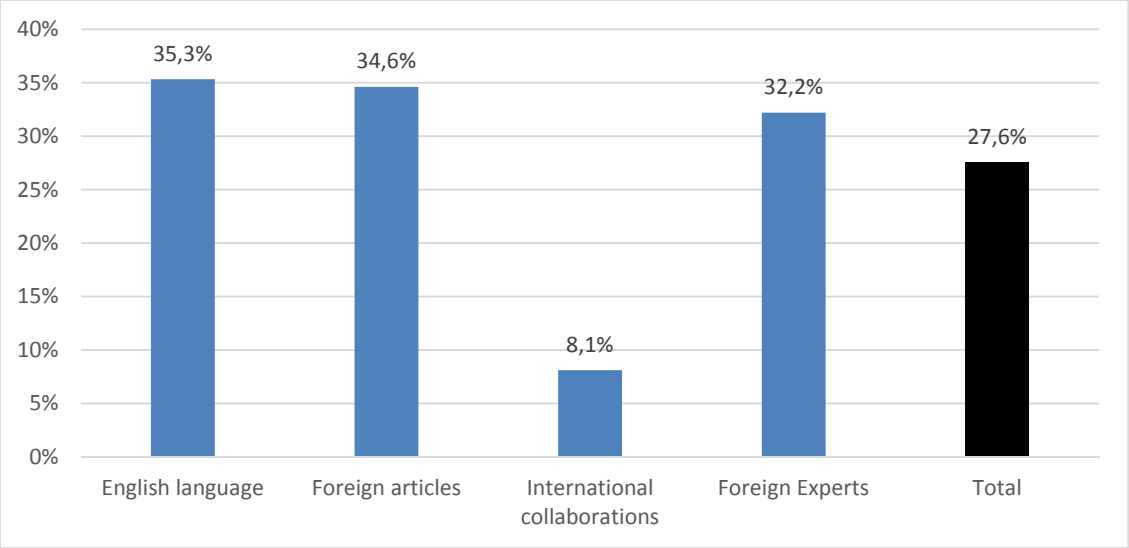


Figure 66 – Internationality elements

Since global averages lack in-depth analysis, it is necessary to observe relations that lie among them and with other journal indicators.

Spearman's correlation have been calculated for every pair or elements (Table 39). All rho values are significant not only at 0.05 level but also at 0.01 (confidence interval: 99%), which means that correlations are strong.

| Correlation (rho) | English language | Foreign articles | International collaborations | Foreign experts |
|---|---|---|---|---|
| **English language** | -- | 0.400** | 0.445** | 0.232** |
| **Foreign articles** | -- | -- | 0.506** | 0.463** |
| **International collaborations** | -- | -- | -- | 0.186** |
| **Foreign experts** | -- | -- | -- | -- |

**Table 39 – Pearson and Spearman correlation values among internationality elements**
** Correlation is significant at 99%

All elements are positively correlated, but to different extents.

The highest correlation appears between foreign-authored articles and foreign members at editorial teams (0.463). It could mean that they are attracting foreign authors to send manuscripts to the journal, but this is not a cause and effect relation and therefore it cannot be stated. If countries of origin were included in this study, that relation could have been further analyzed, but that's not the case. It can be said, too, that journals open to foreign contributions consider both authors and experts at a similar level.

Another high correlation exists between foreign-authored articles and international collaborations, since the latter are a subclass of the former. Nevertheless, they are not as correlated as they could be (0.506), since international collaborations depend much on journal categories, as seen before.

English language values are correlated both with foreign articles (0.400) and international collaborations (0.445). Again, as countries have not been considered, it is not possible to know if the origin of foreign authors makes a difference in the languages used. In other words, are Latin American contributions published in Spanish or English?

English language element is also moderately correlated with foreign experts (0.232). It seems that a more international scientific team could bring more English content to a certain extent, but this aspect is less important than the origin of authors and the collaboration among them. In addition, foreign experts' correlation with international collaboration is even less important (0.186).

As to relations among internationality elements and other journal characteristics, Kruskal-Wallis H test reveals that all elements are associated with access types and subject areas, but publisher types are only associated with foreign authors and experts[315].

All impact indicators are positively and strongly correlated with internationality elements, especially English language and international collaborations, and especially with Scopus indicators. Foreign experts poorly correlate with Scopus indicators, and not with IF, as proved by the fact that rho values are below Scopus'.

[315] See 4.5.2/4.5.4.

| Correlation (rho) | English language | Foreign articles | International collaborations | Foreign experts |
|---|---|---|---|---|
| **SNIP** | 0.444** | 0.253** | 0.472** | 0.132** |
| **SJR** | 0.502** | 0.269** | 0.603** | 0.119* |
| **IF** | 0.289** | 0.191* | 0.248** | -0.016 |

**Table 40 – Internationality elements and bibliometric impact**

** Correlation is significant in a 99%

* Correlation is significant in a 95%

Correlation is not significant.

# 5. Conclusions

## 5.1. Basic characteristics

Spanish scholarly journals began growing from the 40s after the Spanish Civil War, and had a continuous increase from the 80s, which was coincidental in time with the end of the dictatorship and the beginning of freedom of speech in the country. As a matter of fact, 69.7% of the journals studied were created thenceforth, and their average age is 30 years (as per 2015).

The number of journals indexed either in WoS or Scopus has been growing exponentially for the last years. There were about 300 titles in 2012 (**Rodrigues & Abadal**, 2014) and 406 in 2013 (**Abadal et al.**, 2015). There are 445 in this study, representing around 25% of the total at the time of the data collection. In addition, there are other 416 Spanish journals in the Emerging Sources Citation Index (ESCI), and some of those could be included in WoS Core Collection in the near future.

It is necessary to point out that these 445 journals are not a sample, and their characteristics may differ much from the global. Indeed, SSH fields are underrepresented while STM are overrepresented, and, with them, the associated aspects as language and publisher types. For instance, almost a half (45.6%) of all Spanish scholarly journals are on social sciences, but only 19.4% of them are indexed in WoS/Scopus (although, after all, they represent 35% of the studied set). Conversely, only 18.1% of the titles are on health sciences, but these are indexed in a much higher proportion (44.2%), reaching a 32% of the analyzed population. This way, both subject areas have similar relative weight in this study (35-32%, respectively), when their global proportions are very different (46-18%). Therefore, findings should not be extrapolated to the total population of Spanish titles, and should not be compared with full journal populations from other countries.

Universities and research centers (mostly CSIC, with an 8% of the total) publish a 43% of the titles. By means of their publishing services, they use OJS platforms massively (34% of the total). Commercial publishers are the second in importance, accounting for a 32% of the journals. Elsevier is the largest publisher, with about a 17%. Scientific societies, professional associations and other non-for-profit private institutions are responsible for a 21%, but they hand over the publishing activity of another 24% to companies like Elsevier. Indeed, their scientific participation is crucial, reaching almost half of the population studied (45%). Government only publishes a 4% of all journals (figure 67).

As to languages, almost half of the journals (47%) is published only in Spanish. Nonetheless, a 26% is published both in Spanish and English, and an 18% just in English. Other languages are residual.

While private non-profit and government publishers do not have special relations with other elements, the landscape results clearly divided between the action of academic publishers, on the one hand, and commercial institutions, on the other.

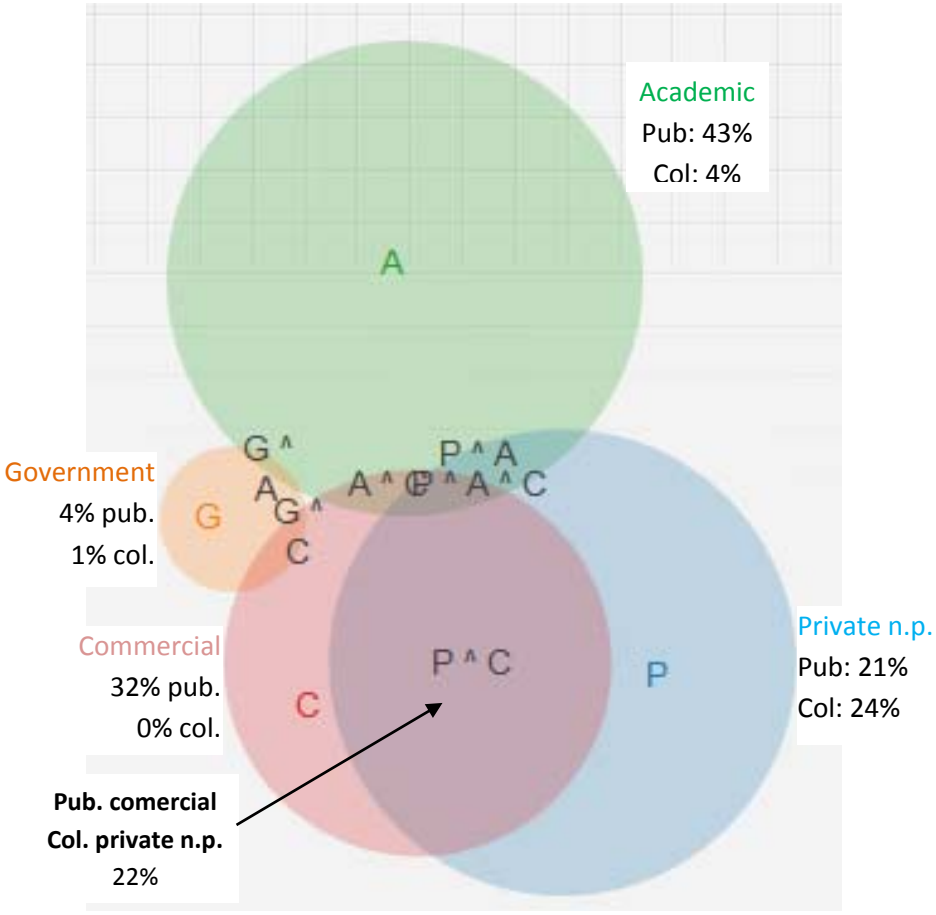


**Figure 67 – Institutions as journal publishers and collaborating institutions**
Institution types: A, academic; G: government, C: commercial, P: private n.p. ^: conjunction.
Pub: publisher. Col: collaborating institutions.

Universities and research centers publish mostly on arts & humanities (in Spanish language) and social sciences. Online-only format and free access are their favorite output.

Commercial publishers focus on health sciences, APCs (free-access and hybrid journals), and online + print format, since the paper version is supposed to belong to prestigious journals. Hybrid journals are commonly published only in English, or with an important number of articles written in this language.

The rest of STM fields are not directly linked with companies, but are related to hybrid access and English language. Embargo access stands alone, but it uses print versions as well. Print-only journals are residual (4.3%) – most of them are on religion and philosophy, and their average age is the oldest (43 years).

The most representative type of Spanish journal indexed in WoS or Scopus is that published by an academic institution, on SSH, and free-access (27.7% of the total). The second one is that published by a company, on STM, and subscription-based (including embargo, hybrid and restricted access, a 15.8%). These two groups alone reach almost a half of the population studied (43.5%).

## 5.2. Access

A 64.5% of journals studied are free access, the vast majority without APCs. When analyzing self-archiving permissions through Sherpa-RoMEO color, the final proportion of Open Access journals results in a 56.9%, surpassing the 48.5% reported by **Abadal et al.** (2015a).

Open Access concept has different approaches, or even meanings, in the "global South" and in the "global North". In Latin America, and also in Spain, OA publishing costs are subsidized or supported by the publishers (mostly universities). When there are APCs, a difference is made and this type of OA is called "commercial OA". In Western Europe and Northern America, it is assumed that OA journals charge APCs. When they do not, it is called Diamond or Platinum OA. In any case, all that is Open Access.

APCs are a new concept in Spain. Previous studies have not reported any case, which is similar to what happens in Latin America. This study has collected only 11 cases of free-access journals charging APCs and 20 cases of hybrid journals. An 81% of them belong to commercial publishers, and they are associated with high impact rates.

Almost all those free-access titles (10 out of 11) belong to health sciences or social sciences, which are the most populated areas in general. Thus, the initial distribution is similar to the global.

There were only 20 hybrid journals at the time of the data collecting – multidisciplinary, mostly by commercial publishers (50% by Springer), in English language and with high impact. Nevertheless, these titles were just restricted-access publications that changed to hybrid recently. Therefore, they did not have enough time to become international and develop impact indicators. This fact questions the theory that hybrid journals attract more internationality and impact – it seems that, at least in Spain, there is no such cause and effect relation, because these characteristics were already there before they opened to OA options. Even if hybrid journals continue to have high internationality and bibliometric impact degrees in the near future, it could be due to Mathew effect.

APC market is just starting in Spain. Elsevier did not offer any hybrid journal in this country at the time of the data collection, and presumably some of them will show in the short time. Longitudinal studies would help to follow their development.

It is difficult and risky to make predictions, but, although commercial publishers are important in indexed journals, APCs are strange the Spanish scientific culture and its approval is uncertain. Also, some institutions as the University of Barcelona exclude hybrid journals from their OA funding, which might be an impediment for their flourishing.

