Universalism and Particularism: Explaining the Emergence and Growth of Regional Journal Indexing Systems

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I hereby declare that this thesis has not been and will not be submitted in whole or in part to another University for the award of any other degree.

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Doctor of Philosophy in Science and Technology Policy Studies

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SUMMARY

Journal indexing systems (JIS) are bibliographic databases that are used to search for scientific literature and for bibliometric analyses. This thesis addresses the emergence and growth of regional JIS, focusing on the Scientific Library Online (Scielo) and the Red de Revistas Científicas de América Latina, el Caribe, España, y Portugal (RedALyC) in a challenging environment in which the Web of Science (WoS) and Scopus prevail. WoS and Scopus are referred to as mainstream JIS and Scielo and RedALyC as alternative JIS. The research questions are:

(1) Why did alternative JIS emerge in light of the dominance of WoS?

(2) Why do researchers publish in journals indexed by alternative JIS?

The research draws on the concepts of cognitive authority from information science, and universalism and particularism from the sociology of science. A cognitive authority is an information source that is credible. JIS are becoming cognitive authorities in the science communication system. Their credibility relies on their application of objective criteria to select journals (universalism). However, journal selection can be influenced by subjective criteria (particularism). The tensions between universalism and particularism suggest two scenarios for the emergence and growth of alternative JIS. A universalistic view suggests that they emerge to cover journals with low scientific impact and editorial standards. A particularistic view poses that they emerge to cover disciplinary, linguistic, and regional gaps created by biases in mainstream JIS, particularly in the coverage of WoS.

The research questions were addressed through mixed methods to produce quantitative and qualitative evidence. The evidence was obtained from (1) documentary and literature reviews; (2) descriptive and correlational statistics; and (3) a case study that involved interviews with researchers in private and public universities in Colombia in agricultural sciences, business and management, and chemistry.

The findings indicate that disciplinary, linguistic, and geographical biases in the coverage of mainstream JIS motivated the development of Scielo and RedALyC. The reasons for their growth have been conceptualised in this thesis as: (1) training; (2) knowledge-gap filling; and (3) knowledge bridging.

This thesis addresses a significant gap in the sociology of science by studying new authorities in the science communication system. It contributes to debates on universalism and particularism, showing that both are involved in the selection of journals by JIS. It also contributes to understanding how particularism in mainstream JIS can pose barriers to the communication of scientific knowledge that has the potential to address pressing social demands. The findings could contribute to the design of research policy and research evaluation in contexts not widely covered by mainstream JIS.

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During the previous months to my viva I had the opportunity to do a research visit at INGENIO – Universidad Politécnica de València, València, Spain. During this visit I produced two papers derived from my thesis, one of which has been submitted for publication in a relevant journal in the field of research policy. I thank INGENIO's community for welcoming me, especially to Jordi Molas Gallart for supporting my application for an EU-SPRI circulation award that made my visit possible. This award was fundamental to further develop my research, for which I am indebted to EU-SPRI.

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Abbreviations

A&HCI: Arts and Humanities Citation Index

ANSI: American National Standards Institute

ARWU: Academic Ranking of World Universities (ARWU)

BIREME: Latin America and the Caribbean Centre on Health Sciences Information Centre

CLACSO: Latin American Council of Social Sciences

CONICYT: Comisión Nacional Científica y Tecnológica

CvLAC: Curriculum vitae database managed by Colciencias

DOAJ: Directory of Open Access Journals

FAPESP: São Paulo Research Foundation

FOS: Revised Field of Science and Technology

h-Index: citation impact indicator

IDB: Inter-American Development Bank

ISI: Institute for Scientific Information

ISSN: International Standard Serial Number

JCR: Journal Citation Report

JIS: journal indexing system(s)

LATINDEX: Regional Online Information System for Scientific Journals of Latin America, the Caribbean, Spain, and Portugal

OCyT: Colombian Observatory of Science and Technology

OLS: Ordinary Least Squares

PAHO/WHO: Pan-American Health Organisation

QS: Quacquarelli Symonds World University Ranking

RedALyC: Red de Revistas Científicas de América Latina, el Caribe, España y Portugal

REDIAL: European Network for Information and Documentation on Latin America

RES: research evaluation system(s)

SCI: Science Citation Index

Scielo: Scientific Library Online

SPARC: Scholarly Publishing and Academics Coalition

SSCI: Social Sciences Citation Index

THE: Times Higher Education ranking

TOEFL: Test of English as a Foreign Language

UAEM: Universidad Autónoma Del Estado de México

UNCSTD: United Nations Commission on Science and Technology for Development

VIF: variance inflation factor

VINITI: [Soviet] All-Union Institute for Scientific and Technical Information

WoS: Web of Science

Introduction

This thesis examines the emergence and growth of alternative journal indexing systems (JIS) in an international context that is dominated by a mainstream JIS – the Web of Science (WoS). JIS are bibliographic databases that include journal publications and their contents, and make them available to users. They are used as data sources to search for scientific literature, build indicators on scientific production, and assess the fulfilment of journals' editorial standards. Some of these JIS are produced by multinational companies and are extensively used in influential university rankings, scientific performance reports of multilateral organisations, and national research evaluation systems (RES). I refer to them as 'mainstream JIS'. Thomson Reuters' WoS and Elsevier's Scopus are the main examples. In contrast, 'alternative JIS' are supported by public organisations and were started as country or regional initiatives. Although not as influential as mainstream JIS, their geographic coverage is expanding, their infrastructure is improving, and the number of journals and documents covered by them is increasing (alternative and mainstream JIS are discussed further in chapter 1).

The mainstream JIS, WoS, is becoming increasingly important, as it is used to reflect countries' scientific excellence and to produce descriptions of the state of research. This suggests that it has become a *cognitive authority* in science. From an informational point of view, cognitive authorities are people, organisations, or sources of information whose opinions influence what others think (Wilson 1983). RES informed by bibliometrics, which have been adopted by some countries, have elevated the importance of WoS for the academic community and policy-makers. This is because WoS is widely used as a benchmark to evaluate the scientific production of researchers worldwide. Publishing in journals indexed by WoS has come to be synonymous with international quality standards (Lillis & Curry 2010, p. 137). Although Scopus entered the market in 2004 and is gaining ground in the market of mainstream JIS, WoS continues to be perceived by the academic and policy communities as one key 'authority' with the 'power' to identify what matters in science.

It is the apparent cognitive authority of WoS that has motivated me to write this thesis, the aim of which is to explore the emergence and growth of alternative JIS. Specifically, two big Latin American initiatives are the focus of this thesis: Scientific Library Online (Scielo) and Red de Revistas Científicas de América Latina, el Caribe, España y Portugal (RedALyC). These are multidisciplinary JIS that include journals produced in Central and South America, the Caribbean, Portugal, Spain, and recently South Africa. In China there is the Chinese Citation Index, and in some countries, in particular Japan, India, Russia, and Denmark, Finland, and Norway[1] there are new developments towards creating bibliographic and citation indices as well. What may explain the development of these alternative JIS? In this thesis, I have aimed to uncover the reasons through two research questions:

(1) Why did alternative JIS emerge in light of the dominance of WoS?

(2) Why do researchers publish in journals indexed by alternative JIS?

In answering these questions, concepts from the sociology of science and information science are used to conceptualise JIS as cognitive authorities in the communication system of science. This conceptualisation locates JIS within a context in which 'the changing governance of the public sciences … has been accompanied by a rapid increase in the types and numbers of formal organisations involved in the production, coordination and evaluation of public scientific knowledge' (Whitley & Gläser 2012). The findings in this thesis contribute to the understanding of JIS as cognitive authorities in the communication system of science involved in the production and steering of research.

In this introduction, I present an overview of the thesis. First, I discuss the conditions under which alternative JIS have emerged, the literature available,

[1] Indian Citation Index: http://en.wikipedia.org/wiki/Indian_Citation_Index [last accessed 20 June 2016].
Russian Citation Index: http://en.wikipedia.org/wiki/Russian_Science_Citation_Index [last accessed 20 June 2016].
Japanese Periodicals Index: http://en.wikipedia.org/wiki/Zasshi_Kiji_Sakuin [last accessed 20 June 2016].
Nordic cooperation on research publication channels towards a common list: https://dbh.nsd.uib.no/publiseringskanaler/Forside [last accessed 20 June 2016]

and gaps in the study of alternative JIS. Second, I describe the research design, which is based on mixed methods research. Third, I summarise the main contribution of this thesis, and finally I present the outline of the thesis.

The challenging conditions to the emergence and growth of alternative JIS

In Latin America[2], Spain, and Portugal, which serve as the geographical focus of this thesis, RedALyC and Scielo are gaining momentum as information services for scientific research. To start with, they were country-specific initiatives with limited disciplinary scope. Scielo started as a database for medical and health sciences in 1998 and RedALyC started as a database for the social sciences in 2002. Over the last 18 years they have grown to become multidisciplinary and international web services that are supported by a network of organisations. Scielo, for instance, is a distributed system that is maintained by different countries that each host part of the database. The data can be accessed from a single search interface through a server in Brazil. RedALyC is operated through collaboration between international and national organisations such as the Directory of Open Access Journals (DOAJ), the Latin American Council of Social Sciences (CLACSO), and some national research councils. The operation of both Scielo and RedALyC depends on funding from public organisations, universities, and the work of a community of researchers and editors.

What is particularly interesting about Scielo and RedALyC is that they emerged while WoS dominated and have managed to survive despite challenging conditions. Arguably, in the 1990s and early 2000s WoS dominated the market of JIS, with its established reputation as the source for world-class scholarly journals. At the time of the emergence of RedALyC and Scielo, WoS had become the cornerstone of scientific quality control (Guédon 2001; Paasi 2005; Lillis & Curry 2010). This can be seen in national policies that encouraged the publication of papers in journals covered by WoS, particularly in countries such as Chile, Colombia, and Venezuela (Delgado 2011). By directing researchers towards WoS-indexed journals, these policies acted to decrease interest in

[2] Includes Central America, South America, and the Caribbean.

other journals. In the last decade these policies have also encouraged publication in journals covered by Scopus, which has not improved the popularity of journals produced in Latin America, Spain, and Portugal among researchers (Cetto, Alonso-Gamboa & Córdoba González 2010). In addition, Scielo and RedALyC include papers in Spanish and Portuguese at a time when English is regarded as the language of science (Gordin 2015). An important part of the knowledge covered by these JIS is generated in countries that are not considered economic and scientific powers, and in universities that do not appear in the top positions of global rankings.

These conditions are challenging to the emergence and growth of Scielo and RedALyC. Many processes are involved in developing a JIS, such as securing funds, convincing editors to adjust the editorial standards of their journals, building readership, improving technical equipment for databases, developing software, and hiring skilled workers. Much effort is put into the process even though it is uncertain whether the JIS could compete in the information systems market. Despite the challenges, RedALyC and Scielo have managed to grow as complex systems for the communication of scientific research. They are run by scientific and technical committees (Aguado-López et al. 2008; Montanari & Packer 2014, pp. 77–79) which perform regular evaluations for inclusion and continuity of the journals in their databases (Cetto, Alonso-Gamboa & Córdoba González 2010; Vessuri, Guédon & Cetto 2014), organise international editorial workshops (Negrete Rodríguez 2010; Molina Gómez et al. 2011; also see Packer et al. 2014), develop software, publish quantitative reports (López Castañares et al. 2013), and at the same time create new services based on bibliographic data, such as mobile apps and data downloads in XML for automated processing. In summary, RedALyC and Scielo have emerged in parallel to the consolidation of WoS as the dominant JIS. Moreover, they are growing despite the pressure to publish in WoS-indexed journals, while covering papers in non-English languages that are produced in countries that are not dominant in scientific research.

The above suggests that Scielo and RedALyC have gained stability and continuity as information systems, and have continued to grow in a challenging environment. The increasing number of papers and journals included by these

JIS show that researchers are using their journals to publish their findings. At the same time, Scielo and RedALyC are arousing some interest in the bibliometrics[3] literature of Latin America. In this regard, some studies are using Scielo and RedALyC as data sources to perform bibliometric analyses based on their data. These include quantitative publication analyses of institutions (Packer & Meneghini 2006; Babini 2011), journals (Meneghini, Mugnaini & Packer 2006; Huamaní & Pacheco-Romero 2009), disciplines (Rodríguez-Morales & Mayta-Tristán 2009; Peña 2012), and coverage analyses comparing Scielo and RedALyC to Scopus and WoS (Miguel 2011; Aguado-López et al. 2014). The coverage analyses in particular examine the extent to which WoS and Scopus include journals from Scielo and RedALyC, which are used as representative of scientific production in Latin America, Spain, and Portugal.

In addition to their use as data sources, some studies reflect on the achievements of Scielo (Meneghini, Mugnaini & Packer 2006) and RedALyC (Aguado-López et al. 2008) in terms of the web visibility of literature produced in Latin America, Spain, and Portugal, and the editorial quality of journals. In this respect, Cetto, Alonso-Gamboa and Córdoba González (2010) have argued that there has been an improvement in the editorial standards (peer review, internationality of authorship, timeliness, and others) of journals produced in Latin America, Spain, and Portugal driven by the requirements of alternative JIS. However, these authors point out that the shift in editorial quality has not been reflected in an increase of coverage by WoS and Scopus (Cetto, Alonso-Gamboa, & Córdoba González 2010, pp. 5–6). This can make it difficult for journals covered by alternative JIS to be noticed by researchers that rely only on WoS and Scopus for their literature reviews.

Other researchers appear to be optimistic about the role of Scielo and RedALyC in increasing the visibility of non-Anglophone literature. Williams, Bórquez and Basáñez (2008), for instance, argue that there is a rich research tradition in epidemiology that is not searchable through WoS in Spanish- and Portuguese-speaking countries. These include the pioneering studies on Chagas disease by

[3] Some authors talk about ‘scientometrics’ instead of ‘bibliometrics’. Scientometrics encompasses all statistics about science, including bibliometrics (Godin 2006). As the information provided by JIS is bibliographical, I have retained the term bibliometrics.

Carlos Chagas (Chagas 1909), and onchocerciasis by Rodolfo Robles (Calderon 1917[4]). Scielo and RedALyC have the potential to solve the systematic omission of science not published in WoS-indexed journals. A similar view is provided by Vélez-Cuartas, Lucio-Arias and Leydesdorff (2015), who consider Scielo to be complementary to WoS.

Nevertheless, one aspect that has been neglected by the literature mentioned above is the reasons for the emergence and growth of these information systems. In contrast to WoS, about which a comprehensive study has been done regarding its role in scientific communication (Wouters 1999), no similar studies have been done about alternative JIS. There is some information about the history of RedALyC and Scielo which was mainly published by their respective founders at different stages of their development (e.g. Aguado-López 2002; Aguado-López & Rogel 2006; Packer et al. 2014). Moreover, the literature on the coverage mentioned above provides some information about the characteristics of these systems that help to explain their origins and development. However, they do not consistently address the study of alternative JIS. These systems remain neglected in the study of science communication. Specifically, no analysis has been found that focuses on alternative JIS as cognitive authorities emerging and growing in an environment dominated by mainstream JIS. These questions deserve further exploration and answering them is the aim of this thesis.

An implicit factor in the study of alternative JIS is a discussion related to exclusion, represented by the lack of coverage of certain journals by Scopus and WoS. This exclusion is believed to make it very difficult for scientists who publish in those journals to gain a reputation among a wider community of researchers through their research production. This debate appears to be further galvanised by researchers who are increasingly questioning the authority and business models of powerful publishing houses like Elsevier and information companies like Thomson Reuters (Guédon 2001). This perceived disgruntlement has contributed to the creation of initiatives such as the

[4] This is the first report of onchocerciasis in an academic journal, and is based on a presentation by Rodolfo Robles in the “La Juventud Médica” Society in Guatemala.

Scholarly Publishing and Academics Coalition (SPARC) and movements such as 'the cost of knowledge'[5] to counteract them.

SPARC is an initiative to counteract the power of big publishing houses that sell bundles of journals to libraries, charging considerable sums of money for them, even though the libraries might not be interested in some of the journals. By creating this consortium[6], libraries can gain negotiating power and react to commercial pressures and interests in an organised way. SPARC is committed to the development of new business models that will benefit the academic community worldwide.

The 'cost of knowledge' boycotts Elsevier for its practice of charging what are regarded as unfair prices for its journals, which impedes the free exchange of knowledge. Mathematician Tim Gowers began the boycott, and created a web page in which he commits not to publish in, or review papers from, Elsevier's journals. His web page also allows other researchers to do the same and to express it publicly. Other movements and initiatives such as the Open Access initiative could be included here, although the big publishing houses appear to have hijacked the latter initiative by charging academics a fee (Elsevier charges between £1500 and £3000) for publishing under Open Access conditions.

Nonetheless, these movements indicate researchers' growing uneasiness towards the sway of these dominant publishing houses and their JIS, and they have begun to take action in open discussions and protests related to authority, hegemony, and control of the communication system of science. Considering this context of nascent 'rebellion', the questions addressed in this study contribute to expanding research on the changing dynamics of science communication. These changing dynamics are characterised by the involvement of an increasing number of organisations in the production and steering of research, and by the emergence of alternatives such as the new communication channels that are the subject of this thesis.

[5] http://thecostofknowledge.com/ [Last accessed 20 June 2016].
[6] Universities in the USA and some other countries are members of this consortium. See http://sparcopen.org/who-we-are/members/ [last accessed 20 June 2016] for a complete list.

Research design

Understanding the reasons for the emergence and growth of alternative JIS is a complex issue that involves the analysis of different data sources. Some of them are historical accounts and perceptions, and some are quantitative indicators constructed from the data provided by the JIS. Specifically, the JIS' coverage statistics are used to support opinions, interpretations, and arguments by researchers and policy-makers. At the same time, quantitative indicators published in science policy reviews, research papers, and other documents generate discussions and perceptions amongst the readers. Therefore, both qualitative and quantitative data are needed to understand the emergence and growth of alternative JIS. For this reason, a *mixed methods* research approach has been used for this thesis.

Mixed methods research is the integration of qualitative and quantitative evidence in order to achieve a more complete picture of a phenomenon than when using only one approach (Creswell 2014, p. 4). There are different mixed methods research designs; the most commonly used are the convergent parallel model, the explanatory sequential model, and the exploratory sequential model (Creswell 2014, pp. 240–248). In the first model, quantitative and qualitative data are collected during the same stage of research; the data are then compared to produce an integrated interpretation. In the second model, the quantitative data collection precedes the qualitative data collection, and the qualitative data help to further explain the quantitative data. In the third model, the qualitative data collection precedes the quantitative data collection; the qualitative data provide preliminary evidence which is subsequently tested through quantitative methods in a larger population. Given the equal importance of quantitative and qualitative data in answering the research questions, and their complementary nature, the convergent parallel model has been used in this study. Qualitative and quantitative data were collected during the same stage of research, and data from both methods were used in conjunction to answer the two research questions. Qualitative and quantitative evidence helped to corroborate facts and extend findings.

To address the first question, 'why did alternative JIS emerge in light of the dominance of WoS?', a partly descriptive and partly explanatory analysis was

conducted for which literature and documentary reviews were used, as shown in chapter 3. A set of data analyses to corroborate and expand the findings was also performed, and is presented in chapters 4 and 5. Written accounts by founders about their respective JIS were obtained for WoS, RedALyC, and Scielo from literature and documentary reviews. These opinions were analysed to explain the emergence of alternative JIS. In addition, quantitative data analyses were performed on datasets from journals found on Latindex, Ulrich's, Scielo, RedALyC, WoS, and Scopus. A regression was performed to aid the understanding of the rationales of WoS' coverage of journals produced in Latin America, Spain, and Portugal, and a global coverage analysis of WoS and Scopus provided data to support and add to the qualitative evidence. These analyses are explained in chapters 4 and 5.

To address the second question, 'why do researchers publish in journals indexed by alternative JIS?', evidence from a case study of publication patterns of Colombian researchers is presented. This case study involved a programme of semi-structured interviews with researchers from agricultural sciences, business and management, and chemistry in universities and research institutes. In order to corroborate and expand the interviewees' answers, data from their CVs were used to obtain their quantitative publication patterns, and data from Scielo and WoS were used to triangulate their opinions and expand their examples. The analysis is presented in chapter 6. In summary, the two research questions were addressed using both qualitative and quantitative evidence, in particular, by using each type of evidence to corroborate, and expand on, the other type. The specific methodologies and internal validation of the analyses are described in chapters 4 to 6.

Main contribution of this study

The study of alternative JIS contributes to the sociology of science. This body of literature has focused mainly on the study of science communication as an autonomous system of certification and diffusion of knowledge in which scientific authority provided by peers prevails. However, in a context in which scientific recognition is being increasingly formalised (Whitley & Gläser 2007; 2012) other authorities are becoming more influential in these processes. JIS are one of them. Studying JIS as cognitive authorities embedded in the

communication system of science contributes to expanding the sociology of science literature. Specifically, the study of alternative JIS provides insights into a neglected but important subject, namely, the emergence and growth of alternative communication channels for scientific research. The study of alternative JIS connects with wider debates in the sociology of science about the objectivity of appraisals of scientific research – universalism – and the effects of biases – particularism – in the dissemination of scientific research. The concepts that serve as a framework to answer the research questions are further described in chapter 2. The insights provided by this framework, and the qualitative and quantitative analyses are further discussed in chapter 7.

Outline of the thesis

Chapter 1. Mainstream and alternative JIS in the production and steering of research

This chapter uses examples that demonstrate that WoS and Scopus are widely used in influential rankings, research assessments, and in policy overviews that have an impact on the production and steering of research. In contrast, Scielo and RedALyC have a less salient role in these processes. The extent of their use and influence helps to differentiate between mainstream JIS and alternative JIS. The chapter provides elements to understand JIS as authorities in the production and steering of research. This understanding is further developed in the conceptual framework in chapter 2 below.

Chapter 2. Conceptual framework

This chapter combines concepts from the sociology of science and information science to explain the emergence and growth of alternative JIS. The concept of cognitive authority, which refers to a source of information with credibility in its knowledge domain (Wilson 1983), is borrowed from information science, while the concepts of universalism and particularism (Merton 1973b, pp. 270–272) are borrowed from the sociology of science. Universalism is the appraisal of scientific contributions on objective criteria, and particularism is the appraisal of scientific contributions on subjective criteria such as race, religion, or nationality of the knowledge producer. To examine the research questions of this thesis,

this chapter shows how cognitive authority binds together the concepts of universalism and particularism.

Chapter 3. Two initial explanations for the emergence of alternative JIS

This chapter contains a literature and documentary review of documents mainly produced by the founder of WoS, Eugene Garfield, the founders of Scielo, Abel Packer and Rogerio Meneghini, and the founder of RedALyC, Eduardo Aguado. The documents suggest two explanations for the emergence of alternative JIS. The first, based on Garfield's view, is that they emerged to cover journals that do not fulfil the scientific impact and editorial standards required by WoS. These are mainly timeliness, peer review, openness of the editorial board, international authorship, and citation impact. The second explanation, supported by documents written by the founders of Scielo and RedALyC, is that they emerged to counteract biases in the coverage of WoS. This means that the exclusion of journals based on characteristics such as country of publication, language, and discipline motivated researchers to start their own JIS. These two initial explanations are further examined quantitatively in chapters 4 and 5.

Chapter 4. Universalism and particularism in the selection of journals by WoS

This chapter tests the two competing explanations for the emergence of alternative JIS: the first is that they emerged to cover journals that do not fulfil the scientific impact and quality standards of WoS; the second is that they emerged to counteract linguistic, geographic, and disciplinary biases in its coverage. In order to analyse the evidence in support of the two explanations, the relationship between coverage by WoS and universalistic and particularistic variables of the journals has been tested. The universalistic variables are peer review, external authors, openness of the editorial board, timeliness, abstract and keywords in two languages, citation impact indicator (h-Index), and age of the journal. The particularistic variables are country of journal publication, language, and discipline. A logistic regression has been done on a set of journals produced in Latin America, Spain, and Portugal to test the relationship between coverage by WoS and universalistic and particularistic variables of the journals.

Chapter 5. Geographical, disciplinary, and linguistic coverage of mainstream JIS and its relationship to alternative JIS

This chapter extends chapters 3 and 4 by providing a global contextualisation of the findings in those chapters. It positions the emergence of alternative JIS with respect to the global coverage of WoS and Scopus. The extent of the concentration of the journal coverage of WoS and Scopus and the exclusion of other journals from these mainstream JIS is described. Analyses have been conducted on countries, disciplines, and languages of the journals covered, paying special attention to the position of journals produced in Latin America, Spain, and Portugal – regions covered by Scielo and RedALyC – as compared to other regions in the world.

Chapter 6. Reasons to publish in journals covered by alternative JIS

This chapter examines researchers' publishing patterns and the reasons behind these patterns, and presents their perceptions on the role of alternative JIS for their research. It is the result of a case study conducted in Colombia, which is a country whose journals are poorly covered in WoS. Additionally, the national science policies in this country encourage the publication of papers in WoS-indexed journals. While the number of papers by Colombian researchers is increasing in WoS-indexed journals, Colombia ranks third in terms of the number of journals covered by Scielo and RedALyC. These contrasts make Colombia an interesting case for this thesis. The information analysed in this chapter yields further insights into the growth of alternative JIS.

The main data source for this chapter is a set of interviews with researchers from the fields of agricultural sciences, business and management, and chemistry working for different universities and research institutes. The interviews were analysed through the use of the thematic analysis method (Braun & Clarke 2006). In addition to the interviews, the analysis of the researchers' CVs and data obtained from WoS and Scielo helped to corroborate and better understand their explanations. I found eight reasons why researchers publish in alternative JIS-indexed journals. These reasons are discussed in chapter 7.

Chapter 7. Discussion

Chapter 7 combines the insights from chapters 3 to 6 to answer the research questions, linking them to wider debates in the literature of the sociology of science about universalism and particularism. The empirical evidence produced for the research question 'why did alternative JIS emerge in light of the dominance of WoS?' is relevant and provided some observations for the wider issue of the use of JIS for the appraisal of scientific research and scientists. Importantly, the eight reasons for the growth of alternative JIS presented in chapter 6 have been summarised into three main reasons for the growth of alternative JIS in this chapter. The reasons provide insights into the debate on the effects of particularism on the diffusion of scientific research. Additionally, this chapter discusses policy implications of the findings for policy-making, specifically for research evaluation. It also presents suggestions by the researchers interviewed on future directions for alternative JIS.

Chapter 8. Conclusion

This chapter summarises the theoretical and empirical insights of this thesis and its policy implications. It also discusses some limitations of this study, mainly regarding the scope of the empirical results and the limitations concerning inference of causality. The chapter concludes with suggestions for future research.

Chapter 1. Mainstream and alternative JIS in the production and steering of research

1.1 Introduction

The aim of this chapter is to describe the functions of JIS and some of the processes in which they are used, showing that certain JIS have gained a reputation as sources for identifying what matters in science in the world. This makes them influential in the production and steering of research. Through a differentiation between mainstream and alternative JIS, I argue that JIS can be regarded as cognitive authorities on science communication in an environment of increasing appraisal of scientific research by organisations outside the peer-review system[7].

The JIS I analyse in this thesis are WoS, Scopus, RedALyC, and Scielo. WoS is composed of three databases known as the Science Citation Index (SCI), the Social Sciences Citation Index (SSCI), and the Arts and Humanities Citation Index (A&HCI)[8]. These indices started to be developed in 1964 by Eugene Garfield, and are now owned by Thomson Reuters. For 40 years, WoS was the only multidisciplinary citation database in the world. Scopus is a JIS offered by Elsevier, and it entered the market in 2004. Its coverage has outgrown the coverage of WoS and it is currently the largest citation database. Scielo is a publicly funded JIS that started in 1998 in Brazil. RedALyC is also publicly funded and started in 2002 in Mexico. Scielo and RedALyC started as JIS for medical and health sciences and the social sciences, respectively, but have expanded their coverage to all other disciplines. Geographically, these JIS are focused on Latin America, Spain, and Portugal. However, they are expanding to other countries. Scielo, for instance, is being implemented in South Africa and there are plans to include India in the initiative (Van Noorden 2013).

[7] Although JIS are systems run by organisations, they have come to be considered as organisations in their own right, and therefore in this thesis I have frequently treated them in this manner.

[8] WoS has changed its composition since I started this thesis. Currently it includes conference proceedings, books, and other databases. Its use, however, has been mainly focused on the three citation databases (Wouters 1999). As this thesis is on JIS, and the main use of WoS continues to be related to journals and their papers, I refer to WoS as composed of the SCI, SSCI, and A&HCI.

In section 1.2, I describe the functions of JIS. In section 1.3, I show some of the uses of JIS that influence the production and steering of research. In section 1.4, I differentiate between mainstream and alternative JIS. This differentiation provides a starting point for the understanding of JIS as cognitive authorities for the communication of science, which will be further analysed in the next chapter to produce a framework for this research.

1.2 Functions of JIS

JIS are bibliographic data sources that were created primarily with the aim of offering a selection of journals and their contents to the scientific community. JIS are catalogues that play the role of an index of available literature: they identify bibliographic references, list them in a suitable format for citation, show their location, and allow the search for, and identification of, literature according to criteria defined by researchers such as title, subject, and author (Hagler 1997, p. 13). One function of JIS, then, is to provide information about documents and make it available to users through search interfaces. This function enables a second related function: the construction of quantitative indicators on publications. A third function of JIS is the assessment of journals for inclusion in their collections. Based on these functions JIS gain power over information on scientific production, and in this section, I describe the functions of JIS that are related to this power.

According to Wilson (1968), information systems such as JIS have two kinds of power derived from their functions. The first is ‘descriptive power’ – the power to list references satisfying certain criteria. This kind of power is regarded as ‘evaluatively neutral’ (Wilson 1968, p. 23), because it requires only the compilation of references without judgements of their value or utility for the user. The second kind of power is ‘exploitative power’ (Wilson 1968, p. 22), which is the ability to evaluate knowledge, differentiating the relevant from the irrelevant. The descriptive power of JIS can be seen in their function as information retrieval instruments. Their exploitative power can be seen in two connected functions: these are indicators construction and assessment of journals for inclusion in their databases. Below the three functions of JIS are described.

1.2.1 Information retrieval

From a technical perspective, information retrieval is the primary goal for which JIS were initially developed. This function includes the transformation of documents into bibliographic records, their further processing to organise them into collections (thematic, alphabetic, etc.), and the availability of search interfaces to allow a user to locate content. In order to identify a document, an agreement on the attributes that best represent it is required: author, subject, year of publication, number of pages, title, and abstract are some of the most common attributes of a document. Based on the fields that describe a set of documents, JIS offer, in theory, the possibility of identifying every document fulfilling the search criteria.

As information retrieval tools, JIS started from compilations of lists organised by subjects and other criteria (Clapp 1954), and it was not until the availability of punched cards, and the improvement in computer processing capacity, that automated searching was possible (Herner 1984). This increased the stock of data and the search speed of information services in an unprecedented manner. There has been an improvement in query parsing, from the command line to sophisticated online search interfaces, filtering, friendliness of the systems, availability of data for download and analysis, and speed of searches – all supported by computing systems and the internet.

1.2.2 Indicators construction

Information retrieval is the basis for the production of quantitative indicators. JIS are very successful in implementing services derived from this basic search functionality. The services they offer have to do mainly with analytical tools, which have been adopted for the evaluation of scientific research, scientists, universities, and other organisational units in terms of research productivity. Based on the data provided by JIS, a user can generate a series of quantitative indicators to make comparisons and produce reports. For instance, a user can obtain the number of documents per researcher of a country, or the number of citations to the papers published by a university over time.

1.2.3 Assessment of journals for inclusion

The assessment of journals for inclusion consists of examining if a journal fulfils the criteria required to be included in a JIS. Usually, a committee assesses the editorial standards of journals for their inclusion: timely publication, composition of the editorial board, compliance with peer-review processes, and diversity of authorship, among others. This process implies excluding some journals. For instance, JIS may implement filters to exclude journals that publish similar papers to other journals in their collection. They may also filter out non-scientific publications such as manuals and technical literature, or publications of lesser interest because of their inferior scientific quality.

The three functions described above relate JIS to the description and evaluation of scientific research: information retrieval allows JIS to provide descriptions of documents; indicators construction allows JIS to be an important source of quantitative reports on publications; and the assessment of journals for inclusion allows JIS to add a second layer of validation on top of the peer-review system of the journals. This means that the descriptive and exploitative powers of JIS represented in these three functions can influence different processes for the production and steering of research. Below I show some of these processes.

1.3 JIS in the production and steering of research

In section 1.2, I showed that JIS have descriptive and exploitative powers over information in scientific publications. These powers allow them to be used as data sources for descriptions and evaluations of scientific research. JIS are directly or indirectly used in the selection of literature by researchers, the distribution of funds, the certification of publication venues, the support of science policies, and the production of rankings, among others. These processes are fundamental to the production and steering of research. In this section I argue that through their use in research evaluation systems, rankings, and policy documents, JIS impact the production and steering of research. In other words, JIS have acquired cognitive authority. To reiterate, a cognitive authority is a person, organisation, or information source whose opinions influence what others think (Wilson 1983). Within the knowledge domain of scientific communication, JIS provide information to researchers and policy-

makers which enables them to do literature reviews, describe and analyse the state of scientific research through publication indicators, and evaluate the quality of journals. This is especially seen in the use of WoS and Scopus in global rankings. Their influence can be seen also at the level of journals and researchers, who are using them as mechanisms to indicate reputation and quality.