Embargo journals are not new. A 14.4% of the titles are embargoed, also known as delayed OA. They are mostly on "soft" sciences, such as the SSH group and health sciences. Government agencies are the publishers that use embargo access with more frequency (29% of its titles), while companies (17%) and universities and research centers (14%) use it with less. Associations and societies only use it for an 8% of its journals.

The average time for embargoes is 14 months, but periods depend on the nature of the publisher. Thus, while median, mode and average range between 12-14 months, commercial companies tend to establish a longer term (an average of 24 months).

Restricted-access journals account for just a 17% of the total. A 72% of them refer to STM, a 66% are commercial, and a 57% are Spanish-only. Not every restricted-access journal belongs to a commercial publisher – actually, a 35% of them are free-access.

## 5.3. Price and impact

Publication prices, access prices and impact values differ much depending on every category, as expected.

APCs for free-access journals cost around €215 while those for hybrid reach a price ten times higher (€2,150, both mean and median values). Clearly, hybrid journals are for-profit while the few cases of free-access APC-paid titles only cover costs, or try to do so.

The market of APCs is incipient in Spain with very few journals and OA articles. Some future studies may follow its development, and larger journal sets will provide richer and more reliable data. No big changes are expected in the short-term, though.

Annual subscription prices are much higher for STM, commercial companies and English language content, but the difference is lower when using price per article, because expensive journals usually provide more scientific content. IF values are higher in STM fields, free access with APCs and embargo journals, and English language. Differences between SJR and SNIP values are smaller, still being higher for the same categories but with one exception: hybrid journals have greater values, as compared with the IF.

As to impact, the three indicators behave in similar ways because they are correlated among themselves. Their values are higher for STM areas (especially IF in health sciences) and APC-paid and embargo journals. Nevertheless, the highest IF average appears in the commercial publisher type, while the highest SNIP applies to journals published by associations and societies. With regard to language, English is entirely associated with high impact (higher for SNIP and SJR values than for IFs).

Internationality elements are also related to bibliometric impact. This fact can be understood as a cause and effect relationship, but such elements could just appear in journals that already had high indicator values, originated by other factors. Most important elements are, in this order, international collaborations, English language, foreign articles and foreign experts. Somehow surprisingly, IF correlation[316] is the lowest and the weakest.

[316] Correlations of IF values have always been calculated including only journals with such indicator. Therefore, no distortion applies in this analysis.

Yet, is the more expensive the better? Not really. Higher APCs do not necessarily bring better IF values, while there is a low positive correlation regarding SJR and SNIP ($p = 0.3$) for both free and hybrid access.

As per subscription costs, both volume and article prices have no correlation at all with any of these impact indicators, for any category. There are enough evidences that more expensive journals do not necessarily bring better content in terms of impact. It is necessary, though, to bear in mind the limitations of calculating subscription prices for comparison purposes.

On a global level, subscription market is dysfunctional because products (journals) are unique and cannot be replaced by others. The pricing of subscriptions has little to do with the quality level of individual journals, and more with the oligopolistic power of the big publishers, whose revenues come mainly from big deals with libraries and national consortia.

On the contrary, APC prices are determined by the quality as an impact to some extent, but also by the prestige of the publisher and by the scientific discipline. For instance, there is more money and funds available in the field of biomedicine than in arts & humanities, and pricing adjusts to such situation.

In Spain, although APC cases are still a few, the situation is similar. No relation has been found between subscription prices and impact, not even between restricted-access journals by commercial publishers. On the contrary, some relationship has been found between APC-paid journals (both free access and hybrid) and impact. Nonetheless, other factors as subject area and publisher type affect pricing as well.

## 5.4. Internationality

Internationality is a major goal for journals and authors, since it is a factor considered by funders, quality agencies and academic promotion systems. In Spain, it has been frequently studied from the 90s onwards, but mostly in specific subjects. In addition, journals are not always the object of analysis, but authors, subjects and countries outputs as well. The concept also admits a diversity of approaches – internationality as foreign participation, and/or global representation. In Spain, the first case is more common, although recent studies have used composite indexes for conducting the second.

There is discussion within the Spanish academia on whether to pursue internationalization according to the publishing “core” (English language, Anglo-Saxon authors and countries, WoS-indexed content) or consider other options (Spanish as an international language, Latin American territories, etc.). In any case, what seems indisputable is that internationality cannot be analyzed in the same way across all disciplines (just as quality and impact).

For this study, some elements have been identified and selected: languages, foreign-authored articles, international collaborations and foreign members at scientific teams (including both editorial boards and scientific committees). Dissemination has been dismissed, because journals in this study are already indexed in international databases. International citation would be a

much deeper indicator of internationality, since all the previous elements indicate characteristics for potential use, but not for real use. Nevertheless, international citations are out of the scope of this study, and collecting them would have been too time-consuming.

Main internationality indicators (English language, foreign-authored articles and foreign experts) have global averages around 1/3 (from 32% to 35%). Nevertheless, this harmony fails to replicate within journal categories. Indeed, those elements depend on subject and access types, and less on publisher types.

The percentage of English has been chosen as the only indicator for assessing internationality in language, because there are hardly any other international languages in these journals. Spanish is an international language too, but it has been considered domestic in this study. As expected, the English language dominates in journals on STM (44%), published by companies (45%) and with APCs (both hybrid and free access).

Foreign participation has been measured as foreign-authored articles and international collaborations, which is a subtype of the former.

Foreign-authored articles are especially noticeable in mathematics and physics, life sciences, experimental sciences and engineering (between 50% and 60% of articles are so). International collaborations have the highest proportions in these areas as well, but particularly in life sciences. On the other hand, they are very low in arts & humanities. These results match findings for global journals indexed in WoS as reported by **Aman** (2016).

As to publisher types, differences are not remarkable, except for government publications that are poor in international collaborations. Embargo and restricted access journals perform deficiently in foreign author participation, for both indicators.

Foreign experts' proportions are similar to foreign authors', but, since their contribution is indirect (or even suspicious), differences among categories are smoother. As to subject areas, average percentages are higher in engineering and mathematics & physics, while surprisingly low in health sciences – it could be due to the great number of articles on professional practice by domestic authors working in hospitals, laboratories, etc. Arts & humanities have this time high proportions of internationality, although it seems that many of such experts are from Latin America[317]. Academic publishers include more members from foreign institutions than the rest of the types (37%), and government agencies lag much behind again. Within access types, all are even except for hybrid journals (52%).

Internationality could be further assessed if countries were analyzed. This could lead to findings on concentration (few countries participate) or dispersion (many do). Also, linkages among regions, languages and subject fields could be shown. This study, however, does not go that far.

[317] Data collected do not lead to such conclusion but some of the journals analyzed show language linkages between scholars on SSH fields.

Another interesting approach to internationality in Spanish journals would be to analyze if those journals indexed in WoS and Scopus are actually "more international" or have higher internationality indicator values than the rest.

Internationality elements are also related among them. The participation of foreign authors is related to the existence of foreign members in editorial teams (rho = 0.463), but it does not mean that there is a cause and effect relation. English language proportions strongly correlate with that of foreign articles (0.400) and international collaborations (0.445), but correlates in a lesser degree with foreign experts (0.232). Such information seems to support the idea that foreign experts' impact in internationality is low, and that the English language is used by foreign authors.

## 5.5. Summary

Figure 68 summarizes all the relationships among journal characteristics. They show association, and also correlation when it is positive and strong. Clearly, there is a division between the academic publishers' area of influence and that of commercial publishers'. In the former area, SSH fields, Spanish language, free access and online-only format appear. In the latter, all the rest does – including subscription-access types, STM subjects, impact and higher price. The only connection is internationality, since journals published by universities and research centers (namely CSIC) reach good levels in every element except language. Engineering and bilingual Spanish-English publications do not seem to be related to any other category in particular.

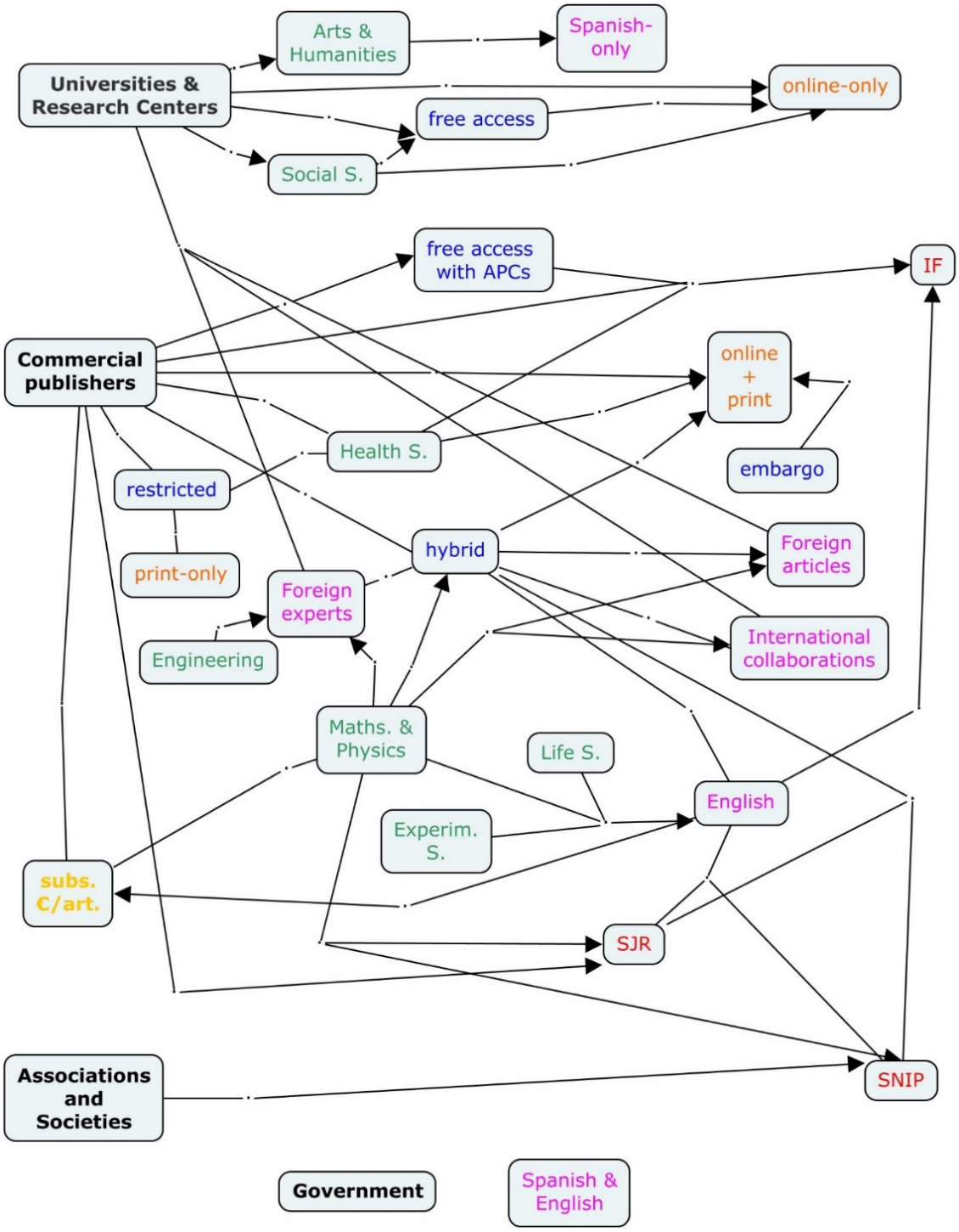


Figure 68 – Relationships among all journal characteristics

## 5.6. Final considerations and recommendations

Spain appears in all world rankings in top-ten position. For instance, it is number 10 among most productive countries according to Ulrich's in 2016 (it was no. 13 in 2005). It is also no. 15 in the ranking of countries with more journals in JCR, and no. 8 in Scopus (the data is from 2014 for both sources). It is also no. 10 in the ranking of countries with more scientific output in the world. The proportion of Spanish journals indexed in JCR (5.8%) is far from reaching that of the four core countries (19-38%), but it is still higher than the percentage of other countries like China, India, Russia, Italy and Brazil. As for Open Access journal publishing, Spain is the fourth world power, according to both Ulrich's and DOAJ, and its degree of adoption is one of the greatest (57% according to this study). Finally, Spain is country no. 10 in the classification of internationality (**Aman**, 2016).

Previous data show a privileged position of the country in the scientific communication arena, as well as a balanced outcome among journal publishing, Open Access, scientific output, indexation of journals, and internationality. Even so, it does not seem to be properly valued by the global academic community, as it usually happens with the so-called "peripheral" countries.

Bearing in mind that journals studied here are not a representative sample but a specific population, distribution of languages and subject areas in Spanish journals are typical of a "peripheral" country – SSH journals are usually published in local languages, while STM titles are mainly in English. These characteristics are shared by other "peripheral" European countries, such as the Nordic countries and Croatia. Nevertheless, other features are different – academic publishers prevail in Spain, while commercial publishers predominate in the Nordic countries (except in Finland, where associations and societies are predominant). There is another key differentiating factor – the degree of OA adoption, which is particularly high in Spain. This feature is not shared with most of the European countries, but with Latin American (Brazil above all).

As to the dichotomies commercial/non-commercial publishers and Open Access/toll access, **Björk** (2005, p. 165) wrote that "although a substantial part of the scientific communication process has traditionally taken place within the academic community itself, commercial publishers served as intermediaries in the print world and continue to do so in the digital era. Their influence and power is undeniable, and they not only publish subscription-access journals but also Open Access titles, which may have access barriers or publication fees, depending on the business model. So there are still established players and monopolies and also high barriers to entry for new types of actors". Such power from commercial publishers is in force in Spain too; it is mostly exercised by Elsevier and limited to the health sciences area (also, to a lesser extent, by Springer in mathematics and physics). Somehow surprisingly, other globally-leading houses as Taylor & Francis, Wiley-Blackell and Sage lag much behind. In any case, commercial publishers are beginning to introduce APCs to turn restricted-access journals into free-access and hybrid.

Open Access represents a 56.9% of the total of these selected journals and it is growing according to previous studies and data. Nevertheless, there is still a 7.6% of the total of the population, which provide free access but are not Open Access, basically because they do not

allow re-use. There is still work to do, though, to turn the 100% of free access into Open Access, and to improve the total proportion of free-access journals indexed in WoS and Scopus (the proportion of the total Spanish journals is 74.4%).

Given this panorama, Open Access adoption could be still increased if scientific societies and professional associations turned their subscription-based journals (28%) into OA. They also hand over the publication of a 24% of the total journals studied to companies, and most of them are not only subscription-based but also expensive. Those titles could be published by the societies and associations themselves in full OA model. To do so, these organizations should count on their own sources and subsidize costs, using low cost infrastructures[318] or joining platforms as RACO or FECYT. The handicap they may encounter is that, unlike universities and research centers, they lack presses and publishing services, and they usually work isolated and may not be familiar with OA publishing. In addition, some of their journals have been published for a long time by prestigious companies (e.g. Elsevier) and have reached high impact indicators. Thus, they may observe the conversion to OA as a constraint to their budgets and a threat to the quality achieved by their publications.

Regarding associations, societies and other private non-for-profit institutions, only 31 of their 88 online journals directly published by them (32.6%) are at an OJS platform.

Embargo journals represent a 14.4% of all titles studied, and they could also be turned into OA. Private non-for-profit and government publishers account for only 13 of such journals, but they could be easily turned into full OA by eliminating the print version. As a matter of fact, their short embargo periods (normally blocking access to just 1 or 2 issues) serve to cover the expenses of the hard copy publishing, which is only available to subscribers or members as an exclusive benefit. Academic publishers use delayed OA less (14%), but this proportion stands for 27 journals, twice the previous number. Those journals belong to smallest universities and centers, which could join academic networks or government and regional platforms, or even launch their own OJS-built website. Embargo journals by commercial publisher have similar importance (24 journals, a 17.1% within the category), but their periods are longer. Actually, they could be considered restricted-access journals that open their past issues archives, rather than “delayed OA” journals.

Social networks as ResearchGate and Academia.eu are also “taking over” in Spain, since their platforms seem to be used to disseminate OA papers far more than repositories or even journals. There is no specific action to be undertaken in Spain, except trying to take advantage of these popular platforms by linking contents and services.

With respect to the discussion over price/quality, more expensive access do not produce better contents, as it happens globally as well. The case is different when talking about APCs, but they are just starting to be introduced in Spain.

Internationalization is probably growing, but there are no previous global data on Spanish journals as to compare with. There is a need for further longitudinal research. Nonetheless,

[318] For instance, http://www.ubiquitypress.com/

information on international citation and use is necessary to check if internationality elements are actually reaching an international audience. For instance, are the efforts to follow the trail of the "publishing core" having any effect? Internationality does not necessarily imply English language and Anglo-Saxon countries, and some contents published in Spanish language could be actually reaching an international audience while other contents translated into English could be just lost in space. At this point, another question arises: do publishers pursue internationality to reach an international audience and then be indexed in prestigious databases, or they want to be indexed in the first place in order to get international citations? In any case, if journals with various internationality elements do not get international impact, they could remain unindexed.

Also, relationships and correlations among internationality elements indicate, in the author's opinion, not a cause and effect relationship, but an effort to internationalize journals in all directions (authors, languages, experts, etc.).

## 5.7. Limitations and further research lines

This study has some limitations, mentioned and described along the methodology section. Contents analyzed cover only one year, subscription prices are only comparable to a limited extent, hybrid and free-access journals with APCs are too few as to draw ultimate conclusions, and internationality assessment does not include countries of origin. In spite of these weaknesses, this work intends to bring current, all-subject, deep data analysis that has not been provided yet.

Interesting further research on Spanish journals could include longitudinal studies on the evolution and characteristics of this specific population, the progress of APC market in Spain, and the development of the internationalization process.

From another perspective, it will be interesting to analyze the entire Spanish journal population, and observe what journal types are indexed where, and why. Such data would also be suitable for comparing the Spanish full ecosystem with other "peripheral" countries, and follow this evolution in Latin America and globally.

Dulcinea database is the main tool used by Acceso Abierto research group for studying Spanish journals. To help to improve results and get more accurate findings, journal records should also include language and publisher type. Dulcinea should also be able to search by indexing source (e.g. WoS, Scopus, Latindex, etc.) and to record dates of changes in order to be able to study longitudinal developments (e.g. conversions of access types, adoption of more languages, etc.).

# 6. Bibliographic references


**Abadal, E., 2012.** Challenges for Open Access journals: quantity, quality and economic sustainability. *Hipertext.net*, (10). Available at: http://www.upf.edu/hipertextnet/en/numero-10/challenges-for-open-access-journals-quantity-quality-and-economic-sustainability.html [Accessed January 31, 2016].

**Abadal, E., 2013.** Gold or green: the debate on Open Access policies. *International Microbiology: the official journal of the Spanish Society for Microbiology*, 16(3), pp. 199–203. Available at: http://www.ncbi.nlm.nih.gov/pubmed/24568035 [Accessed December 3, 2014].

**Abadal, E. et al., 2015.** Spanish scholarly journals in WoS and Scopus: the impact of Open Access. *Journal of Scholarly Publishing*, 47(1). Available at: http://www.utpjournals.press/doi/abs/10.3138/jsp.47.1.04 [Accessed September 23, 2015].

**Abadal, E. & Rius Alcaraz, L., 2008.** Revistas científicas de las universidades españolas: acciones básicas para aumentar su difusión e impacto. *Revista Española de Documentación Científica*, 31(2), pp. 242–262. Available at: http://eprints.rclis.org/handle/10760/11539.

**Abad-García, M.-F. et al., 2015.** Características y visibilidad de las revistas españolas de ciencias de la salud en bases de datos. **El Profesional de la Información**, 24(5), p. 537. Available at: http://recyt.fecyt.es/index.php/EPI/article/view/epi.2015.sep.04 [Accessed March 28, 2016].

**Aguolu, C.C. & Aguolu, I.E., 2012.** Scholarly publishing and Nigerian universities. In A.N. Greco, **ed.** *The essential JSP: volume 2: scholarly publishing in emerging nations*. Toronto: University of Toronto Press, pp. 198–211.

**Alperin, J.P., 2014.** Open Access indicators: assessing growth and use of Open Access resources from developing regions: the case of Latin America. In J.P. Alperin, D. Babini, G. Fischman, eds. *Open Access indicators and scholarly communications in Latin America*. Buenos Aires: UNESCO, pp. 15–78. Available at: http://biblioteca.clacso.edu.ar/clacso/se/20140917054406/OpenAccess.pdf [Accessed April 2, 2016].

**Alperin, J.P. et al., 2014.** Open Access indicators and scholarly communications in Latin America. J. P. Alperin, D. Babini, & G. Fischman, eds., Buenos Aires: CLACSO; UNESCO. Available at: http://biblioteca.clacso.edu.ar/clacso/se/20140917054406/OpenAccess.pdf [Accessed March 28, 2016].

**Althouse, B.M. et al., 2009.** Differences in Impact Factor across fields and over time. **Journal of the American Society for Information Science and Technology**, 60(1), pp. 27–34. Available at: http://doi.wiley.com/10.1002/asi.20936 [Accessed June 18, 2016].

**Álvarez-Ossorio, J.R.P., Gómez, I. & Martín-Sempere, M.J., 1997.** International visibility of domestic scientific literature. *Journal of Information Science*, 23(1), pp.98–101. Available at: http://jis.sagepub.com/cgi/doi/10.1177/016555159702300109 [Accessed January 30, 2015].

**Aman, V., 2016.** Measuring internationality without bias against the periphery. In *STI Conference*. València, 8 p. Available at: http://www.sti2016.org/full-programme/.

**Amat, C.B. & De la Cueva, A., 1990.** Difusión internacional de los trabajos publicados en revistas biomédicas españolas: un estudio cuantitativo del período 1980-1986. *Revista Española de Documentación Científica*, 13(1), pp. 562–569.

**American Research Libraries (ARL), 2008.** ARL Statistics 2006 - 2007. Available at: http://www.arl.org/storage/documents/publications/arlstat07.pdf [Accessed May 5, 2016]

**American Research Libraries (ARL), 2012.** ARL Statistics 2010 - 2011. Available at: http://publications.arl.org/ARL-Statistics-2010-2011 [Accessed May 5, 2016]

**Anglada, L. & Abadal, E. (eds.), 2010.** Open Access in southern European countries, Madrid: FECYT. 190 p.

**Archambault, E. et al., 2013.** Proportion of Open Access Peer-Reviewed Papers at the European and World Levels: 2004-2011, Available at: http://www.science-metrix.com/pdf/SM_EC_OA_Availability_2004-2011.pdf [Accessed February 6, 2014].

**Archambault, E. et al., 2014.** Proportion of Open Access papers published in peer-reviewed journals at the European and world levels: 1996-2013, Brussels. Available at: http://science-metrix.com/en/publications/reports#/en/publications/reports/proportion-of-open-access-papers-published-in-peer-reviewed-journals-at-the [Accessed March 16, 2014].

**Babini, D., 2014.** The risk of Open Access becoming integrated into existing commercial publishing: the need of a global system of non-commercial Open Access. *Revista Eletrônica de Comunicação, Informação & Inovação em Saúde*, 8(September), pp. 438–442. Available at: http://www.reciis.icict.fiocruz.br/index.php/reciis/article/download/431/pdf_337 [Accessed April 27, 2015].

**Babini, D., 2015.** Repositories as key players in non-commercial Open Access: a developing region perspective. In *Connecting research, bridging communities, opening scholarship*. University of Porto, Portugal, April 15-16, 2015. Porto: COAR; SPARC. Available at: http://www.slideshare.net/CLACSOredbiblio/repositories-as-key-players-in-noncommercial-open-access-a-developing-region-perspective [Accessed April 27, 2015].

**Beall, J., 2012.** Defining Platinum Open Access. Scholarly Open Access. Available at: https://scholarlyoa.com/2012/05/08/defining-platinum-open-access/ [Accessed May 7, 2016].

**Bennett, L., 2012.** The potential effect of making journals free after a six month embargo: a report for the Association of Learned, Professional and Society Publishers (ALPSP) and The Publishers Association, Available at: http://recolecta.fecyt.es/sites/default/files/contenido/documentos/ALPSPPApotentialresultsofsixmonthembargofv.pdf [Accessed December 27, 2015].

**Bergstrom, T., 2001.** Free labour for costly journals? *Journal of Economic Perspectives*, 15(4), pp.183–198. Available at: http://econpapers.repec.org/RePEc:aea:jecper:v:15:y:2001:i:4:p:183-198 [Accessed January 28, 2016].

**Bergstrom, T. & McAfee, P., 2014.** Journal cost-effectiveness 2013. Available at: http://journalprices.com [Accessed June 20, 2016].

**Bhattacharya, S. & Kaul, A., 2015.** Emerging countries assertion in the global publication landscape of science: a case study of India. *Scientometrics*, 103(2), pp. 387–411. Available at: http://link.springer.com/10.1007/s11192-015-1551-4 [Accessed March 25, 2016].

**Björk, B.-C., 2004.** Open Access to scientific publications: an analysis of the barriers to change? *Information Research*, 9(2). Available at: http://www.informationr.net/ir/9-2/paper170.html [Accessed October 5, 2015].

**Björk, B.-C., 2005.** A lifecycle model of the scientific communication process. *Learned Publishing*, 18(3), pp. 165–176. Available at: http://onlinelibrary.wiley.com/doi/10.1087/0953151054636129/pdf [Accessed September 11, 2016]

**Björk, B.-C., 2012.** The hybrid model for open access publication of scholarly articles: a failed experiment? **Journal of the American Society for Information Science and Technology**, 63(8), pp. 1496–1504. Available at: http://doi.wiley.com/10.1002/asi.22709 [Accessed October 4, 2015].