The evaluation of science has passed from the peer-to-peer appraisal conducted internally in the different disciplines to formalised procedures in order to make science accountable to wider society (Whitley 2007). In particular, RES, rankings, and demands from transnational organisations have actively encouraged the development of indicators to account for the scientific productivity of countries, universities, and researchers. As a result, the formal evaluation of science and its management has gained a place in the research process, becoming part of what researchers have to take into account when writing proposals, making publishing decisions, and in other instances. From a more general perspective, JIS as cognitive authorities are located between a policy discourse based on research productivity, and a scientific discourse based on reputation and contribution to human knowledge, with rigorous quality standards. This section focuses on the uses of JIS as cognitive authorities at the intersection between policy and research.

1.3.1. JIS in RES

RES are ‘organised sets of procedures for assessing the merits of research undertaken in publicly funded organisations that are implemented on a regular basis, usually by state or state-delegated agencies’ (Whitley 2007, p. 6) which operate usually at the national level. RES are based on criteria for assessment of research with an emphasis on the quantity and quality of scientific production through appraisals of research papers. A variety of countries including the UK, Brazil, Australia, and Colombia have developed frameworks to measure scientific productivity in order to make, and justify, research funding decisions.

RES can employ different evaluation methods, but one that is increasingly being used worldwide is the bibliometric method (Gläser & Laudel 2007). In the case of RES, bibliometrics is used to produce quantitative indicators to measure

scientific activity through publications. Bibliometrics makes extensive use of JIS in order to gather information for the construction of indicators, and this is reflected in different RES. In Brazil, for instance, the score of a paper is related to the JIS in which the journal is covered. The Brazilian Qualis system is based on a classification of journals in which indexing is an important part of their assessment (Frigeri 2012, p. 15, p. 63). The Colombian system is similar to this model. Charum (2004) published a categorisation of JIS that has been used as the basis for ranking journals, papers, and researchers for the purposes of deciding on public funding in that country. At the disciplinary level in management and business studies Australia has compiled and ranked a list of journals in which the citations provided by WoS are part of the assessment criteria. In other countries, for example Canada and the USA, the impact factor available through WoS is being used for 'rank, tenure, and funding' (Brumback 2009, p. 260), albeit not formally implemented at the national level. In Finland, the impact factor has been used to decide on public funding for health research and hospitals nationally (Adam 2002). Bibliometrics is not the only type of indicator taken into account by all RES, but the above examples illustrate that when bibliometrics is used JIS can be expected to play a role in the evaluation of scientific research. This extends to universities that implement incentive schemes based on publications.

The fact that JIS play such an important role in the formal evaluation of scientific productivity translates into power to steer research. In the UK, Martin and Whitley (2010) have shown that the UK Research Assessment Exercise[9] has produced strategic adaptive behaviours of scientists that do not always correspond with an increase in research capabilities. Based on a compilation of analyses of RES, Whitley has commented that RES 'make researchers aware of competition with others'. He has also listed other consequences arising out of the use of RES:

[9] The UK's Research Assessment Exercise is significant because it was one of the first formal research assessments, and also one of the first to link the assessment outcomes to funding for universities (Martin & Whitley 2010).

> evaluation criteria for quality in one field tend to be imposed; researchers tend to adapt to mainstream, rather than to innovative approaches; organisations tend to invest less in risky projects, inhibiting the development of new fields; [RES also] strengthen the formation of elites that concentrate the majority of resources, like people and funds (Whitley 2007, pp. 11–12).

The impact of RES in the shaping of research is a means by which JIS influence the production and steering of science at the national level.

1.3.2 JIS in rankings

International rankings are another kind of evaluation of research that influence policies and perceptions of science. University rankings in particular are used by universities to attract prospective students to their programmes. In a sense, rankings translate the idea of academic quality into a unidimensional scale conceived as a competition to be highly ranked[10]. This makes rankings suitable for advertisement of universities and their programmes. Because of the standing of these rankings, universities make huge efforts to appear in top positions, in some cases changing their research policies (Hazelkorn 2015). One of the aspects that university rankings take into account is research performance, and some of the performance indicators are drawn from JIS. Due to the connection between JIS, indicators on research performance, and rankings, JIS also have an influence on the public perception of the research quantity and quality of universities.

The use of JIS in rankings can be seen in three examples: the *Times Higher Education* ranking (THE), the QS World University Ranking (QS), and the Academic Ranking of World Universities (ARWU). The latter is also known as the Shanghai Ranking. The THE is published by British magazine *Times Higher Education*, and measures a set of indicators including on teaching and research. Citations and number of papers per academic staff member make up 36% of the 2016 THE ranking[11]. The QS ranking is published by Quacquarelli Symonds, a company that specialises in information about higher education; in

[10] Multidimensional rankings are now being constructed (Vught & Ziegele 2012).

[11] https://www.timeshighereducation.com/news/ranking-methodology-2016 [last accessed 20 June 2016].

this ranking, citations account for 20%[12] of the overall score of a university. The Shanghai Ranking is produced by the Centre for World-Class Universities of the Shanghai Jiao Tong University in China. In this ranking, indicators on highly cited researchers and number of papers published by the academic staff of a university account for 40% of the ranking[13]. The three rankings use either WoS or Scopus to produce indicators on research performance.

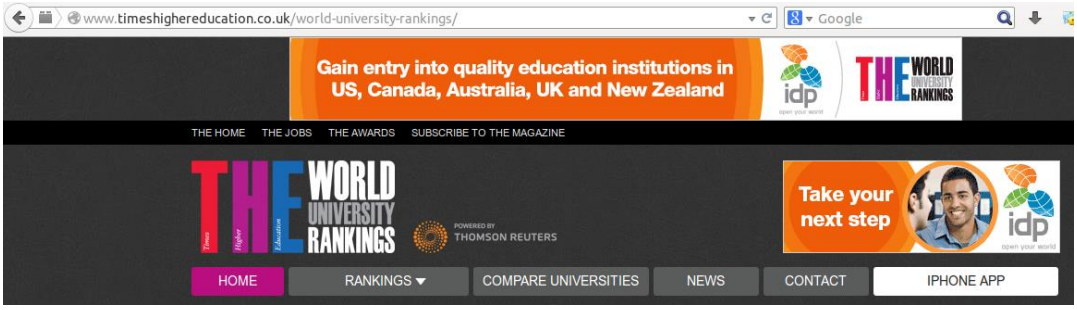
The use of JIS for rankings implies that the indicators produced for a single university will differ depending on the journal coverage of the database used; the wider the coverage, the more likely it is that indicators will show a higher performance of certain universities. At the same time, universities that publish in journals not covered by the JIS used will not have a research performance indicator. In this sense, the data offered by the coverage of JIS constrains the indicators produced, and this in turn impacts upon the scores given to universities. The use of JIS on rankings may therefore impact upon the reputation and public perception of universities. For this reason, the companies behind the rankings 'certify' the quality and comprehensiveness of their data by showing their links with JIS.

The use of JIS as certification mechanisms can be seen in the case of the THE and QS rankings. The two companies responsible for the rankings used to produce a joint ranking called the THE–QS ranking until 2009. At that time, the ranking used WoS as its data source, but after the companies split THE stayed with WoS and QS started using Scopus. The JIS effectively equate to certification of the quality and comprehensiveness of the data. This can be seen in the advertisement of the QS and the THE rankings. While QS advertises the use of Scopus, THE advertised WoS for its 2015 university ranking through the strapline 'powered by Thomson Reuters' (figure 1.1). The relevance of this is that it shows that rankings pay attention to JIS and promote them as the most accurate data sources for their results. Correspondingly, JIS advertise the rankings in which they are used as proof of their credibility. In figure 1.2 it can

[12] http://www.topuniversities.com/university-rankings-articles/world-university-rankings/qs-world-university-rankings-methodology [last accessed 20 June 2016].
[13] http://www.shanghairanking.com/ARWU-Methodology-2015.html#2 [last accessed 20 June 2016].

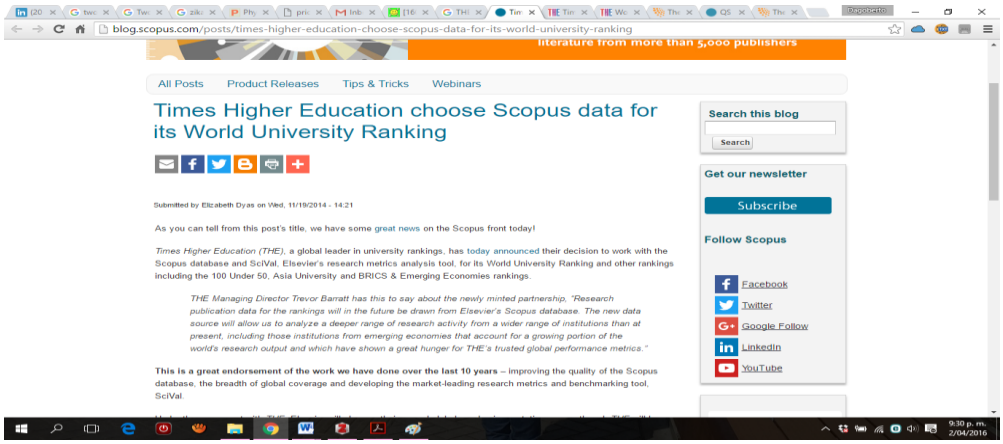
be seen that Elsevier celebrates the decision by THE to use Scopus instead of WoS for its 2015 university ranking[14].

Figure 1.1 THE's 'powered by Thomson Reuters' (2015)



Source: THE World University Rankings 2015

Figure 1.2 Elsevier announces that the THE ranking has chosen Scopus as its data source



Source: Scopus 2014

As can be seen, JIS are used in global university rankings. Specifically, the examples have shown that WoS and Scopus participate in important global rankings that influence the reputation of universities. The information built on the data of WoS and Scopus therefore helps to determine the positions of universities in these rankings; they are used to measure their research performance. Given the importance of rankings for the reputation of universities, the producers of rankings advertise WoS and Scopus as trusted bibliographic

[14] Recently, Thomson Reuters (the producer of WoS) started its own university ranking. See http://stateofinnovation.thomsonreuters.com/the-worlds-most-innovative-universities [last accessed 20 June 2016].

sources to show that they use reliable data. At the same time, these JIS advertise that they are used in these well-known rankings to show that they are considered to be reliable sources. This was seen in the case of Scopus, but WoS has used similar advertisements.

1.3.3 JIS in policy documents

Public policy-making is another domain in which JIS have an important presence. Basically, JIS are used to produce 'information about research [that] is translated into strategic knowledge for policy decisions' (Gläser & Laudel 2007, p. 101). In science policy, bibliometric indicators based on the data provided by JIS are usually translated into proxies for scientific impact or quality (Glänzel et al. 2006, p. 268). In order to measure the progress of countries in this regard, some organisations provide indicators, based mainly on WoS and more recently on Scopus, against which progress can be assessed. These indicators become embedded in the way policy-makers look at science, shaping research policies and orienting research publication goals. The use of WoS and Scopus to provide these indicators can be seen in international, national, and regional policy-relevant documents in which the number of publications indexed by them is considered as a proxy for scientific progress.

UNESCO's retrospective (Lemarchand 2010, p. 65) and prospective (Schlegel 2015, p. 35) documents on science and technology, and some of OECD's science and technology country reviews (OECD 2014), are examples of their use. In these documents different countries are compared over time on the basis of their production of papers and citations received according to WoS or Scopus. These data sources, then, provide representations of global research performance and help to evaluate past trends and future expectations. Therefore, through their use in policy-relevant documents, JIS influence the representations of science that are taken as evidence for policy-making.

1.3.4 JIS in the certification of journals

The uses of JIS in RES, rankings, and policy-making are reflected in the uses made by journals and researchers. Scientists use JIS, directly or indirectly through their libraries, to search for references for their research. The indicators produced by JIS are part of international university rankings, RES, and policy

documents which serve as a means to attract students. In this way, the lists provided by JIS can be perceived by academic managers or researchers as a way to identify the venues in which it is desirable to publish. Indeed, various evaluation agencies only count as valuable those articles published in some JIS (e.g. in Spain's Sexenio[15]).

As mentioned in 1.2.3, one of the functions of JIS is to assess journals for inclusion in their collections. For a journal, not being included could send the message to potential authors and readers that it does not fulfil the quality standards to be considered for publication. This implies that the papers published in it do not count for RES, rankings, or policy-makers. Being included, then, is an indication that the journal has fulfilled the standards required by the JIS. For this reason, many electronic journals have a link under the label 'abstracting and indexing' to show their inclusion in JIS. This helps them to send the message that they are reliable journals. Other journals are starting to use the logos of different JIS in their web pages for the same purpose, as can be seen in figure 1.3.

Figure 1.3 Example of the layout of a journal including the JIS that cover it

Source: Revista Latinoamericana de Psicología 2015

JIS, therefore, are used as signalling mechanisms by journals to show potential authors and readers that they comply with standards. In this way JIS act as third parties for certification, but at the same time they gain 'visibility' by being listed in the web pages of journals. This was also seen in the example of rankings, in

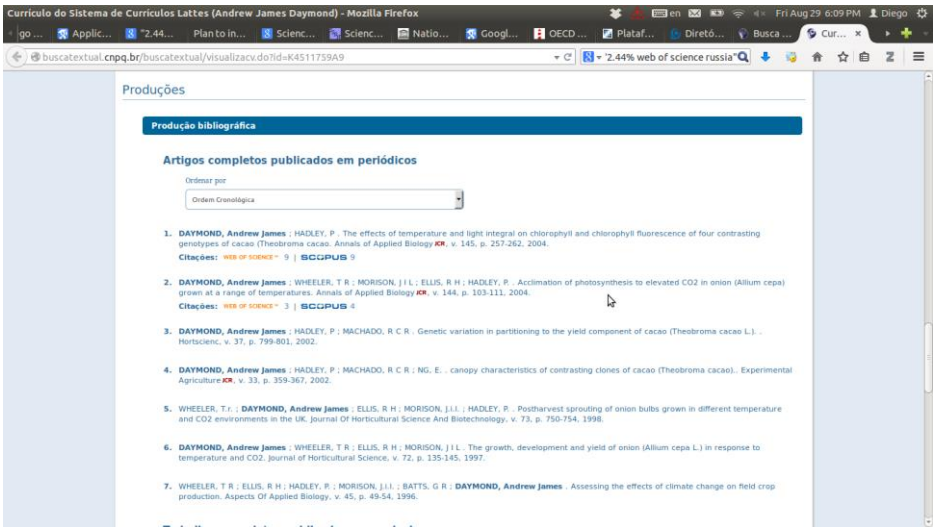
[15] Sexenio is a research assessment exercise for tenured academics linked to the process for awarding salary increases. It is based on their publications (Rafols et al. 2016).

which both JIS and rankings advertise their partnership. Recently conferences have been following a similar strategy to journals. An increasing number of calls for papers start with the word ‘Scopus indexed conference’, ‘Thomson Reuters’, etc., in order to grab the interest of researchers.

1.3.5 JIS in the certification of papers and researchers

Researchers have also started to use JIS as a means of adding weight to their publications. In Colombia, Mexico, and Brazil it is not uncommon to hear comments such as ‘I have three ISIs[16] and two Scopuses’ when researchers compare their publication records. I have also found CVs in which the publications are listed according to the JIS in which they appear. At least in the layout, they give more visual salience to the JIS than to the journal. This means that JIS are used by researchers to effectively certify their publications. At a more aggregated level, in Brazil the national system of CVs of researchers (CvLattes) includes the logo of the JIS covering each paper of the researcher, with a link to the JIS. This reinforces the idea that JIS can certify the papers produced by researchers. Figure 1.4 shows an example.

Figure 1.4 Example of a CV generated by the CvLattes system with links to JIS



Source: CvLattes Brazil 2015

[16] ISI stands for the Institute for Scientific Information, which was the company that used to produce WoS. Researchers still refer to WoS by using the name of this company.

The idea that a JIS can certify journals and papers is augmented by the fact that some JIS give awards to scientists for being cited. In Colombia, Mexico, Russia, China, and other countries, Elsevier organises an event to award the most cited scientists of the country according to its JIS (Scopus)[17]. Other ways in which JIS are promoted is by compiling lists of highly cited researchers, as in the case of WoS. The awards by JIS make them become not only certification authorities, but also judges and promoters of the scientific performance of researchers, organisations, and countries. This shows their involvement in the different processes of production and steering of science that use information on scientific publications.

In summary, JIS are increasingly being used as cognitive authorities for RES, rankings, and policy documents. At the same time, they are being used by journals and researchers in order to show the certification of scientific knowledge. Through their use, JIS have effectively become certification mechanisms to endorse journals, papers, and researchers, participating in the production and steering of research. In these processes, WoS and Scopus play an important role. Other JIS, such as RedALyC and Scielo, either are not used or are less influential in these processes. The next section examines these differences to give a context for the emergence and growth of alternative JIS.

1.4 Mainstream and alternative JIS

In the previous sections I have shown that JIS have two kinds of power: descriptive and exploitative. These powers are reflected in the search possibilities offered by them, the indicators built on their data, and their use in the assessment of journals. These three functions, especially the latter two, allow them to be used in RES, rankings, policy documents, and in the certification of journals and research. In this way, JIS are used as cognitive authorities to provide descriptive and evaluative information for the processes of production and steering of research. WoS and Scopus in particular are widely used in these processes. However, not all JIS have the same reputation and influence. In this section I show a differentiation between JIS based on their

[17] https://www.elsevier.com/solutions/scopus/promo/scopus_awards_romania/award-1 [last accessed 20 June 2016].

influence on the production and steering of research through the categories ‘mainstream JIS’ and ‘alternative JIS’.

Mainstream refers to the ‘chief direction or trend of a system of theories, developments, etc.’ (*Cambridge dictionaries online* 2016). As an adjective, mainstream is applied to the characteristics of principal or dominant groups or movements, as in ‘mainstream politics’ or ‘mainstream culture’. As shown in section 1.3, the functions of WoS and Scopus make them influential on a large scale in processes related to the production and steering of research. In addition, WoS and Scopus belong to powerful companies. WoS is offered by Thomson Reuters, a group that manages a wide range of information services including news, financial information systems, and business intelligence, among others (Thomson Reuters 2016). Scopus is produced by Elsevier, the biggest publishing company of scholarly literature in the world, with more than 3,000 journals[18]. It is also an information company that produces information in the fields of health, education, and engineering, among others (Elsevier 2016). Because of their influential position supported by the resources of powerful multinational companies, Scopus and WoS can be considered mainstream JIS.

The reputation of WoS and Scopus has grown along with their use in the production and steering of research. It can be argued that there is a perception that the journals covered by them are representative of the most important science in the world, or ‘mainstream science’ (Guédon 2001, pp. 19–23). WoS has been particularly dominant in this sense. From 1964 up to 2004 (at which point Scopus entered the market), it was used as the main data source for global citation analyses. Along with the spread of the use of bibliometrics, the reputation of WoS has been extended (Wouters 1999, pp. 131–163). WoS has been used to provide objective representations of science for descriptive and evaluative purposes, becoming the yardstick for the appraisal of scientific research.

The association by researchers of WoS as the most important science in the world can be observed in the bibliometrics literature. Derek de Solla Price, considered the father of bibliometrics, used the SCI to build the foundations of

[18] https://www.elsevier.com/journals/title/all [last accessed 20 June 2016].

the field. In his 1965 paper, Price opened up the possibilities of analysis of this JIS by examining the citation network of scientific papers. One of his observations was that most of the journals in the world were 'distant noise' isolated from 'the research front' (Price 1965, p. 512, p. 515). His observation was based on the low probability that papers in journals outside SCI received a high number of citations from journals in the SCI (Price 1965, p. 515). In a similar way, many bibliometricians regard journals included in WoS as mainstream, attributing to them a higher importance than to journals excluded from it (Arunachalam & Manorama 1988; Arunachalam 1995; Nagpaul 1995; Regalado 2010; Lemarchand 2012). Although other researchers are critical of this approach (Davis & Eisemon 1989; Spagnolo 1990; Sancho 1992; Tijssen 2007; Özkazanç-Pan 2012; Vessuri, Guédon & Cetto 2014), the identification of WoS with 'mainstream science' continues, and further identifications have started to appear. For instance, Lillis and Curry (2010) have found that WoS is also being used as a proxy for 'international science'.

The existence of mainstream JIS implies the existence of non-mainstream JIS, which are referred to as alternative JIS in this thesis. Their influence on the production and steering of research is not as strong and extensive as the influence of mainstream JIS as explained below. Additionally, their funds do not come from big multinational companies, but from public institutions and universities committed to their development. Scielo and RedALyC are two of the biggest initiatives of this type. According to the Ranking of Web Repositories, these JIS are among the top 15 in the world in size (number of web pages), links received, and number of papers retrieved from Google Scholar[19]. Currently Scielo receives most of its funding from the São Paulo Research Foundation (FAPESP) and from Brazil's National Council for Scientific and Technological Development. RedALyC is mainly funded by the Universidad Autónoma del Estado de Mexico. Both Scielo and RedALyC benefit from the coordinated work of higher education institutions and other organisations from different countries for their development. Scielo is a distributed system. Each journal is responsible for the formatting of its own articles, which are evaluated for inclusion by

[19] http://repositories.webometrics.info/en/top_portals?sort=asc&order=World%20Rank [last accessed 20 June 2016].

scientific committees comprising researchers and librarians from different organisations. All country databases are searchable through a web service located in Brazil. RedALyC has a more centralised scientific committee, but it constantly holds other meetings in which criteria for inclusion of journals are agreed. Both Scielo and RedALyC organise workshops in which editors and policy-makers of the region interact in order to improve the editorial standards and plan avenues for their development (Aguado-López & Rogel 2006; Packer & Meneghini 2014). The public funding received by these JIS, the extent of their influence on the production and steering of research and the participation of a community in their development differentiates Scielo and RedALyC from WoS and Scopus. In this sense, Scielo and RedALyC can be considered alternative JIS.

As mentioned, the influence of Scielo and RedALyC in the production and steering of research is not as strong and extensive as the influence of WoS and Scopus. This is not to say that they are not taken into account in some research assessment exercises, rankings, and policy documents. Scielo is used in the research assessment exercise of Brazil as an indicator of quality for journals, especially in education (Frigeri & Monteiro 2014, p. 305). RedALyC is taken into account in the assessment of researchers in Mexico in some areas such as the arts and humanities (CONACYT 2016). Scielo and RedALyC are also accepted as part of the quality indicators for including journals in the Mexican Index of Scholarly Journals (CONACYT 2014), and in Chile they are used in some disciplines to evaluate the quality of researchers who submit applications for funding (CONICYT 2015). They are also used in Colombia for the calculation of scores for the assessment of research groups in all disciplinary areas (Colciencias 2015).

However, in most cases when they are taken into account, Scielo and RedALyC are used as indicators of lesser quality than WoS and Scopus. In the aforementioned research assessments, Scielo and RedALyC are given lower scores or classifications. In the Colombian assessment of research groups, the papers and journals covered by them are assigned to the lowest category. This means that journals and papers indexed by these alternative JIS are associated with a lower editorial quality. The highest categories are reserved for papers in

journals covered by WoS and Scopus. The reason stated by Colciencias is that WoS and Scopus 'guarantee the quality of the editorial policy of the journals indexed' (Colciencias 2015, p. 34 [my translation]). No reasons are given for the classification of the alternative JIS Scielo and RedALyC into the lowest category. The implication of this classification of alternative JIS into the lowest category is the association between alternative JIS and low editorial standards of the journals covered by them. A similar case is seen in Chile; here, the public organisation in charge of science policy is the Comisión Nacional Científica y Tecnológica (CONICYT). One of its functions is evaluating and funding research proposals. The evaluation is organised between different disciplinary committees which assess the proposals and also the researchers in the projects. Importantly, the evaluation of researchers is determined by their previous research productivity (CONICYT 2015). In most areas, the papers in journals covered by WoS are the only ones that count for the evaluation. Some exceptions are seen in the social sciences, such as in anthropology, economics, and business and management, but even in these disciplines, journals covered by alternative JIS are given a lower score than journals in WoS (CONICYT 2015). The lower weight of Scielo and RedALyC can also be seen in the research assessment exercises of Brazil and Mexico.

In contrast to the perception of the journals included in WoS and Scopus, it can be seen that from a research evaluation perspective Scielo and RedALyC have been less valued, and this extends to their journals and papers. However, there are some efforts to make use of RedALyC and Scielo in policy-relevant documents. For instance, the Colombian Observatory of Science and Technology (OCyT) offers comparisons between the production of scientific research in WoS and Scielo (OCyT 2015). At the same time, RedALyC is producing a series of reports on the scientific production of different countries, disciplines, and universities using its database (e.g. López Castañares et al. 2013; Rodríguez-Sánchez et al. 2013).

Despite these efforts, the use of Scielo and RedALyC as data sources in widely diffused policy documents is less important than the use of WoS and Scopus. A regional review of national science, technology, and innovation systems in Latin America and the Caribbean by UNESCO (Lemarchand 2010) can be used as

an example. In this document the author compared the scientific papers of different countries in the region. Although he acknowledged the existence of Scielo and RedALyC (Lemarchand 2010, p. 64), all the charts and comparisons are based on Scopus and WoS. In this way, the scientific production in Scielo and RedALyC is ignored. This can also be seen in a statistical compendium of science and technology indicators in the region by the Inter-American Development Bank (IDB 2010). In this document, the only data source used is WoS. Reviews at the country level by the OECD for Mexico (OECD 2009) and Colombia (OECD 2014) also rely on WoS and Scopus only. Scielo and RedALyC are therefore absent from the view of science and technology in the region diffused by UNESCO, the IDB, and the OECD.

To recapitulate, WoS was the most influential multidisciplinary citation JIS in the world when Scielo and RedALyC emerged. In many cases, WoS has been used as a mirror of global science to build science policy overviews and evaluations. In contrast, Scielo and RedALyC emerged in countries that remain as developing economies. Besides, the organisations behind them are financially less resourceful than the multinational companies behind WoS and Scopus. RedALyC and Scielo depend on funding from public organisations, which entails some uncertainty over their long-term support.

In connection with the above, the conditions under which alternative JIS emerged pose a question for their growth. As has been shown, WoS and Scopus are widely used in influential science policy documents, research assessment exercises, and scientific rankings. Also, when RedALyC and Scielo are used for research assessment they are given a lower weight. This implies that the articles published in journals covered by them are less valued in these assessments. It could be expected, then, that researchers feel less motivated to publish in journals covered by alternative JIS, which in turn threatens their permanence. However, the number of papers in Scielo and RedALyC is growing: Scielo went from 8,502 papers in 2000 to 573,525 in 2015 (Scielo 2015); RedALyC went from 4,500 papers in 2000 (Aguado-López, Sandoval & Rogel 2004, p. 113) to 435,186 in 2015 (RedALyC 2015). This means that researchers are publishing in journals covered by alternative JIS, despite the higher reputation of mainstream JIS.

As can be seen, the context for the emergence and growth of alternative JIS is characterised by the dominance of WoS and the increasing influence of Scopus. These JIS are not only data sources, but also authorities on descriptions and evaluations of scientific research with an impact on its production and steering. Studying JIS, then, requires conceptualising them as cognitive authorities on the communication of science. In this way, the emergence and growth of alternative JIS can be understood in an environment in which scientific communication is increasingly being certified by organisations outside the peer-review system. In this case, mainstream and alternative JIS are used as certification mechanisms for scientific research and scientists, and differ importantly in their impact on the production and steering of research. For these reasons, the emergence and growth of alternative JIS merits further exploration.

1.5 Conclusions of the chapter

JIS have two kinds of power: descriptive and exploitative. Through description they allow the retrieval of bibliographic information from scientific publications. Through exploitation they allow the construction of evaluative perspectives based on the information they contain. Description and evaluation confer upon them a cognitive authority over information used in the production and steering of research. As cognitive authorities, JIS are used in a variety of processes. For instance, they are used in the evaluation of scientific research, the construction of rankings, the production of policy documents, and the certification of journals, research, and researchers. Overall, the descriptions, indicators, and assessments provided by JIS make them influential in the certification and evaluation of scientific research.

However, not all JIS have the same reputation. WoS was for 40 years the dominant JIS, being used to publish global and local studies of scientific production to inform policy and steer research. The dominance of WoS was reduced in 2004 when Scopus entered the market. Scopus is also being used in important international university rankings and policy documents. There are other indexing systems that have emerged as well. Scielo (founded in 1998) and RedALyC (founded in 2002) are two of them. These are the biggest multidisciplinary JIS for the coverage of academic literature in Latin America,

Spain, and Portugal. One of them, Scielo, is expanding to other countries. When compared to WoS and Scopus, it can be said that as certification and evaluation mechanisms Scielo and RedALyC have a lower reputation.

Given the dominance of WoS at the time when Scielo and RedALyC started, it is necessary to explain why they emerged and are growing. As shown in this chapter, JIS are not only data sources but also cognitive authorities on descriptions and evaluations of scientific research. For this reason, it is necessary to conceptualise JIS as cognitive authorities in relation to the principles of scientific communication in a context in which the appraisal of research is increasingly being certified by authorities outside the peer-review system. In the next chapter the conceptual framework that draws from the concepts examined in this chapter is presented.

Chapter 2. Conceptual framework

2.1 Introduction

The previous chapter explained how JIS are used in rankings, policy documents, and research evaluation. WoS and Scopus – mainstream JIS – are extensively used as certification mechanisms for scientific research and are regarded as cognitive authorities on descriptions and evaluations of scientific research. Against this the emergence and growth of alternative JIS such as Scielo and RedALyC become issues of query. In this chapter a framework that conceptualises JIS as cognitive authorities and helps to explain the research questions of this thesis is presented. To reiterate, the research questions are: 'why did alternative JIS emerge in light of the dominance of WoS?'; and 'why do researchers publish in journals indexed by alternative JIS?'

The framework draws on concepts from the sociology of science and information science, specifically those related to the study of the certification and communication of scientific research. The concepts from the sociology of science are universalism and particularism, and the concept from information science is cognitive authority. In section 2.2 the concepts of universalism and particularism are explained. Also, the empirical literature on the subject, the main debates addressed by this literature, and how this research contributes to the debates are presented. Section 2.3 shows how the concepts of cognitive authority, universalism, and particularism can be used to answer the two research questions.

2.2 Universalism and particularism in the study of science

In this section the concepts of universalism and particularism are defined. These concepts have been central to the sociology of science, which studies science as a distinctive institution in society that is at the same level as politics and religion (Merton 1973b). Science, in the sociology of science literature, refers to 'a socially shared and socially validated body of knowledge' (Merton 1973a, p. 450) whose main tangible product is peer-reviewed publications. Two main issues are relevant for the study of science in such terms: the normative structure that governs it (its 'norms') and its certification and communication

system. Norms are ethical principles that are expected to guide the behaviour of scientists in their profession; the certification and communication system fulfils what is considered by the sociologists of science as the main function of science, which is the extension of certified knowledge (Orozco & Chavarro 2010). This thesis is positioned at the intersection between the normative structure of science and its certification and communication system. It uses the concepts of universalism and particularism, which are part of the norms of science, to study the emergence of data sources that are involved in the certification and communication system of science.

2.2.1 Universalism

Universalism expresses a commitment to the construction and validation of knowledge regardless of the national, religious, political, or other personal characteristics of the knowledge producers (Daston 1991; Somsen 2008). Although the concept was present in the works of the ancient Greeks, it was diffused widely by the philosophers of the eighteenth-century Republic of Letters (Daston 1991). They proclaimed the idea that in order to be part of the Republic of Letters the only requirement was to pursue the truth through the use of reason and discuss the findings with other members of the community. The modern scientific community is usually described in these terms: a community devoted to the pursuit of knowledge without boundaries or prejudices.

For Robert Merton universalism is one of the most important foundations of science (Merton 1973b). It refers to the application of impersonal criteria to validate scientific research and accord recognition to scientists (Merton 1973b, pp. 270–272). The universalism of science advanced by Merton is based on the principle that the validity of knowledge claims must be judged on the soundness of scientific research. According to Merton (1973b, p. 270), universalism helps to achieve the institutional function of science, which is the extension of certified knowledge. In other words, research activities should use scientific methods, and results should be validated by peer reviewers to certify that the knowledge in academic journals is sound and free from subjective judgements. For Merton, those who can demonstrate the validity of their claims – such as the novelty of their findings and their contribution to the literature of their discipline – by following scientific methods and standards accepted globally, deserve

recognition by their peers and should obtain an influential position within the scientific community (Merton 1973b, pp. 270–277). In summary, Merton understood science as a system in which objectivity should prevail over subjectivity.