**Björk, B.-C., 2013.** Open Access: are the barriers to change receding? *Publications*, 1(1), pp. 5–15. Available at: http://www.mdpi.com/2304-6775/1/1/5/ [Accessed August 25, 2014].

**Björk, B.-C., 2016.** The Open Access movement at a crossroad: are the big publishers and academic social media taking over? *Learned Publishing*, Early View. Available at: http://doi.wiley.com/10.1002/leap.1021 [Accessed March 20, 2016].

**Björk, B.-C. & Solomon, D.J., 2012.** Open access versus subscription journals: a comparison of scientific impact. *BMC Medicine*, 10(1), p.73. Available at: http://www.biomedcentral.com/1741-7015/10/73 [Accessed March 18, 2015].

**Björk, B.-C. & Solomon, D.J., 2014.** Developing an effective market for Open Access Article Processing Charges, London: Welcome Trust. Available at: http://www.wellcome.ac.uk/About-us/Policy/Spotlight-issues/Open-access/Guides/WTP054773.htm [Accessed March 18, 2015].

**Björk, B.-C. & Solomon, D.J., 2015.** Article processing charges in OA journals: relationship between price and quality. *Scientometrics*, (online first), pp.1–13. Available at: http://link.springer.com/10.1007/s11192-015-1556-z [Accessed March 18, 2015].

**Björk, B.-C., Sylwestrzak, W. & Szprot, J., 2014.** Analysis of economic issues related to Open Access to scientific publications, Warszawa: ICM. Available at: https://www.fosteropenscience.eu/content/analysis-economic-issues-related-open-access-scientific-publications [Accessed February 6, 2014].

**Björk, B.-C. et al., 2010.** Open access to the scientific journal literature: situation 2009. E. Scalas, ed. *PloS one*, 5(6), p.e11273. Available at: http://dx.plos.org/10.1371/journal.pone.0011273 [Accessed February 6, 2014].

**Bonnevie-Nebelong, E., 2013.** Journal citation identity, journal citation image and internationalisation: methods for journal evaluation. *Scientometrics*, 66(2), pp.411–424. Available at: http://link.springer.com/10.1007/s11192-006-0029-9 [Accessed April 29, 2015].

**Bordons, M., Felipe, A. & Gómez, I., 2002.** Revistas científicas españolas con factor de impacto en el año 2000. *Revista Española de Documentación Científica*, 1(25), pp. 49–71. Available at: http://digital.csic.es/bitstream/10261/11560/1/147.pdf [Accessed February 25, 2016]

**Borrego Huerta, À., 2016.** Measuring compliance with a Spanish Government open access mandate. *Journal of the Association for Information Science and Technology*, 67(4), pp. 757–764. Available at: http://doi.wiley.com/10.1002/asi.23422 [Accessed August 13, 2016].

**Borrego Huerta, À. & Urbano Salido, C., 2006.** La evaluación de revistas científicas en ciencias sociales y humanidades. *Información, cultura y sociedad,* (14), pp. 11–27. Available at: http://eprints.rclis.org/17115/1/n1402.pdf [Accessed August 13, 2016].

**Bouabid, H., Paul-Hus, A. & Larivière, V., 2015.** Scientific collaboration and high-technology exchanges among BRICS and G-7 countries. *Scientometrics*, 106(3), pp. 873–899. Available at: http://link.springer.com/10.1007/s11192-015-1806-0 [Accessed February 26, 2016].

**Bourdieu, P., 1975.** La spécificité du champ scientifique et les conditions sociales du progrès de la raison. *Sociologie et sociétés*, 7(1), p. 91. Available at: http://id.erudit.org/iderudit/001089ar [Accessed April 15, 2016].

**Buela-Casal, G. et al., 2006.** Measuring internationality: reflections and perspectives on academic journals. *Scientometrics*, 67(1), pp.45–65. Available at: http://link.springer.com.sire.ub.edu/article/10.1007/s11192-006-0050-z.

**Capel, H., 2004.** Libelo contra el inglés. Biblio 3W: revista bibliográfica de geografía y ciencias sociales. Geo Crítica., IX(490). Available at: http://www.ub.edu/geocrit/b3w-490.htm.

**Chen, X. & Olijhoek, T., 2016.** Measuring the degrees of openness of scholarly journals with the Open Access Spectrum (OAS) evaluation tool. *Serials Review*, 42(2), pp.108–115.

Available at: http://www.tandfonline.com/doi/full/10.1080/00987913.2016.1182672 [Accessed August 16, 2016].

**Cheng, W. & Ren, S., 2008.** Evolution of open access publishing in Chinese scientific journals. *Learned Publishing*, 21(2), pp.140–151. Available at: http://openurl.ingenta.com/content/xref?genre=article&issn=0953-1513&volume=21&issue=2&spage=140 [Accessed March 3, 2014].

**Cheng, W.H., Ren, S.L. & Rousseau, R., 2012.** Digital publishing and China's core scientific journals: a position paper. *Scientometrics*, 98(1), pp.11–22. Available at: http://link.springer.com/10.1007/s11192-012-0873-8 [Accessed April 21, 2016].

**Clabo Clemente, N., 2015.** Luces y sombras del marco normativo del acceso abierto en la Administración General del Estado en España. *Revista General de Información y Documentación*, 25(2), pp.245–263. Available at: https://revistas.ucm.es/index.php/RGID/article/view/51234 [Accessed March 13, 2016].

**Claudio-González, M.G. & Villarroya, A., 2015.** Desafíos de la edición de revistas científicas en acceso abierto. *El Profesional de la Información*, 24(5), pp.517–525. Available at: http://recyt.fecyt.es/index.php/EPI/article/view/epi.2015.sep.02 [Accessed October 24, 2015].

**Comisión Nacional Evaluadora de la Actividad Investigadora (CNEAI), 2014**. Resolución de 26 de noviembre de 2014, de la Comisión Nacional Evaluadora de la Actividad Investigadora, por la que se publican los criterios específicos aprobados para cada uno de los campos de evaluación. Boletín Oficial del Estado (BOE), 290 (1 dic.), p. 98204 a 98219. Available at: https://www.boe.es/diario_boe/txt.php?id=BOE-A-2014-12482 [Accessed October 10, 2015].

**Crawford, W., 2015.** The Gold OA landscape: 2011-2014. *Cites & Insights*, 15(9), pp. 1–73. Available at: http://citesandinsights.info/civ15i9.pdf [Accessed January 24, 2016].

**Crawford, W., 2016.** Gold Open Access journals 2011-2015: corrected growth and shrinkage tables, Livermore (CA): *Cites & Insights Books*. Available at: http://waltcrawford.name/goaj1115.pdf [Accessed December 2, 2015].

**Crow, R., 2009.** Income models for Open Access: an overview of current practice, Washington DC: SPARC. Available at: http://www.sparc.arl.org/sites/default/files/incomemodels_v1.pdf [Accessed October 3, 2015].

**Crow, R. & Goldstein, H., 2003.** Guide to business planning for launching a new Open Access journal, New York. Available at: http://www.budapestopenaccessinitiative.org/pdf/business_planning.pdf [Accessed November 24, 2015].

**Czerniewicz, L. & Goodier, S., 2014.** Open access in South Africa: a case study and reflections. South African journal of science, 110(9/10), pp. 1–9. Available at:

http://www.sajs.co.za/open-access-south-africa-case-study-and-reflections/laura-czerniewicz-sarah-goodier [Accessed September 28, 2014].

**Dallmeier-Tiessen, S., 2011.** Highlights from the SOAP project survey: what Scientists Think about Open Access Publishing, Geneva: CERN. Available at: http://arxiv.org/ftp/arxiv/papers/1101/1101.5260.pdf [Accessed June 30, 2015].

**Delgado López-Cózar, E., Ruiz-Pérez, R. & Jiménez-Contreras, E., 2006.** La edición de revistas científicas: directrices, criterios y modelos de evaluación, Granada: FECYT. Available at: http://www.revistacomunicar.com/pdf/2011-04-Delgado.pdf [Accessed Febrary 26, 2016].

**Dewatripont, M. et al., 2006.** Study on the economic and technical evolution of the scientific publication markets in Europe, Brussels: European Commission. Available at: https://www.ulb.ac.be/unica/docs/librarians_2006_scientific_pub_study.pdf [Accessed August 2, 2016].

**Dinkel, A. et al., 2004.** On raising the international dissemination of German research: Does changing publication language to English attract foreign authors to publish in a German basic psychology research journal? *Experimental Psychology*, 51(4), pp. 319–28. Available at: http://www.ncbi.nlm.nih.gov/pubmed/15620233 [Accessed September 3, 2016].

**Donovan, S.K., 2012.** Making international journals truly international. In The essential JSP: volume 2: scholarly publishing in emerging nations. Toronto: University of Toronto Press, pp. 34–37.

**Fecher, B. & Wagner, G., 2016.** Open Access, innovation, and research infrastructure. Publications, 4(2), p.17. Available at: http://www.mdpi.com/2304-6775/4/2/17 [Accessed June 27, 2016].

**Federacion Española para la Ciencia y la Tecnología (FECYT), 2012a.** Análisis de las presencia de las revistas científicas españolas en el JCR de 2011, Madrid: FECYT. Available at: https://www.accesowok.fecyt.es/wp-content/uploads/2012/07/2012_07_10RevEspanolasJCR2011_Vdef.pdf [Accessed February 24, 2015].

**Federacion Española para la Ciencia y la Tecnología (FECYT), 2012b.** Manual de buenas prácticas en edicion de revistas científicas, Federacion Española para la Ciencia y la Tecnología (FECYT). Available at: http://www.fecyt.es/buenas_practicas_edicion_revistas_cientificas/ [Accessed February 24, 2015].

**Federación Española para la Ciencia y la Tecnología (FECYT), 2014.** Recomendaciones para la implementación del artículo 37 Difusión en Acceso Abierto de la Ley de la Ciencia, la Tecnología y la Innovación, [Madrid]: FECYT, REBIUN. Available at: http://recolecta.fecyt.es/sites/default/files/contenido/documentos/Implantacion_Art37_AccesoAbierto.pdf [Accessed February 24, 2015].

**Federación Española para la Ciencia y la Tecnología (FECYT), 2015.** Guía de evaluación de la quinta convocatoria de evaluación de la calidad editorial y científica de las revistas científicas españolas. P. 20. Available at: http://evaluacionarce.fecyt.es/doc/2015Bases5Conv.pdf\nhttp://evaluacionarce.fecyt.es/doc/2015GuiaEval5Conv.pdf.

**Fenglian, Z. & Li, L., 2012.** Improving the international influence of Chinese academic journals. In A. N. Greco (ed.) *The essential JSP: volume 2: scholarly publishing in emerging nations*. Toronto: University of Toronto Press, pp. 156–161.

**Feng-Nian, W., 2012a.** Measures to shorten publication lags for journals in China. In *The essential JSP: volume 2: scholarly publishing in emerging nations*. Pp. 141–146.

**Feng-Nian, W., 2012b.** Problems and solutions for social science journals at Chinese universities. In A. N. Greco (ed.). *The essential JSP: volume 2: scholarly publishing in emerging nations*. Toronto: University of Toronto Press, pp. 134–140.

**Finardi, U., 2014.** Scientific collaboration between BRICS countries. *Scientometrics*, 102(2), pp.1139–1166. Available at: http://link.springer.com/10.1007/s11192-014-1490-5 [Accessed March 25, 2016].

**Finardi, U. & Buratti, A., 2016.** Scientific collaboration framework of BRICS countries: an analysis of international coauthorship. *Scientometrics*, (Online first). Available at: http://link.springer.com/10.1007/s11192-016-1927-0 [Accessed March 25, 2016].

**Galyani-Moghaddam, G., 2009.** Why are scholarly journals costly even with electronic publishing? *Interlending & Document Supply*, 37(3), pp. 149–155. Available at: http://eprints.rclis.org/14213/1/Why_are_scholarly_journals_costly_even_with_electronic_publishing_2009_ILDS_37__3_.pdf [Accessed May 27, 2016].

**Ganu, K.M., 2012. Scholarly publishing in Ghana: the role of Ghana universities press.** In A. N. Greco (ed.) *The essential JSP: volume 2: scholarly publishing in emerging nations*. Toronto: University of Toronto Press, pp. 179–190.

**García Marín, Á. & Román-Román, A., 1998.** Las publicaciones periódicas de Historia Antigua, Prehistoria y Arqueología: difusión internacional. *Trabajos de Prehistoria*, 55(1), pp.139–146. Available at: http://tp.revistas.csic.es/index.php/tp/article/view/321 [Accessed January 24, 2016]

**Gargouri, Yassine; Lariviere, Vincent; Gingras, Yves; Carr, Les; Harnad, S., 2012.** Green and Gold Open Access percentages and growth, by discipline. In *17th International Conference on Science and Technology Indicators (STI)*, Montreal (Canada), 5 - 8 Sep. 2012. P. 11. Available at: http://eprints.soton.ac.uk/340294/ [Accessed February 22, 2016].

**Gargouri, Y. et al., 2010.** Self-selected or mandated, open access increases citation impact for higher quality research. *PloS one*, 5(10), p.e13636. Available at: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0013636 [Accessed December 25, 2015].

**Gazni, A., 2015.** Globalization of national journals: investigating the growth of international authorship. *Learned Publishing*, 28(3), pp.195–204. Available at: http://doi.wiley.com/10.1087/20150305 [Accessed March 25, 2016].

**Gazni, A. & Ghaseminik, Z., 2016.** Internationalization of scientific publishing over time: analysing publishers and fields differences. *Learned Publishing*, Early View. Available at: http://doi.wiley.com/10.1002/leap.1018 [Accessed March 25, 2016].

**Ghosh, S.B. & Das, A.K., 2006**. Open access and institutional repositories: a developing country perspective: a case study of India. In *World Library and Information Congress: 72nd IFLA General Conference and Council*. Seoul: IFLA, p. 21.

**Giménez-Toledo, E., 2013.** Reflexiones sobre las revistas científicas españolas. *Anuario ThinkEPI*, 7, pp.118–121. Available at: http://recyt.fecyt.es/index.php/ThinkEPI/article/view/30344 [Accessed May 25, 2015].

**Giménez-Toledo, E., Román-Román, A., et al., 2009.** The Editorial Boards of Spanish Scholarly Journals: What Are They Like? What Should They Be Like? *Journal of Scholarly Publishing*, 40(3), pp.287–306. Available at: http://muse.jhu.edu/journals/journal_of_scholarly_publishing/v040/40.3.gimenez-toledo.html [Accessed September 25, 2014].

**Giménez-Toledo, E., Rodríguez-García, G. & Moneda Corrochano, M. de la, 2009.** Spanish scientific journals on psychology (II): editorial quality, visibility, internationality and editors attitude towards open access. *Psychology Science Quarterly*, 51(1), pp.119–134. Available at: http://www.psychologie-aktuell.com/fileadmin/download/PschologyScience/S1-2009/09_Gimenez.pdf [Accessed November 18, 2015].

**Giménez-Toledo, E., Román-Román, A. & Alcain-Partearroyo, M.D., 2007.** From experimentation to coordination in the evaluation of Spanish scientific journals in the humanities and social sciences. *Research Evaluation*, 16(2), pp. 137–148. Available at: http://rev.oxfordjournals.org/content/16/2/137.short [Accessed January 21, 2014].

**González–Albo, B. et al., 2016.** Los sectores institucionales en la producción científica española de difusión internacional. *Revista Española de Documentación Científica*, 39(1). Available at: http://redc.revistas.csic.es/index.php/redc/article/view/918/1322 [Accessed December 21, 2015].

**Gray, A., 2015.** Considering non-Open Access Publication Charges in the "total cost of publication." *Publications*, 3(4), pp.248–262. Available at: http://www.mdpi.com/2304-6775/3/4/248/htm [Accessed February 21, 2016].

**Greco, A.N. et al., 2006.** The state of scholarly journal publishing: 1981-2000. *Journal of Scholarly Publishing*, 37(3), pp.155–214. Available at: http://muse.jhu.edu/content/crossref/journals/journal_of_scholarly_publishing/v037/37.3greco.html [Accessed February 8, 2013].

**Greco, A.N. (ed.), 2012.** The essential JSP: volume 2: scholarly publishing in emerging nations, University of Toronto Press.

**Guédon, J.-C., 2008.** Open Access and the divide between "mainstream" and "peripheral" science. In *Como gerir e qualificar revistas científicas*. [S.l.]: [s.n.]. Available at: http://eprints.rclis.org/10778/1/Brazil-final.pdf [Accessed April 15, 2016].

**Gumpenberger, C., Ovalle-Perandones, M.-A. & Gorraiz, J., 2012.** On the impact of Gold Open Access journals. *Scientometrics*, 96(1), pp. 221–238. Available at: http://link.springer.com/10.1007/s11192-012-0902-7 [Accessed November 14, 2013].

**Guo, F., Xue, J.-Y. & Li, R.-X., 2014.** Open Access in China: a study of Social Science journals. *Journal of Scholarly Publishing*, 45(4), pp. 336–352. Available at: http://www.utpjournals.press/doi/abs/10.3138/jsp.45.4.02 [Accessed March 25, 2016].

**Gutiérrez Puebla, J., 1999.** Las revistas internacionales de geografía: internacionalización e impacto. *Boletín de la Asociación de Geógrafos Españoles*, (27), pp.117–136. Available at: http://dialnet.unirioja.es/servlet/articulo?codigo=1319318 [Accessed February 26, 2015].

**Haider, J., 2005.** The geographic distribution of open access journals. In *ICML 9 World Congress on Health Information and Libraries*. Available at: http://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=1549482&fileOId=3738628 [Accessed October 14, 2015].

**Harnad, S., 2015.** Berlin stonewalling: or flip-flop. *Open Access Archivangelism*. Available at: http://openaccess.eprints.org/index.php?/archives/1167-Berlin-Stonewalling-or-Flip-Flop.html [Accessed May 15, 2016].

**Harnad, S., 2013.** On "Diamond OA," "Platinum OA," "Titanium OA," and "Overlay-Journal OA," again. *Open Access Archivangelism*. Available at: http://openaccess.eprints.org/index.php?/archives/993-On-Diamond-OA,-Platinum-OA,-Titanium-OA,-and-Overlay-Journal-OA,-Again.html.

**Hebrang Grgić, I., 2011.** Open Access to scientific information in Croatia: increasing research impact of a scientifically peripheral country, Saarbrücken: Lambert Academic Publishing. Available at: http://darhiv.ffzg.unizg.hr/1397/1/Hebrang_Grgic_ffzg.pdf [Accessed February 11, 2014].

**Hebrang Grgić, I., 2014**. Scholarly journals at the periphery: the case of Croatia. *Learned Publishing*, 27(1), pp.15–20. Available at: http://openurl.ingenta.com/content/xref?genre=article&issn=0953-1513&volume=27&issue=1&spage=15 [Accessed December 30, 2013].

**Herb, U., 2014.** Open Access heatmap. Available at: http://www.scinoptica.com/pages/topics/open-access-heatmap.php [Accessed January 30, 2014]

**Hew, M., 2012.** Scholarly journal publishing in Malaysia. In *Scholarly publishing in emerging nations*. University of Toronto Press, pp. 82–86. Available at: http://www.ihcs.ac.ir/UploadedFiles/2/9/9957.pdf [Accessed April 30, 2015]

**Hu, D., 2012.** The availability of open access journals in the humanities and social sciences in China. *Journal of Information Science*, 38(1), pp.64–75. Available at: http://jis.sagepub.com/cgi/doi/10.1177/0165551511428919 [Accessed February 8, 2013].

**Hu, D., 2015.** Open Access in China: the development of Open Access journals. In *J. Schöpfel, ed. Learning from the BRICS: Open Access to scientific information in emerging countries*. Sacramento: Litwin Books, pp. 129–151.

**Inhaber, H., 1975a.** Canadian scientific journals: part I, coverage. *Journal of the American Society for Information Science*, 26(4), pp. 253–258.

**Inhaber, H., 1975b.** Canadian scientific journals: part II, interaction. *Journal of the American Society for Information Science*, 26(5), pp. 290–293.

**Islam, M., 2012.** Academic publishing and the University presses: the case in a developing region (Saudi Arabia). In A. N. Greco, ed. *The essential JSP: volume 2: scholarly publishing in emerging nations*. Toronto: University of Toronto Press, pp. 224–232.

**Jahn, N. & Tullney, M., 2016.** A study of institutional spending on Open Access publication fees in Germany. *PeerJ*, 4, p.e2323. Available at: https://peerj.com/articles/2323 [Accessed August 15, 2016].

**Jaygbay, J., 1998.** The politics of and prospects for African scholarly journals in the information age in the third world. In *Knowledge dissemination in Africa: the role of scholarly journals*. Chestnut Hill: Bellagio Publishing, pp. 64–73.

**Jaygbay, J., 2012.** Self-censorship in African scholarship and scholarly publishing. In A. N. (ed. . Greco, ed. *The essential JSP: volume 2: scholarly publishing in emerging nations*. Toronto: University of Toronto Press, pp. 191–196.

**Jiménez Hernández, J.A., 2015.** Calidad editorial, difusión y visibilidad de las revistas científicas digitales de enfermería españolas. Universidad de Murcia. Available at: https://digitum.um.es/xmlui/handle/10201/47119 [Accessed March 28, 2016].

**Jubb, M., 2011.** Heading for the open road: costs and benefits of transitions in scholarly communications. *LIBER Quarterly*, 21(1), p.102. Available at: https://www.liberquarterly.eu/article/10.18352/lq.8010/ [Accessed June 15, 2016].

**Kamada, H., 2007.** Kiyo Journals and Scholarly Communication in Japan. *Portal: Libraries and the Academy*, 7(3), pp. 375–383. Available at: http://muse.jhu.edu/content/crossref/journals/portal_libraries_and_the_academy/v007/7.3kamada.html [Accessed February 8, 2013].

**Kao, C., 2009.** The authorship and internationality of Industrial Engineering journals. *Scientometrics*, 81(1), pp.123–136. Available at:

http://link.springer.com/article/10.1007%2Fs11192-009-2093-4 [Accessed February 8, 2016].

**King, D.W., 2007.** The cost of journal publishing: a literature review and commentary. *Learned Publishing*, 20(2), pp. 85–106. Available at: http://doi.wiley.com/10.1087/174148507X183551 [Accessed May 27, 2016].

**Kortelainen, T.A.M., 2001.** Studying the international diffusion of a national scientific journal. *Scientometrics*, 51(1), pp. 133–146. Available at http://link.springer.com/article/10.1023/A%3A1010568829054 [Accessed March 7, 2016]

**Laakso, M. & Björk, B.-C., 2013.** Delayed Open Access: an overlooked high-impact category of openly available scientific literature. *Journal of the American Society for Information Science and Technology*, 64(7), pp.1323–1329. Available at: http://doi.wiley.com/10.1002/asi.22856 [Accessed March 7, 2016]

**Laakso, M. & Björk, B.-C., 2016.** Hybrid Open Access: a longitudinal study. *Journal of Informetrics*, 10(4), 919-932. In print. http://dx.doi.org/10.1016/j.joi.2016.08.002

**Laakso, M. & Lindman, J., 2016.** Journal copyright restrictions and actual Open Access availability: a study of articles published in eight top information systems journals (2010–2014). *Scientometrics*, pp.1–23. Available at: http://link.springer.com/10.1007/s11192-016-2078-z [Accessed August 16, 2016].

**Laakso, M. et al., 2011.** The development of Open Access journal publishing from 1993 to 2009 M. Hermes-Lima, ed. *PloS one*, 6(6), p.e20961. Available at: http://dx.plos.org/10.1371/journal.pone.0020961 [Accessed March 25, 2014].

**Laakso, M., Solomon, D. & Björk, B.-C., 2016.** How subscription-based scholarly journals can convert to Open Access: a review of approaches. *Learned Publishing*. Available at: http://onlinelibrary.wiley.com/doi/10.1002/leap.1056/abstract [Accessed September 24, 2016].

**Laine, H., 2015**. The case against the journal article: the age of publisher authority is going, going, gone: and we'll be just fine. *The Impact Blog*. Available at: http://blogs.lse.ac.uk/impactofsocialsciences/2015/07/14/the-case-against-the-journal-article/ [Accessed November 25, 2014].

**Landini, F., Malerba, F. & Mavilia, R., 2015.** The structure and dynamics of networks of scientific collaborations in Northern Africa. *Scientometrics*, 105(3), pp.1787–1807. Available at: http://link.springer.com/10.1007/s11192-015-1635-1 [Accessed March 25, 2016].

**Larivière, V., Haustein, S. & Mongeon, P., 2015.** The oligopoly of academic publishers in the digital era. *PloS one*, 10(6), p.e0127502. Available at: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0127502 [Accessed June 11, 2015].

**Lawson, S., 2015.** Fee waivers for Open Access journals. *Publications*, 3(3), pp.155–167. Available at: http://www.mdpi.com/2304-6775/3/3/155/htm [Accessed March 25, 2016].

**Leeuwen, T. van, Tatum, C. & Wouters, P., 2015.** Open Access publishing and citation impact: an international study. *Proceedings of ISSI 2015 Istanbul: 15th International Society of Scientometrics and Informetrics Conference, Istanbul, Turkey, 29 June to 3 July, 2015, (Boai)*, pp. 1130–1141. Available at: http://www.issi2015.org/files/downloads/all-papers/1130.pdf [Accessed August 3, 2015].

**Leydesdorff, L. et al., 2013.** International collaboration in science: the global map and the network. *El Profesional de la Información*, 22(1), pp.87–95. Available at: http://recyt.fecyt.es/index.php/EPI/article/view/epi.2013.ene.12 [Accessed March 31, 2016].