Polanyi (2000) considered universalism as a defining norm of scientific authority. For him, scientific authority has the responsibility to define what is considered science and to give recognition to scientists (Polanyi 2000, p. 8). This authority is endorsed by 'the uniformity of scientific standards throughout science [that] makes possible the comparison between the value of discoveries in fields as different as astronomy and medicine' (Polanyi 2000, p. 8). Polanyi considered that the scientific standards on which contributions to knowledge should be judged are: degree of plausibility as per the current disciplinary consensus, scientific value – accuracy, systematic importance, interest of the subject – and originality of the findings (Polanyi 2000, pp. 5–6). For this author, therefore, scientific authority is achieved through the application of scientific standards.

Polanyi saw the scientific enterprise as a coordinated global project for the advancement of knowledge to which individual efforts contribute. Building on his idea of scientific authority – and by analogy to the Republic of Letters – Polanyi advanced the concept of the 'Republic of Science', which is constituted by the scientific community. In it, said Polanyi, scientific authority prevails over other authorities such as the political and the religious. Scientific authority is not held by a single person, but by the collective. In this way, the individual efforts of scientists contribute to the achievement of a common goal, such as the understanding of a phenomenon or the development of a theory. This is made possible through a self-coordinating mechanism that allows scientists to build on the work of others. Polanyi compared science to a puzzle that has to be solved, a jigsaw that all the scientists have to put together. For Polanyi, there is a 'hidden system of things' (Polanyi 2000, p.3) that awaits discovery, and the only authority that can guide this exploration is the scientific authority based on universalism.

According to this perspective, science is performed by a global community of peers whose main objective is to produce and certify scientific knowledge[20] that is universally verifiable, regardless of the producer of the knowledge and the conditions of that production (Merton 1973b, p. 270). The definition of scientific community and scientific authority in these terms has promoted the idea that science is a separate realm that operates with its own norms and is detached from politics, religion, race, and other features external to the knowledge produced. This defines science as autonomous, meaning that the scientific community worldwide is governed by a special set of norms[21] independent of external forces. From this point of view, science is a system based on the validity of the knowledge produced, and universalism should ensure that scientists and scientific research are objectively and equally assessed and recognised.

In summary, according to Merton and Polanyi, knowledge claims should be validated applying universalistic criteria, and recognition should be awarded to those who produce validated knowledge. This understanding relies on the conception that science is a global enterprise underpinned by established objective criteria.

2.2.2 Particularism

Merton and Polanyi observed that universalism is threatened when the appraisal of scientific research and scientists is influenced by the personal characteristics of scientists (Merton 1973b; Polanyi 2000). Personal characteristics such as the nationality, race, or religion of scientists can influence appraisals of the validity or importance of their research. Merton called this particularism. An example is found in the case of Aryan physics, which was deemed by the Nazis as superior on the grounds of race. Merton considered that if science is a global collaborative enterprise whose validity depends on objective criteria and not on who produces it, then appraisals based on race or nationalism have no scientific basis (Merton 1973b, p. 273). In contrast to

[20] Talcott Parsons (who influenced Merton's ideas) conceptualised the characteristics of scientific knowledge as those who can prove 'empirical validity, logical clarity, logical consistency of propositions, and generality of principles' (Rothman 1972, p. 102).

[21] The norms according to Merton are: communism, universalism, disinterestedness, and organised scepticism. This thesis focuses on the concept of universalism (Merton 1973b).

universalism, particularism does not rely on agreed standards and norms, but on biases. Biases are extra-scientific criteria (Merton 1973c, p. 259), such as interpersonal relationships, economic interests, race, country, language, and other personal characteristics. These are considered by Merton 'irrelevant criteria' that are introduced into the certification of knowledge (Merton 1973c, p.258). Merton acknowledged the influence of particularism in the validation of scientific research. However, he argued that universalism is dominant, meaning that it is generally applied in the evaluation of science and in the recognition given to scientists (Merton 1976).

In contrast to Merton, Mitroff (1974) argued that particularism can be equally dominant to universalism. He selected a group of elite scientists who had worked on the Apollo Moon project and interviewed them over a period of four years. His aim was to test Merton's norms in the responses of the scientists. He found that the scientists reacted to the violation of the norm of universalism (Mitroff 1974, p. 587). The interviewees generally agreed that scientists who are highly committed to fixed ideas or theories are harmful to science because they are biased. Paradoxically, they also asserted that science is a personal enterprise and also admitted that emotions and biases influenced the way they valued potential theories to explain a phenomenon, and also their opinion about other scientists. In practice, then, the scientists interviewed showed a strong commitment to their own theories despite their stated universalism. For Mitroff, this ambivalence indicated that particularism can also play a dominant role in scientific research (Mitroff 1974, p. 587). However, he conjectured that its dominance can vary according to the disciplines and the problems researched.

Mulkay (1976) considered that the study of Mitroff (1974) indicated that norms and counter-norms[22] are ideologies used discursively by scientists to construct a social image of science and scientists. These ideologies are based on 'social stereotypes' that are widely diffused and accepted, such as the idea that science is universalistic (Mulkay 1976, p. 653). According to Mulkay, scientists use 'moral language' such as the norms and counter-norms of science to

[22] Mitroff found that the scientists in the Apollo project usually acted in contradiction to the norms of science. For instance, instead of producing objective appraisals of the work of other researchers – universalism – they produced subjective appraisals based on personal characteristics of the researcher – particularism.

‘evaluate, justify, and describe the professional actions of scientists’ (Mulkay 1976, p. 654). Based on Mulkay, it can be argued that universalism and particularism can be used as ideological justifications. Whether ideologies or norms, what the different discussions on particularism and universalism show is that there is a widespread view that the two concepts are in conflict. However, it is also apparent that they are used to justify recognition of research and scientists. Below I review the empirical investigations on universalism and particularism, with the aim of illustrating how this literature relates to the research questions of the thesis.

2.2.3. Empirical studies on universalism and particularism

Long & Fox highlighted a central debate that underpins the scholarly discussion on universalism and particularism: ‘To what extent can the inequality (in science) be explained by normatively justifiable, universalistic characteristics as opposed to unjustifiable, particularistic characteristics?’ (Long & Fox 1995, p. 46; see also Cole 1989, p. 53). The debate on the application of universalism and particularism to scientific recognition connects with a second debate on the effects of particularism. Specifically, Crane (1967) argued that particularism could deter the effective dissemination of scientific research: ‘if the academic stratification system controls opportunities for publication and distributes them differentially to scientists differently located in the system, the system is inhibiting some scientists from performing their scientific roles and possibly the diffusion of scientific ideas’ (Crane 1967, p. 195). In summary, the two debates on universalism and particularism illustrate a central issue: whether they are applied in the appraisal of scientific research and scientists and on their effects on the dissemination of scientific research. These two debates inform the research questions of this thesis.

Empirical studies on universalism and particularism focus mainly on the peer-review system. This system is constituted by authors, editors, and peer reviewers who are responsible for producing, certifying, and communicating scientific research. Some studies look at other dimensions, such as the career advancement of scientists (Long & Fox 1995) and the prestige of universities (Burris 2004). Usually, the studies on universalism and particularism in science assess the objectivity of standards in the appraisal of scientific research and

scientists. Their main aim is to test whether the appraisal responds to particularism or universalism. The interest in this subject is mainly because some scientists are accorded a disproportionate amount of credit for their contributions, whereas others struggle to gain visibility within the scientific system. Merton (1973a) called this phenomenon the 'Matthew effect'[23].

Some papers have focused on the study of the social sciences as compared to the natural sciences. Crane (1967) researched the cases of two journals in economics. She suggested that the peer review of papers in some journals was likely to be influenced by the background of the editors (affiliation, age, theoretical preference). The presence of particularism in the peer-review process is important because 'an author's academic affiliation may cast a kind of "halo" effect over his work which impedes objective evaluation' (Crane 1967, p. 195). She compared the characteristics of authors who published in a journal that did not practise anonymous peer review – the *American Economic Review* – to those who published in a journal that did practise anonymous peer review – the *American Sociological Review*. She found that the academic affiliation of an author was frequently related to that of the editor of the journal, especially in the *American Economic Review*. Crane suggested this was because the academic training of the editors made them more appreciative of theories and methods used by their colleagues although she did not discard the notion that personal ties might have been at play (Crane 1967, pp. 200–201). However, the data used in her study did not allow her to test which was the better explanation for the behaviour observed.

Along similar lines, Zuckerman and Merton (1971) showed that journals in the humanities and the social sciences had higher rejection rates than journals in the natural sciences. They argued that this could have been partly due to a lack of consensus on scholarship standards in the social sciences, and other issues, such as lack of physical space (number of pages in the journal) to publish. The authors also presented a case study of *The Physical Review,* one of the most

[23] Merton used this particular name based on the Gospel According to St. Matthew: "for unto every one that hath shall be given, and he shall have abundance; but from him that hath not shall be taken away even that which he hath" (quoted by Merton 1973a, p. 445). In other words, recognised scientists will get more recognition for their work than other scientists 'who have not yet made their mark' (Merton 1973a, p. 446).

cited journals in physics at the time (Zuckerman & Merton 1971, p. 80). They found evidence that the editors of the journal assigned the papers to reviewers based on their expertise and competence. They also argued that scientists with a higher degree of recognition – some of them Nobel Prize winners – generally submitted papers that were judged to be of a better quality by the peer reviewers, as compared to papers written by less reputable scientists; their interpretation of these findings was that the peer-review system in the sciences tended towards universalism, but they acknowledged that their evidence was not conclusive and that some degree of particularism could have been involved.

On a related topic, Yoels (1974) studied editorial appointments in leading journals in seven disciplines, and found that publishers of social science were more likely to use particularistic criteria – such as the affiliation of persons to appoint editors – compared with publishers of the natural sciences. Editors-in-chief from Harvard, Chicago, and Columbia universities were likely to appoint their editors from their own or each other's universities. Although Yoels acknowledged he could not explain the findings, he speculated that the prestige of an institution allows it to control the top journals in its fields. He suggested that the connections of these institutions constitute an advantage for their staff in securing influential positions as editors. The author did not explain why the social sciences were more likely to exhibit this pattern, although he seemed to support the idea that a lack of standards on what constitute appropriate scholarship could have been the answer. Other studies, such as those of Pfeffer, Leong and Strehl (1977) and Beyer (1978) arrived at similar conclusions about journals in the social sciences as compared to journals in the natural sciences.

The studies on universalism and particularism have also considered other aspects of academic publication. Some studies have compared quantitative and qualitative research, such as on the determinants for citations to papers, the prestige of university departments for career prospects of the academic staff, and the career advancement opportunities for women and minorities with respect to their publications. Lindsey and Lindsey (1978) found that the research method orientation of an editor influenced the way that research articles were validated: hence they found that the design and sophistication of

methodologies were more valued by editors with a quantitative orientation, whereas qualitatively oriented editors put more weight on the logic of the argument and theoretical contribution of the papers accepted for publication.

Burris (2004) tested whether the prestige ranking of university departments or the productivity of journal articles of their faculty was more influential on job opportunities for their graduates. He found these opportunities were significantly correlated with the prestige ranking of the department from which the researcher graduated, rather than with the individual researcher's productivity or citations received. Based on this finding Burris questioned what he considered the 'conventional view' that researchers are assessed on universalistic criteria (Burris 2004, p. 240).

Judge et al. (2007) have also evaluated the influence of particularism and universalism on citations to papers on management. They examined a set of 614 papers and classified them according to variables that apply to these concepts. Through a regression model based on structural equations, they found that universalistic variables, such as originality of the paper, soundness of the methodology, size of the sample used in each paper, and writing, outweighed particularistic variables, such as individual prestige, prestige of the organisation to which the authors were affiliated, and gender of the first author. However, they acknowledged that the particularistic variables were related to citations as well, although to a lesser extent (Judge et al. 2007, p. 504).

Long and Fox (1995) examined the participation, position, productivity, and recognition of women and some racial and ethnic groups in science on their scientific career opportunities. These authors argued that the scientific careers of women and racial minorities were at a considerable disadvantage compared to white men; for them, the confirmation that these groups were disadvantaged in all dimensions as compared to white men was an indication that 'universalism falters in science' (Long & Fox 1995, p. 67).

As seen above, some of the studies reviewed support the notion that peers make their judgements on the basis of reputation, acquaintance, respect, gender, and other personal criteria; these are all features of particularism. Other studies support the idea that peers use the objective standards that constitute

universalism. The evidence, then, suggests that 'both universalistic and particularistic standards might be concretely involved in the actual process of evaluation, but to varying extents and in different parts of the stratification system of science' (Zuckerman & Merton 1971, p. 86).

Overall the idea that universalism has to be practised in order to accord fair scientific recognition and to effectively disseminate research is widely shared by scientists (Long & Fox 1995, p. 46; Gieryn 1999). In line with Mulkay (1976) and Gieryn (1983), it can be said that universalism and particularism are ideologies used to demarcate what matters in science. Because of this, universalism and particularism can be expected to play a role in the appraisal of data sources on science, such as JIS. At the same time, JIS can be expected to justify their coverage of scholarly journals on similar grounds to show their adequacy and objectivity.

2.2.4 The study of JIS in the literature on universalism and particularism

The research questions of this thesis connect with wider debates in the sociology of science. For this reason, it is necessary to show the links between the empirical questions and the debates that underpin them. These links help to interpret the findings of the thesis, which are discussed in chapter 7.

As shown in section 2.2.3, the study of universalism and particularism in science has been focused mainly on the peer-review system, with some studies addressing the prestige of universities and the career advancement of scientists. However, the number and types of institutions involved in the certification and communication of scientific knowledge transcend the peer-review system. Specifically, the validation of scientific research and the recognition given to scientists are increasingly being formalised through research assessments, rankings, and indicators produced by multilateral organisations such as the IDB, the OECD, and UNESCO. As seen in chapter 1, besides their search functionalities JIS are data sources used in the formal assessment of research. In some cases, the organisations behind them plan events in which scientists are awarded economic incentives for their publication indicators. This applies in the case of Elsevier, a company that has organised various events in different countries to reward the most cited scientists

according to Scopus. Thomson Reuters produces its highly cited researchers list showing the top 100 scientists according to citations in WoS, and from this a formal ranking of individuals. These cases show that the indicators produced by some JIS are increasingly being used to build the reputation of scientists. For this reason, Whitley (2007) has suggested that studying JIS expands the studies in the sociology of science to include the institutions that participate formally in the recognition given to research and scientists.

In section 2.2.3, I presented two important debates in the literature on universalism and particularism. These are whether universalism or particularism influence appraisals of scientific research and scientists (Cole 1989; Long & Fox 1995), and whether particularism can affect the diffusion of scientific knowledge (Crane 1967). The studies reviewed on universalism and particularism are concerned with the influence of universalism and particularism on the validation of research and the recognition of scientists. To summarise the conflicting perspectives: 'one is supportive of the status quo, viewing the existing distribution of rewards as just, equitable, and frequently also inevitable. The other is highly critical, denouncing the distributive system as basically unjust and unnecessary' (Lenski 1966, p. 5).

Studying JIS through the question 'why did alternative JIS emerge in light of the dominance of WoS?' will contribute to the debate on the influence of universalism and particularism in the recognition of scientific research and scientists. JIS assess journals to include them in their collections. Inclusion in the collections of the data source, mainly in WoS, increases the formal recognition of journals. However, many journals are excluded, and this has consequences for their reputation and for researchers who publish in them. Given that the coverage of journals offered by JIS is selective, similar questions on universalism and particularism can be asked of JIS about the adequacy of their coverage. Studying JIS from the perspective of universalism and particularism will produce evidence that will aid the understanding of the relationship between particularism, universalism, and the assessment of journals for inclusion (chapters 4 and 5). This is important because JIS are data sources involved in the formal recognition of scientific research and scientists.

Studying JIS through the question ‘why do researchers publish in journals indexed by alternative JIS?’ will increase the understanding of the effect of universalism and particularism on the diffusion of scientific knowledge. As shown in section 2.2.3, some authors such as Mulkay and Gieryn understood universalism and particularism as ideologies. This means that these concepts are a result of shared perceptions of scientists on how things should work. The main perception is that universalism should be practised and particularism avoided because universalism is seen as fair, whereas particularism is seen as unfair. In addition, it has been posed that the practice of particularism may deter the diffusion of scientific research (Crane 1967, p. 195). The responses of the researchers interviewed for this thesis (see chapter 6 for detail on the interview programme) reflect their perceptions of different JIS and provide examples of the knowledge that is published by the journals covered by different JIS. In this way, the perceptions and examples given by researchers contribute to the debate on the effects of universalism and particularism on the diffusion of scientific knowledge.

In the next section I show the relevance of universalism and particularism to the study of the emergence and growth of alternative JIS. The concept of cognitive authority helps to relate universalism and particularism to the research questions.

2.3 Studying JIS through cognitive authority

In this section I argue that the concept of cognitive authority – borrowed from information science – relates to universalism and particularism and helps to answer the research questions ‘why did alternative JIS emerge in light of the dominance of WoS?’ and ‘why do researchers publish in journals indexed by alternative JIS?’

I argue that universalism is required to establish the credibility of a data source and that credibility is the foundation of cognitive authority. As credibility depends on perceptions, perceptions of particularism or universalism of a data source can influence its credibility. This leads to two scenarios for the emergence of alternative JIS: the first is a scenario in which the universalism of the dominant JIS (i.e. WoS) is trusted; the second is a scenario in which the universalism of

WoS is contested. The two scenarios provide different reasons for the emergence of alternative JIS. They also suggest reasons why researchers publish in journals covered by them. The reasons to publish will contribute towards an understanding of the growth of alternative JIS. The two scenarios are investigated in subsequent chapters.

2.3.1 Universalism and the credibility of cognitive authorities

As presented in chapter 1, JIS are information sources of scholarly journals that can be analysed from the perspective of cognitive authorities. According to Wilson (1983 p.15), a cognitive authority is perceived as credible within a knowledge domain. For him, 'those we think credible constitute the potential pool of cognitive authorities on which we might draw' (Wilson 1983, p. 16). Wilson argued that credibility relies on the trustworthiness and expertise of the information source in the domain. Trustworthiness is the perception that a source is fair and unbiased (Rieh 2010, p. 1337), and expertise is the skills and knowledge that the source has (Rieh 2010, p. 1338). Therefore, a cognitive authority is a source perceived as trustworthy because it produces unbiased judgements and has the knowledge to produce them. If the judgements produced by the source are biased or its knowledge is questionable or questioned, then its credibility can be compromised. JIS, then, need to establish their credibility within the scientific community in order to be perceived as cognitive authorities.

JIS as cognitive authorities are associated with the principle of universalism (discussed in section 2.2.1). They are being used as sources to judge the quality of scientific contributions and the productivity of scientists, research institutes, and countries, among others (see chapter 1). This means that the indicators produced by JIS, such as WoS, have implications for scientific recognition. For instance, in different research assessments those who publish in journals with high impact factors according to WoS receive a better evaluation than those publishing in journals not covered by it (Adam 2002, p. 727; Geuna & Martin 2003, p. 291; Hicks 2012, p. 254). As there is a perception that recognition of scientific research should be based on universalism, and JIS participate in the recognition of scientific research, it is likely that JIS are expected to select journals according to universalistic criteria. Otherwise,

indications of biases could undermine their credibility as cognitive authorities, especially if they are used as judges for scientific quality.

2.3.2 Particularism as a challenge to cognitive authority

In the previous section I argued that a data source of journals relies on universalism to establish its credibility in order to be perceived as a cognitive authority on science. In chapter 1, I showed that WoS is widely trusted to identify, quantify, and assess the scholarly publication venues in the world and the research published by them. The indicators produced by WoS are incorporated into science policy, international university rankings, bibliometrics, and national research assessments. The credibility of WoS as a cognitive authority therefore appears to be derived from its application of universalistic criteria to the selection of journals.

Wilson (1983) has argued that if a cognitive authority is perceived as an unbiased source, and WoS is regarded as an unbiased source on science, other sources would not be needed. Even in the case of other sources, they would be considered redundant and they would face obstacles to being accepted because scientists would be aiming at publishing only in the journals selected by the cognitive authority. If WoS is perceived as a cognitive authority on science, then why are the principal questions in this thesis (why did alternative JIS emerge, and why do researchers publish in journals indexed by them) being asked?

Alternative JIS are being developed in different parts of the world (see introduction) and Scielo and RedALyC are two examples (they are further examined in chapter 3). Moreover, these systems show a continued presence and use by parts of the scientific community. Under the assumption of the universalism of WoS, Scielo and RedALyC can be seen as redundant efforts. In other words, they can be seen as databases for journals that do not fulfil the objective requirements of WoS. In this scenario, alternative JIS offer a space for journals with poor standards rejected by, or unable to fulfil, the universalistic filters of WoS. Developing JIS to cover journals that do not conform to the requirements of WoS, however, could be useful to scientists who cannot write papers with enough quality to pass the filters of WoS-indexed journals. If this

were the case, the knowledge contained in alternative JIS would not be scientific because it would not pass universalistic validation.

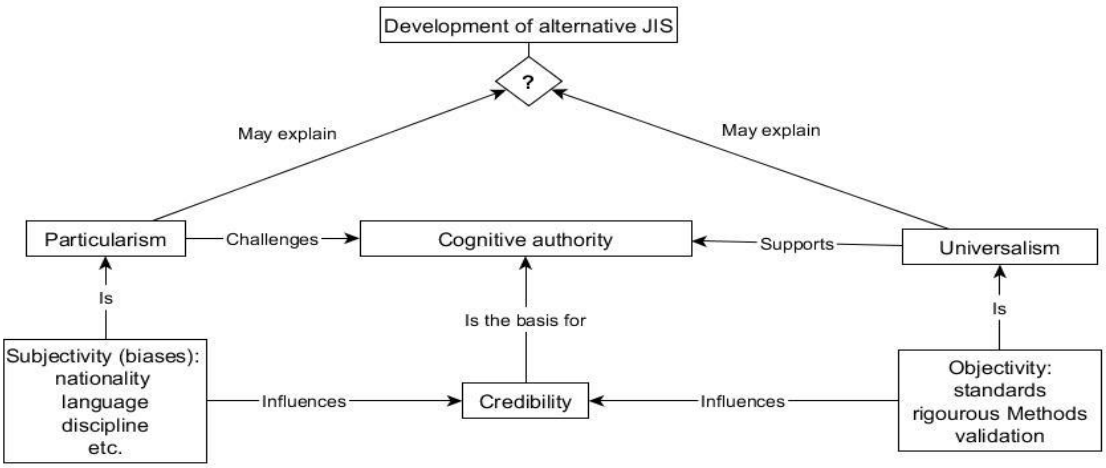
However, another explanation may be advanced. In order to explain the emergence of alternative JIS and their growth, it may be useful to hypothesise a scenario in which the cognitive authority of WoS is challenged. This implies that the cognitive authority of WoS is questioned because it does not adhere to universalism. If the cognitive authority of WoS were challenged on these grounds, then WoS could lose credibility. In other words, the very perception of biases in WoS would challenge its cognitive authority. This is because biases could be seen by the excluded as discrimination and a threat to universalism. The threat in this case has to do with possible unfairness in the selection of journals by WoS. This means that the coverage of WoS could be perceived as incomplete, pointing to a justified need for completeness in order to illuminate those parts of science excluded by biased coverage. Therefore, alternative JIS could have emerged to cover those parts neglected by biases in the coverage of WoS.

Also, a scenario in which the cognitive authority of WoS is challenged can help in the understanding of why researchers publish in alternative JIS-indexed journals. It can be argued that researchers need to communicate their research so that it can be accessed and used to produce more knowledge (Merton 1973a). If a paper produced by a researcher does not fit the foci of WoS-indexed journals, its communication is hampered. This means that the research will not be available and other researchers will not use it to build more knowledge. If there were no alternatives, then this research would be even more difficult to find and access. Alternative JIS, then, could provide opportunities for researchers to make their papers available and increase the chances of their research being found and used in subsequent research. Alternative JIS would constitute a data source for finding research that otherwise would be invisible due to the scope of WoS. Even though the reputation of alternative JIS is lower than the reputation of WoS, researchers may choose to publish in alternative JIS to ensure that their scientific knowledge is available and communicated.

In summary, two scenarios for the emergence of alternative JIS, and the reasons why researchers publish in journals indexed by them, have been proposed. The first assumes the universalism of the coverage of WoS. If this were the case, alternative JIS could have emerged to cover those journals that do not fulfil the objective filters of WoS. Researchers would publish in alternative JIS-indexed journals because it is easier to publish in journals that do not fulfil such filters. The second scenario assumes the particularism of WoS, meaning that its coverage could be biased. If this were the case, the cognitive authority of WoS would be challenged. Alternative JIS, then, could have emerged in order to illuminate the scientific research that is excluded from the biased coverage of mainstream JIS. In the same way, researchers could see opportunities in alternative JIS-indexed journals to publish papers that otherwise would be hard to find and use in subsequent research.

In order to examine the two scenarios above – the first assuming the universalism of WoS and the second assuming its particularism – evidence from documentary accounts and journal coverage has to be analysed. Also, the perceptions of scientists need to be included. This is because universalism and particularism influence the perceived credibility of sources, and credibility is the basis for cognitive authority. Figure 2.1 shows the general framework explained in this section (the figure should be read from bottom to top and in the direction pointed by the arrows).

Figure 2.1 Universalism and particularism in the development of alternative JIS



Source: own elaboration

2.4 Conclusions of the chapter

In this chapter I have explained the framework that allows the study of the emergence and growth of alternative JIS. Universalism and particularism are the main concepts of the framework. The third concept of cognitive authority binds together these two concepts to provide an examination of the research questions: 'why did alternative JIS emerge in the light of the dominance of WoS?' and 'why do researchers publish in journals indexed by alternative JIS?' The combination of these three concepts offers a novel framework to study the emergence and growth of alternative JIS. Universalism and particularism are used by the sociology of science to explain the validation of scientific research and the recognition of scientists. The observation that scientific recognition is distributed unequally can be explained in terms of universalism or particularism. Sociologists of science try to understand whether this unequal recognition is justified by the application of objective criteria (based on universalism) or subjective criteria (based on particularism). Since universalism is seen as a norm that ensures that scientific contributions and scientists are judged fairly, whereas particularism is seen as an indication of unfair judgement, this debate translates into perceptions of fairness or unfairness of recognition.

JIS are data sources that intend to offer a selection of scholarly journals and their published papers, and they are widely used in the formal evaluation of science. This means that they are a factor in the recognition of scientific research and scientists. For this reason, they can be expected to be subject to similar questions about their universalism or particularism in the selection of journals. A perception of universalism would support their credibility as cognitive authorities on science, whereas a perception of particularism could compromise it.

In relation to the objective of this research, which is to understand the emergence and growth of alternative JIS, two scenarios have been posed. The first assumes the universalism of WoS; in this scenario, WoS is seen as a cognitive authority on science, which means that it applies objective criteria to select scholarly journals. If WoS applies objective criteria, then its coverage is very likely to be seen as fair by the scientific community. Therefore, alternative JIS could have emerged to cover journals that do not fulfil the inclusion criteria

of WoS. Their growth could therefore be due to articles in those journals, which would be less rigorous than articles accepted for publication in WoS-indexed journals.

The second scenario assumes the particularism of WoS. In this scenario, the cognitive authority of WoS is questioned because it uses subjective criteria to select journals for coverage. If WoS applies particularistic criteria, then its coverage is very likely to be seen as unfair by part of the scientific community, especially by those who are excluded. Given the importance that universalism holds within the scientific community, it is possible to think that the particularism of WoS could be seen as a justification for alternatives. Therefore, alternative JIS could have emerged as a response to the particularism of WoS. The growth of alternative JIS could be due to the opportunities offered by them to increase the availability and dissemination of research that otherwise would be hard to find and use in subsequent research.

The framework presented is based on the sociology of science. This body of knowledge has mainly focused on the analysis of the peer-review system, editorial processes, and the career advancement of researchers. Studying JIS extends the analysis of universalism and particularism to the study of the formal recognition of science. In addition, the study of universalism and particularism contributes to two debates found in the literature. The first is whether particularism and universalism intervene in the recognition of science. This is mainly addressed by the research question ‘why did alternative JIS emerge in light of the dominance of WoS?’ The second debate is whether particularism deters the dissemination of scientific knowledge. This is mainly addressed by the research question ‘why do researchers publish in journals indexed by alternative JIS?’ Finally, the framework allows JIS to be conceptualised as cognitive authorities in scientific communication, joining concepts from information science and the sociology of science.

In the next chapter I present an analysis based on documentary and literature reviews that has produced evidence in relation to the first research question presented here. The examination of the literature, including documents produced by founders of WoS, Scielo, and RedALyC, has been used to arrive at the initial explanations for the emergence and growth of alternative JIS that are considered in chapters 3 to 5.

Chapter 3. Two initial explanations for the emergence of alternative JIS

3.1 Introduction

The previous chapter presented the framework for this thesis, based on the concepts of cognitive authority, universalism, and particularism. This chapter is a starting point for answering the research question 'why did alternative JIS emerge in light of the dominance of WoS?' It is based on a documentary and literature review that provides a first insight into the creation of alternative JIS. This insight provides two initial explanations that help to lay the foundations for the deeper analyses of the creation of alternative JIS that are presented in chapters 4, 5, and 6. The first explanation is that alternative JIS emerged to cover journals that do not have the editorial quality and scientific impact required by WoS; the second is that alternative JIS emerged to counteract biases in the coverage of WoS, which, again, will be analysed in greater detail in chapters 4, 5, and 6. These biases are disciplinary, geographical, and linguistic. In order to arrive at these initial explanations, I gathered three sets of documents related to the development of alternative JIS, which are explained below.

The first set comprises documents that reveal the view of the founder of WoS, Eugene Garfield. I mainly reviewed documents on the principles behind the development of the citation indices that form WoS. I also looked at the criticisms and debates held at various stages of their development. The SCI was the first citation index developed by Garfield and has been commercially available since 1964. Garfield argued that its implementation was based on the idea of 'core' journals, which is explained in section 3.3.2. In 1973 Garfield launched the SSCI, following the same model of the SCI (Garfield 1975, p. 242). The A&HCI was launched in 1978. These three citation indices were combined to form the WoS in 1997. The pre-1997 literature cited in this chapter refers to the SCI; nonetheless, the main idea of core journals applies to the three citation indices in WoS.

The second set of documents show how the WoS' citation indices were received by academics across the world, and illustrate the debates over the relevance of journals not covered by WoS. I started by looking at the proceedings of an international workshop on scientific publications in Latin America, held in Mexico in November 1994 (Cetto & Hillerud 1995a), in which a number of editors and researchers presented their papers. The proceedings of this meeting provide an overview of the context in which alternative JIS were developed. I also looked at documents that reflect the reception of the ideas of Eugene Garfield and other bibliometricians in Latin America, to see the points of the debate that may have affected the emergence of alternative JIS.

The third set of documents contains the views of the founder of RedALyC, Eduardo Aguado, and the founders of Scielo, Abel Packer and Rogerio Meneghini. I analysed the documents written by them in order to understand what motivated them to actually implement alternative JIS. To this end, I gathered the papers listed on RedALyC's and Scielo's websites, which have been written mostly by the founders of these JIS; RedALyC's website lists 29 documents between 2002 and 2012, and Scielo's website lists 69 documents since 1998. Given that the arguments advanced by the founders of these JIS are repeated in many of the documents, I only cite some of them.

The three sets of documents described above have helped to advance the two initial explanations for the emergence of alternative JIS. In section 3.2, I describe the use of journal coverage to study JIS, relating coverage to the explanation of the emergence of alternative JIS. In sections 3.3 and 3.4, I present the two initial explanations for the emergence of alternative JIS. In these sections I report on my scrutiny of the documents produced by Eugene Garfield, Eduardo Aguado, and Abel Packer to uncover what motivated them to start WoS, RedALyC, and Scielo, respectively. Additionally, I contextualise the emergence of alternative JIS within debates on the improvement of the international recognition of scientific research produced in Latin America.

3.2 The role of journal coverage in the explanation of the emergence of alternative JIS

The notion of coverage is emphasised through this chapter. Coverage by JIS should ensure the preservation of references to documents (Wilson 1983) that can be accessed in principle by researchers in order to build more knowledge (Merton 1973a). An ideal JIS should be able to provide a complete bibliography of scientific publications in the world, serving both as a database and as a structured guide to scientific knowledge. However, indexing all the bibliographic references in the world is not attainable. For this reason, there is a need to rely on cognitive authorities to select the most relevant sources. As Wilson (1983) stated:

> It would be ideal if there were someone whom we could trust who could tell us about the single sources that seem to answer our question, 'you need go no further'. It would be ideal if someone could tell us about multiple sources, 'you can ignore this lot, and of those remaining, this one and that one are the most important, the others adding little to what they contain. Whoever did this would be providing us with the most important sort of quality control on texts (Wilson 1983, p. 170).

JIS try to fulfil the role of cognitive authorities on scholarly journals (see chapter 2). Because of the difficulties in achieving complete coverage, JIS offer a selective coverage that allows their users to search within the boundaries of the covered literature. When coverage is perceived as insufficient, as when journals on a certain subject are not included, users are likely to claim a need for better coverage. Although JIS try to offer a selection of scholarly journals that satisfy the research needs of their users, the specific selections of JIS are a point of debate. This debate is presented in the next sections. Basically, the literature shows that the coverage offered by WoS has been debated on the grounds of its comprehensiveness. This debate serves to suggest two potential explanations for the emergence of alternative JIS, as described below.

3.3 Explanation 1: alternative JIS emerged to cover non-core journals

The first explanation is based on the idea that there is a set of core journals – i.e. those with outstanding editorial standards (detailed in section 3.3.2) and scientific impact. According to Eugene Garfield, the core journals publish the most significant research in the world for all disciplines (Garfield 1971; 1996). He stated that WoS identifies them through indicators of scientific impact (through citation analysis) and compliance with editorial standards (Garfield 1980b; 1985). Thus, journals that pass these filters are included in WoS. This implies that there is a set of journals that are excluded from WoS on the basis of poor editorial standards and scientific impact. Within this perspective, it is possible to think that alternative JIS emerged to cover those journals that fail to pass the editorial and scientific impact filters that are applied by WoS.

The concept of core journals comes from information and library science, and it has two meanings: the first describes how the papers related to a subject are distributed throughout a set of journals (Bradford 1985); the second refers to the journals that publish the majority of highly cited papers (Garfield 1971). Although the two uses of the concept are related to the phenomenon of 'concentration'[24], the rationales behind the approaches are in opposition. Whereas the first was intended to promote the coverage of all scientific literature (Hertzel 1987, p. 175), the second was intended to justify the selection of a small number of journals as representative of the most important scientific publications in the world (Guédon 2001, pp. 19–22). In order to understand the role of the concept of core journals in WoS, it is necessary to exemplify the two perspectives. For this, the approaches of Bradford and Garfield are presented: Bradford has looked at the distribution of papers; and Garfield has considered the distribution of citations.

3.3.1 Bradford's law of scatter and its use to select core journals

Bradford's 1934 paper – reprinted as Bradford (1985) - is considered to be the seminal study on the distribution of papers in journals (Bradford 1985). Bradford was concerned with the amount of effort and money that was spent on

[24] Concentration in this context refers to the number of journals covered as compared to the whole population of journals in the world.

duplicated efforts to index scientific literature, and he wanted to contribute to the construction of a global and comprehensive indexing system that helped to solve this issue. He tried to test the hypothesis that insufficient coverage was due to the peculiarities of the distribution of papers in journals, and that this could be solved by collaboratively indexing parts of the literature by different public organisations, constituting a universal repertoire to maintain the records (Bradford 1985, p. 180).

In his study, Bradford sorted a library's catalogue of journals on 'applied geophysics and lubrication' in descending order according to the number of documents related to a subject. He identified three groups of journals: a small group that provided one third of the papers; a second, larger group that accounted for the second third of the papers; and the largest group containing the last third of the papers. He found that despite the concentration of papers in the first group, there were many references related to the subject that were being missed because they appeared in journals that published fewer related papers. The author formulated his observations in what came to be known as 'Bradford's law of scattering' that states:

> If scientific journals are arranged in order of decreasing productivity of articles on a given subject, they may be divided into a nucleus of periodicals more particularly devoted to the subject and several groups or zones containing the same number of articles as the nucleus, when the numbers of periodicals in the nucleus and succeeding zones will be as $1:n:n^2$ (Bradford 1985, p. 178).

For Bradford, this showed that there were a considerable number of journals left out of the catalogues, and a solution had to be provided in order to include them. Paradoxically, Bradford's law of scattering was seen as a useful mechanism to find the core journals that a library had to purchase, rather than a motivation to expand coverage of the scientific literature (Hertzel 1987, p.180). Due to the rise in journal prices caused by the publishing industry during the twentieth century (Guédon 2001), libraries were unable to purchase the same quantity of journals without increasing their budgets. The question over how to minimise the investment by libraries propelled a series of studies that tried to explore the best way to satisfy most users with a minimum number of journals. Again, ironically, Bradford's law seemed suitable for librarians to use to define a

'core' of literature (Goffman & Morris 1970; Hertzel 1987; Bensman 2001, pp. 715–716); and they interpreted it as the journals that had to be held in their libraries' inventories to satisfy the needs of most of their users. In summary, Bradford's study was intended to promote inclusion but in practice was used to justify exclusion. The idea of core journals was further advanced by Eugene Garfield, who drew on the above interpretation of Bradford's work in order to formulate what he called 'Garfield's law of concentration'.

3.3.2 Garfield's law of concentration and the coverage of WoS

Garfield's law of concentration states that there is a set of journals that are core for all disciplines in terms of scientific usage (Garfield 1971). Based on an examination of the SCI in 1971, Garfield argued that most citations referenced a reduced set of between 500 to 1,000 journals. He also maintained that because of their high number of citations these journals could provide sufficient coverage of the world's scientific literature (Garfield 1971). The rest of the journals in the world were considered of little relevance by the author (Garfield 1980a, p.480). By extrapolating Bradford's finding to indexing systems, Garfield tried to minimise the investment required by his ISI to index scientific literature: 'Any abstracting or indexing service that ignores Bradford's law in attempting to realize the myth of complete coverage does so at its great financial peril' (Garfield 1971, p. 222). In order to reduce the costs, Garfield designed a system that provided references to a small set of journals, known as core journals. Thus, in addition to the academic justification for the limited coverage of journals, Garfield advanced an economic argument to persuade researchers and policy-makers that the coverage provided by WoS was the best that could be achieved given investment constraints. This argument, based on a specific understanding of Bradford's research, is used to justify the concentration of coverage on a small set.

Garfield constantly argued that his citation indices offered the best coverage available based on the concept of core journals. For him, the core journals were the ones that published the most significant literature in the world for all disciplines – no more than 150 journals (Garfield 1996), and he defended the sufficiency of the coverage of WoS for research purposes based on this argument (Garfield 1980a, p. 482). Operationally, Garfield explained the

identification of core journals through the use of citation indicators and fulfilment of editorial standards (Garfield 1980b; 1985). The citation indicators are proxies for the scientific impact of a journal, and the editorial standards control for rigour in the publication of the journal. The indicators that are shown in the web page of WoS as important for the inclusion of a journal are: timeliness, peer review, international diversity of authors and editors, citation impact, and established presence of the journal in a scientific community (Testa 2014). In order to ensure that journals are assessed equally, the web page of WoS states that the criteria are checked objectively (Testa 2014). This objectivity means that characteristics such as country of the journal, language, and discipline are not important in defining the journals that are included.

According to the framework for this thesis, which is based on the concepts of cognitive authority, universalism, and particularism (see chapter 2), it can be argued that the coverage of journals in WoS is supported by Garfield through the objectivity – universalism – of the criteria for inclusion of journals. This implies that journals are assessed on their merits (in terms of scientific impact and fulfilment of editorial standards), regardless of their place of publication, language, or discipline. The argument of universalism in the assessment of journals for inclusion in WoS by Garfield suggests a potential explanation for the emergence of alternative JIS. If the journals in WoS are considered as the core, because they have good editorial standards and high scientific impact, then alternative JIS emerged to cover non-core journals, these being journals that do not comply with the universalistic standards required by WoS. The next section describes this possibility further.

3.3.3 The emergence of alternative JIS in Latin America from the perspective of core journals

As mentioned, the concept of core journals states that there is a small set of journals that publish the most significant literature in the world in all disciplines. According to Garfield, the coverage of WoS is representative of the set of internationally influential journals that are considered the core: ‘it [WoS] generally represents the best science performed in any nation’ (Garfield 1995, p. 88). However, the number of Latin American journals in WoS has been traditionally low (further details are in chapter 5), and Garfield suggested two

options to alleviate this situation. The first option was to publish in WoS-indexed journals produced elsewhere. Garfield addressed this issue on different occasions. In 1976, he analysed the coverage of WoS by regions of the world. Regarding Latin America, he observed that the number of journals included in WoS was small and that they were poorly cited. From this observation he derived the following recommendation:

> Why not publish in a Latin American journal printed in Philadelphia or New York? Such a journal – or several such journals – would certainly appear more promptly and, I have no doubt, would have greater impact than the present products of the fragmented scientific publication apparatus of Latin America. It would certainly improve the utilization of Latin American contributions. It seems absurd that Latin American scientists should be impeded in disseminating their work by archaic publishing printing facilities and by an unsupportable proliferation of mediocre journals (Garfield 1976, p. 583).

Later, in 1995, Garfield was invited to give a talk in Brazil about the use of bibliometrics for science policy in the region. One of his recommendations for policy-makers was to incentivise Latin American scientists who publish in WoS-indexed journals: 'recognizing and providing for this elite would seem a logical way to efficiently and systematically improve a nation's science base' (Garfield 1995, p. 95). For Garfield, by publishing in journals covered by WoS – which are mainly produced outside Latin America – Latin American scientists could achieve international recognition for their work (Garfield 1995).

Another option was to improve the editorial standards of scholarly journals produced in Latin America to be included in WoS. This was proposed in a 1985 workshop in ISI in Philadelphia (Garfield & Small 1991, p. 21). The workshop was about ways to improve the international recognition of science produced in the 'Third World' (Moravcsik 1985). It synthesised a year-long project in which 30 experts (from different countries) led by Michael Moravcsik[25] exchanged their

[25] Michael Moravcsik was a prominent bibliometrician and physicist (Garfield & Small 1991) whose works were influential on the policy formulation and recommendations of international organisations such as UNESCO, the Ford Foundation, and the United Nations Commission on Science and Technology for Development (UNCSTD) (Goldstein 1990, p.46). At the request of UNESCO, for instance, he lectured widely: in Pakistan, Indonesia, Sri Lanka, Bangladesh, Nepal, Nigeria, Guyana, Singapore, Czechoslovakia, Colombia, Venezuela, Panama, Brazil,

views on barriers to inclusion of journals in WoS, and solutions. The barriers identified were lack of the use of English, topics that were only relevant for a country or a region, lack of conformance to editorial standards such as timeliness and number of issues per year, and difficulties in gaining access to peer reviewers by communities that were considered isolated and small (Moravcsik 1988, pp. 149–150). Thus, the barriers to inclusion of journals in WoS were seen in the weaknesses of the journals and editorial processes.

In order to circumvent those difficulties, the report of the workshop (Moravcsik 1988) included recommendations to policy-makers and editors to improve the chances of inclusion of scholarly journals in WoS. Some of them were:

- to improve editorial standards of journals in developing countries, as well as providing English titles and abstracts (Moravcsik 1988, p. 152; 153);
- to compile lists of selected journals by country and submit them to ISI in Philadelphia for consideration (Moravcsik 1988, p. 152);
- to implement ways to ease the international peer review of articles from developing countries (Moravcsik 1988, p. 152);
- to improve the access to databases from developing countries (Moravcsik 1988, p. 153);
- to distribute the cost of coverage by ISI through the purchase of licences to acquire the SCI (this would cost approximately 250,000 USD – 100 additional licences of the SCI – that would be covered by developing countries to add 500 to 1,000 journals to the collection) (Moravcsik 1988, p. 154).

The last idea seemed to have awakened some interest in Eugene Garfield. His contact details were provided by Moravcsik at the end of his paper. Moravcsik suggested that those wanting to place new orders contact Garfield directly, keeping Moravcsick informed of any progress. As can be seen, the recommendations were intended to shape the journals outside WoS according to criteria suitable for their inclusion.

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and Costa Rica. Knowledge of the academic systems in these countries led him to campaign for more inclusive research policies for developing countries.

The two options mentioned above, publishing in WoS-indexed journals and improving the standards of journals for their inclusion, are based on the notion that WoS contains the core journals. The recommendations derived from this perspective suggest that research policy programmes in regions such as Latin America should be devoted to encouraging publishing in the journals covered by WoS, and not to producing more journals (Garfield 1976, p. 583). In the terms of the framework of this thesis, if WoS applies universalistic filters to include journals, then its coverage is a faithful representation of the scientific literature in the world. This implies that alternative JIS emerged to cover the non-core journals, which in practice are those that fail to fulfil the objective criteria for inclusion in WoS.

3.4 Explanation 2: alternative JIS emerged to counteract biases in the coverage of WoS

The second explanation is based on the idea that the coverage offered by WoS is biased, and different researchers have argued that these biases are disciplinary, geographical, and linguistic in nature. This means that potentially WoS tends to favour the coverage of journals from specific countries, disciplines, and languages over other journals. The studies on biases in the coverage of WoS argue that there are journals excluded from it that have good editorial standards and scientific impact, but because of their place of publication, discipline, or language are not included. This has been regarded as a signal of insufficient coverage of scientific research by WoS. From this perspective, the emergence of alternative JIS may be related to the counteraction of biases in the coverage of WoS; in the next section I show some of the criticisms to this coverage and their implications for the understanding of the emergence of alternative JIS.

3.4.1 Biases in the coverage of WoS

The idea of core journals has attracted the attention of different academic communities. This is because the journals covered by WoS determine the authors, subjects, and ultimately the scientific communities that obtain more recognition than others in research assessments and rankings (Guédon 2001). Specifically, different authors have criticised the selection of core journals by

WoS, arguing that its coverage is biased (Aguado-López et al. 2014; Vessuri, Guédon & Cetto 2014). Early on in the appearance of the SCI, the main criticism was that its coverage was poor in highly regarded disciplines such as physics. In 1965, for instance, it was brought to Garfield's attention that only 5% of the journals in physics were covered, and that the strong emphasis of the SCI on the life sciences was due to its origins as an index on genetics (Garfield 1965). Even in countries that are considered scientific powers, such as Germany, the coverage of the SCI was seen as insufficient to represent scientific output. Another bias that has been discussed is that of variable geographical coverage. Specifically, the citation indices of WoS have been seen as more representative of American (i.e. USA) science than any other country's science (Seglen 1997, pp. 500–501). Similarly, Hicks (1999) showed that although the SSCI could work well for social sciences in the USA, it did not represent them well outside that country (Hicks 1999, p. 204). As can be seen, the coverage offered by WoS based on the idea of core journals has stimulated debate.

The biases in coverage have been studied by researchers such as Yaalon (1962, as cited by McDonald 1994, p.58) and Arvanitis and Chatelin (1988). They argued that certain topics have national characteristics that are not reflected in mainstream JIS. The latter authors, for instance, showed that the three top producing countries on soil research were at that time India, Brazil, and Egypt, whose number of articles were greater than those of developed countries in the same field (McDonald 1994, p.58). This means that by using only mainstream JIS the number of articles of certain countries can be underestimated.

Similarly, Velho and Krige (1984) argued that WoS was highly biased towards industrialised countries and basic sciences, and because of this it misrepresented publication patterns in other disciplines and contexts (Velho & Krige 1984, p. 49). They estimated that 85% of the production in soil science was published in journals not covered by WoS. They arrived to this estimation by manually gathering data on publications reported by the Federal University of Vicosa and the University of São Paulo in Brazil. Interestingly, this result contradicted Rabkin and Inhaber (1979): using data based on WoS, they

estimated that the figure was 23% in journals not indexed by it and the rest in WoS-indexed journals (Rabkin & Inhaber 1979, p. 265; Velho & Krige 1984, p.50). These differences in the proportions of productions are a direct consequence of the inclusion or exclusion of journals not covered by WoS in the calculations.

Spagnolo (1989) also reported that the four Brazilian journals in WoS in 1989 did not account for the number of quality journals produced in Brazil (Spagnolo 1989, p. 180). Although he found acceptable coverage of chemistry papers by Brazilian authors in core journals found in WoS, he had to merge two databases to achieve a more accurate representation for his evaluation of Brazilian graduate programmes (Spagnolo 1989, p. 201).

Sanz, Aragón and Méndez (1995) argued that recognising only journals covered by WoS can do a disservice to national science. To illustrate this argument, the authors performed a study on the type of research being published in national journals (60 papers) versus the type being published by the same set of authors in other (international) Spanish journals (also 60 papers) that were covered by WoS. They found that while the papers published in national journals were more applied, the papers published in journals indexed by WoS were more theory-oriented. Disregarding the function of national journals in research assessments, said the authors, could disadvantage technology and knowledge transfer between academia and the industry (Sanz, Aragón & Méndez 1995, pp. 321–322). Earlier, Méndez, Gómez and Bordons (1993) had also noted differences in the research published on immunology, neurosciences, and pharmacognosy by Spanish researchers in national and international journals.

Other more recent studies, such as the work of Larsen and von Ins (2010), have shown that the coverage of WoS is decreasing in comparison to the rate of growth of scientific literature. In particular, some fields with significant growth in number of papers published between 1907 and 2007, such as computer science, are only partially reflected in the coverage of WoS. Language has also been shown to affect coverage. Lillis and Curry (2010), for example, have shown that there is pressure on scientists from southern and eastern Europe to

publish in English-language journals indexed by WoS, to the detriment of journals that are published in non-English languages. Meanwhile, Larivière and Macaluso (2011) have shown that the inclusion of non-English language journals in the social sciences that are not covered by WoS could increase the publication indicators of francophone universities by a third.

The studies above hint that scientific impact and editorial standards might not be the only reasons for the exclusion of journals from WoS. The point made by these researchers is that the indicators obtained from WoS give a partial view of scientific publications, and that by expanding the coverage of WoS or using more databases it is possible to obtain a more accurate representation (Sivertsen & Larsen 2012). In general, what can be inferred from this literature is that there is a perception that WoS is under-representing scientific research because of biases in coverage. Therefore, from this perspective it can be conjectured that alternative JIS emerged to mitigate the biases in the coverage of WoS.

From the point of view of the framework of this research, the second explanation for the emergence of alternative JIS is based on the idea that WoS is not universalistic in its coverage. This means that characteristics of the journals such as place of publication, discipline, and language, can play a role in their inclusion in WoS. In other words, the coverage of WoS is potentially related to particularism.

In summary, there are two initial reasons for the emergence of alternative JIS that are in opposition. From Garfield's perspective, literature outside of WoS does not have appropriate editorial standards and enough scientific impact. Therefore, alternative JIS may have emerged to cover those journals (see section 3.3.3). From the perspectives of other researchers, the coverage of WoS is biased. Therefore, alternative JIS may have emerged to remedy those biases. In the next section I analyse the emergence of alternative JIS in Latin America according to the second argument.

3.4.2 The emergence of RedALyC and Scielo in Latin America from the perspective of biased coverage

The emergence of RedALyC and Scielo is surrounded by a debate about ways to improve the international recognition of scientific research. Basically, the debate is about whether to promote the production of journals in Latin America and their diffusion to an international audience or to encourage researchers to publish in WoS-indexed journals. This was the motivation behind an international workshop on scientific publications in Latin America that was held in 1994 in Guadalajara, Mexico. The workshop discussed the benefits of supporting national and regional journals for the development and international recognition of Latin American research (Cetto & Hillerud 1995b, p. 17). Although the general impression was that there was a need to support these journals, the initiative was nuanced by the dichotomy between promoting publication in 'international' journals, i.e. those indexed by WoS (Fortes 1995, p. 44; Krauskopf & Vera 1995), and enhancing the capabilities to publish journals in the region (Russell & Macias-Chapula 1995, p. 179; Zapata & Larrain 1995, p.99). The debate on how to make Latin American science more recognised internationally is found in documents about the rationale for the development of RedALyC and Scielo.

Founders of these alternative JIS have argued that the biases in the coverage of WoS disadvantage the scholarly publications produced in Latin America and other regions. Their expectation was that covering journals with adequate editorial standards would accord more recognition to research neglected by WoS. Below I describe the origins of RedALyC and Scielo, showing some of the arguments advanced by their founders. I focus on the way they positioned alternative JIS with respect to WoS.

3.4.2.1 RedALyC

The origins of RedALyC can be traced to a second workshop on scientific publications in Guadalajara in 1997, but RedALyC started officially in 2002 (Aguado-López, Sandoval-Forero & Chávez-Avila 2003, p. 30). It is funded by the Universidad Autónoma del Estado de Mexico (UAEM), and comprises a database for journal and article references, providing open access to their full texts. Initially it included selected journals in the social sciences, but later it

incorporated journals in the arts and humanities, engineering and technology, and the natural sciences. Its mission is to increase the visibility of journals through the internet, and to select journals from Latin America, Spain, and Portugal. The Centre for Research on Science Communication and Technological Development, led by Eduardo Aguado, is behind its development.

Basically, RedALyC was proposed as a mechanism to increase the recognition of what is considered lost science, i.e. science that is not covered by WoS. The paper by Gibbs (1995) on this topic is often cited by Aguado. As a solution to this lack of coverage by WoS, RedALyC made use of internet and open access. Increasing the access and web visibility of journals published in the region was seen as key in order to 'internationalise' the knowledge in them, at the same time reducing the editorial and printing costs (Aguado-López, Sandoval-Forero & Chávez-Avila 2003, p. 26). According to Aguado-López, Sandoval-Forero and Chávez-Avila (2003, p. 24), this strategy, along with a programme to increase the editorial standards of journals, were developed to remedy the exclusion of Latin American journals from WoS. Aguado-López (2002, p. 322) portrayed RedALyC as an 'alternative to counteract the current policy for international recognition and the neglect of science for the solution of national problems, which revolves around indices produced in the USA, in English, and the quantitative impact factors that more developed countries have achieved' (my translation).

In the above quotation WoS is seen as a device for scientific production measurement that is not suitable for the Latin American context, and RedALyC is offered as an alternative to it. According to Aguado-López et al. (2005, pp. 5–6), the biases in the coverage of WoS include disadvantaging scientists in developing countries, enforcing the use of a foreign language, and using WoS as a yardstick for journals that are not covered by it. For this reason, Aguado-López et al. (2005, p.6) argued that there was a need for the development of systems that give recognition to scientific research published in Latin American journals. The main points in this argument for the development of RedALyC are:

(1) In the global system of science there are regions disadvantaged by biases against them.
(2) These biases are: favouring developed countries over developing countries, publishing in non-English languages, and using only indicators from WoS for the measurement of science in the world.
(3) RedALyC is a way of giving recognition to scientific research excluded by the biased coverage of WoS, through the use of internet and open access.

3.4.2.2 Scielo

Scielo was started in 1998 after a pilot project between FAPESP and the Latin America and the Caribbean Centre on Health Sciences Information Centre (BIREME). It received initial funding from the Pan-American Health Organisation (PAHO/WHO) because it started as an electronic library on medical and health sciences. Scielo is a database for journals, and journal contents are made available through open access. Its network covers 15 countries that operate in a decentralised way, with each country running its own website. However, another site aggregates all the databases to make them searchable from one website[26]. Abel Packer and Rogerio Meneghini have led its development, which is currently supported by FAPESP and implemented by BIREME. Packer and Meneghini (2014, p. 13) stated that the reason for its development was to increase the 'visibility, use and impact of the [Scielo] indexed journals and of the research they publish'. Also in the case of Scielo the strategies to achieve the aims were to offer open access to scientific research and improve the editorial standards of journals in the region (Packer 2001).

The Scielo project included a methodology for the mark-up of articles and journals in XML[27] that enabled them to be published on the web. This methodology was published after a workshop in 1998 (Antonio & Packer 1998). As with RedALyC, Scielo was intended to increase the recognition of publications through web visibility and access to papers. As with RedALyC, Scielo was proposed as a mechanism to increase the recognition of science that was not covered by WoS (Gibbs 1995). In contrast to RedALyC, the

[26] http://www.scielo.org/ [last accessed 26 June 2016].
[27] XML is a language that allows documents to be structured so that they can be processed by computers. In this way, each section in a Scielo paper is marked by identifiers, which transform the papers into bibliographic records that can be incorporated into a database.

project's founders also considered building indicators on the use and impact of the literature in the database (Antonio & Packer 1998, p.237). This was inspired by WoS and is a notable feature of Scielo. Since its beginnings, it has been driven not only by the goal to make papers available online, but also by the desire to create analytical bibliometric tools in much the same way as WoS. As a result, the Scielo site offers statistics such as impact factor[28], immediacy index[29], number of publications, number of citations, number of co-authorships, and other citation indicators for each journal.

Special attention has been given to the compatibility between Scielo and WoS (Antonio & Packer 1998). The attendance by James Testa (a staff member of ISI) at Scielo's 1998 workshop, and the incorporation of a part of Scielo as a separate database into Thomson Reuters' Web of Knowledge[30] in 2014, show that the conceptual design of Scielo reflected the standards of WoS. Firstly, Scielo stressed the quality of the journals included through the establishment of peer-review committees; secondly, there was an emphasis on the fulfilment of editorial standards; thirdly, there was an effort to make Scielo compatible with WoS through the calculation of similar bibliometric indicators and categorisation of disciplines (Antonio & Packer 1998, p. 238). In other words, Scielo intended to shape Latin American journals to the standards of WoS.

Despite the efforts to reflect the criteria and design of WoS, Packer and Meneghini (2007) have argued that biases against journals covered by Scielo exist. For them, there is a 'significant under-representation of developing countries in the international bibliographic indices, particularly in the Thomson ISI Journal Citation Report (JCR)' (Packer & Meneghini 2007, pp. 643–644). The authors asserted that the reason for this under-representation may lie in perceptions shared by researchers and research councils that the best journals can only be produced in developed countries (Packer & Meneghini 2007, p. 647). According to them, this is reinforced by 'the establishment of an

[28] The impact factor for a journal is the average number of citations that papers in that journal receive in the two years previous to its calculation.
[29] The immediacy index is the average number of citations that a paper in a journal receives in the year it is published.
[30] Web of Knowledge used to be the name used by Thomson Reuters to refer to all databases available through its web services. Recently Thomson Reuters stopped using this name. Instead, it differentiates between the 'core collection' and other databases. The core collection is mainly formed of the three citation indices, the book citation index, and proceedings.

international publishing system relying on the increasing value attributed to the ISI–JCR journal ranking, a view adopted by authors worldwide and by funding and evaluation systems' (Packer & Meneghini 2007, p. 643). For these researchers, this results in a lower recognition of Scielo journals, and in a later study (Packer & Meneghini 2014), they examined the Scielo-indexed journals that had been accepted for coverage by WoS, which had presumably passed its filters. They argued that even these journals face biases, as reflected by citation indicators. They argued that in comparison to journals from developed countries, the Scielo-indexed journals have an insignificant citation impact, lowering the expectation that an improvement in editorial quality could bring more recognition from the international academic community (Packer & Meneghini 2014, p. 21).

In summary, the main points in this argument for the development of Scielo are:

(1) Scielo tries to achieve the recognition of Latin American journals by the international community, as represented by the researchers who publish mainly in the set of journals covered by WoS.
(2) In order to achieve this recognition, Scielo's methodology shapes the journals it includes to the standards of WoS.
(3) However, Packer and Meneghini (2014) question whether the biases against journals from developing countries restrict their recognition, even when they pass the quality filters of WoS.

3.5. Conclusions of the chapter

In this chapter I have analysed the literature and documents related to the emergence of alternative JIS. I have advanced two initial reasons that are mainly found in the idea by Eugene Garfield of core journals, and in the literature produced by the founder of RedALyC, Eduardo Aguado, and the founders of Scielo, Abel Packer and Rogerio Meneghini. Additionally, I have reviewed other literature that is relevant to the emergence of alternative JIS, which has further helped me to confirm the two initial explanations: the first is that alternative JIS emerged to cover non-core journals, which are journals that apparently do not have enough scientific impact and editorial quality to be

indexed by WoS; the second is that they emerged to counteract geographical, disciplinary, and linguistic biases in its coverage.

Both explanations indicate that exclusion from WoS was a pre-existing condition for the emergence of alternative JIS. However, the first suggests that exclusion alone – justified on objective criteria – motivated their emergence. In contrast, the second suggests that it was not only exclusion, but exclusion based on subjective criteria.

The first explanation was derived from an analysis of the concept of core journals. According to this concept, there are a small number of journals in which most of the citations in the world are concentrated. Because of this, Garfield argued that they publish the most significant science for all disciplines. In order to identify them, Garfield stated that the journals go through an objective assessment of their compliance with editorial standards and their scientific impact. By covering these journals, Garfield said that WoS covers the most significant journals in the world. This thinking leads to the conclusion that those journals that do not fulfil the standards required by WoS are those covered by alternative JIS. Therefore, alternative JIS could have emerged to cover those journals with poor editorial standards and scientific impact.

The second explanation is based on the idea that the coverage of WoS is biased. This means that the assertion of objectivity in the selection of core journals is challenged. The implication of this for the inclusion of journals in WoS is that its coverage may not be totally explained by the scientific impact and editorial standards of the journals, and a biased coverage by WoS may have been the motivation behind initiatives like RedALyC and Scielo.

However, claims of biases have been challenged by Garfield and other researchers. They argue that the coverage of WoS is an outcome of the editorial standards and scientific impact of the journals, and journals from developing countries do not usually have the quality demanded by WoS. In light of this discussion it is necessary to further analyse the two explanations for the emergence of alternative JIS. Specifically, RedALyC and Scielo appeared when there was a debate in Latin America about the best way to improve the international recognition of the research produced in the region. The options

were to publish in WoS-indexed journals, or to promote journals produced in Latin America. To address this debate, chapters 4 and 5 examine potential biases in the coverage of WoS, and the concentration of its global coverage, respectively. These chapters provide detailed analysis of these two initial explanations for the emergence of alternative JIS.

Chapter 4. Universalism and particularism in the selection of journals by WoS

4.1 Introduction

This chapter contributes towards answering the research question ‘why did alternative JIS emerge in light of the dominance of WoS?’ As explained in chapter 3, the documentary and literature reviews offer two competing explanations for the emergence of alternative JIS: the first is that they emerged to cover non-core journals, meaning journals with poor editorial standards and scientific impact (Garfield 1985); the second is that alternative JIS emerged to cover geographical, linguistic, and disciplinary biases (Gibbs 1995) produced by the foci of WoS.

The two explanations can be expressed in terms of universalism and particularism. To reiterate, universalism is the judgement of scientific contributions based on pre-established impersonal criteria; and particularism is the judgement of scientific contributions based on features of the knowledge producer or the knowledge focus, such as country of origin, language or discipline (Merton 1973b, pp. 270–272). Researching whether the coverage of WoS is related to the application of universalistic or particularistic standards helps in the further understanding of the reasons for the emergence of alternative JIS. In this study, universalism in coverage means the inclusion of journals based on high editorial standards and scientific impact, as stated by Garfield (1997) and Thomson Reuters on its website (Thomson Reuters 2015). The key criteria for inclusion are timeliness, peer review, international diversity of authors and editors, citation impact, and established presence of the journal in a scientific community (Testa 2014). Meanwhile, particularism is the inclusion of journals based on their countries of production, languages, and disciplines.

The availability of the editorial features of journals produced in Latin America, Spain, and Portugal provided by the Latindex Catalogue and citation statistics from Google Scholar allows one to test if these variables are related to coverage by WoS. The technique used to analyse this relationship is a logistic regression analysis. A logistic regression can be used to calculate the

probability that a dependent variable (in this case being *indexed by WoS*) is related to a set of explanatory variables that can be related to universalistic and particularistic properties. The variables related to universalism are:

(1) *editorial standards*, composed of (a) *peer review of original research content*, (b) *external authors*, (c) *openness of the editorial board*, (d) *timeliness*, (e) *abstract and keywords in two languages*;

(2) *scientific impact* expressed by a citation impact indicator (here I use *h-Index*, which is explained below) and

(3) *journal age*, expressed in years (2012 minus start year of the journal).

The particularistic variables are: *country*, *language*, and *discipline* of the journal. These variables are further explained in section 4.2.3. The hypotheses are:

> **Null hypothesis (H0)**: inclusion in WoS is not related to *country*, *language*, or *discipline* of the journals (particularistic variables), after controlling for *editorial standards*, *h-Index*, and *journal age* (universalistic variables);
>
> **Alternate hypothesis (H1)**: inclusion in WoS is related to *country*, *language*, or *discipline* of the journals after controlling for *editorial standards*, *h-Index*, and *journal age*.

Testing the universalistic and particularistic variables mentioned above helps to assess the strength of the two explanations for the emergence of alternative JIS. H0 supports the notion that alternative JIS emerged to cover non-core journals. H1 supports the notion that the emergence of alternative JIS was motivated by gaps produced by the geographical, disciplinary, and linguistic coverage of WoS. In other words, if universalistic standards are the only significant criteria used by WoS to cover journals, the argument that alternative JIS emerged to cover non-core journals gains weight. Alternatively, if the inclusion of journals in WoS is related to their country of origin, discipline, and language, the second argument is more sensible. In this way, the study helps determine to what extent the explanations for the emergence of alternative JIS are supported.

4.2 Methodology

4.2.1. Population and sample

The population studied was formed of active journals in the Latindex Catalogue covered by WoS, Scopus, Scielo, or RedALyC (n=1,954). The sample for the study in this chapter was formed of journals indexed by WoS after 2005 and journals indexed by Scielo, RedALyC, and Scopus produced in Latin America, Spain, and Portugal that were active in 2005 or later. The year 2005 is important because from 2005 to 2010 there was an increase in the journal coverage of WoS, with the inclusion of journals from countries usually not well represented in WoS. Vice-president of the Editorial Development & Publisher Relations at Thomson Reuters, James Testa, called this increase in coverage 'the globalisation of the Web of Science' (Testa 2011). The sudden inclusion of around 1,600 journals from different continents raised a discussion about the criteria used. Some researchers argued that the increase in coverage was not due to scientific impact and editorial standards, but that Thomson Reuters' unclear policy for inclusion was possibly due to competition from Scopus (Gavel & Iselid 2008; Kosanović & Šipka 2013; Collazo-Reyes 2014; Utrobičić et al. 2014). For this reason, data from 2005 provide the opportunity to test the characteristics of the journals included by WoS, given its increase in coverage.