**Li, E.Y., Liao, C.H. & Yen, H.R., 2013.** Co-authorship networks and research impact: a social capital perspective. *Research Policy*, 42(9), pp. 1515–1530. Available at: http://www.sciencedirect.com/science/article/pii/S0048733313001169 [Accessed February 4, 2015].

**Malalana Ureña, A., 2007a.** Visibilidad internacional de las revistas españolas de Historia Contemporánea. Studia Historica. *Historia Contemporánea*, (25). Available at: http://campus.usal.es/~revistas_trabajo/index.php/0213-2087/article/view/1067 [Accessed May 1, 2015].

**Malalana Ureña, A., 2007b**. Visibilidad internacional de las revistas españolas de Historia Medieval. *En la España Medieval*, 30, pp. 455–496. Available at: http://revistas.ucm.es/index.php/ELEM/article/view/ELEM0707110455A [Accessed May 1, 2015].

**Malalana Ureña, A., 2007c.** Visibilidad internacional de las revistas españolas de Historia Moderna. *Cuadernos de historia moderna*, (32), pp. 159–193. Available at: http://revistas.ucm.es/index.php/CHMO/article/view/CHMO0707110159A [Accessed January 30, 2015].

**Malalana Ureña, A., Román-Román, A. & Rubio-Liniers, M.C., 2007.** Visibilidad internacional de las revistas españolas de Historia. *Scripta Nova: Revista Electrónica de Geografía y Ciencias Sociales*, XI(234). Available at: http://www.ub.edu/geocrit/sn/sn-234.htm [Accessed January 30, 2015].

**Mañana-Rodríguez, J. & Giménez-Toledo, E., 2015.** Revistas de educación e investigación educativa: modelos de negocio y desempeño bibliométrico = Education & educational research journals: business models and bibliometric performance. Revista de Educación, (jul./sep.), pp.31–58. Available at: http://www.mecd.gob.es/revista-de-educacion/numeros-revista-educacion/numeros-anteriores/2015/369/369_2.html [Accessed September 29, 2015].

**McVeigh, M.E., 2004.** Open Access journals in the ISI citation databases: analysis of impact factors and citation patterns: a citation study from Thomson Scientific, Available at:

http://biblioteca.uned.es/lenya/bibliuned/search-authoring/docpdf/oacitations2.pdf [Accessed March 25, 2016].

**Melero, R. et al., 2014.** Journal author rights and self-archiving: the case of Spanish journals. Learned Publishing, 27(2), pp.107–120. Available at: http://www.ingentaconnect.com/content/alpsp/lp/2014/00000027/00000002/art00005 [Accessed November 1, 2015].

**Melero, R. & Abad, F., 2008.** Revistas open access: características, modelos económicos y tendencias. BiD: textos universitaris de biblioteconomia i documentació, (20). Available at: http://bid.ub.edu/20meler2.htm [Accessed March 24, 2014].

**Merton, R.K., 1968.** The Matthew effect in science: the reward and communication systems of science are considered. Science, 159(3810), pp.56–63. Available at: http://www.ncbi.nlm.nih.gov/pubmed/5634379 [Accessed June 24, 2016].

**Merton, R.K., 1942.** The normative structure of science [excerpts]. Panarchy: a gateway to selected documents and web sites. Available at: http://www.panarchy.org/merton/science.html [Accessed March 20, 2016]

**Merton, R.K., 1973.** The sociology of science: theoretical and empirical investigations. N. W. Storer, ed., Chicago: University of Chicago Press.

**Miguel, S., Tannuri de Oliveira, E. & Cabrini Grácio, M., 2016.** Scientific production on Open Access: a worldwide bibliometric analysis in the academic and scientific context. Publications, 4(1), p.1. Available at: http://www.mdpi.com/2304-6775/4/1/1/htm [Accessed January 15, 2016].

**Mongeon, P. & Paul-Hus, A., 2016.** The journal coverage of Web of Science and Scopus: a comparative analysis. *Scientometrics*, 106(1), pp.213–228. Available at: http://link.springer.com/10.1007/s11192-015-1765-5 [Accessed October 19, 2015].

**Morris, S., 2005.** The true costs of scholarly journal publishing. *Learned Publishing*, 18(2), pp.115–126. Available at: http://doi.wiley.com/10.1087/0953151053584975 [Accessed June 12, 2016].

**Morrison, H., 2016a.** Elsevier: now the world's largest open access publisher. *Sustaining the Knowledge Commons Commons / Soutenir les savoirs communs*. Available at: https://sustainingknowledgecommons.org/2016/05/13/elsevier-now-the-worlds-largest-open-access-publisher/ [Accessed May 16, 2016].

**Morrison, H., 2016b.** Small scholar-led scholarly journals: can they survive and thrive in an Open Access future? *Learned Publishing*, 29(2), pp.83–88. Available at: http://doi.wiley.com/10.1002/leap.1015 [Accessed February 20, 2016].

**Morrison, H. & Salhab, J., 2015.** OA APC preliminary data 2015: range, central tendencies and preliminary longitudinal analysis. Sustaining the Knowledge Commons. Available at: http://sustainingknowledgecommons.org/2015/12/03/oa-apc-preliminary-data-2015-

range-central-tendencies-and-preliminary-longitudinal-analysis/ [Accessed February 1, 2016].

**Morrison, H. et al., 2015.** Open Access Article Processing Charges: DOAJ survey May 2014. *Publications*, 3(1), pp. 1–16. Available at: http://www.mdpi.com/2304-6775/3/1/1/htm [Accessed January 4, 2016].

**Mukherjee, B., 2014.** Green and gold open access in India. *Learned Publishing*, 27(1), pp. 21–32. Available at: http://openurl.ingenta.com/content/xref?genre=article&issn=0953-1513&volume=27&issue=1&spage=21 [Accessed December 30, 2013].

**Murray, S. & Clobridge, A., 2014.** The current state of scholarly journal publishing in Africa: findings & analysis, [S.l.]: [s.n.]. Available at: http://www.ajol.info/public/Scholarly-Journal-Publishing-in-Africa-Report-Final-v04c.pdf [Accessed April 15, 2016].

**Navas-Fernández, M., 2014.** Sustainability of Open Access journals: a short review. In *BOBCATSSS 2014 Proceedings*. Barcelona, pp. 106–112. Available at: http://proceedings.bobcatsss2014.hb.se/article/view/336 [Accessed September 19, 2014].

**Nentwich, M. & König, R., 2014.** Academia goes Facebook? The potential of social network sites in the scholarly realm. In *Opening science: the evolving guide on how the internet is changing research, collaboration and scholarly publishing*. London: Springer. Available at: http://link.springer.com/book/10.1007/978-3-319-00026-8 [Accessed July 19, 2015].

**Nicholas, D. et al., 2012.** Digital repositories ten years on: what do scientific researchers think of them and how do they use them? *Learned Publishing*, 25(3), pp.195–206. Available at: http://doi.wiley.com/10.1087/20120306 [Accessed August 14, 2016].

**Niyazov, Y. et al., 2016.** Open Access meets discoverability: citations to articles posted to Academia.edu. P. Dorta-González, ed. *PloS one*, 11(2), p.e0148257. Available at: http://dx.plos.org/10.1371/journal.pone.0148257 [Accessed August 16, 2016].

**Van Noorden, R., 2013.** Open access: the true cost of science publishing. *Nature*, 495(7442), pp. 426–9. Available at: http://www.nature.com/news/open-access-the-true-cost-of-science-publishing-1.12676 [Accessed November 10, 2013].

**Nwagwu, W.E., 2013.** Open Access initiatives in Africa: structure, incentives and disincentives. *The Journal of Academic Librarianship*, 39(1), pp. 3–10. Available at: http://linkinghub.elsevier.com/retrieve/pii/S0099133312001929 [Accessed June 3, 2014].

**Odlyzko, A., 1997.** The economics of electronic journals. *First Monday*, 2(8). Available at: http://firstmonday.org/ojs/index.php/fm/article/view/542/463 [Accessed May 7, 2016].

**Olijhoek, T., Bjørnshauge, L. & Mitchell, D., 2015.** Criteria for Open Access and publishing. ScienceOpen Research. Available at: https://www.scienceopen.com/document/vid/2befee62-f9c0-4dc8-93c5-790d6102877d?1 [Accessed November 27, 2015].

**Ondari-Okemwa, E., 2007**. Scholarly publishing in sub-Saharan Africa in the twenty-first century: challenges and opportunities. *First Monday*, 12(10). Available at: http://firstmonday.org/ojs/index.php/fm/article/view/1966/1842 [Accessed April 15, 2016].

**Open Science Initiative Working Group, 2015.** Mapping the future of scholarly publishing, [S.l.]: National Science Communication Institute. Available at: http://nationalscience.org/wp-content/uploads/2015/02/OSI-report-Feb-2015.pdf [Accessed February 24, 2015].

**Ortega, C., Plaza, L.M., Martín-Sempere, M.J., et al., 1992.** Spanish scientific and technical journals: state of the art. *Scientometrics*, 24(1), pp. 21–42. Available at: http://link.springer.com/10.1007/BF02026471 [Accessed February 17, 2015].

**Osca-Lluch, J. et al., 2008.** Difusión y factor de impacto nacional e internacional de las revistas científicas españolas. *Anales de Documentación*, (11), pp. 145–164. Available at: http://revistas.um.es/analesdoc/article/view/24861 [Accessed February 17, 2015].

**Ouya, D. & Smart, P., 2006.** Open Access survey of Africa-published journals, Available at: http://www.codesria.org/IMG/pdf/Daisy_Ouya_Paper.pdf [Accessed December 17, 2015].

**Packer, A.L., 2011.** Os periódicos brasileiros e a comunicação da pesquisa nacional. *Revista USP*, (89), pp.26–61. Available at: http://www.revistas.usp.br/revusp/article/view/13868/15686 [Accessed November 29, 2015]

**Packer, A.L., 2016.** The adoption of English among SciELO Brazil journals has been increasing. SciELO in perspective. Available at: http://blog.scielo.org/en/2016/05/10/the-adoption-of-english-among-scielo-brazil-journals-has-been-increasing/ [Accessed September 21, 2015]

**Panitch, J.M. & Michalak, S., 2005.** The serials crisis: a white paper for the UNC-Chapel Hill Scholarly Communications Convocation, [Chapel Hill]: University of North Carolina. Available at: http://www.unc.edu/scholcomdig/whitepapers/panitch-michalak.html [Accessed May 30, 2014].

**Peters, M.A., 2007**. Scientific communication and the Open Society: the emerging paradigm of "Open Knowledge production." *The Encyclopaedia of Educational Philosophy and Theory*, p.18. Available at: http://eepat.net/doku.php?id=scientific_communication_and_the_open_society [Accessed June 10, 2015].

**Pinfield, S., Salter, J. & Bath, P.A., 2016.** The "total cost of publication" in a hybrid open-access environment: institutional approaches to funding journal article-processing charges in combination with subscriptions. *Journal of the Association for Information Science and Technology*, 67(7), pp. 1751–1766. Available at: http://doi.wiley.com/10.1002/asi.23446 [Accessed June 18, 2016].

**Pislyakov, V., 2009.** Comparing two “thermometers”: impact factors of 20 leading economic journals according to Journal Citation Reports and Scopus. *Scientometrics*, 79(3), pp. 541–550. Available at: http://link.springer.com/10.1007/s11192-007-2016-1 [Accessed January 21, 2016].

**Publishers Association (UK), 2016.** The role of hybrid journals in Open Access. Available at: http://publishers.org.uk/_resources/assets/attachment/full/0/20877.pdf [Accessed February 23, 2016]

**Qing, F., Lifang, X. & Xiaochuan, L., 2012.** Peer-Review practice and research for academic journals in China. In A. N. Greco (ed.). *The essential JSP: volume 2: scholarly publishing in emerging nations*. Toronto: University of Toronto Press, pp. 146–155.

**Raju, R., Raju, J. & Claassen, J., 2015.** Open scholarship practices reshaping South Africa’s scholarly publishing roadmap. *Publications*, 3(4), pp.263–284. Available at: http://www.mdpi.com/2304-6775/3/4/263/htm [Accessed March 25, 2016].

**Regier, W.G., 1997.** EPIC: Electronic Publishing is Cheaper. In *Conference on Scholarly Communication and Technology* (Atlanta, GA, April 24-25, 1997). Atlanta (GA): Association of Research Libraries (ARL), p. 10. Available at: http://eric.ed.gov/?id=ED414919 [Accessed June 15, 2016].

**Ren, S., 2005.** Editing scientific journals in mainland China. *European Science Editing*, 31(1), pp.8–10. Available at: https://www.researchgate.net/publication/281007744_Editing_scientific_journals_in_mainland_China [Accessed April 20, 2016].

**Ren, S. et al., 2013.** China’s scientific journals in a transforming period: present situation and developing strategies. *Scholarly and Research Communication*, 4(1). Available at: http://src-online.ca/src/index.php/src/article/view/106/173 [Accessed April 21, 2016].