A second filter for the selection of journals was that they were active in 2009, as the information to measure scientific impact is available only from 2009 onwards (further details are given below). In order to check for coverage by WoS, I included only those journals for which the assessment of the editorial standards by the relevant coordinating organisations associated with Latindex was available during the whole indexing period (i.e. 2005–2012). This is because the editorial characteristics of journals can change over time (either improving or worsening), leading to uncertainty about these characteristics at the time that WoS indexed the journals. Hence, if the editorial standards of a journal were assessed in 2006 and its indexing time span in WoS was 2005 to 2010, the journal was classified as being covered by WoS, but if the journal was assessed in 2004 but it began to be indexed by WoS only in 2006, the journal was classified as not being covered by WoS. In addition, only languages with more than ten journals were included. This was to isolate journals about Latin

America produced in Latin America, Spain, and Portugal ('latinoamericanistas' journals). After these filters, there were 1,360 journals in the dataset, 270 of which were covered by WoS. The remaining journals were indexed by Scopus, RedALyC, or Scielo. The sample accounted for 70% of a population of 1,954 journals produced in Latin America, Spain, and Portugal that were indexed by the four JIS studied.

4.2.2. Data collection

A database was built based on the journals published in Latin America, Spain, and Portugal as found in the Latindex Catalogue database. The records offered by the Latindex Catalogue provide basic cataloguing information and editorial standards that are met by the journals, specifying the date at which the assessment was done. Compliance with editorial standards is certified by national research councils, libraries, and international networks such as the European Network for Information and Documentation on Latin America (REDIAL), who check these standards by directly inspecting issues of the journals. The information is validated and uploaded to Latindex's website by national coordinators[31], and there is an annual meeting in which the representatives of the countries discuss the procedures, report results and plan editorial workshops[32] (Alonso-Gamboa & Russell 2012). For this study, the Latindex Catalogue provided information on country, language, discipline, type of publishing organisation, type of journal, and editorial standards (discussed below). This information was complemented with data from Google Scholar for citations, and information on coverage was obtained from WoS, Scopus, Scielo, and RedALyC.

In order to gather information about coverage, the journals collected from Latindex were matched with journals indexed by WoS, Scopus, Scielo, and RedALyC. The reason for including only indexed journals was that it helped ensure that the journals in the sample had been evaluated for coverage by at least one JIS in addition to Latindex. The initial and most recent date of coverage and the number of documents covered by each JIS were checked for

[31] http://www.latindex.org/latindex/coordinadores [last accessed 28 June 2016].
[32] See https://es.wikipedia.org/wiki/Latindex#Reuniones_T.C3.A9cnicas_de_Latindex [last accessed 28 June 2016] for a record of all the meetings held.

each journal. Two groups were classified: (1) journals indexed by WoS and (2) journals not indexed by WoS. Coverage was checked through the ISSNs of journals and also at the title level. Only journals with 100% match in their titles were included. Also, journals with 95% or more similarity in their titles[33] were checked manually against their web pages and WoS. After this check, journals that matched WoS were classified as covered and other journals as excluded. Details on the start dates of the journals were collected from Latindex and all four JIS (WoS, Scopus, Scielo, and RedALyC), as well as from the web pages of the journals. It is important to note that journals can have more than one version, such as paper and online versions. Sometimes the online versions replicate the contents of the printed versions, but in other cases they differ. For instance, a journal can publish more articles online than in paper, and the start date of the online version is usually more recent than the printed version. For this reason, it was necessary to identify the versions that were actually included in the different JIS. I checked this manually in the cases in which journals had more than one version to ensure that the information for the journals was correct. Only the versions of the journal that were covered by WoS, Scopus, Scielo, and RedALyC were included.

In addition to collecting data on coverage, Google Scholar was used as a source to identify citation impact for all the journals gathered. Google Scholar was chosen because it covers a wider range of journals than RedALyC, Scielo, WoS, and Scopus, and therefore helped to increase the chances of finding citation information for the journals[34]. Google Scholar was also useful as a third-party source for citation information that is independent of the various JIS in this study (Harzing & van der Wal 2009). However, its interface does not allow the filtering of results by year of the citing documents. This makes it difficult to build citation statistics from its data. For this reason, the publicly available h-Index produced by Google Scholar Metrics to characterise the citation impact of journals was used (further detail on variables is given in section 4.2.3). In order

[33] For this procedure, the Levenshtein distance function was used. It calculates similarity as the minimum number of characters that have to be inserted, deleted, or replaced in order to transform one word into another word. The implementation was done in PhP language. The routine compared all titles, taking into account country, start year of the journal, and publisher, where available. This produced the list that was manually checked.

[34] Google Scholar is not examined in this thesis because it is not a JIS but a web document search engine that includes citations.

to gather information on as many journals as possible, I also used the software Publish or Perish (Harzing 2007) to build the h-Index for journals unavailable in Google Scholar Metrics. This software queries Google Scholar directly, gathers documents published in a given source, produces the h-Index, and allows published items to be filtered by year. In summary, the data collected on cataloguing information were gathered from Latindex, and the h-Index from Google Scholar.

4.2.3. Variables

4.2.3.1 Dependent variable

The dependent variable in this study is *indexed by WoS*. This is a dichotomous variable indicating whether a journal was covered by WoS at the time of its evaluation by Latindex (1= covered by WoS and 0 = not covered).

4.2.3.2 Independent variables

Two sets of independent variables were considered in the study; some were related to universalistic and some to particularistic criteria. The universalistic variables were chosen with the aim of reflecting the criteria for inclusion of journals stated by WoS, these being: *editorial standards*, *scientific impact* (as measured by the *h-Index*), and *journal age* (Garfield 1980b; Testa 2014). The particularistic variables used in this study were: *country*, *language*, and *discipline* of the journal (Gibbs 1995; van Leeuwen et al. 2001; Klein & Chiang 2004). In addition, other variables that might be related to coverage by WoS have been included. They emerged as possibly relevant in the course of the data exploration and analysis phase: *type of publishing organisation*, *type of publication*, and *high editorial standards* (i.e., fulfilling all editorial standards in table 4.1).

4.2.3.2.1 Universalistic variables

Editorial standards. Latindex makes publicly available 33 editorial characteristics of journals in their database. These are grouped into basic characteristics, layout of the journal, editorial policy and management, and content. For the purposes of this research, I have excluded basic and layout characteristics. Basic characteristics are met by all journals in the Latindex Catalogue. Layout characteristics are not mentioned in the selection process of

WoS. I have selected the characteristics that are closer to the editorial standards stated by WoS in their web page (Testa 2014). These are: timeliness (i.e. regular periodicity), peer review, internationality of authors and editors, and whether titles and abstracts are available in English.

Table 4.1 Selected variables based on editorial criteria of WoS

Label	Criterion	Description
PeerRes	Peer review of original research content	There is a stated requirement of originality and at least 40% of the documents published are research papers, scientific communications, or original contributions that are externally peer reviewed according to the process mentioned in the instructions for authors.
ExAu	External authors	At least 50% of the works published must be from authors external to the organisation or publisher of the journal. In the case of journals published by associations this includes affiliations of the staff members and persons on the board of directors of the association.
EdOp	Openness of the editorial board	At least two thirds of the editorial board must be external to the organisation or publisher of the journal, confirmed by the institutional affiliations of the members.
Regul	Regularity	The periodicity is stated and there is timely publication of the journal in accordance with this statement.
AbsKeyLang	Abstract and keywords in two languages	The abstract and keywords are provided in at least two languages, mainly the original language and English.

Source: these variables are provided by Latindex for journals produced in Latin America, Spain, and Portugal.

h-Index. The h-Index of journals is a measure based on publications and citations and is publicly available from Google Scholar. The h-Index is expressed as the *x* number of papers with at least *x* number of citations (Hirsch 2005). This indicator has been used to characterise the scientific performance of researchers, journals, among others, in bibliometrics. For instance, an h-Index of 15 for a journal means that it has published 15 papers with at least 15 citations. In this way, the h-Index partially captures the size (i.e. number of articles) of the journal and partially captures the citation impact. Many

bibliometric analysts, e.g. Waltman and van Eck (2012), consider that theoretically size should not influence comparisons of journal scientific impact. Instead, Waltman and van Eck recommend a size-independent indicator such as impact factor (Waltman & van Eck 2012, p. 409) for comparisons of scientific impact between journals.

Ideally, collecting the citations to the journals in the sample before they are indexed by WoS could provide a good approximation to their scientific impact previous to being indexed (e.g. Tijssen, 2007). However, it was not possible to build this indicator. The time needed to compile these citations, and the complexity of the different sources to compile them, would require a separate project. Specifically, it would have required joining citations from WoS, Scopus, and Scielo – citation databases – and RedALyC would have been omitted because it is not a citation database. Even then, journals in Scielo would have been disadvantaged as compared to journals in WoS because the citations in each JIS depend on the size of their collections. As Scielo is smaller in size – number of journals covered – the citations to Scielo journals would have been underestimated. A possible solution to this could have been to use the 'cited reference search' available in WoS and Scopus. This is a service that allows the citations to any journal or paper to be calculated by searching for keywords in the bibliographic references of the papers they cover. However, the search is very inaccurate, it restricts the citations to the journals covered by WoS or Scopus, and requires the manual identification of journals. Despite the feasibility of projects for the expansion of structured citation data (see Sivertsen & Larsen 2012), Google Scholar – the biggest search engine for publications – currently appears to be the only feasible solution to the unavailability of the citation data for journals in the sample.

Although not ideal, the h-Index indicator provided by Google Scholar has been found empirically to be correlated with WoS' impact factor (Bornmann & Daniel 2009; Harzing & van der Wal 2009; Franceschet 2010; Hodge & Lacasse 2011; Romero-Torres, Acosta-Moreno & Tejada-Gómez 2013). This means that despite the inclusion of size in the calculation of h-Index (Waltman & van Eck 2012), in practice it can be used as proxy for impact factor. Based on its availability and correlation with the impact factor, the h-Index of journals (Braun,

Glänzel & Schubert 2006) was used. It is an attempt to indicate scientific impact as defined by Martin and Irvine (1983), i.e. in terms of influence.

In order to get the h-Index of a journal, two ways to query Google Scholar were used. The first was through the Google Scholar Metrics service, which lists a set of journals with the calculation of their h-Index. As not all the journals are part of this list, it was necessary to try a second strategy. This strategy consisted of using the software Publish or Perish (Harzing 2007), which queries Google Scholar and aggregates records to construct the h-Index. In total, 1,360 journals were gathered, 937 directly from Google Scholar Metrics, and 423 through Publish or Perish.

Journal age. This variable shows the time in years from the start of the journal until 2012. It can be expected that established journals are likely to be included in WoS in comparison to new journals (Testa 2014). The age of the journal is based on its start date as it appears in Latindex.

4.2.3.2.2 Particularistic variables

Country of publication. This variable has been seen as a source of bias in the coverage of WoS (Gibbs 1995; van Leeuwen et al. 2001) – it is the place where the publisher is located, as reported in Latindex. Even though some countries do not have journals indexed by WoS, they are kept in the dataset as they constitute part of the academic community in Latin America, Spain, and Portugal.

Language. Language is also seen as a source for biased coverage in WoS (van Leeuwen et al. 2001; Lillis & Curry 2010). In this study it refers to the main language of the publication as found in Latindex. Only languages with more than ten journals listed, after use of the filters, were included in the analyses. These are Spanish, Portuguese, English, and Catalan.

Discipline. The third variable that has been seen as prone to bias is the discipline of the journal, mainly in the social sciences (Larivière & Macaluso 2011). (For an analysis of coverage of different disciplines in the social sciences, see Sivertsen & Larsen 2012, p. 572.) I use the main Frascati Field of Science classification (OECD 2006): natural sciences, social sciences,

engineering and technology, medical and health sciences, agricultural sciences, humanities, and multidisciplinary, as found in Latindex.

4.2.3.3 Control variables

During the course of this research additional variables emerged as possibly related to indexing by WoS. These are: *type of organisation*, *type of publication*, and *high editorial standards*. The first two could have an impact on coverage by WoS given its foci on commercial publishers and scholarly journals, as explained below. The third can help to further clarify the relationships between coverage and editorial quality. For this reason, they have been included in the analysis, despite not being explicitly addressed by the literature on the objectivity of evaluations of journals for inclusion in databases.

Type of organisation. This refers to the organisation that publishes the journal. Importantly, most of the journals in WoS are published by commercial companies (Larivière, Haustein & Mongeon 2015), whereas most of the journals in the sample are published by universities. Therefore, one could expect some significant relationship between commercial publishing houses and coverage by WoS. The types of organisation found in Latindex are: governmental / international organisation, learned society, educational organisation, private company, and research institute.

Type of publication. Most of the publication venues in WoS are scholarly journals. In the sample, however, there are also academic magazines and trade journals. This variable was used to control for these other types of publications.

High editorial standards (HighQ). This variable was used to group journals into those that fulfil all the criteria in table 4.1 and those that do not fulfil the criteria. It was used to test variation in the sample according to the number of editorial criteria met.

4.2.4. Data analysis

The journal database was assembled and processed with the statistical package R. Summary statistics and logistic regression were used to provide evidence for the null hypothesis (H0): inclusion in WoS is not related to *country*,

language, or *discipline* of the journals (particularistic variables), after controlling for *editorial standards, h-index, and journal age* (universalistic variables).

4.2.4.1 Descriptive statistics

The data gathered provided some information to produce descriptive statistics. The descriptive statistics helped to explore the distribution of the journals mainly in terms of *editorial standards*, *h-Index*, *journal age*, *country*, *discipline*, and *language*. The exploration of the data was followed by an inferential statistical test, regression analysis.

4.2.4.2 Logistic regression

The relationship between coverage by WoS and universalistic and particularistic variables of the journals was assessed through the use of a regression analysis. Regression techniques are dependence analyses to test the association between explanatory and dependent variables.

Logistic regression is suitable when the dependent variable is dichotomous, as is the case in this study, and it is widely used in the bibliometrics literature (Thelwall & Wilson 2014, p. 964). Other statistical techniques require strict conditions to be met of multivariate normality and equal distribution of variance and covariance matrices. This is the case of discriminant analysis. In contrast, logistic regression is robust when the data does not meet such conditions (Hair, Tatham & Black 2005, p. 276). This makes logistic regression suitable to test the null hypothesis.

Logistic regression estimates the coefficients using maximum likelihood estimation. This estimation is based on probability, fitting an S-like curve to the data[35]. The values produced range from 0 when there is no probability that the event happens, and approach 1 as the probability that the event happens increases. Maximum likelihood estimation is needed because the distribution of

[35] The general logistic regression equation is as follows (Field, Miles & Field 2012, p.314):

$$P(Y) = \frac{1}{1 + e^{-(b_0 + b_1 X_{1i} + b_2 X_{2i} \ldots + b_n X_n)}}$$

Where P(Y) is the probability of event Y happening, e is the base of the natural logarithm; in brackets there is a linear combination of predictor variables (X) multiplied by their coefficients (b). The logarithmic transformation is needed in order to overcome the violation of the assumption of linearity between the predictors and the outcome variable.

a dichotomous dependent variable is not normal and the variance is not constant (Hair, Tatham & Black 2005, p. 277). For these reasons, logistic regression is preferred to other statistical techniques such as Ordinary Least Squares (OLS) regression and discriminant analysis. The first is suited for numerical dependent variables, and the second is not robust when normality and variance assumptions are violated.

The dependent variable is whether a journal has been indexed by WoS. The initial explanatory variables were: *editorial standards*, *scientific impact* (*h-Index*) of the journal, and *journal age* (model 1 in table 4.2 below). Hence, the model starts with the assumption that universalistic criteria are those predicting inclusion into WoS. The logistic regression has been performed in a step-wise manner: after including the initial predictors, I added the other variables one by one (model 2 in table 4.2). These were: *country*, *language*, *discipline* (particularistic criteria), *type of publishing organisation*, and *type of journal* (controls). Additionally, I performed a third regression to differentiate journals fulfilling all editorial criteria (*HighQ*) from the others (model 3 in table 4.2).

Table 4.2 Main models tested

Model #	Model
1	WoS ~ Editorial standards + h-Index + Journal age
2	WoS ~ Editorial standards + h-Index + Journal age + Language + Discipline + Country + Type of publishing organisation + Type of journal
3	WoS ~ HighQ + h-Index + Journal age + Language + Discipline + Country + Type of publishing organisation + Type of journal

4.2.4.3 Model assessment

The reduction in log-likelihood was used as a parameter to estimate the reliability of the models. This estimation was done by summing the probabilities of predicted and observed values to obtain the extent of unexplained information[36]. Higher values indicate poorer fit of the model. In logistic

[36] The calculation for each record (i) is as follows (Field, Miles & Field, 2012, p. 315):

$$\log\_likelihood = \sum_{i=1}^{N} [Y_i \ln(P(Y_i)) + (1 - Y_i)\ln(1 - P(Y_i))]$$

regression, -2 times log-likelihood (referred to as -2LL) is a measure used to show the deviance. This measure has a chi-square distribution, which makes it suitable to test for its statistical significance through an Anova analysis (Field, Miles & Field 2012, pp. 315–316). For this reason, I used an Anova analysis to select the most reliable model. Additionally, I used two pseudo-R^2 measures to further assess the models. The first measure was Hosmer & Lemeshow's R^2, and the second Nagelkerke's R^2 (Field, Miles & Field 2012, p. 765). The first is calculated as:

$$\frac{(-2LLoriginalmodel)-(-2LLnewmodel)}{-2LLoriginalmodel}.$$

(0 = no improvement and 1 = total fit of the model.) This measure, however, does not take into account the size of the sample. For that, Nagelkerke's R^2 was used. These two statistics were used to complement the assessment of the goodness of fit of the model

I have also provided the percentage of correctly classified instances as an intuitive measure of the effectiveness of the models for the specific sample of journals, as compared to classification by chance. I used the 'proportional accuracy by chance' measure as a benchmark to compare the models (Bayaga 2010, p. 293). Proportional accuracy by chance is measured as the sum of the squared proportion of records in each category of the outcome variable:

$$accuracy\ by\ chance = propA^2 + propB^2$$

where *propA* is the proportion of records when the event happens and *propB* the proportion of records when the event does not happen. In this study, the proportion of records covered by WoS was 0.2, and that excluded was 0.8. Applying the equation above, the accuracy by chance is 68% (=0.2^2+0.8^2). Models that correctly classify a higher percentage of records achieve an improvement in accuracy in the sample. In conclusion, a significant reduction of the log-likelihood in the model, higher pseudo-R^2, and classification accuracy of more than 68%, were the criteria used to assess the models. The significance tests used an alpha value of 0.05 as a threshold to reject the null hypothesis.

In the equation, i is a record, Y is the actual occurrence of the event (1 or 0) and P(Y) is the probability that the event i happens estimated by the model.

Finally, in order to check the assumptions of logistic regression, I performed an analysis of linearity between the numeric variables and their log, outliers and influential observations, and multicollinearity (data available in annex 1). These assumptions had to be met to ensure that the regression was not producing biased or inflated coefficients. In the next section I present a general description of the data followed by the results of the regression.

4.3. Results

As explained, this chapter helps to answer the research question 'why did alternative JIS emerge in light of the dominance of WoS?' Specifically, the analysis presented here has been used to investigate the relationship between coverage by WoS and universalistic and particularistic variables of the journals. The hypotheses tested were:

> **H0**: inclusion in WoS is not related to *country*, *language*, or *discipline* of the journals (particularistic variables), after controlling for *editorial standards*, *h-Index*, and *journal age* (universalistic variables);
>
> **H1**: inclusion in WoS is related to *country*, *language*, or *discipline* of the journals after controlling for *editorial standards*, *h-Index*, and *journal age*.

The descriptive and inferential statistics results are presented below.

4.3.1. Results of descriptive statistics

According to the data, journals are concentrated on Spain, Brazil, Colombia, Mexico, Chile, and Argentina. These countries produce 85% of the journals in the sample. In terms of disciplines, the social sciences and medical and health sciences are the most prominent (62% of the journals). Spanish prevails as the main language for all journals produced (81%).

Regarding *editorial standards*, the variables with the highest variability are *editorial openness* (*EdOp*) and *peer review* (*PeerRes*). They are fulfilled by 66% and 73% of the journals respectively. These two variables are related to the control of quality of the works published and the diversity of views in editorial policies. The other editorial variables exhibit a less obvious contrast, being fulfilled by at least 80% of the journals. Fulfilment of all standards, however, is achieved by less than half of the journals. Table 4.3 shows the distribution of all

the categorical variables. Table 4.4 shows the descriptive statistics for the numerical variables. The sample has diverse observations in terms of *h-Index* and *journal age*. Important differences are seen between the maximum and minimum values for these variables.

Table 4.3 Categorical variables

Variable		No. of journals	% over total
WoS-indexed	No	1,090	80.1%
	Yes	270	19.9%
Country	Argentina	102	7.5%
	Brazil	272	20.0%
	Chile	99	7.3%
	Colombia	164	12.1%
	Costa Rica	19	1.4%
	Cuba	43	3.2%
	Dominican Republic	2	0.1%
	Ecuador	3	0.2%
	Mexico	161	11.8%
	Peru	14	1.0%
	Portugal	36	2.6%
	Puerto Rico	6	0.4%
	Spain	352	25.9%
	Uruguay	3	0.2%
	Venezuela	84	6.2%
Discipline	Agr	74	5.4%
	Hum	85	6.3%
	Eng	60	4.4%
	Med	311	22.9%
	Mult	153	11.3%
	NatSci	142	10.4%
	Soc	535	39.3%
Language	Catalan	13	1.0%
	English	134	9.9%
	Portuguese	114	8.4%
	Spanish	1,099	80.8%
Editorial standards**			
PeerRes	No	364	26.8%
	Yes	996	73.2%
ExAu	No	67	4.9%
	Yes	1,293	95.1%
EdOp	No	457	33.6%
	Yes	903	66.4%
AbsKeyLang	No	202	14.9%
	Yes	1,158	85.1%

Variable		No. of journals	% over total
Regularity	No	232	17.1%
	Yes	1,128	82.9%
Type of publication	Magazine	80	5.9%
	Scholarly journal	1,079	79.3%
	Trade journal	201	14.8%
Type of organisation	Educational organisation	730	53.7%
	Government/Int. org.	62	4.6%
	Private company	83	6.1%
	Research institute	134	9.9%
	Scientific society	351	25.8%
Fulfilment of all standards (HighQ)	No	809	59.5%
	Yes	551	40.5%
Total records		1,360	100.0%

Sources: Latindex, WoS, Scopus, Scielo, RedALyC

* Agr = agricultural sciences, Hum = humanities, Eng = engineering and technology, Med = medical and health sciences, Mult = multidisciplinary, NatSci = natural sciences, Soc = social sciences.

**For editorial standards abbreviations, see table 4.1.

Table 4.4 Numerical variables

	Min	Max	Average	St. Dev.
h-Index	0	39	5.78	5.11
Journal age	2	160	24.01	17.89

Sources: Google Scholar, Latindex

In terms of coverage, only 20% of all indexed journals in the sample were covered by WoS. The following regression tests whether inclusion in WoS was related to *editorial standards*, *h-Index*, or *journal age* (universalistic characteristics) or to *country*, *language*, or *discipline* of the journals (particularistic characteristics).

4.3.2. Results of the logistic regression

The dependent variable (*indexed by WoS*) was correlated with the independent variables and control variables. The independent universalistic variables are (a) *editorial standards* (i.e. *peer review*, *external authors*, *openness of the editorial board*, *regularity*, *abstract and keywords in two languages*), (b) *h-Index*, and (c) *journal age*. The independent particularistic variables are (a) *country*, (b) *language*, and (c) *discipline* of the journal. The control variables are (a) *type of publishing organisation*, (b) *type of publication*, and (c) *high editorial standards* (HighQ).

As has been previously noted (see table 4.2), there are three principal models to test the null hypothesis. The first model includes only the independent universalistic variables. The second model adds the particularistic variables to model 1, and the control variables *type of publishing organisation* and *type of publication*. Finally, the third model replaces the *editorial standards* in model 2 with *high editorial standards* (*HighQ*), to discriminate the sample according to fulfilment of all editorial criteria. The models are explained below and the coefficients can be seen in table 4.5.

4.3.2.1 Model 1 (universalistic variables)

This model relates universalistic characteristics and coverage by WoS. The variables are: *editorial standards*, *h-Index*, and *journal age*. According to this model, *external authorship* (*ExAu, p value <0.05)*, *editorial openness* (*EdOp, p value <0.01*), *h-Index (p value < 0.001),* and *journal age* (*p value <0.001*) have significant positive relationships with coverage by WoS. The exponential coefficients show that the fulfilment of the external authorship standard increases by 293% the odds for a journal to be covered in comparison with those journals that do not meet this standard. Also, editorial openness increases the odds by 62% as compared to journals that do not meet this

criterion. The other editorial standards are not significant (*p value > 0.05)*. At the same time, for every positive unit change in the variable h-*Index* the odds of being covered by WoS increases by 17% and by 1% for every unit change in the variable *journal age*. The model explains between 13% and 19% of the variability, as shown by the pseudo-R^2 measures. Its classification accuracy as obtained from the number of correct records classified is 27%. This makes it a poor model to fit data in the sample as compared to an estimated proportional accuracy by chance of 68% (see section 4.2.4.3).

4.3.2.2 Model 2 (particularistic variables)

In model 2 the particularistic variables were added. The results indicate that the variables *h-Index* and *journal age* remain stable in their direction and strength as compared to model 1. However, the variables *discipline* and *country* have a significant relationship with coverage by WoS. Medical and health sciences, multidisciplinary sciences, and social sciences are negatively related with coverage as compared to the natural sciences (*p value < 0.001)*. As compared to the natural sciences, the chances of being covered by WoS for these disciplines are between 26% and 35%.

Regarding *country*, Argentina, Brazil, Colombia, Mexico, Portugal, and Venezuela are disadvantaged compared to Spain (*p value < 0.05)*. Colombia and Argentina exhibit the lowest odds among these countries. Other countries have 0 odds as they do not have indexed journals. The non-significant variables in model 2 are: *editorial standards*, *language*, *type of journal*, and *type of organisation* (*p value > 0.05)*. The model explains between 26% and 36% of the variability, as shown by the pseudo-R^2 measures. Its classification accuracy is 77% as compared to an estimated accuracy by chance of 68%. The model reduces significantly the -2LL as compared to the null model (*p < 0.001*). Based on this model it can be said that the particularistic variables *country* and *discipline* have a significant relationship with being covered by WoS, after controlling for universalistic characteristics.

4.3.2.3 Model 3 (aggregated editorial standards)

Model 3 substitutes the individual editorial standards in model 2 for a variable differentiating the journals which fulfil all five editorial standards. The

coefficients for the variables *h-Index* and *journal age* are significant and positively related to *indexing by WoS* (*p < 0.01).* In this model, the variable *HighQ*, which identifies the journals fulfilling all editorial criteria, shows a positive significant relationship with coverage (*p < 0.01*). The exponential coefficients reveal that fulfilling all criteria increases by 66% the odds for a journal to be covered by WoS. Despite this finding, the significant decreases in odds of being covered by WoS for the social sciences, medical and health sciences, and multidisciplinary sciences remain stable (*p < 0.01)*. This holds also for the countries mentioned in section 4.3.2.2. Based on this model it can be said that the particularistic variables *country* and *discipline* have a significant relationship with being covered by WoS, after controlling for universalistic characteristics, in this case controlling for journals fulfilling all editorial criteria.

The model explains between 26% and 36% of the variability, as shown by the pseudo-R^2 measures. Its classification accuracy is 77% as compared to an estimated accuracy by chance of 68%. According to these characteristics, model 3 has the same power as model 2. In contrast to model 2, however, the -2LL reduction achieved by model 3 is not significant (*p > 0.05)*.

Table 4.5 Results of the logistic regression±

	Dependent variable: *indexed by WoS*		
Variable†	Model 1	Model 2	Model 3
PeerRes	-0.120 (0.178)	-0.028 (0.197)	
ExAu	**1.369** (0.609)**	0.982 (0.646)	
EdOp	**0.484*** (0.177)**	0.276 (0.199)	
Regul	0.175 (0.214)	0.134 (0.241)	
AbsKeyLang	0.251 (0.228)	0.179 (0.266)	
h-Index	**0.160*** (0.015)**	**0.169*** (0.018)**	**0.169*** (0.018)**
Journal age	**0.013*** (0.004)**	**0.013*** (0.004)**	**0.014*** (0.004)**
Magazine		0.363 (0.366)	0.342 (0.368)
Trade journal		-0.252 (0.244)	-0.273 (0.244)
Agr		0.143 (0.382)	0.112 (0.382)
Hum		0.448 (0.351)	0.416 (0.352)
Eng		0.228 (0.437)	0.248 (0.433)
Med		**-1.199*** (0.297)**	**-1.221*** (0.295)**
Mult		**-1.361*** (0.356)**	**-1.400*** (0.356)**
Soc		**-1.044*** (0.271)**	**-1.104*** (0.272)**
Catalan		**-1.377 (1.081)**	-1.381 (1.085)
English		0.371 (0.289)	0.424 (0.283)
Portuguese		-0.482 (0.367)	-0.443 (0.366)
Government / Int. org.		0.322 (0.446)	0.282 (0.445)
Private company		0.470 (0.337)	0.478 (0.336)
Research institute		0.464 (0.298)	0.457 (0.299)
Learned society		-0.199 (0.221)	-0.220 (0.220)
Argentina		**-1.640*** (0.417)**	**-1.708*** (0.418)**
Brazil		**-0.591** (0.277)**	**-0.570** (0.276)**
Colombia		**-2.487*** (0.439)**	**-2.544*** (0.436)**
Mexico		**-0.938*** (0.285)**	**-0.922*** (0.284)**
Portugal		**-1.511** (0.682)**	**-1.504** (0.685)**
Venezuela		**-1.212*** (0.443)**	**-1.185*** (0.444)**
HighQ			**0.508*** (0.173)**
Constant	**-4.736*** (0.663)**	**-2.823*** (0.777)**	**-1.635*** (0.334)**
Observations	1,360	1,360	1,360
Hosmer & Lemeshow R^2	0.13	0.26	0.26
Nagelkerke R^2	0.19	0.36	0.36
-2LL	**1,177.7*** **	**1,010.4*** **	1,008.1

*p<0.05; **p<0.01 ***p<0.001

±Reference categories: Spain for country, Spanish for language, natural sciences for discipline, scholarly journal for type of journal, educational organisation for type of organisation. Statistically significant results in bold.

†For abbreviations, see tables 4.1 and 4.3. Note: only countries with significant coefficients are shown. Countries excluded from the table are: Chile, Costa Rica, Cuba, Dominican Republic, Ecuador, Peru, Puerto Rico, and Uruguay. Each one of the three models is specified in table 4.2.

4.3.2.4 Hypotheses test

To reiterate the research hypotheses in this chapter are:

> **Null hypothesis (H0)**: inclusion in WoS is not related to *country*, *language*, or *discipline* of the journals (particularistic variables), after controlling for *editorial standards*, *h-Index*, and *journal age* (universalistic variables);
>
> **Alternate hypothesis (H1)**: inclusion in WoS is related to *country*, *language*, or *discipline* of the journals after controlling for *editorial standards*, *h-Index*, and *journal age*.

After running a logistic regression based on three models, H0 was rejected and the alternate hypothesis H1 was accepted. This is because the results of models 2 and 3 show that some disciplines and countries are significantly related to coverage by WoS, after controlling for the effects of universalistic variables.

Three criteria were used to choose the best model: (1) accuracy of classification of the records in the sample; (2) higher values of pseudo-R^2; and (3) statistically significant reduction of -2LL. The two models with higher accuracy and pseudo-R^2 are model 2, which adds particularistic variables, and model 3, which replaces individual editorial standards by an indicator of the journals fulfilling all editorial criteria. However, model 2 produces a significant reduction in -2LL ($p < 0.001$), while the reduction produced by model 3 is not significant ($p > 0.05$). This means that model 3 could be influenced by sampling variability. For this reason, the model that best fits the data is model 2. Model 2 shows that even though the effects of universalistic variables are significant, the effects of the particularistic variables are also significant. With regards to the research question of this chapter, 'why did alternative JIS emerge in light of the dominance of WoS?', the results support the idea that the emergence of alternative JIS was motivated by gaps produced by the geographical, disciplinary, and linguistic biases in the coverage of WoS. However, the significant coefficients of the universalistic variables cannot be dismissed. The results of this chapter are discussed further in chapter 7.