**Repiso, R., 2014.** A las puertas de SciELO. Available at: http://www.ec3metrics.com/a-las-puertas-de-scielo-2/ [Accessed April 22, 2014].

**Research Councils United Kingdom (RCUK), 2013.** RCUK Policy on Open Access and Supporting Guidance, London: RCUK. Available at: http://www.rcuk.ac.uk/documents/documents/RCUKOpenAccessPolicy.pdf [Accessed December 17, 2014].

**Research Councils United Kingdom (RCUK), 2014.** Counting the costs of Open Access: the estimated cost to UK research organisations of achieving compliance with Open Access 2013/14, London: RCUK. Available at: http://www.researchconsulting.co.uk/wp-content/uploads/2014/11/Research-Consulting-Counting-the-Costs-of-OA-Final.pdf [Accessed December 17, 2014].

**Research Councils United Kingdom (RCUK), 2015.** Review of the implementation of the RCUK Policy on Open Access, London: RCUK. Available at: http://www.rcuk.ac.uk/RCUK-

prod/assets/documents/documents/Openaccessreport.pdf [Accessed December 17, 2014].

**Research Information Network (RIN), 2008.** Activities, costs and funding flows in the scholarly communications system in the UK: report commissioned by the Research Information Network (RIN), [S.l.]: Research Information Network (RIN). Available at: http://www.rin.ac.uk/files/Income-&-cost-flows-report-(summary)-final.pdf [Accessed September 6, 2013].

**Research Information Network (RIN), 2012.** Accessibility, sustainability, excellence: how to expand access to research publications, London. Available at: http://www.researchinfonet.org/wp-content/uploads/2012/06/Finch-Group-report-FINAL-VERSION.pdf [Accessed September 6, 2013].

**Rey-Rocha, J. & Martín-Sempere, M.J., 1999.** The role of domestic journals in geographically-oriented disciplines: the case of Spanish journals on Earth Sciences. *Scientometrics*, 45(2), pp.203–216. Available at: http://link.springer.com/10.1007/BF02458433 [Accessed April 17, 2015].

**Rey-Rocha, J. & Martín-Sempere, M.J., 2004.** Patterns of the foreign contributions in some domestic vs. international journals on Earth Sciences. *Scientometrics*, 59(1), pp.95–115. Available at: http://link.springer.com/10.1023/B:SCIE.0000013301.01329.7a [Accessed February 25, 2015].

**Rodrigues, R. & Abadal, E., 2014a.** Ibero-American journals in Scopus and Web of Science. *Learned Publishing*, 27(1), pp.56–62. Available at: http://onlinelibrary.wiley.com/doi/10.1087/20140109/abstract [Accessed December 17, 2013].

**Rodrigues, R.S. & Abadal, E., 2014b.** Scientific journals in Brazil and Spain: alternative publishing models. *Journal of the Association for Information Science and Technology*, 65(10), pp. 2145–2151. Available at: http://dx.doi.org/10.1002/asi.23115.

**Rodríguez Yunta, L., 2015.** Metodología aplicada en la categorización de las revistas españolas en la base de datos ISOC: indicadores sobre trayectoria, apertura de la autoría e internacionalidad en el periodo 2004-2013, CSIC. Available at: http://digital.csic.es/handle/10261/114589 [Accessed May 5, 2015].

**Rodríguez-Yunta, L. & Giménez-Toledo, E., 2013**. Fusión, coedición o reestructuración de revistas científicas en humanidades y ciencias sociales. *El Profesional de la Información*, 22(No. 1 (Jan./Feb.), pp.36–45. Available at: http://recyt.fecyt.es/index.php/EPI/article/view/epi.2013.ene.05 [Accessed September 25, 2015].

**Rodríguez-Gairín, J.-M., Somoza-Fernández, M. & Urbano, C., 2011.** MIAR: hacia un entorno colaborativo de editores, autores y evaluadores de revistas. *El Profesional de la Información*, 20(5), pp. 589–596. Available at:

http://elprofesionaldelainformacion.metapress.com/openurl.asp?genre=article&id=doi:10.3145/epi.2011.sep.15 [Accessed May 5, 2015].

**Román-Román, A. & Giménez-Toledo, E., 2010.** Cómo valorar la internacionalidad de las revistas de Ciencias Humanas y su categorización en ERIH. *Revista española de Documentación Científica*, 33(3), pp. 341–377. Available at: http://digital.csic.es/handle/10261/27336 [Accessed October 30, 2014].

**Román-Román, A., Sorli-Rojo, Á. & Giménez-Toledo, E., 2007.** ¿Tienen las revistas españolas de estudios latinoamericanos los niveles de internacionalización esperable, dado su ámbito de especialización? *Anuario Americanista Europeo*, (4/5), pp. 425–440. Available at: http://www.red-redial.net/revista/anuario-americanista-europeo/article/view/96 [Accessed October 12, 2015].

**Le Roux, E. & Galloway, F., 2012.** Assessing the demand for scholarly publishing in South Africa. In A. N. Greco (ed.). *The essential JSP: volume 2: scholarly publishing in emerging nations*. Toronto: University of Toronto Press, pp. 162–178.

**Rozemblum, C. et al., 2015.** Calidad editorial y calidad científica en los parámetros para inclusión de revistas científicas en bases de datos en Acceso Abierto y comerciales. *Palabra Clave (La Plata)*, 4(2), pp. 64–80. Available at: http://www.palabraclave.fahce.unlp.edu.ar/article/view/PCv4n2a01/6596 [Accessed May 18, 2015].

**Saha, S., Saint, S. & Christakis, D.A., 2003.** Impact factor: a valid measure of journal quality? *Journal of the Medical Library Association*, 91(1), pp.42–6. Available at: http://www.ncbi.nlm.nih.gov/pubmed/12572533 [Accessed June 18, 2016].

**Sánchez Hernández, A. et al., 2008.** Calidad y excelencia editorial de las revistas científicas mexicanas ante nuevos retos. In *IBERSID: Avances y perspectivas de sistemas de información y documentación*, pp. 93–108.

**Santa, S. & Herrero Solana, V., 2010.** Producción científica de América Latina y el Caribe: una aproximación a través de los datos de Scopus (1996-2007). *Revista Interamericana de Bibliotecología*, 33(2) (jul./dic.), pp.379–400.

**Santillán-Aldana, J.F., 2013.** Características de las revistas científicas de Acceso Abierto del Perú, 25 p. Pre-print. Available at: http://hdl.handle.net/10760/20148 [Accessed August 20, 2014].

**Santillán-Aldana, J.F. & Lima-Leite, F.C., 2015.** Estudio preliminar de las caracteristicas y modalidades de financiamento adoptadas por las revistas científicas de acceso abierto en América Latina. Pesquisa Brasileira em Ciência da Informação e Biblioteconomia, 10(2). Available at: http://periodicos.ufpb.br/ojs2/index.php/pbcib/article/view/25097 [Accessed August 27, 2015].

**Santin, D.M., Vanz, S. de S. & Caregnato, S.E., 2016.** Internationality of publications, co-authorship, references and citations in Brazilian Evolutionary Biology. *Publications*, 4(1),

p.4. Available at: http://www.mdpi.com/2304-6775/4/1/4/htm [Accessed February 28, 2016].

**Sarwar, R. & Hassan, S.-U., 2015.** A bibliometric assessment of scientific productivity and international collaboration of the Islamic World in science and technology (S&T) areas. Scientometrics, 105(2), pp. 1059–1077. Available at: http://link.springer.com/10.1007/s11192-015-1718-z [Accessed March 25, 2016].

**Sawant, S., 2009.** The current scenario of open access journal initiatives in India. Collection Building, 28(4), pp. 159–163. Available at: http://www.emeraldinsight.com/10.1108/01604950910999819 [Accessed February 8, 2013].

**Sawant, S., 2015.** Open Access in India: awareness and acceptance of institutional repositories and Open Access journals. In J. Schöpfel, ed. *Learning from the BRICS: Open Access to scientific information in emerging countries*. Sacramento: Litwin Books, pp. 97–116.

**Schimmer, R., Geschuhn, K.K. & Vogler, A., 2015.** Disrupting the subscription journals' business model for the necessary large-scale transformation to Open Access, München. Available at: http://pure.mpg.de/pubman/faces/viewItemOverviewPage.jsp?itemId=escidoc:2148961 [Accessed April 30, 2015].

**Schöpfel, J., 2015.** Open Access: the rise and fall of a community-driven model of scientific communication. *Learned Publishing*, 28(4), pp.321–325. Available at: http://doi.wiley.com/10.1087/20150413 [Accessed March 25, 2016].

**Schöpfel, J. (ed.), 2015.** Learning from the BRICS: Open Access to scientific information in emerging countries, Sacramento: Litwin Books. 220 p. ISBN: 978-1-936117-84-0.

**Shao, J. et al., 2013.** The current state of Open Access in journals sponsored by the China Association for Science and Technology. *Journal of Scholarly Publishing*, 44(4), pp. 373–383. Available at: http://www.utpjournals.press/doi/abs/10.3138/jsp.44-4-005 [Accessed March 25, 2016].

**Sharma, G., 2014.** Transforming Open Access scholarly publishing and scientific delivery: challenges and opportunities in Asian regions. *Research Journal of Information Technology*, 6(4), pp. 413–426. Available at: http://www.scialert.net/abstract/?doi=rjit.2014.413.426 [Accessed March 25, 2016].

**Shen, C. & Björk, B.-C., 2015.** "Predatory" open access: a longitudinal study of article volumes and market characteristics. *BMC Medicine*, 13(1), p. 230. Available at: http://www.biomedcentral.com/1741-7015/13/230 [Accessed January 25, 2016].

**Shieber, S.M., 2009.** Equity for Open Access journal publishing. *PLoS Biology*, 7(8), p. e1000165. Available at: http://dx.plos.org/10.1371/journal.pbio.1000165 [Accessed June 22, 2016].

**Sicilia, M.-A., Sánchez-Alonso, S. & García-Barriocanal, E., 2011.** Comparing impact factors from two different citation databases: the case of Computer Science. *Journal of Informetrics*, 5(4), pp. 698–704. Available at: http://www.sciencedirect.com/science/article/pii/S1751157711000083 [Accessed February 1, 2016].

**Smart, P. & Murray, S., 2014**. The status and future of the African journal. In B. Cope & A. Phillips, eds. *The future of the academic Journal*. Amsterdam: Elsevier, p. [19 p.].

**Solomon, D.J., 2013a.** Digital distribution of academic journals and its impact on scholarly communication: looking back after 20 years. *Journal of Academic Librarianship*, 39(1), pp.23–28. Available at: http://www.openaccesspublishing.org/apc4/final.pdf [Accessed August 31, 2014].

**Solomon, D.J., 2013b.** Types of Open Access publishers in Scopus. *Publications*, 1(1), pp.16–26. Available at: http://www.mdpi.com/2304-6775/1/1/16/htm [Accessed March 9, 2014].

**Solomon, D.J. & Björk, B.-C., 2012a**. A study of Open Access journals using article processing charges. *Journal of the American Society for Information Science and Technology*, 63(8), pp.1485–1495. Available at: http://www.openaccesspublishing.org/apc2/preprint.pdf [Accessed September 3, 2014].

**Solomon, D.J. & Björk, B.-C., 2012b**. Publication fees in Open Access publishing: sources of funding and factors influencing choice of journal. *Journal of the American Society for Information Science and Technology*, 63(1), pp.98–107. Available at: http://doi.wiley.com/10.1002/asi.21660 [Accessed October 4, 2015].

**Solomon, D. & Björk, B.-C., 2016.** Article Processing Charges for Open Access publication: the situation for research intensive universities in the USA and Canada. *PeerJ*, (Aug.), pp.1–19. Available at: https://peerj.com/articles/2264/.

**Solomon, D.J., Laakso, M. & Björk, B.-C., 2013.** A longitudinal comparison of citation rates and growth among Open Access journals. *Journal of Informetrics*, 7(3), pp. 642–650. Available at: http://linkinghub.elsevier.com/retrieve/pii/S175115771300028X [Accessed August 20, 2014].

**Solomon, D., Laakso, J.M. & Björk, B.-C., 2016**. Converting scholarly journals to Open Access: a review of approaches and experiences P. Suber, ed., p. 222. Available at: https://dash.harvard.edu/handle/1/27803834 [Accessed August 20, 2014].

**Sorli-Rojo, Á., 2013.** Revistas españolas de arquitectura, ciencias de la construcción y urbanismo: visibilidad e internacionalidad. *BiD: textos universitaris de biblioteconomia i documentació*, (30). Available at: http://bid.ub.edu/es/30/sorli.htm [Accessed October 1, 2014].

**Sorli-Rojo, Á. & Mochón-Bezares, G., 2014.** "Informes de la Construcción": a bibliometric analysis (2007-2013). *Informes de la Construcción*, 66(536). Available at:

http://informesdelaconstruccion.revistas.csic.es/index.php/informesdelaconstruccion/article/view/3634/4101 [Accessed October 25, 2015].