4.4. Robustness

The results presented were shown to be robust after tests of variance inflation

factor (VIF), linearity of the logit, and outlier detection. Following Hosmer, Lemeshow and Sturdivant (2013, pp. 197, 360) outliers were detected by looking at standardised residuals greater than 3 or less than -3, as well as influential observations with Cook's distance greater than 1. The accuracy of model 2 improved after controlling for outliers by 3%, reaching 80%. The coefficients remained stable in direction although they changed in strength for countries as most of the outliers were concentrated on countries with few journals indexed. After checking the outliers for correctness of their data, I confirmed that they are valid observations of journals produced in Latin America, Spain, and Portugal. In addition, all observations fell within accepted VIF and tolerance values of less than 10, indicating that multicollinearity is not a concern in this sample. For these reasons model 2 was kept without modification.

4.5 Conclusions of the chapter

This chapter has contributed evidence towards answering the research question ‘why did alternative JIS emerge in light of the dominance of WoS?’ The two explanations that were examined are whether alternative JIS emerged to cover non-core journals, or to cover gaps produced by the geographical, linguistic, and disciplinary coverage focal points of WoS. In order to do this, a set of variables were related to coverage by WoS: universalistic variables (*editorial standards*, *h-Index*, and *journal age*); particularistic variables (*discipline*, *country*, and *language*); and other control variables (*journals fulfilling all editorial criteria*, *type of organisation*, and *type of journal*).

Based on the evidence produced by three regression models in this chapter, it can be said that *country* and *discipline* have a significant relationship with indexing after controlling for *h-Index*, *journal age*, and *editorial standards*. This means that journals from certain countries and disciplines have better odds than others of being included by WoS, keeping universalistic variables constant. Therefore, the argument that alternative JIS emerged to cover biases produced by the particularistic coverage of WoS is sensible. However, universalistic variables also have significant relationships with coverage by WoS. The existence of both particularistic and universalistic reasons for inclusion requires further discussion that is presented in chapter 7. The results in this chapter

show WoS in the context of journals produced in Latin America, Spain, and Portugal. However, WoS and more recently Scopus are used as global cognitive authorities on descriptions and evaluations of scientific research (chapter 1). An examination of the global coverage of these JIS can provide a global perspective to the emergence of the alternative JIS RedALyC and Scielo. This is the aim of the next chapter.

Chapter 5. Geographical, disciplinary, and linguistic coverage of mainstream JIS and its relationship to alternative JIS

5.1 Introduction

This chapter provides further evidence towards answering the research question 'why did alternative JIS emerge in light of the dominance of WoS?' In order to answer it, in the previous chapter I examined two possible explanations to their emergence: the first is that alternative JIS emerged to cover non-core journals, which cannot fulfil the editorial and scientific impact requirements of WoS[37]. The second is that alternative JIS emerged to remedy geographical, linguistic, and disciplinary biases (Gibbs 1995) in the coverage of WoS. A regression analysis showed that the coverage of WoS is significantly related to certain disciplines and countries, holding editorial standards, h-Index, and journal age equal. However, there were also significant relationships between h-Index, journal age, and coverage that cannot be underestimated. They are discussed further in chapter 7.

The main objective of this chapter is to give a global perspective to the emergence of the alternative JIS RedALyC and Scielo. In order to do this, I have compared those regions, disciplines, and languages that dominate the coverage of WoS, to other regions, languages, and disciplines, especially those related to the coverage of RedALyC and Scielo. For this reason, special attention has been paid to the position of journals produced in Latin America, Spain, and Portugal as compared to the regions with the highest coverage in WoS. In addition, analyses of languages and disciplines in its coverage have been performed. Having found a correlation between coverage by WoS, discipline, and country of the journals in Latin America, Spain, and Portugal (chapter 4), this chapter examines the emergence of alternative JIS with respect to the global coverage of WoS.

[37] As mentioned in chapter 1, in this thesis I refer to WoS as composed of the SCI, the SSCI, and the A&HCI.

It is important to note that since 2004 WoS has faced competition from Scopus in the market of mainstream JIS. In a recent marketing campaign, Scopus claimed to offer a more comprehensive coverage of the scientific literature than any other JIS: 'Scopus has twice as many titles and over 30% more publishers listed than any other abstracting and indexing database' (Elsevier 2015). The emergence of Scopus as a competitor to WoS has provided the opportunity to look at the coverage offered by the two most used databases for international benchmarking and research evaluation. Analysing their coverage has allowed an estimation to be made of the extent of global inclusion/exclusion of regions, languages, and disciplines in relation to the emergence of alternative JIS, specifically RedALyC and Scielo. Including Scopus in the analysis has therefore enabled a second objective of this chapter to be achieved, which is to further examine the motivation behind the development of RedALyC and Scielo.

In summary, in this chapter the world coverage of WoS and Scopus in terms of disciplines, countries, and languages of the journals covered is presented. In order to do this, the journal coverage of WoS and Scopus was assessed against a catalogue of scholarly journals in the world listed in *Ulrich's Periodicals Directory* (referred to as 'Ulrich's' from here on). In light of the correlations between country, discipline, and coverage by WoS found in chapter 4, the progression of the coverage of these two databases since 1999 is shown. As mentioned, special consideration has been given to the coverage indicators of Latin America, Spain, and Portugal, the reason being that RedALyC and Scielo – the alternative JIS studied in this thesis – emerged in, and cover, mainly journals from this region.

5.2 Methodology

The coverage analyses in this chapter include discipline, region, country, and language of the journals covered by Scopus and WoS. Discipline and country were found to be significantly related to coverage by WoS in chapter 4. Language was not significant in the best regression model – most of these journals are not published in English. However, language can be expected to play an important role in coverage at the global level given the dominance of English in scientific writing (van Leeuwen et al. 2001; Lillis & Curry 2010; Gordin 2015). Analysing the coverage of these variables in WoS and Scopus has been

fundamental to understanding the extent of exclusion/inclusion of journals, and this in turn has enabled the reasons that motivated the development of alternative JIS to be further examined.

5.2.1 Population and sample

In order to set a point of reference for coverage comparison it was necessary to use a source that tries to provide comprehensive coverage of scholarly literature. Three sources were considered: (1) Ulrich's; (2) EBSCO's The Serials Directory; and (3) the ISSN International Centre database.

Ulrich's has been running since 1932 and is one of the most complete sources of serials in the world (Eldredge 1993; Grimes & Morris 2006). This directory intends to cover serials from all disciplines, publishers, and languages, and its collection comprised over 300,000 serials at the time of this research. It includes a classification that allows scholarly journals to be identified. Being listed in Ulrich's collection is free for journal publishers and is done in cooperation with them.

The Serials Directory was started in 1986, and at the time of this research it had approximately 250,000 titles from all disciplines, countries, and languages. In terms of accuracy of the data provided, however, it has been shown that Ulrich's performs better than The Serials Directory (Grimes & Morris 2006).

The ISSN database was started in 1975, and covers 1.9 million titles. It gives information about all periodicals with a registered ISSN number. This database, however, does not offer information on whether the journals are academic, and its update depends on the cooperation of different national ISSN centres that send their data to the centralised repository. In addition, my experience of working with journals in Colombia has suggested that the information might not always be sent regularly to the ISSN centralised repository. For these reasons the ISSN database was discarded, although it was considered as mentioned previously.

Based on Ulrich's wide coverage of academic journals and better accuracy compared to the other two databases, it was chosen as the reference set. This database has also been used in different studies of coverage, for example,

Braun, Glänzel, and Schubert (2000) and Moya-Anegón et al. (2007). Ulrich's was used only to collect country, language, and discipline of the journals because this information is sent directly by the publishers. However, it should be noted that information on coverage by JIS in Ulrich's cannot always be assumed to be accurate – for example, a 7% inaccuracy was estimated by Eldredge (1993). For this reason, coverage information was gathered directly from WoS and Scopus (see section 5.2.2).

Apart from some possible inaccuracies, it is also important to note that Ulrich's is not complete because there are scholarly journals in the world that are not listed in it (Wagner & Wong 2012). For this reason, the number of scholarly journals provided by Ulrich's could be underestimated (this is a limitation common to all the databases mentioned). After applying a set of filters to this dataset (detailed in the next section), the number of journals used for this analysis was 62,671.

5.2.2 Data collection

5.2.2.1 Academic periodicals listed in Ulrich's

The number of academic publication venues in Ulrich's was 160,957 as of January 2014. Of these, 115,965 were journals or bulletins, and the rest were other types of serials; 88,978 publications that have an ISSN were included as candidates to build the reference set. It should be noted that in Ulrich's each different ISSN is considered a record. For instance, if a journal has printed and online versions, it has two ISSNs that count as two separate records. All appearances of a journal were merged into one record to prevent double counting of titles. In order to merge these titles, if they had the field start date, then the start date of the oldest record was kept, and if the title had an end date then the latest year was kept. Both ISSNs were kept as identifiers of the same journal. Only online and print versions of the journals were considered to identify repetitions. In total 24,433 records were identified as having been repeated one or more times using title, country, publisher, and language of the publication venue as the key to identify them. Removing the duplicates produced 65,545 distinct records; 335 journals that have different editions were kept as different records. These journals were mainly versions in different languages under the same name, which may have differed in content from

edition to edition. These journals were discernible because the title had ‘Edition’ or ‘Series’ as part of it.

A final filter was applied to ensure that the venues were active in 1999, in order to get information to build time series (explained in section 5.2.4.2). Only journals marked as active by Ulrich’s during the study (i.e. in 2014), or that had ceased after 1999, or with content indexed by any of the JIS in 1999 or later were chosen. This produced 62,671 journals and bulletins that formed the reference set.

5.2.2.2 WoS

The list of journals from WoS came from Thomson Reuters’ Master Journal List. The date of query for content was February 2013. There were 12,474 journals in WoS[38] that were collected from the lists published by Thomson Reuters on their web page (Thomson Reuters 2014a, 2014b, 2014c). This was the dataset used in this research. In addition to this list, I checked the bibliographic records of the journals in WoS to ensure that they were searchable within the system. From WoS, I also gathered the earliest year of coverage in the database and the latest year. This information was used to choose the journals that were active from 1999 onwards.

5.2.2.3 Scopus

The list of journals from Scopus came from Scopus’ website[39]. Scopus’ list is updated by Elsevier. The date of query for content was February 2013. The references in the lists produced by Scopus’ search engine were checked to ensure that the titles were actually indexed by it. As in the case of WoS, information about the earliest and latest years of coverage was gathered for each source. In total there were 31,878 sources, 1,110 of which did not have ISSN. This left 30,768 sources, and of these, 2,510 could not be matched against the records in Ulrich’s, which left 28,258 that could be matched.

[38] http://ip-science.thomsonreuters.com/mjl/ [last accessed 25 November 2014].

[39] http://info.sciencedirect.com/documents/files/scopus-training/resourcelibrary/xls/title_list.xlsx [last accessed 25 November 2014].

5.2.3 Variables

The set of 62,671 journals was classified into regions, countries, main disciplines, and languages. The countries of the journal corresponded to the country of the publisher – this did not always reflect the predominant country in terms of the editorial board or the affiliations of publications of the journal. This limits the extent to which the results on geography can be interpreted as accurate indicators of country and region coverage between mainstream and alternative JIS. These countries were aggregated into wider geographical categories in order to make comparisons more meaningful for the purposes of this analysis. The classification used was the UN's classification of the world into continental and subcontinental zones[40]. Although this classification incorporates both geographical and cultural definitions of territories such as 'Latin America', it remains close to a geographical aggregation of countries. However, in order to highlight the regions in which the alternative JIS RedALyC and Scielo have an important presence, I created a category for Latin America – i.e. Central and South America and the Caribbean – Spain, and Portugal. In terms of detail, the three zones with the highest coverage at the subcontinental level were kept (Northern America, Western Europe, and Northern Europe), and all other zones were classified at the continental level (Asia, Africa, and Oceania).

For disciplines, I mapped Ulrich's classification (150 top-level categories) to the agricultural sciences, social sciences, natural sciences, medical and health sciences, engineering and technology, and humanities. This classification is based on the Revised Field of Science and Technology (FOS) classification in the *Frascati Manual* (OECD 2006). The mapping is attached in annex 2 at the end of the thesis.

For languages, I used those in which the journal publishes the full text of their papers as found in Ulrich's. Apart from English, only the top 10 languages as measured by the number of journals produced in Ulrich's were taken into account. These are Spanish, German, Chinese, French, Portuguese, Russian, Italian, Japanese, Polish, and Czech. The total number of journals can slightly

[40] http://unstats.un.org/unsd/methods/m49/m49regin.htm [last accessed 30 June 2016]. This is an aggregation that tries to classify subcontinental regions based on their geography.

change when aggregating by disciplines and languages, because not all journals have this information and, for this exercise, when a journal had more than one language it was counted for each language.

5.2.4 Data analysis

The analyses in this chapter are based on a general method used in related studies of coverage, namely Braun, Glänzel and Schubert (2000), Archambault et al. (2006), Moya-Anegón et al. (2007), Wagner and Wong (2012), and Aguado-López et al. (2014). These studies assess the journal coverage of a JIS against a reference set; most of those mentioned use Ulrich's as the reference set because it is one of the most complete sources on periodicals in the world (see section 5.2.2.1 above).

The time span for coverage analysis was February 1999–February 2013. The choice of starting year was made because, up until 2004, WoS had been the only global generalist citation index in the world, and Scopus, its only competitor with a comparable scope, mainly covered content from 1996 onwards (Elsevier 2014). Around the same time (between 1995 and 1998) the alternative JIS Scielo was founded, and the design of RedALyC had been started, all of which meant that 1999 was deemed to be an appropriate starting point to look at coverage.

The analysis focused on estimating the coverage of world scholarly journals by WoS and Scopus against Ulrich's collection. The data were organised into three blocks: geographical, disciplinary, and linguistic coverage. In order to analyse the data, descriptive indicators of coverage and time series to see the progression of coverage over time have been provided. The time series have enabled a chronological picture to be built up of the coverage scenario faced by alternative JIS.

5.2.4.1 Indicators of coverage and item share

In order to analyse the data, the number of journals covered by WoS and Scopus has been used as an indicator of coverage. In comparing the coverage of databases, some authors sort the variables country, discipline, and language according to number of journals in each database to create a ranking. For instance, if a country occupies the same position in different databases, this is

regarded as equal coverage of the country in the databases. The researchers test the similarity of the rankings through a rank correlation between the reference set and the JIS (Braun, Glänzel & Schubert 2000; Moya-Anegón et al. 2007). However, the rank correlation only shows a general trend that does not take into account the extent of coverage and does not reflect the weight of an item within the collection. For instance, a country that occupies the first position in two databases will have the same rank even if it has coverage of 80% in one database and 60% in the other. Therefore, there is a risk of producing a misleading result, suggesting that the coverage of the databases is very similar when this may not be the case. Some of the authors defend this approach based on the assumption that the ranking is what matters in coverage (Braun, Glänzel & Schubert 2000, p. 277). This understanding neglects the fact that rankings do not provide an estimation of quantity. If journals are regarded as communication venues for scientific communities, and as opportunities for users to learn from, and contribute to, those communities, then the extent of coverage becomes important. In fact, the omission of journals can decrease the scope of knowledge discovery for users (Wilson 1968), and of publication venues for certain scientific communities. This brings the need to estimate the extent of coverage, and looking at the percentages of covered journals by country, discipline, and language can provide such estimation.

Rather than focusing on comparisons of rankings, two indicators that allow for a more encompassing understanding of indexing systems have been used. The first is *coverage*, which is related to the extent of inclusion of journals by WoS and Scopus. For instance, if Ulrich's has 100 journals and 80 are covered by WoS, then the coverage of WoS is 80%. Coverage allows for comparison against the reference set. It shows the extent to which WoS and Scopus covered journals listed in Ulrich's by country, discipline, and language. The second indicator is *item share*, understood as the proportion of journals by discipline, country, and language in each database. For instance, if WoS has 1,000 journals in total, 200 on social sciences, 500 on natural sciences, and 300 on engineering and technology, then the item share for each discipline is 20%, 50%, and 30% respectively. The difference between item share and coverage is that item share is a variable relative to the JIS itself. It calculates the proportion

of journals covered by country, discipline, or language relative to the total number of journals in WoS and Scopus. These two indicators give an idea of the inclusion and composition of JIS in terms of countries, disciplines, and languages of the journals.

5.2.4.2 Time series

As mentioned previously, chronological analysis of coverage complements the coverage and item share indicators. The time series presented in this chapter show the progression of coverage by WoS and Scopus. Given that this research is about the emergence and growth of alternative JIS, time series help to follow the conditions under which alternative JIS have developed over time. For the time-series analysis the time span is from 1999 to 2012. This is because the collection of data on content coverage for each journal was made in February 2013 for WoS and Scopus. It is important to explain the construction of this time series. As there is no access to previous snapshots of the databases, each journal was checked for coverage in the collections of WoS and Scopus. This information allowed the specific period in which the journal had actual content in the database to be found. This way of constructing the time series has had some effects on the trends obtained. Specifically, there was a tendency towards less coverage at the end of the series. This has been noted in other studies, and some attempts to explain this phenomenon have been advanced. One is that it is probably due to content updates in which some journals are dropped, added, are in the process of being updated (Arunachalam 2004, p. 630), or have been dropped and reactivated in some years[41] (Michels & Schmoch 2012, p. 833). Another explanation is that deliberate attempts to increase coverage were made by WoS and Scopus between 2005 and 2010 (Testa 2011; Michels & Schmoch 2012, p. 835), the rate of which may have

[41] For instance, some journals can be dropped and reactivated several times. See the following page: http://www.thomsonscientific.com/cgi-bin/jrnlst/jlchange.cgi?Full=BioChemistry+Journal [last accessed 28 November 2014]. Thomson preserves a list of changes for the previous year, but the number of dropped and reactivated journals over long periods is not available. An exploration of Ulrich's database for this chapter showed that from 2005 to 2010 1,270 journals ceased to be published – 242 of these journals were produced in the UK and 399 were produced in the USA. Together, these two countries accounted for 50% of the ceased journals in the period. Simultaneously, 10,816 journals were started between 2005 and 2010. The UK contributed 1,517 and the USA 2,517. Together this makes up 37% of all new journals recorded by Ulrich's during the period. It may be that the disappearance of some journals and the appearance of many others produced the drop in coverage seen in the latest years of the series.

decreased thereafter. In line with this second explanation, Larsen and von Ins (2010) argue that the drop shows an actual decrease in the coverage offered by some databases, mainly SCI and SSCI. Despite this drop in coverage, the main patterns between regions, countries, and disciplines shown in this chapter are constant.

5.3 Results

The results for geographical, disciplinary, and linguistic coverage and item share are presented in Table 5.1. As explained in section 5.2.4.2, there is a drop in coverage at the end of the time series for coverage. This is possibly due to updates, disappearance of journals, appearance of new ones, and deliberate attempts to increase the coverage of certain regions or disciplines (Arunachalam 2004; Larsen & von Ins 2010; Michels & Schmoch 2012). The results show the extent of the concentration of WoS and Scopus on certain countries, disciplines, and a language. This concentration is relatively stable over time.

5.3.1 Geographical coverage and item share

Table 5.1 summarises the journal coverage and item share of WoS and Scopus by world regions. The comparison is based on the number of journals listed in Ulrich's that are covered by the two JIS. WoS covers approximately 20% of all the journals listed in Ulrich's, while Scopus covers approximately 31%. It should be noted that WoS tends to focus on journals produced in Northern Europe, Northern America, and Western Europe. These regions have the highest coverage in the dataset: 39%, 28%, and 26% respectively. Together, they constitute 83% of WoS' collection, as obtained from the values in item share. Although the three regions represent 53% of world scholarly journals (Ulrich's item share in table 5.1), they make up 93% of WoS' collection. The situation is different for the other regions, which show a lower item share in WoS than in Ulrich's. Specifically, Latin America, Spain, and Portugal have the second lowest coverage and item share in WoS. In conclusion, in the global coverage of WoS, the region represented by Latin America, Spain, and Portugal is under-represented as compared to Northern Europe, Northern America, and Western Europe.

With regards to Scopus, it can be seen that it offers a wider regional coverage than WoS. However, in terms of concentration, WoS and Scopus are similar. Northern Europe, Northern America, and Western Europe make up 74% of Scopus' collection, compared to 53% of Ulrich's. Despite the higher regional coverage of Scopus, the differences between the three top regions and the other regions are considerable. For instance, the coverage of Northern Europe is 53% while the coverage of Latin America, Spain, and Portugal is only 15%. This region has the second lowest coverage and item share in the dataset.

Table 5.1 Global coverage of WoS and Scopus by region*

	Ulrich's		WoS		Scopus	
Region	**Journals**	**Item share**	**Coverage in %**	**Item share**	**Coverage in %**	**Item share**
Northern Europe	9,039	14.4%	39.0%	28.7%	53.2%	24.9%
Northern America	15,184	24.2%	27.9%	34.5%	39.0%	30.7%
Western Europe	9,260	14.8%	25.7%	19.4%	38.2%	18.4%
Oceania	1,520	2.4%	14.1%	1.8%	25.7%	2.0%
Southern and Eastern Europe**	8,359	13.3%	8.8%	6.0%	18.7%	8.1%
Asia	12,126	19.3%	6.2%	6.2%	16.9%	10.6%
Latin America, Spain, and Portugal	6,042	9.6%	6.2%	3.0%	14.7%	4.6%
Africa	1,136	1.8%	5.4%	0.5%	11.6%	0.7%
Not identified	5	0.0%	0.0%	0.0%	0.0%	0.0%
Total	**62,671**	**100.0%**	**19.6%**	**100.0%**	**30.8%**	**100.0%**

*Sorted by per cent coverage.
**Excludes Spain and Portugal.

Sources: Ulrich's, WoS, Scopus

Table 5.2 shows a comparison of selected countries in WoS and Scopus. The countries selected were those with the highest coverage in the three top regions and the countries that produce more journals in Latin America, Spain, and Portugal. As the three top countries are home to the headquarters of some of the biggest publishing houses[42], other countries in those regions which do not exhibit such a high concentration of publishers were included in the analysis. These are Germany, France, Finland, and Canada.

The three countries with the highest coverage in WoS concentrate 68% of all journals in the collection. In terms of coverage, they have even higher values than the zones to which they belong (table 5.1). In contrast, the ten selected countries from Latin America, Spain, and Portugal have less than 10% coverage, except for Chile that has 13% (table 5.2). Interestingly, the 241 journals produced by Cuba and Peru are completely excluded from WoS. Overall, it can be seen that there is a big gap between the countries with the highest coverage in WoS and the top 10 countries in production of journals in Latin America, Spain, and Portugal.

The data for Scopus show a similar concentration on the three top countries, although in this case it is the Netherlands that leads in coverage (incidentally, the country where Elsevier is based). The three countries account for 60% of all journals in Scopus – their item shares in Scopus exceed their item shares in Ulrich's. In general, the top 10 countries in production of journals in Latin America, Spain, and Portugal, have a higher coverage and item share in Scopus than in WoS. Peru and Cuba, countries whose journals are not included in WoS, both have some indicators of coverage and item share in Scopus. However, the item share of the top 10 countries in production of journals in Latin America, Spain, and Portugal are generally less than those in Ulrich's. The gaps in coverage and item share between the top three countries and the other countries in the selection are high. This shows that although Scopus offers a wider coverage than WoS, countries in certain regions nevertheless have a much lower coverage and item share with respect to the UK, the Netherlands, and the USA.

[42] Journals such as "Research Policy" will be counted as Dutch because they are edited by Elsevier although the editorial office is in Brighton, UK.

Country differences also arise within regions. For instance, France and Germany – comparable in number of journals to the Netherlands – have a lower coverage in both Scopus and WoS. In turn, the coverage of the USA is approximately twice that of Canada. However, when compared to countries such as Brazil and Spain, Germany has approximately three times more coverage in WoS and almost twice as much in Scopus. France has approximately twice the coverage of Brazil and Spain in both JIS. Canada also has more coverage in WoS and Scopus than Brazil or Spain despite having a lower number of journals. Finland, a smaller country in terms of journals, has a low coverage in comparison to France, Germany, and the top three countries. Nevertheless, it has a higher coverage in WoS and Scopus than countries with a similar number of journals such as Venezuela, Cuba, and Peru.

Table 5.2 Coverage of selected countries by WoS and Scopus*

	Ulrich's		WoS		Scopus	
Country	**Journals**	**Item share**	**Coverage in %**	**Item share**	**Coverage in %**	**Item share**
Top publishing countries						
USA – NA	**14,070**	**22.5%**	29.1%	**33.4%**	40.4%	**29.5%**
UK – NE	7,815	12.5%	**42.8%**	27.2%	58.3%	23.6%
Netherlands – WE	2,318	3.7%	41.4%	7.8%	**58.8%**	7.1%
European comparators						
Germany – WE	**3,809**	**6.1%**	**22.7%**	**7.1%**	31.1%	**6.1%**
France - WE	1,511	2.4%	14.9%	1.8%	**32.9%**	2.6%
Canada – NA	1,114	1.8%	12.7%	1.2%	21.3%	1.2%
Finland – NE	167	0.3%	9.0%	0.1%	19.8%	0.2%
Latin America, Spain, and Portugal						
Spain	**1,842**	**2.9%**	7.1%	**1.1%**	18.5%	**1.8%**
Brazil	1,466	2.3%	7.5%	0.9%	15.8%	1.2%
Argentina	490	0.8%	3.7%	0.1%	8.2%	0.2%
Colombia	452	0.7%	3.8%	0.1%	11.1%	0.3%
Portugal	399	0.6%	1.5%	0.0%	5.0%	0.1%
Mexico	363	0.6%	9.6%	0.3%	18.5%	0.3%
Chile	314	0.5%	**12.7%**	0.3%	21.3%	0.3%
Venezuela	178	0.3%	6.2%	0.1%	17.4%	0.2%
Peru	150	0.2%	0.0%	0.0%	2.7%	<0.1%
Cuba	91	0.1%	0.0%	0.0%	**24.2%**	0.1%
Rest of the world						
Other countries	26,122	41.7%	8.7%	18.4%	18.6%	25.2%
Total	**62,671**	**100.0%**	**19.6%**	**100.0%**	**30.8%**	**100.0%**

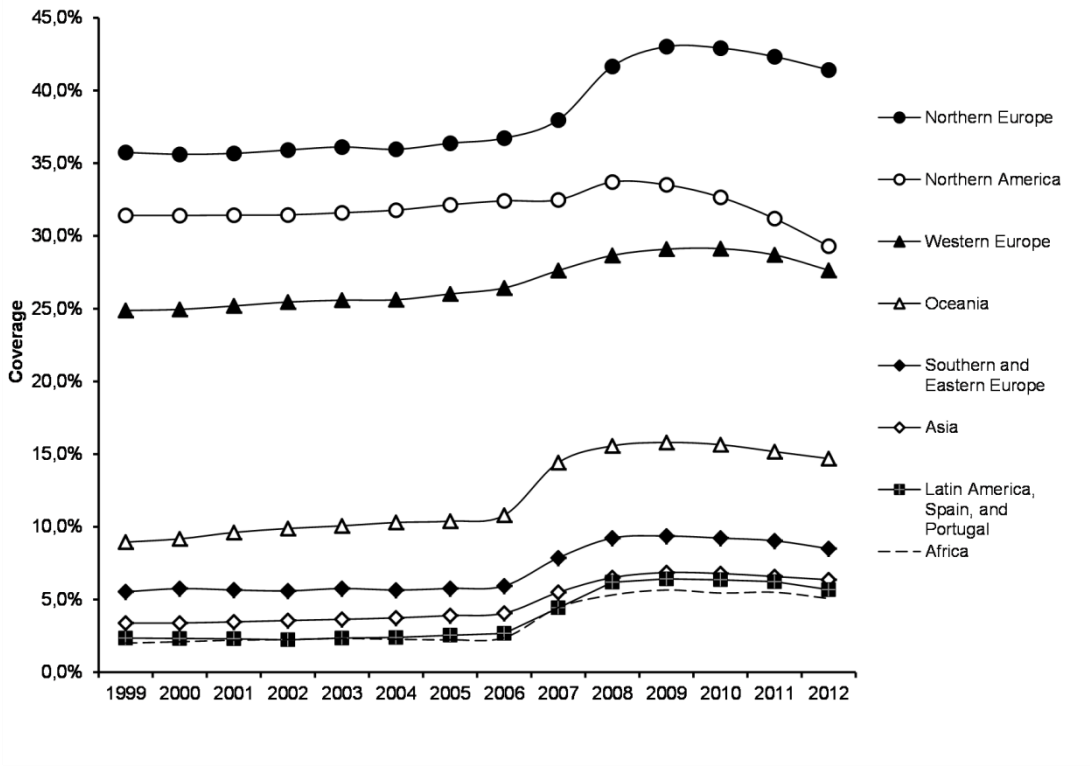
* (1) NE = Northern Europe, WE = Western Europe, NA = Northern America; (2) highest numbers in bold.

Sources: Ulrich's, WoS, Scopus

The coverage over time of the different regions is shown in figures 5.1 and 5.2. The trend shows that the gap between the top three regions and Latin America, Spain, and Portugal has not been greatly reduced despite the increase in coverage from 2005 to 2010 in WoS. Even after 13 years, the coverage for Latin America, Spain, and Portugal does not reach 5%. The coverage of this region in Scopus increased from 2005 to 2008, and then stabilised close to 13% – the second lowest coverage of all regions (figure 5.2). Therefore, the low coverage shown in the analyses above has persisted.

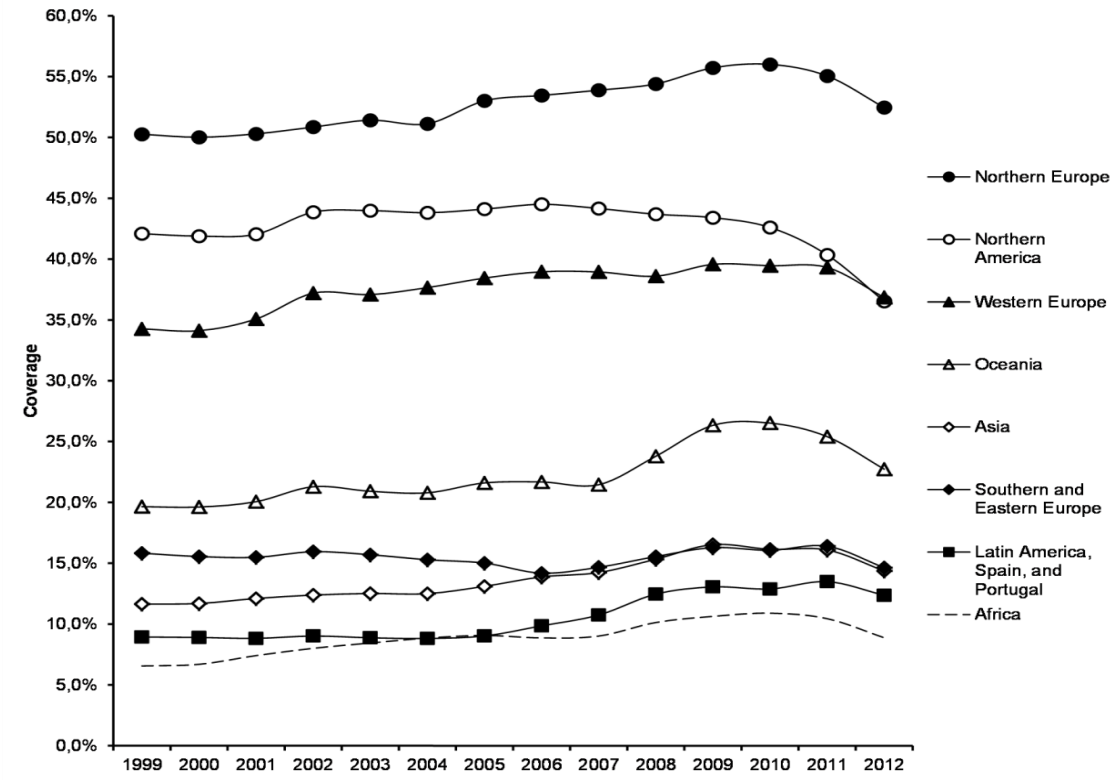
Figures 5.3 and 5.4 show the regional composition (i.e. item share) of WoS and Scopus over time. Overall, the proportion of journals from each region in these two JIS is constant. Slight increases in the item shares of Northern Europe, Asia, and Latin America, Spain, and Portugal had an impact on the item share of Northern America in WoS (figure 5.3). However, in terms of percentage it was not significant. Latin America, Spain, and Portugal had a small increase in item share from 2005, which stabilised at around 3%. A similar pattern is observed in Scopus (figure 5.4). However, the item share of Latin America, Spain, and Portugal in Scopus is higher than in WoS. Also, the item share of Northern America is 5% lower in Scopus than in WoS.