**Steinberg, P., 2015.** Reclaiming society publishing. *Publications*, 3(3), pp. 150–154. Available at: http://www.mdpi.com/2304-6775/3/3/150/htm [Accessed March 25, 2016].

**Suber, P., 2004.** A very brief introduction to Open Access. Available at: http://legacy.earlham.edu/~peters/fos/brief.htm [Accessed July 25, 2015].

**Suber, P., 2007.** Flipping a journal to Open Access. *SPARC Open Access newsletter*, (114). Available at: http://legacy.earlham.edu/~peters/fos/newsletter/10-02-07.htm#flip [Accessed May 7, 2016].

**Suber, P., 2008.** Gratis and libre Open Access. Available at: https://dash.harvard.edu/bitstream/handle/1/4322580/suber_oagratis.html [Accessed April 16, 2016].

**Suber, P., 2009.** Open Access policy options for funding agencies and universities. *SPARC Open Access newsletter*, (130). Available at: http://legacy.earlham.edu/~peters/fos/newsletter/02-02-09.htm [Accessed April 16, 2016].

**Suber, P., 2012.** Economics. In *Open Access*. Cambridge (Massachussets), London (England): Massachussets Institute of Technology (MIT).

**Suchá, L.Z. & Steinerová, J., 2015.** Journal publishing models in the Czech Republic. *Learned Publishing*, 28(4), pp.239–250. Available at: http://doi.wiley.com/10.1087/20150403 [Accessed February 18, 2016].

**Sun, Y.Y. & Mao, M., 2012.** The current status of the publishing industry in China. In *Scholarly publishing in emerging nations*. University of Toronto Press, pp. 108–118. Available at: https://muse.jhu.edu/login?auth=0&type=summary&url=/journals/journal_of_scholarly_publishing/v041/41.1.sun.pdf [Accessed February 18, 2015].

**Swan, A., 2010.** The Open Access citation advantage: studies and results to date. Available at: http://eprints.soton.ac.uk/268516/6/Citation_advantage_paper.doc [Accessed January 30, 2016].

**Swan, A., 2012.** Policy guidelines for the development and promotion of open access, Paris: UNESCO. Available at: http://www.unesco.org/new/en/communication-and-information/resources/publications-and-communication-materials/publications/full-list/policy-guidelines-for-the-development-and-promotion-of-open-access/ [Accessed July 18, 2014].

**Teferra, D., 2012.** Striving at the periphery, craving for the Centre: the realm of African scholarly communication in the digital age. In A. N. Greco (ed.). *The essential JSP: volume 2: scholarly publishing in emerging nations*. Toronto: University of Toronto Press, pp. 212–224.

**Tennant, J.P. et al., 2016.** The academic, economic and societal impacts of Open Access: an evidence-based review. *F1000Research*, 5, p.632. Available at: http://f1000research.com/articles/5-632/v1 [Accessed June 18, 2016].

**Tenopir, C. et al., 2016.** What motivates authors of scholarly articles? The importance of journal attributes and potential audience on publication choice. *Publications*, 4(3), p.22. Available at: http://www.mdpi.com/2304-6775/4/3/22 [Accessed August 16, 2016].

**Tenopir, C. & King, D.W., 2000.** Toward electronic journals, Washington DC: Special Library Association (SLA).

**Tenopir, C. & King, D.W., 2012.** Trends in scientific scholarly journal publishing in the United States. In *The essential JSP: volume 3: scholarly journals: print, digital, Open Access, and Search Engines*. Toronto: University of Toronto Press, pp. 244–286. Available at: http://utpjournals.metapress.com/openurl.asp?genre=issue&id=doi:10.3138/ejsp.vol3 [Accessed August 16, 2015].

**Tenywa, J.S., 2014.** African research journals: challenges and opportunities. Pp. 37–42. Available at: http://repository.ruforum.org/documents/african-research-journals-challenges-and-opportunities [Accessed August 1, 2015].

**Torrado-Morales, S. & Giménez-Toledo, E., 2012.** British scholarly journals on Film Studies: study and evaluation of their internationality. *Journal of Scholarly Publishing*, 44(1), pp.75–90. Available at: http://utpjournals.press/doi/10.3138/jsp.44.1.75 [Accessed August 28, 2016].

**Torres-Salinas, D. et al., 2010.** Clasificación integrada de revistas científicas (CIRC): propuesta de categorización de las revistas en ciencias sociales y humanas. *El Profesional de la Información*, 19(6), pp. 675–684. Available at: http://elprofesionaldelainformacion.metapress.com/openurl.asp?genre=article&id=doi:10.3145/epi.2010.nov.15 [Accessed March 11, 2014].

**Torres-Salinas, D., Robinson-García, N. & Aguillo, I.F., 2016.** Bibliometric and benchmark analysis of gold Open Access in Spain: big output and little impact. *El Profesional de la Información*, 25(1), (ene./feb.), pp. 17–24. Available at: http://www.elprofesionaldelainformacion.com/contenidos/2016/ene/03.html [Accessed March 11, 2016].

**UNESCO, 2010.** UNESCO science report 2010: the current status of science around the world 2n rev. ed., Paris: UNESCO Publishing. Available at: http://www.unesco.org/new/en/natural-sciences/science-technology/prospective-studies/unesco-science-report/unesco-science-report-2010/ [Accessed January 30, 2015].

**UNESCO, 2015.** UNESCO science report: towards 2030 Rev. ed. 2., Paris: UNESCO Publishing. Available at: http://en.unesco.org/unesco_science_report [Accessed January 30, 2015].

**United States. National Science Board, 2016.** Science & Engineering articles, by global share of selected region/country/economy: 2003–13. Available at: http://www.nsf.gov/statistics/2016/nsb20161/#/figure/fig05-24 [Accessed April 3, 2016].

**Universitat Oberta de Catalunya (UOC), 2013.** High-impact Open Access journals: lists & infographics: Open Access journals listed in the DOAJ with impact factor in the Journal Citation Reports 2011 or SCImago Journal Rank. Available at: http://labs.biblioteca.uoc.edu/test/doaj/ [Accessed April 12, 2014]

**Universitat Oberta de Catalunya (UOC), 2016.** Observatory of High-Impact Open-Access Journals. Available at: http://biblioteca.uoc.edu/en/research/observatory-high-impact-open-access-journals [Accessed April 29, 2016].

**University of California Libraries, 2016.** Pay It Forward: investigating sustainable model of Open Access Article Processing Charges for large North American Research institutions, Davis (CA): University of California LIbraries. Available at: http://icis.ucdavis.edu/?page_id=713 [Accessed April 29, 2016].

**Urdín Caminos, C., 2001.** La edición de revistas científicas en España. In *La edición de revistas científicas: guía de buenos usos*. Madrid: CINDOC, pp. 11–16. Available at: http://hdl.handle.net/10261/4347 [Accessed December 29, 2014].

**Uzun, A., 2004.** Assessing internationality of scholarly journals through foreign authorship patterns: the case of major journals in information science, and scientometrics. *Scientometrics*, 61(3), pp. 457–465. Available at: http://link.springer.com/10.1023/B:SCIE.0000045121.26810.35 [Accessed April 29, 2015].

**Villarroya, A. et al., 2012.** Modelos de negocio de las editoriales de revistas científicas: implicaciones para el Acceso Abierto. *El Profesional de la Información*, 21(2), pp. 129–135. Available at: http://hdl.handle.net/10261/47769.

**Vrana, R., 2011.** Journal publishing in era of economic crisis: A case of scientific journals in the field of social sciences in Croatia. *Library Review*, 60(6), pp. 513–531. Available at: http://www.emeraldinsight.com/10.1108/00242531111147224 [Accessed February 8, 2013].

**Wagner, A. Ben, 2010.** Open Access citation advantage: an annotated bibliography. *Issues in Science and Technology Librarianship*, (Winter). Available at: http://www.istl.org/10-winter/article2.html [Accessed January 30, 2016].

**Walters, W.H., 2007.** Institutional journal costs in an Open Access environment. *Journal of the American Society for Information Science and Technology*, 58(1), pp. 108–120. Available at: http://doi.wiley.com/10.1002/asi.20441 [Accessed June 15, 2016].

**Walters, W.H. & Linvill, A., 2010.** Characteristics of Open Access Journals in Six Subject Areas. *College Research Libraries*, 4, pp. 372–392. Available at: http://crl.acrl.org/content/early/2010/09/14/crl-132.abstract [Accessed June 15, 2016].

**Wang, L., 2015.** The structure and comparative advantages of China's scientific research: quantitative and qualitative perspectives. *Scientometrics*, 106(1), pp. 435–452. Available at: http://link.springer.com/10.1007/s11192-015-1650-2 [Accessed March 25, 2016].

**Wang, L., Thijs, B. & Glänzel, W., 2015.** Characteristics of international collaboration in Sport Sciences publications and its influence on citation impact. *Scientometrics*, 105(2), pp. 843–862. Available at: http://link.springer.com/10.1007/s11192-015-1735-y [Accessed March 25, 2016].

**Ware, M., 2006.** Scientific publishing in transition: an overview of current developments, Bristol: Mark Ware Consulting. Available at: http://www.stm-assoc.org/2006_09_01_Scientific_Publishing_in_Transition_White_Paper.pdf [Accessed September 25, 2015].

**Ware, M. & Mabe, M., 2015.** The STM report: an overview of scientific and scholarly journal publishing 4th ed., The Hague: International Association of Scientific, Technical and Medical Publishers (STM). Available at: http://www.markwareconsulting.com/the-stm-report/ [Accessed March 30, 2016].

**West, J.D., Bergstrom, T. & Bergstrom, C.T., 2014.** Cost effectiveness of Open Access publications. *Economic Inquiry*, 52(4), pp. 1315–1321. Available at: http://doi.wiley.com/10.1111/ecin.12117 [Accessed June 19, 2016].

**Wheatley, S., 2016.** BioMed Central Article Processing Charges. *Sustaining the Knowledge Commons Commons / Soutenir les savoirs communs.* Available at: http://sustainingknowledgecommons.org/2016/03/23/biomed-central-article-processing-charges/ [Accessed March 25, 2016].

**Wu, L. & DongFa, X., 2014.** Academic journals in China: past, present and future. In B. Cope & A. Phillips, eds. *The future of the academic Journal.* Oxford: Elsevier Science. Available at: http://store.elsevier.com/The-Future-of-the-Academic-Journal/isbn-9781843347835/ [Accessed May 25, 2016].

**Xia, J., 2015.** Predatory journals and their article publishing charges. *Learned Publishing*, 28(1), pp.69–74. Available at: http://doi.wiley.com/10.1087/20150111 [Accessed March 25, 2016].

**Xian, J., 2006.** The past, present and future of scientific and technical journals of China. *Learned Publishing*, 19(2), pp.133–141. Available at http://onlinelibrary.wiley.com/doi/10.1087/095315106776387039/pdf [Accessed April 30, 2015]

**Xiao-Jun, H., Zhen-Ying, C. & Hui-Yun, S., 2012**. Chinese scientific journals: how they can survive. *Learned Publishing*, 25(3), pp. 219–224. Available at: http://openurl.ingenta.com/content/xref?genre=article&issn=0953-1513&volume=25&issue=3&spage=219 [Accessed February 8, 2013].

**Yun, Q., 2014.** From communization to commercialization: a brief history of China's publishing, 1949-1992. *Journal of Scholarly Publishing*, 45(2), pp. 142–171. Available at: http://www.utpjournals.press/doi/abs/10.3138/jsp.45.2.003 [Accessed March 25, 2016].

**Zainab, A.N. et al., 2013.** Auditing scholarly journals published in Malaysia and assessing their visibility. *Malaysian journal of library and information science*, 17(1), pp. 65–92. Available at: http://arxiv.org/abs/1301.5379 [Accessed August 24, 2015].

**Zemskov, A.I. & Pavlov, L.P., 2015.** Open Access in Russia: the beginning of a long way. In J. Schöpfel, ed. *Learning from the BRICS: Open Access to scientific information in emerging countries*. Sacramento: Litwin Books, pp. 67–89.

**Zhou, P. & Lv, X., 2015.** Academic publishing and collaboration between China and Germany in physics. *Scientometrics*, 105(3), pp. 1875–1887. Available at: http://link.springer.com/10.1007/s11192-015-1643-1 [Accessed March 25, 2016].

**Ziman, J.M., 1968.** Public knowledge: an essay concerning the social dimension of science, Cambridge: Cambridge University Press.

**Zitt, M. & Bassecoulard, E., 1998.** Internationalization of scientific journals: a measurement based on publication and citation scope. *Scientometrics*, 41(1–2), pp.255–271. Available at: http://link.springer.com/10.1007/BF02457982 [Accessed August 28, 2016].

**Zych, I. & Buela-Casal, G., 2010.** Internacionalidad de las revistas de psicología multidisciplinar editadas en iberoamérica e incluidas en la Web of Science. Universitas Psychologica, 9(1), pp. 27–34. Available at: http://revistas.javeriana.edu.co/index.php/revPsycho/article/view/713 [Accessed November 3, 2014].