Figure 5.1 Trends in the regional coverage of WoS



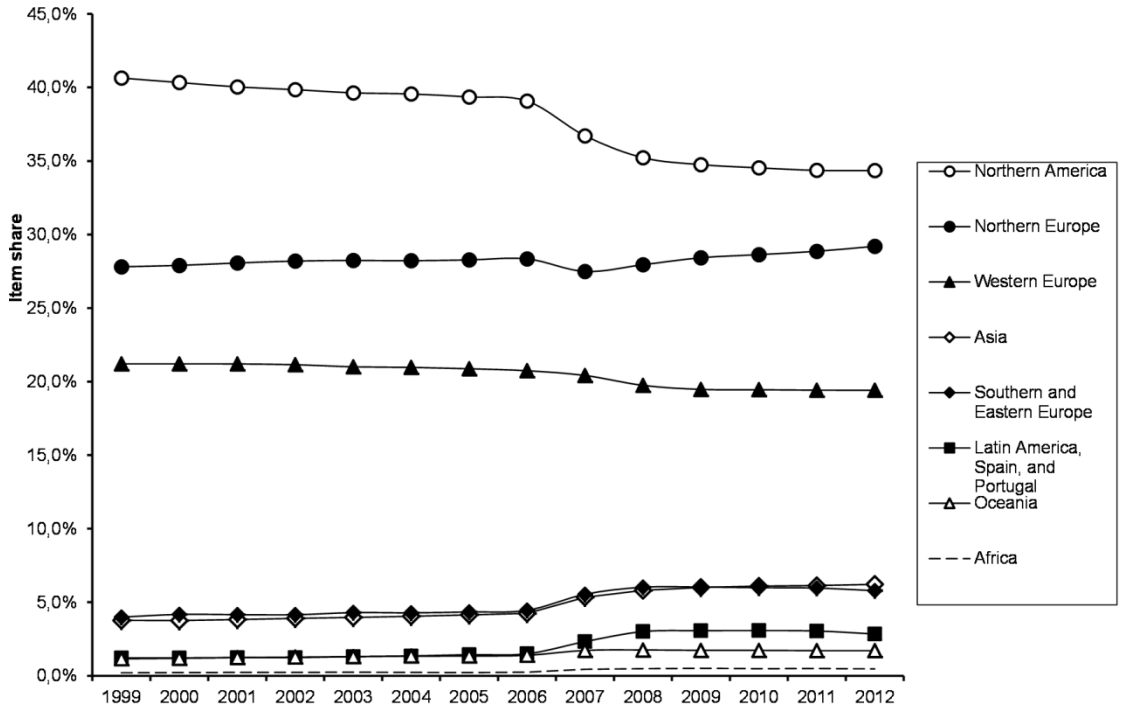
Sources: Ulrich's, WoS

Figure 5.2 Trends in the regional coverage of Scopus



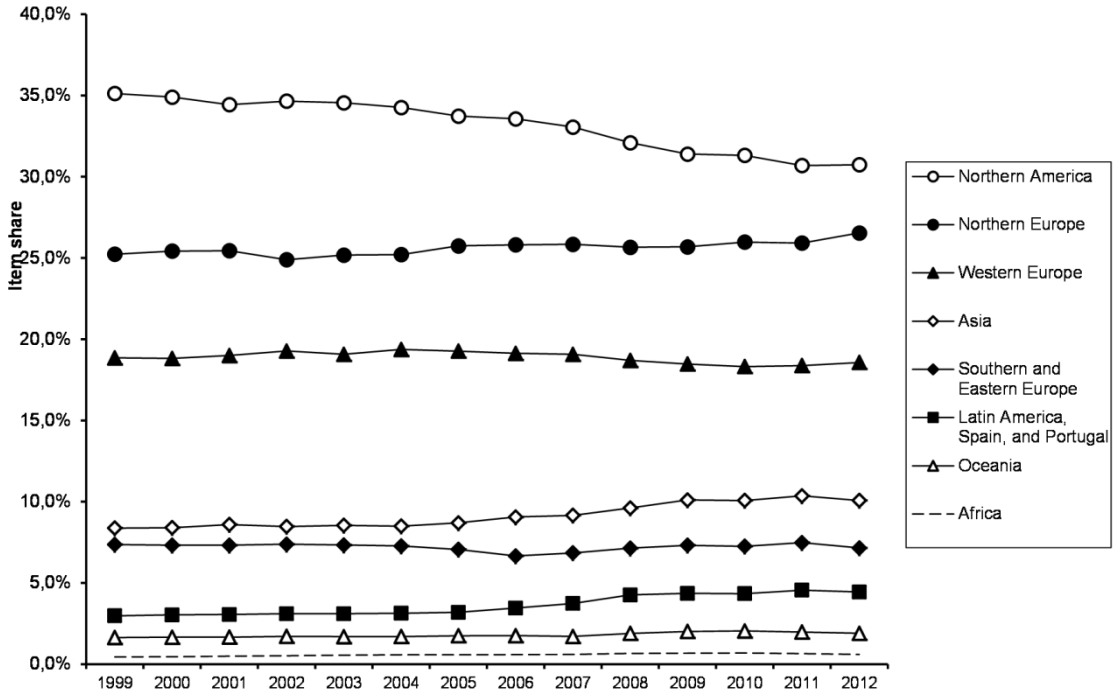
Sources: Ulrich's, Scopus

Figure 5.3 Trends in the regional item share of WoS



Sources: Ulrich's, WoS

Figure 5.4 Trends in the regional item share of Scopus



Sources: Ulrich's, Scopus.

5.3.2. Disciplinary coverage and item share

Table 5.3 shows a summary of the coverage and item share of different disciplines by WoS. Their perceived importance from highest to lowest coverage is: natural sciences, medical and health sciences, agricultural sciences, engineering and technology, social sciences, and humanities. As can be seen, social sciences and humanities present the lowest coverage in WoS, despite the social sciences having the highest item share in Ulrich's. In general, WoS is concentrated on the disciplines that constitute the SCI: the natural sciences, medical and health sciences, agricultural sciences, and engineering and technology account for 72% of WoS' collection.

Scopus offers a wider disciplinary coverage than WoS. The biggest difference is in medical and health sciences, in which Scopus covers 20% more journals. Another difference is that Scopus provides a wider coverage of agricultural sciences than of engineering and technology. However, the social sciences and humanities continue to have the lowest coverage. In terms of the composition of Scopus, the natural sciences still have the highest item share[43].

[43] Leydesdorff, Moya-Anegón & Guerrero-Bote (2010) also found that WoS and Scopus are quite similar with regards to the relative share of disciplines. These authors consider that Scopus is different from WoS mainly in that it includes more journals that are not highly cited.

Table 5.3 Disciplinary coverage of WoS and Scopus*

	Ulrich's		WoS		Scopus	
Discipline	**Journals**	**Item share**	**Coverage in %**	**Item share**	**Coverage in %**	**Item share**
Social sciences	**19,450**	**31.0%**	12.5%	19.8%	21.4%	21.5%
Natural sciences	13,448	21.5%	**31.0%**	**34.0%**	41.8%	**29.1%**
Medical and health sciences	11,959	19.1%	22.9%	22.3%	**42.9%**	26.6%
Humanities	8,018	12.8%	12.2%	7.9%	16.1%	6.7%
Engineering and technology	6,506	10.4%	21.6%	11.4%	35.1%	11.8%
Agricultural sciences	1,926	3.1%	21.9%	3.4%	30.1%	3.0%
Not identified	1,364	2.2%	10.3%	1.1%	17.4%	1.2%
Total	**62,671**	**100.0%**	**19.6%**	**100.0%**	**30.8%**	**100.0%**

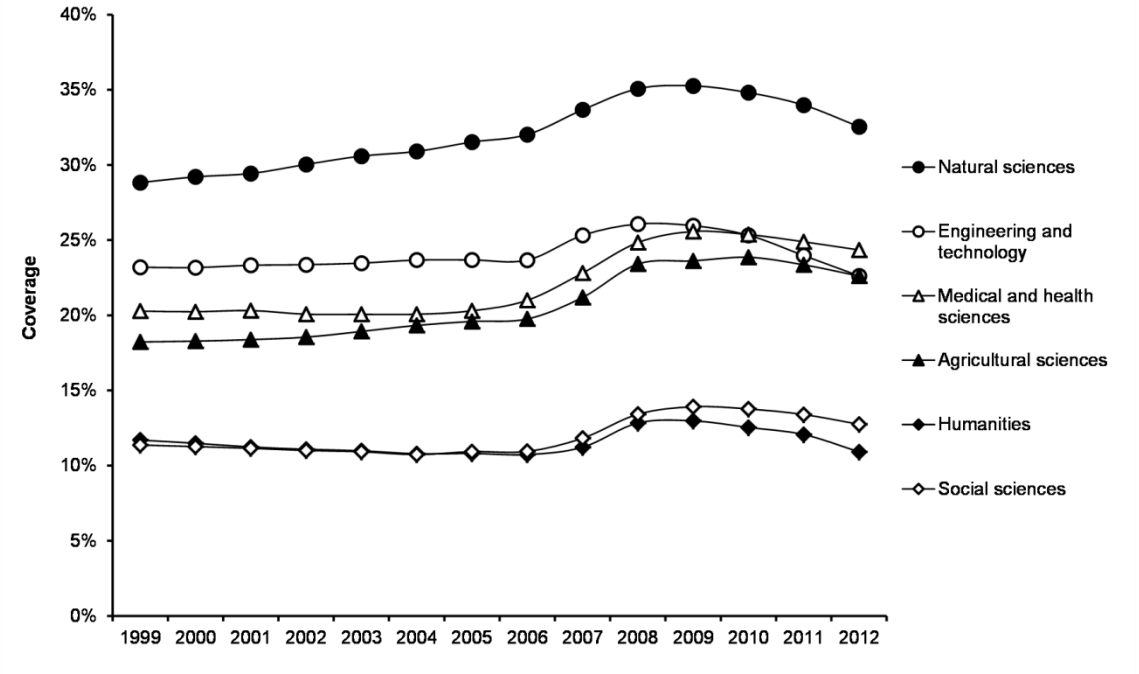
*(1) Sorted by number of journals in Ulrich's; (2) highest numbers in bold.

Sources: Ulrich's, WoS, Scopus

Figures 5.5 and 5.6 show the trends in coverage for the six disciplines over time. In the case of WoS, three groups can be identified: the natural sciences at the top; engineering and technology, medical and health sciences, and agricultural sciences in the middle; and the social sciences and the humanities at the bottom. In comparison to WoS, Scopus shows medical and health sciences and the natural sciences at the top. The other disciplines are less clustered. However, the social sciences and the humanities remain at the bottom. The figures show that both JIS tend to focus on the natural sciences, with Scopus also including medical and health sciences. WoS and Scopus also tend to provide much lower coverage for the social sciences and the humanities, despite the fact that the majority of journals in the world are on the social sciences (table 5.3). In summary, there is a sustained concentration on certain disciplines, while others occupy a comparatively minor position.

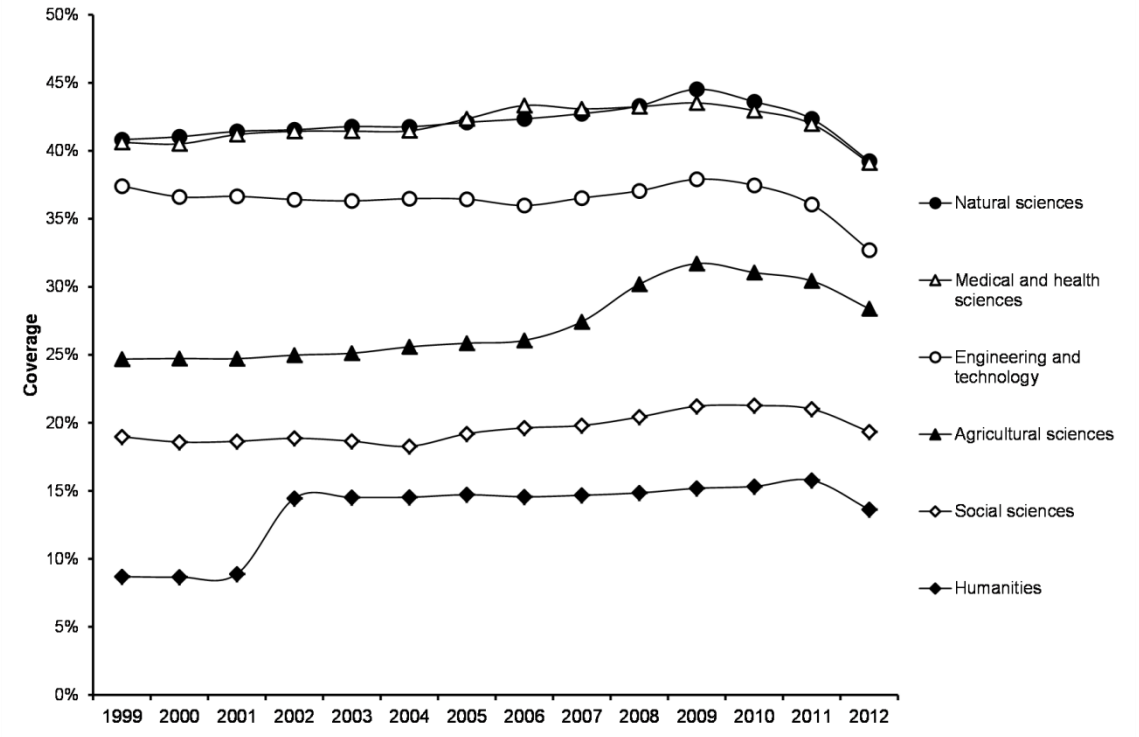
Figures 5.7 and 5.8 show the item share of disciplines over time for WoS and Scopus respectively. The natural sciences and medical and health sciences dominate in both JIS. Interestingly, the social sciences occupy third position, despite having a low coverage. In terms of item share, the social sciences make up around 20% of the journal collections of WoS and Scopus. This contrasts with disciplines such as engineering and technology and agricultural sciences, which have more coverage than the social sciences but a lower share in WoS and Scopus. The natural sciences and medical and health sciences are the two disciplines that have high coverage and high item share in both WoS and Scopus.

Figure 5.5 Trends in coverage of disciplines by WoS



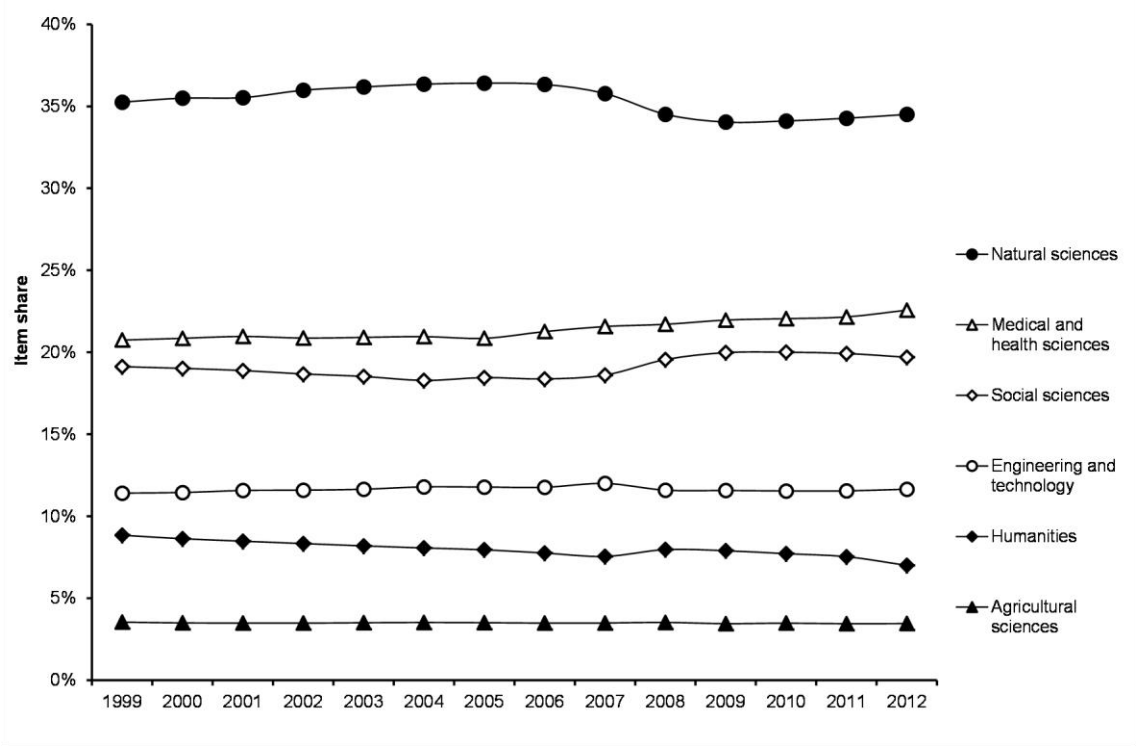
Sources: Ulrich's, WoS

Figure 5.6 Trends in coverage of disciplines by Scopus



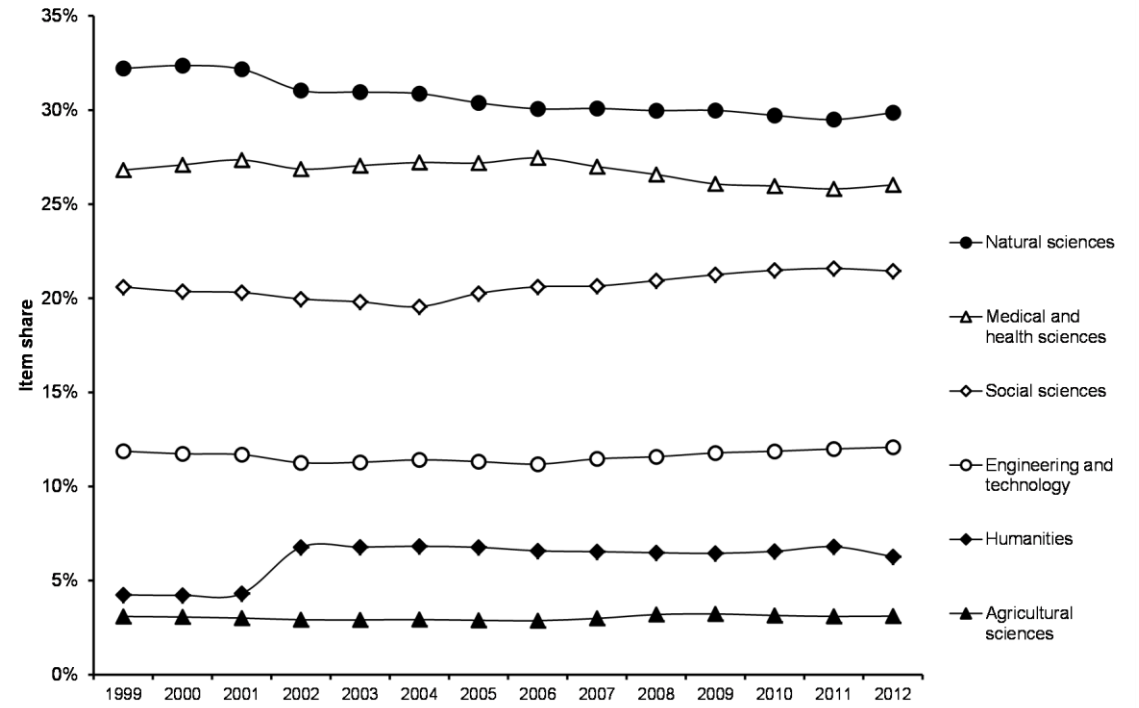
Sources: Ulrich's, Scopus

Figure 5.7 Trends in the item share of disciplines by WoS



Sources: Ulrich's, WoS

Figure 5.8 Trends in the item share of disciplines by Scopus



Sources: Ulrich's, Scopus

5.3.3. Language coverage and item share

Table 5.4 shows a summary of the language coverage of WoS and Scopus. The overwhelming presence of journals in English is constant in the two databases, although it is more concentrated in WoS than in Scopus. While English accounts for 67% of the journals in the world according to Ulrich's, the share of English language journals in WoS and Scopus reaches 92% and 85% respectively (see columns for 'item share' in table 5.4). In WoS the difference between English and French (the latter being the second language in terms of coverage) is 7.2%. In terms of the absolute number of journals this difference amounts to 15 times as many journals in English than in French, as compared to an 11-fold difference in Ulrich's between these two languages. In Scopus this difference is greater than in Ulrich's, being 13-fold.

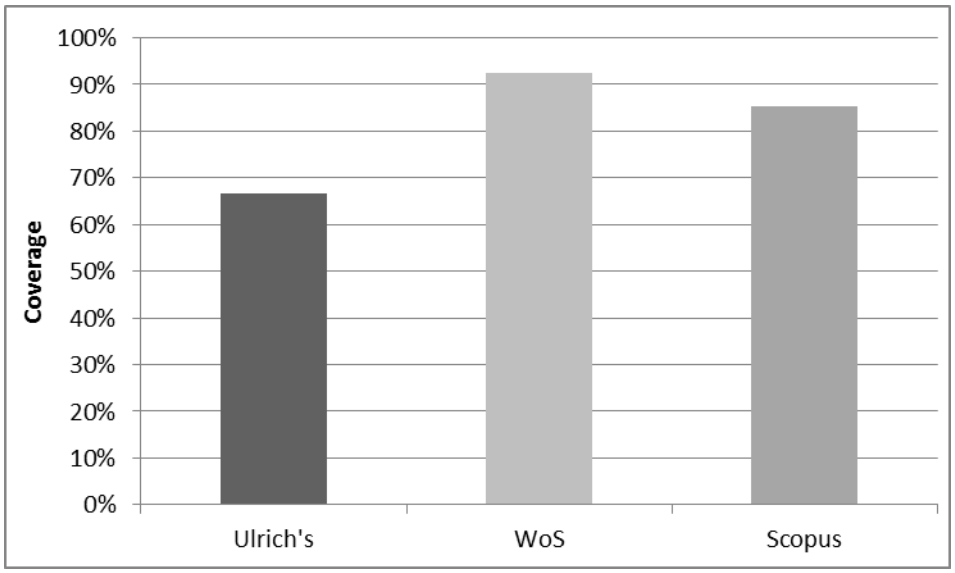
Spanish is the fifth language in the coverage of WoS and Scopus despite being the second in number of journals in the world according to Ulrich's. It is followed by Portuguese in WoS. However, in Scopus, Polish has more coverage than Portuguese despite having a considerably smaller number of journals. In general, the differences in coverage and item share observed in languages with a comparable number of Ulrich's listed journals show the linguistic concentration of WoS and Scopus. They are highly concentrated on English in coverage and item share. This means that the space available for research in languages other than English is small compared to the large space for English, as illustrated in figures 5.9 and 5.10.

Table 5.4 Language coverage of WoS and Scopus

	Ulrich's		WoS		Scopus	
Language*	**Number of journals**	**Item share**	**Coverage in %**	**Item share**	**Coverage in %**	**Item share**
English	**41,780**	**66.7%**	**27.2%**	**92.5%**	**39.4%**	**85.4%**
Spanish	4,533	7.2%	7.5%	2.8%	16.3%	3.8%
German	4,101	6.5%	16.4%	5.5%	25.5%	5.4%
Chinese	4,010	6.4%	0.9%	0.3%	9.6%	2.0%
French	3,680	5.9%	20.0%	6.0%	33.3%	6.3%
Portuguese	1,931	3.1%	6.7%	1.1%	13.8%	1.4%
Russian	1,884	3.0%	3.7%	0.6%	13.6%	1.3%
Italian	1,814	2.9%	8.6%	1.3%	16.7%	1.6%
Japanese	1,625	2.6%	2.8%	0.4%	13.7%	1.2%
Polish	751	1.2%	4.8%	0.3%	15.7%	0.6%
Czech	550	0.9%	5.3%	0.2%	13.1%	0.4%
Other languages	3,505	5.6%	6.4%	1.8%	14.9%	2.7%
Total journals	**62,671**	**100%**	**19.6%**	**100%**	**30.8%**	**100%**

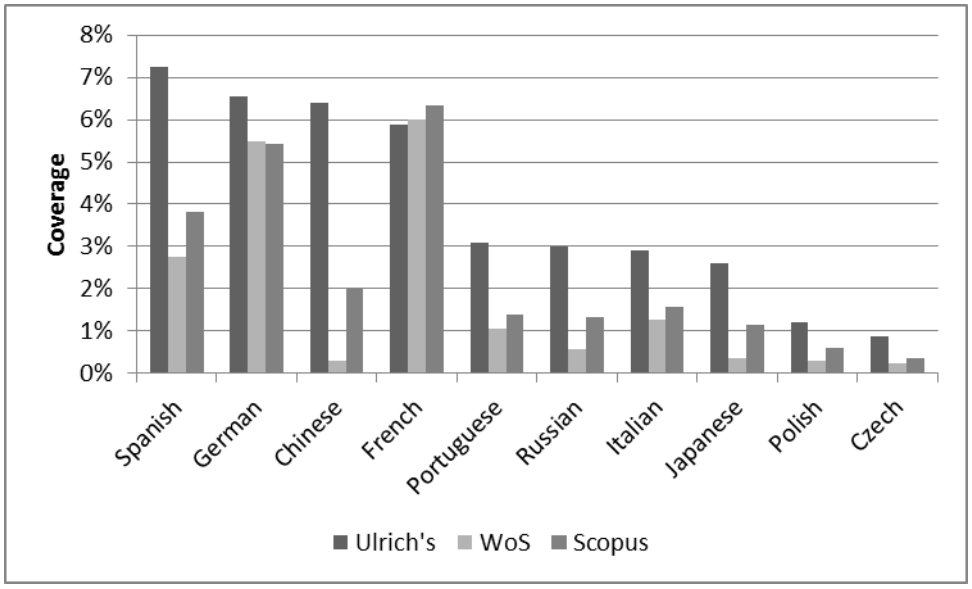
*(1) Only the top ten languages in Ulrich's apart from English are shown; (2) sorted by number of journals in Ulrich's; (3) highest coverage and item share in bold; (4) journals counted for each language; (5) totals row based on distinct journals.
Sources: Ulrich's, WoS, Scopus

Figure 5.9 English item share in Ulrich's, WoS, and Scopus



Sources: Ulrich's, WoS, Scopus

Figure 5.10 Item shares of other languages in Ulrich's, WoS, and Scopus

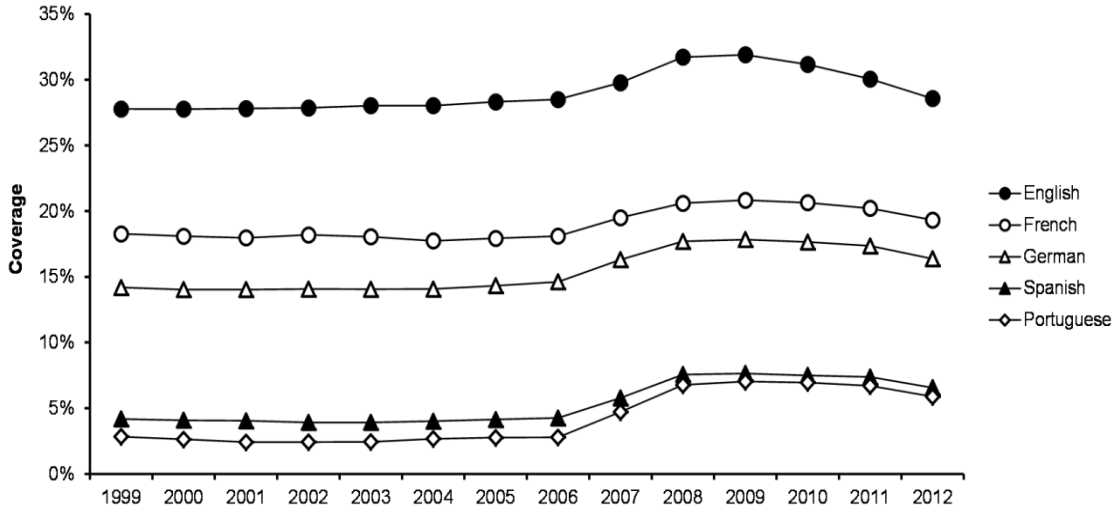


Sources: Ulrich's, WoS, Scopus

As can be seen in figures 5.11 and 5.12, the difference in coverage between English, and Spanish and Portuguese – the main languages of RedALyC and Scielo databases – is relatively constant over time. Even though there was an increase in the coverage of the latter two languages in 2005, this increase was matched by an increase in the coverage of English language journals in the same period. From a user's perspective, this means that there is little knowledge that is accessible in Spanish and Portuguese when searching through WoS and Scopus. Although, according to Ulrich's, there are many journals published in other languages, they represent a very small fraction of WoS and Scopus. This has not changed since 1999.

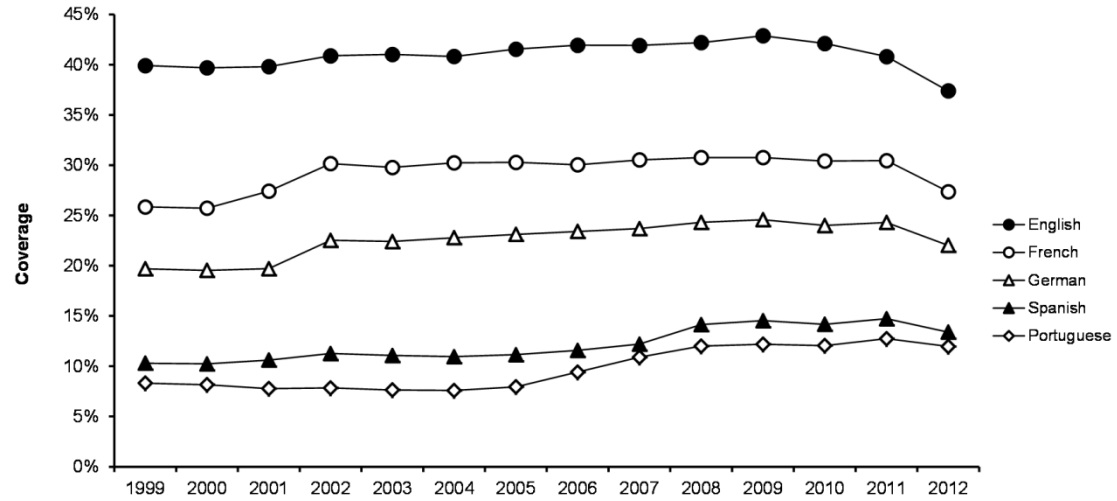
Trends in item share of languages are shown in figures 5.13 and 5.14 for WoS, and in figures 5.15 and 5.16 for Scopus. English prevails in both databases, although Spanish and Portuguese gained more presence between 2005 and 2010, thanks to the inclusion of journals from Latin America, Spain, and Portugal during that period. However, the item share of Spanish and Portuguese stabilised after 2010. Interestingly, the item shares of German and French have decreased by around 1% in the series, and in the case of Scopus they are close to the item share of Spanish.

Figure 5.11 Trends in language coverage by WoS



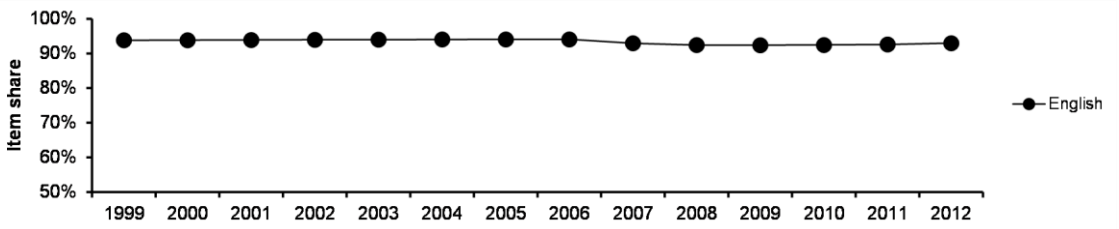
Sources: Ulrich's, WoS

Figure 5.12 Trends in language coverage by Scopus



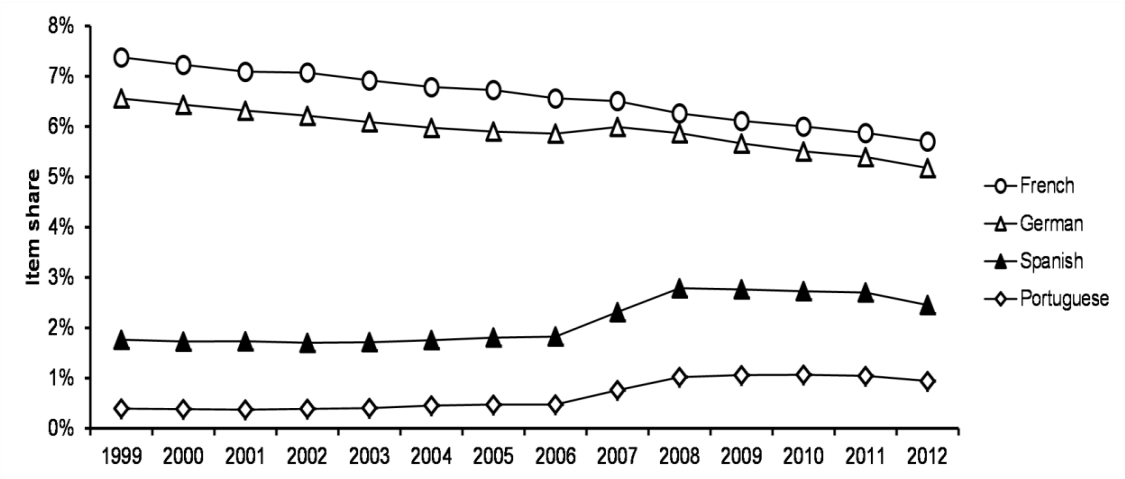
Sources: Ulrich's, Scopus

Figure 5.13 Trends in item share of English language by WoS



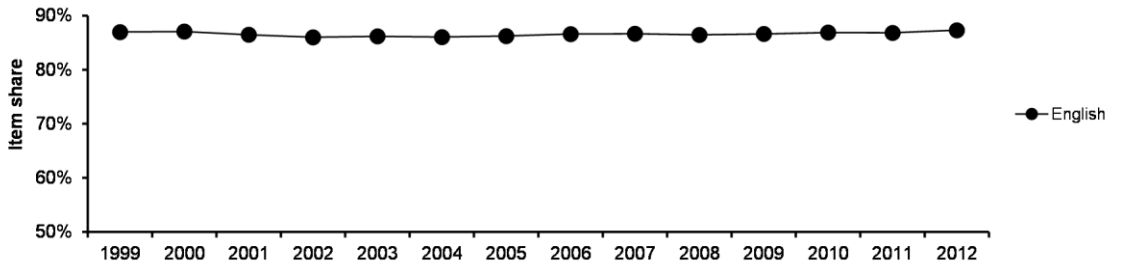
Sources: Ulrich's, WoS

Figure 5.14 Trends in item share of French, German, Spanish, and Portuguese by WoS



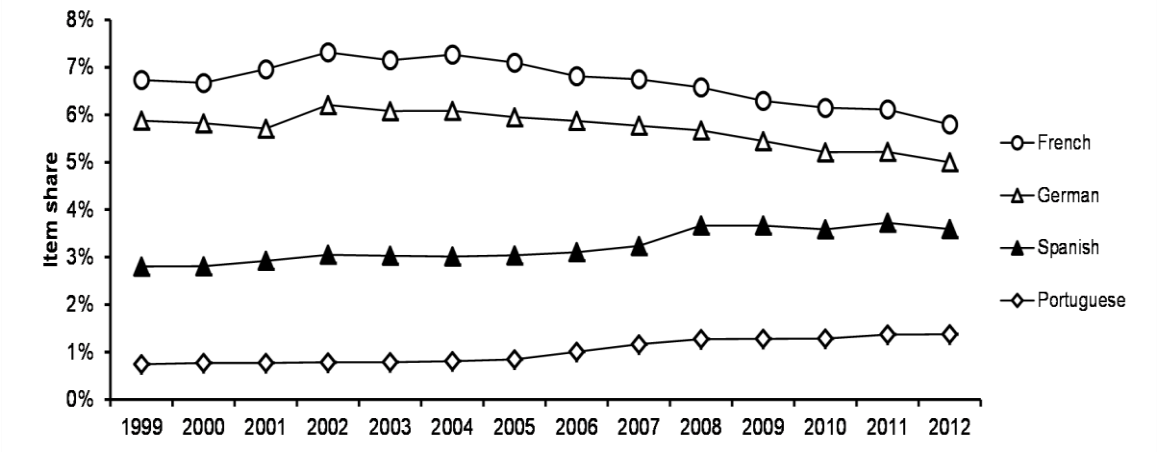
Sources: Ulrich's, WoS

Figure 5.15 Trends in item share of English language by Scopus



Sources: Ulrich's, Scopus

Figure 5.16 Trends in item share of French, German, Spanish, and Portuguese by Scopus



Sources: Ulrich's, Scopus

In summary, the geographical coverage of WoS and Scopus is concentrated on journals produced in three regions: Northern Europe, Northern America, and Western Europe. The countries that have the highest coverage in these regions are the UK, the USA, and the Netherlands. These countries are home to the biggest scholarly publishing houses in the world[44]. In terms of disciplines, WoS and Scopus focus on the natural sciences, although Scopus gives more coverage to medical and health sciences than WoS. Meanwhile, the social sciences and the humanities are located at the bottom in both JIS in terms of coverage. Finally, WoS and Scopus are very much concentrated on English language journals.

The item share indicator exhibits a similar pattern. As explained, item share is the proportion of journals of each country, discipline, or language that make up the databases. The item shares of countries, disciplines, and languages in WoS and Scopus are relatively stable over time. With regards to regions, Northern America, Northern Europe, and Western Europe are at the top. The item share for disciplines shows that the social sciences occupy third place after the natural sciences and medical and health sciences, making up around 20% of both WoS and Scopus. In terms of languages, the dominance of English is sustained over time, although there is a small increase in the presence of other languages.

Latin America, Spain, and Portugal – which account for most of the coverage of RedALyC and Scielo – play a minor role in WoS and Scopus as compared to other regions in the world. Similarly, Spanish and Portuguese – languages of most of the journals covered by RedALyC and Scielo – are well below the coverage of English in WoS and Scopus. Besides, the concentration of WoS and Scopus on the natural sciences shows that other disciplines have a higher rate of exclusion. In relation to the research question on the reasons for the emergence of alternative JIS, these results indicate that the emergence of the

[44] For an analysis of coverage at the publisher level, see Larivière, Haustein and Mongeon (2015). They found that the top five academic publishing houses in the world produce 50% of the journals indexed by WoS (Larivière, Haustein & Mongeon, 2015, p. 1). The publishers are Elsevier (originated in the Netherlands), Wiley-Blackwell (originated in the UK), Springer (originated in the US), Taylor & Francis (originated in the UK), and Sage Publications (originated in the US). The concentration of WoS and Scopus on the UK, the US, and the Netherlands, then, reflects a concentration on publishing houses as well.

alternative JIS Scielo and RedALyC occurred under important limitations of global coverage. These limitations have been sustained over time.

5.4. Conclusions of the chapter

The analyses in this chapter have shown at an aggregated level that there is a concentration of coverage and item share on specific regions, disciplines, and one language with the corresponding exclusion or poor coverage of others in WoS and Scopus. For example, there is a large and sustained concentration of mainstream JIS on natural sciences journals produced in English and originating from Northern America, Western and Northern Europe. The fact that the appearance of Scopus, in spite of its larger coverage, did not significantly change the regional, disciplinary, or linguistic concentrations shows that the conditions under which alternative JIS emerged persisted during the period studied.

The method for the coverage analysis in this chapter has shown in detail the similarities and differences between Ulrich's, WoS, and Scopus. By avoiding a comparison based on rankings, this study has shown that WoS and Scopus differ in important ways from Ulrich's, which is seen as one of the most comprehensive catalogues of journals in the world. The indicators of coverage and item share give an idea of the extent to which the concentration of mainstream databases in some countries, disciplines, and languages differs from the full distribution of journals.

The results provide evidence for the first research question 'why did alternative JIS emerge in light of the dominance of WoS?' and the universalism versus particularism framework of this thesis. The particularistic variables (country, discipline, and language) show a high concentration on a few dominant categories (USA, natural sciences, English) in WoS and Scopus, excluding many journals from participating in what are considered universalistic JIS. In the next chapter, data obtained from the interview programme and which address the second question, 'why do researchers publish in journals indexed by alternative JIS?', are used to complement the observations revealed in this chapter.

Chapter 6. Reasons to publish in journals covered by alternative JIS and their growth

6.1 Introduction

The previous chapters presented documentary and bibliometric evidence that helps address the first research question, ‘why did alternative JIS emerge in light of the dominance of WoS?’ While the previous findings provide insights into the reasons for the emergence of alternative JIS, they do not fully explain their growth. Researchers produce the papers that increase the number of documents in the collections of JIS. Accordingly, interrogating the publishing patterns of researchers, finding out the reasons behind these patterns, and obtaining their views and perceptions on the role of alternative JIS yield further insights into the growth of alternative JIS. This chapter provides findings that help answer the second research question, ‘why do researchers publish in journals indexed by alternative JIS?’

A case study from Colombia has been used to examine the publishing practice of the researchers there. Through an interview programme, their reasons for their publishing practice and views on the role of alternative JIS were obtained. The case study method was chosen considering the type of research question, the degree of control of the researcher over the phenomenon under study, and the time focus of the study. When a question involves personal accounts and deals with a contemporary phenomenon, the variables of which are not under the control of the researcher, a case study is usually an appropriate approach (Yin 2009, pp. 8–14). Besides, case studies are needed to perform in-depth exploration of the phenomenon in its context (Yin 2009, p. 18). The research question in this chapter involves opinions and perceptions of researchers on a current phenomenon – the publishing practice of researchers. In this case, the variables affecting the publishing practices of researchers are beyond the control of the observer. Therefore, the observer is limited to gathering the reasons why researchers publish in journals indexed by alternative JIS. This is a contextual phenomenon because RedALyC and Scielo developed in regions that are not considered scientific powers according to global indicators of

science and technology. For these reasons a case study was chosen to answer this research question.

A case study is a clearly bounded unit of analysis relevant because of its unusual characteristics or similarities to other cases (Stake 1995; Roa 2015, pp. 120–121). Colombia is a suitable choice as a case study because of its similarity to other countries in Latin America. These similarities are related to its economy, the characteristics of its academic publishing industry, and its marginal position in the journal coverage of mainstream JIS. In terms of economy, Colombia is classified as an upper–middle income country by the OECD (OECD 2015). It is also usually classified as an 'S&T [science and technology] developing country' (Ordóñez-Matamoros, Cozzens & Garcia 2010). These two characteristics are shared by other cases analysed in previous chapters, for instance Mexico, Argentina, and Cuba in Latin America.

Regarding its publishing industry, Colombia is an important producer of academic journals in Latin America, comparable on its production of journals to Brazil, Mexico, Chile, Peru, Venezuela, and Cuba. As in other Latin American countries, most of its scholarly publishing houses are higher education institutions. However, few journals produced in Colombia are covered by WoS and Scopus. Additionally, a good number of these journals are from the social sciences and are published in Spanish. This means that Colombia has multiple disadvantages in terms of coverage by mainstream JIS. This situation is also seen in other countries in the region, as shown in chapters 4 and 5.

At the same time, scientists working for Colombian organisations have increased their production in journals indexed by WoS, which is a trend in Latin America (Lemarchand 2012). This shows two phenomena happening in parallel: the first is the increasing production of journals indexed by alternative JIS; the second is the growing number of papers in mainstream JIS-indexed journals by researchers from Latin America, Spain, or Portugal. Researchers create these phenomena by their decisions on where to publish – mainstream JIS, alternative JIS, or both. These researchers are therefore an essential source of information on both their publishing patterns and their perceptions of alternative JIS. Their position as researchers in a country whose journals are not widely

covered by mainstream JIS makes this case valuable in the understanding of the growth of alternative JIS.

6.2 Methodology

6.2.1 Data source and sample

The main data source for this analysis was a series of 30 interviews conducted from May to September 2013 in Colombia. In addition to the interviews, I attended two workshops on visibility for journals through JIS, and a congress on science and technology indicators during the same period. I had discussions with a variety of editors, researchers, indexers, policy-makers, and enthusiasts who had participated in these events. This helped me to learn about the debates related to alternative JIS. Specifically, the main debate was about the uses of alternative JIS for research – a topic which is reflected in the interviews (see results in section 6.3).

I also presented preliminary quantitative results of this thesis (based on chapters 4 and 5) at a Latin American congress (Chavarro 2013), and received important feedback on the results and their interpretation. The questions by researchers showed me that they have informed opinions about Scielo, RedALyC, WoS, and Scopus. Informal conversations with researchers and staff working for alternative JIS provided me with ideas on how to complement the information received from the formal interviews. In particular, I understood the need for the use of secondary data sources – detailed below – to validate and learn more about the publishing practices of researchers. I studied their CVs, web pages, and performed searches and analyses in WoS, Scielo, RedALyC, and Scopus. The combination of these data sources has formed the basis of my analysis. Therefore, this chapter combines perceptions obtained from interviews with observations from other data sources.

The sample of researchers was taken from three different disciplines, namely chemistry, agricultural sciences, and business and management. The main reasons for the choice of these disciplines, in addition to the diversity of their subjects of study, were the extent of their coverage and the application of research results. In terms of coverage, chemistry is generally well covered by WoS while the other two disciplines are not (see chapter 5). This could imply a

lesser need for alternative JIS in chemistry as compared to the other two disciplines. Concerning the context of application, chemistry is usually assumed to be independent of socio-cultural and geographical contexts (Cole 1983). In contrast, agriculture is considered highly localised and its results are related to direct impacts on the country of production (Velho 1985). This may make journals covered by alternative JIS suitable for the publication of results on this subject. Business and management researchers face pressure to publish in specific journals to perform well in world rankings (Rafols, Leydesdorff et al. 2012). These journals are usually covered by mainstream JIS, and for these researchers the pressure to publish in mainstream JIS-indexed journals could have an impact upon their perceptions of JIS. The choice of these three disciplines, then, was based on their potential to show nuances in awareness and responses to JIS.

The researchers in the sample have a variety of backgrounds that are shown in table 6.1.

Table 6.1 Distribution of researchers interviewed

Sector*	Private university	19
	Public university	11
Experience**	Senior	17
	Junior	13
Gender***	Women	9
	Men	21
Nationality	Colombian	26
	Other (one German, one Cuban, two Venezuelan)	4

*Based on the year of the interviews (2013); researchers may have worked in different sectors previously.
**Senior researchers were considered as those with publishing experience before 1995 and within the age bracket of 50 and 70.
*** Gender selection due to availability of respondents.

Source: own elaboration based on researchers' CVs

Importantly, these researchers exhibited different publication patterns in journals covered by WoS, Scopus, Scielo, and RedALyC. They were identified using CvLAC. This is a curriculum vitae database managed by Colciencias, the main public funding agency for science in Colombia. The criteria used to select researchers were based on those (1) participating in a research group endorsed by a Colombian organisation certified by Colciencias[45], (2) having a PhD, and (3) having an individual production of at least three papers in the last ten years. In actuality most of the interviewees have five or more papers (see table 6.2). I contacted 60 researchers in total, and conducted 30 formal interviews with them – ten for each discipline.

Table 6.2 Number of publications by the interviewees in the last ten years

Number of publications	Number of respondents
5 to 10	7
11 to 20	10
21 to 30	4
31 to 40	4
41 to 50	2
51 to 60	1
>60	2

Source: own elaboration based on publications listed in researchers' CVs

6.2.2 Interview protocol

To reiterate, the interview programme was intended to answer the research question: 'why do researchers publish in journals indexed by alternative JIS?' The interviews were carried out in Spanish. All translations of quotations from Spanish to English presented in this chapter were done by me. In line with the research question, the interviews followed a semi-structured questionnaire. It was checked by my supervisors and approved for ethics by the Arts and Social Sciences Committee of the University of Sussex. The questionnaire was tested and refined through a pilot study with five researchers prior to the formal interviews. The pilot study revealed that some of the questions were redundant

[45] In Colombia, in order to be recognised as a research group by Colciencias, the organisation that provides funding for the group has to confirm formally that the group exists and is supported by it. The organisation does so by verifying the information registered by the group and submitting documentation requested by Colciencias. This is known as 'endorsement'.

or not clearly formulated. For instance, a question on whether researchers were acquainted with JIS was addressed by another question with a slightly different wording. Therefore, one of these two overlapping questions was removed. The refinement produced a final questionnaire that I grouped into five main topics (see annex 3 for the interview protocol):

(1) reasons to publish research;
(2) explanation of the publication patterns of researchers in terms of JIS;
(3) use of Scielo, RedALyC, WoS, and Scopus in research[46];
(4) the 'value' of Scielo, RedALyC, WoS, and Scopus for their publications[47];
(5) the future of JIS, and any recommendations or comments.

The first topic – i.e. what motivates publication – mainly served to provide contextual information, which has been excluded from the findings. The second topic focused on the publishing patterns of the sample of researchers and their explanation for them, and their views on alternative JIS – their explanations are the focus of the results section. Here, I encouraged the researchers to talk freely, the aim being to see if they mentioned JIS or related subjects such as impact factors or journal rankings. Whether they did or not, I then introduced the third topic, i.e. questions about the use of different JIS. I asked them how they search for their literature, how they decide to publish in different journals, and if they thought the importance of a bibliographic reference was related to the JIS in which it is found. I then moved on to the fourth topic – I asked them about the value that they attribute to different JIS, and how they use them. I completed the interviews with the fifth topic, i.e. I asked them about their views on the future of alternative JIS, if they thought they should be further developed, and if so, how.

6.2.3 Secondary sources and codification of interviews

Prior to the interviews, I had analysed the publication pattern of each researcher from CvLAC in terms of number of papers produced in journals indexed by RedALyC, Scielo, Scopus, and WoS. This was the basis for my interviews. I contrasted and complemented this information with the researchers' web

[46] To reiterate RedALyC and Scielo are the alternative JIS and to WoS and Scopus as mainstream JIS.
[47] The value was judged both through direct questioning and through each researcher ranking his/her own papers during the interview.

profiles and other publicly available CVs. In all cases I asked for an updated CV from the researchers themselves. To validate the information, I compared the CVs to Colciencia's CvLAC. The comparison showed that CvLAC provided a complete list of publications for the sample until 2012. A few publications were lacking from some records, but I updated them using the Scielo, RedALyC, WoS, Scopus, and the CVs that were provided by the researchers themselves. Notably, in other cases CvLAC was more up to date than the researchers' own CVs. Finally, I organised the list of publications into tables and aggregated them for each researcher. This allowed me to gain an understanding of their publication patterns from matching the journals with the JIS covering them.

Twenty-eight of the interviews with researchers were recorded. Permission was granted through their signature, by email communication, or verbally at the beginning of the interview. In the latter case an audio file of the permission was kept. I then used the method known as 'thematic analysis' (Braun & Clarke 2006). This process consists of taking notes while interviewing, then journalising the notes as soon as the interview is completed by listening to the audio files, identifying categories, and validating the categories found through a second review of the notes and audio files (Braun & Clarke 2006). Although Braun and Clarke advise the use of a second person to review the categories in the last stage, in this case I did the process myself. The review of the categories was carried out six months later. The time lag between the first codification and the second allowed me to double-check the consistency of the categories by codifying the interviews again and comparing the new codification to the previous one. In this way, I could see if I had made mistakes the first time and could identify ambiguous categories. The codification served as a way of finding patterns, discovering themes, and comparing responses. In addition, the answers given by researchers were checked against information from other data sources. To recap, this information was collected through the use of Scielo, RedALyC, WoS, Scopus, and the CVs of researchers in order to expand on their perceptions. The results are reported below.

6.3 Results: interview responses and publishing patterns

The results shown in this section are descriptions of patterns grouped by discipline. Whenever possible, I have complemented and supported the

interviews with other data sources. This is because case studies need to validate and expand information, especially when it comes from perceptions and opinions. This is known as ‘triangulation’, and is suggested by Yin (2009, pp. 114–119) as a way of corroborating facts or phenomena. In this case study, I corroborated the information gathered from interviews using (1) the CVs of the researchers in the sample; (2) data from Scielo, RedALyC, WoS, and Scopus; and (3) the analysis of specific papers mentioned by the researchers.

The main finding derived from the interviews is that some researchers acknowledged needs that are fulfilled by alternative JIS-indexed journals. Namely, researchers gave examples showing that journals covered by Scielo and RedALyC provide opportunities to publish novel scientific knowledge, to diffuse and adapt concepts and models, to provide open access to literature, to introduce PhD students into academic publishing, to bring literature in English closer to Spanish and Portuguese speakers, and to start new areas of research. However, other researchers thought that journals covered by Scielo and RedALyC are only useful to train themselves in how to publish, with the aim of developing the expertise to publish in WoS-indexed journals.

6.3.1 General perceptions of alternative JIS-indexed journals and publishing patterns

As indicated above, two main perceptions of alternative JIS-indexed journals emerged from the interviews. One group of researchers considered them as training mechanisms in order to publish in WoS-indexed journals, conferring a low importance upon them. The other group considered that alternative JIS-indexed journals have the same importance as WoS-indexed journals in terms of the knowledge covered. The responses of the first group suggest that they aim to publish in WoS-indexed journals. To achieve that goal, publishing in alternative JIS-indexed journals is seen by them as a useful step for building capacity. This is based on the idea, expressed by a senior chemist, that ‘WoS is a synonym for quality’. For this respondent, although alternative JIS are training mechanisms for new researchers, ‘the problem is that many researchers get stuck in that stage and never evolve towards the good journals’. In a similar way, a researcher from agricultural sciences said: ‘For me, when I publish in a journal indexed by the Web of Science, it is the best that I can achieve’. Another

researcher from business and management said that his colleagues in the US would not publish in journals not covered by WoS. Even an editor of a journal on agricultural sciences indexed by Scielo said that ‘the role of this journal is to train researchers in order to publish in international journals [meaning journals covered by WoS]’. This perception is congruent with many policy incentives that give the best scores to publications in WoS and Scopus (e.g. in Brazil, Mexico, Colombia, Chile, and Spain).

The same idea of publishing in alternative JIS-indexed journals being a step towards publishing in WoS-indexed journals was provided by 13 researchers in total. They referred to journals and their indexing systems using metaphors that implied a linear sequence understood in terms of chronology. Mainly, these researchers thought that journals covered by alternative JIS give a ‘kick start’ to their careers. For instance, a junior researcher from business and management in a private university compared the progression from alternative JIS-indexed journals to mainstream JIS-indexed journals, to a process that shows progression in terms of education level: ‘as when you go from primary school, to high school, to university, you have to go through that process to publish in the big leagues’. Another researcher from chemistry referred to alternative JIS-indexed journals as a ‘staircase’. Yet another researcher from agronomy called them a ‘pathway’ to WoS. In all cases, there is an implication of a start and an end in conjunction with a qualitative change. The start is represented by non-indexed or alternative JIS-indexed journals and the end by WoS-indexed journals.

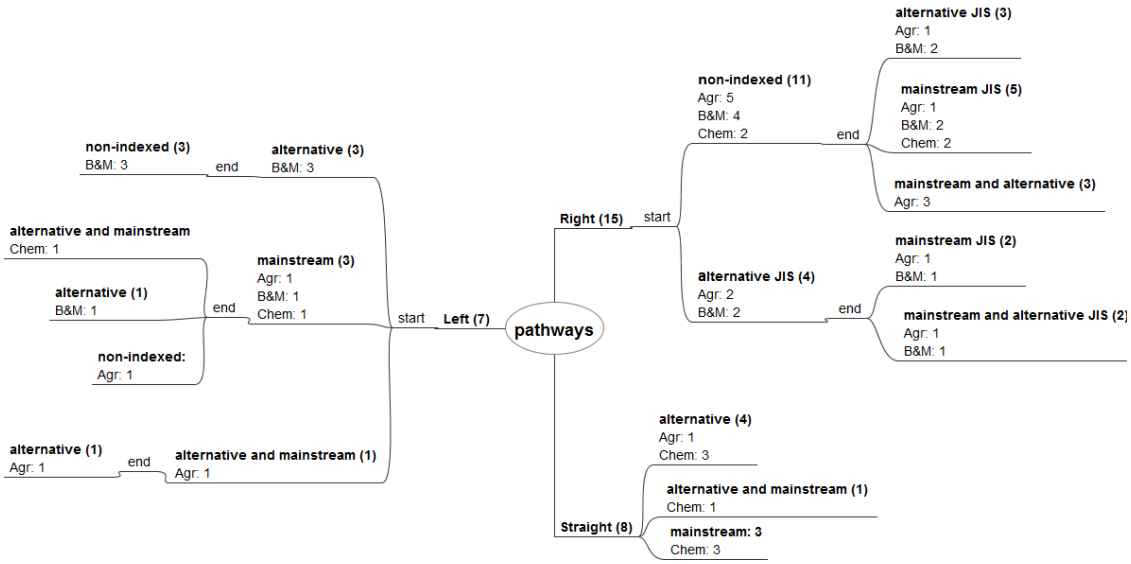
However, other researchers considered that publishing in alternative JIS-indexed journals should not be regarded only as a step towards publishing in WoS-indexed journals. For instance, a researcher from chemistry thought that being a mature scientist meant you had to first of all decide on the type of readership you wanted, and then choose journals to reach that readership. He, however, acknowledged choosing the journals in which he publishes from the set covered by WoS or Scopus. He expressed this dilemma in the following way:

> I feel that researchers, based on God knows what, have prostituted ourselves. By prostitution I mean that researchers are guided by the score in rankings, by career improvement, and by the economic benefits of that. In that sense, if you see my CV, since 2006 I have made every effort to publish in WoS or Scopus-indexed journals. It may sound bad, but I only target ISI [WoS] or Scopus. … Going against the mainstream can be meaningless.

Similarly, a researcher who is also an editor of a business and management journal indexed by Scielo thought that the pressure to publish in mainstream-indexed journals poses limitations. His main point was that it discourages the formation of a distinctive scientific community in Latin America. For him, journals indexed by alternative JIS would find it difficult to become something else other than 'transit stations' to WoS: 'If we are all going towards the same point, I don't think journals here will be able to make progress in those indexing systems. I have doubts that there is real dialogue between the journals from here and the ones from there'. The two comments suggest that some researchers may exhibit a different publication pattern from the sequential pattern as expressed by the researchers towards WoS.

To corroborate the interview data on publication patterns, I looked at the CVs of all researchers in the sample. Firstly, I examined the chronology of their publications, and identified the JIS covering the journals in which they have published. I then classified every journal article in their CVs as *not indexed* when I could not find them in Scielo, RedALyC, WoS, or Scopus; *indexed in alternative JIS* when the publication was in either Scielo or RedALyC; and *indexed in mainstream JIS* when the publication was found exclusively in WoS or Scopus. Finally, I compared the JIS of their first publication to the JIS of their latest one to identify any changes. Figure 6.1 shows the publication patterns of researchers based on a comparison between their first and latest publications.

Figure 6.1 Publication patterns of researchers according to JIS, based on initial and latest publications*



* Agr = agricultural sciences, B&M = business and management, Chem = chemistry; numbers refer to number of researchers; 'start' is JIS of their initial publication; 'end' refers to their latest publication.
Source: own elaboration based on researchers' CVs and Scielo, RedALyC, Scopus, and WoS databases.The figure shows three main pathways identified by branches in the tree. The first is the branch called 'Right'. This pathway was followed by researchers who started publishing in non-indexed or alternative JIS-indexed journals. This means going from non-indexed to alternative or mainstream JIS-indexed journals, or from alternative JIS to mainstream JIS-indexed journals; 15 researchers exhibited this sequential pattern. The majority were from agricultural sciences, followed by business and management and chemistry. At the end of this branch (leaves at top right) I present the distribution of researchers who transitioned from non-indexed journals to alternative or mainstream JIS-indexed journals. This includes those publishing in the same year in journals covered by alternative JIS, and journals covered by mainstream JIS. In this way, the Right branch seems to support the notion that alternative JIS are used as a transition from non-indexed to mainstream JIS-indexed journals.

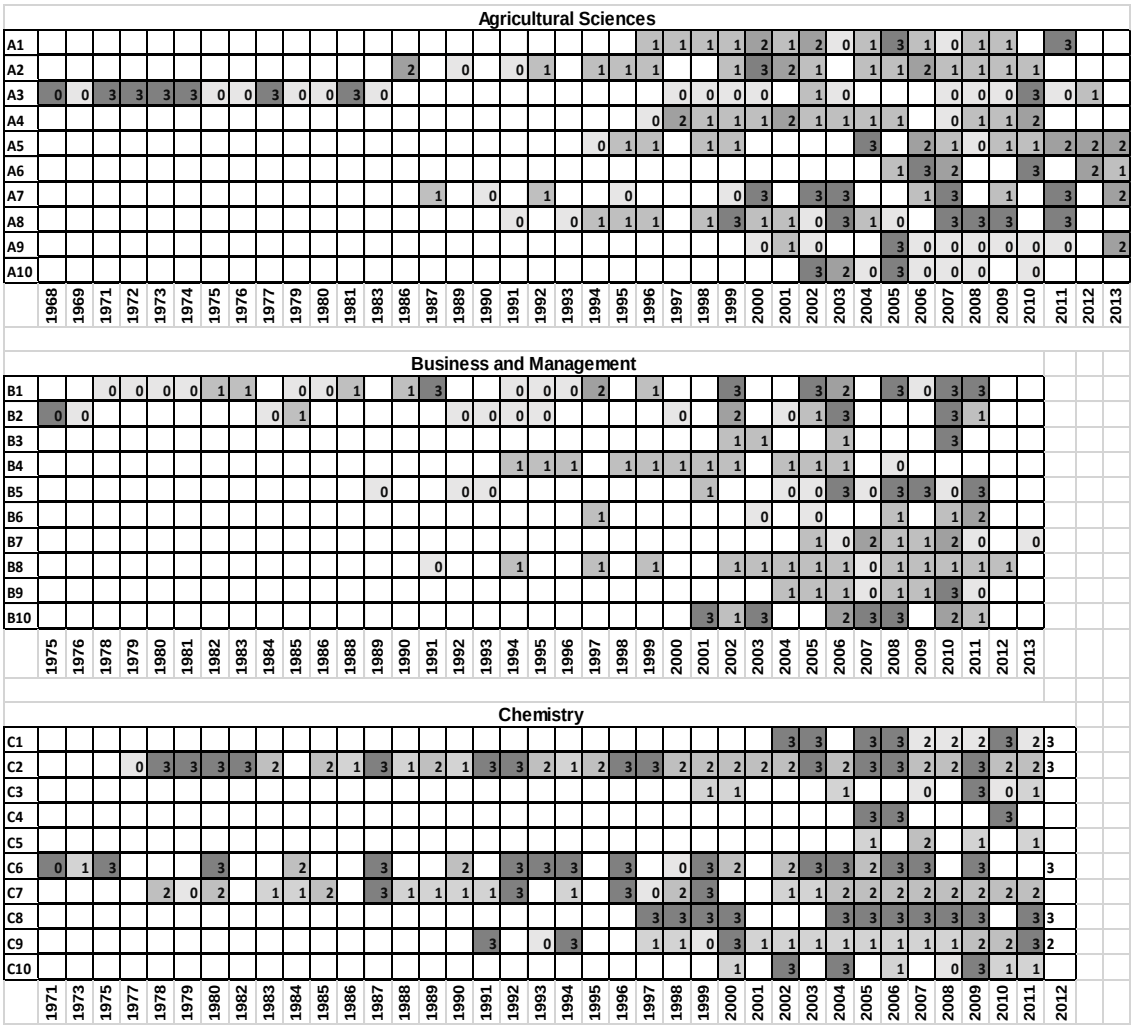
However, the other two branches in figure 6.1 reflect patterns that do not support the sequential pattern from non-indexed or alternative JIS-indexed journals to WoS. The 'Left' pattern is composed of researchers who have transitioned from indexed to non-indexed journals. In this case, the direction

seems to go towards alternative JIS-indexed journals. This is a distinct and opposite pattern to the Right branch. Meanwhile, the ‘Straight’ branch of the tree shows that some researchers have not made a transition in their latest publications. This too does not support the sequence perception. Therefore, the two diverging patterns provide support to the idea that for these researchers alternative JIS-indexed journals may be more than a training arena for publishing in WoS-indexed journals.

A detailed view of the publication trajectory of researchers shows a richer picture. In figure 6.2 I present the extended publication patterns of researchers according to JIS since they started publishing journal articles. The different numbers and shading identify the JIS of their publications in each year where each row represents a researcher.

Figure 6.2 shows the variety of publishing patterns of the researchers in the sample. An observation that arises is that these patterns show a constant movement between non-indexed, alternative JIS-indexed, and mainstream JIS-indexed publications in their trajectories. The perception of a sequential pattern, then, is not clearly found in the publishing records of researchers when examined in detail. The variety of publishing patterns found suggest there could be other reasons for publishing in alternative JIS-indexed journals beyond the perception of sequential patterns towards WoS – these reasons are explored in the next section in which I present the examples contributed by the interviewees.

Figure 6.2 Timeline publication patterns of researchers according to JIS*



*Each row is a researcher. **0** = publications in non-indexed journals; **1** = publications in alternative JIS; **2** = publications in alternative JIS and publications in mainstream JIS; **3** = publications in mainstream JIS.

Source: own elaboration based on researchers' CVs and Scielo, RedALyC, Scopus, and WoS databases.

6.3.2 Use of alternative JIS-indexed journals

6.3.2.1 Opportunity for original research

The majority of interviewed researchers attested that they use alternative JIS-indexed journals to publish topics that are neglected in other venues. This was most noted in agricultural sciences, but also present in business and management. A minority of chemists supported this view.

Agricultural sciences

Arguably, agricultural sciences have an important need for alternative publication venues. Being 'applied' (Velho 1985), they require localisation and their results are likely to be on topics such as endemic crops and animals. Besides, the contextual features surrounding agricultural sciences, such as various industries, economy, and geography, may affect the focus of research. For instance, a senior researcher on *Passiflora* plants, with an interest in the species producing passion fruit, said:

> I searched for all articles on *Passiflora* in the world, and an important number were found in Scielo. I think that's very good, and you know passion fruit is from here. Now, if you look for apple tree, you wouldn't find anything in Scielo. In that sense Scielo is very good. And this is not done by other indexing systems.

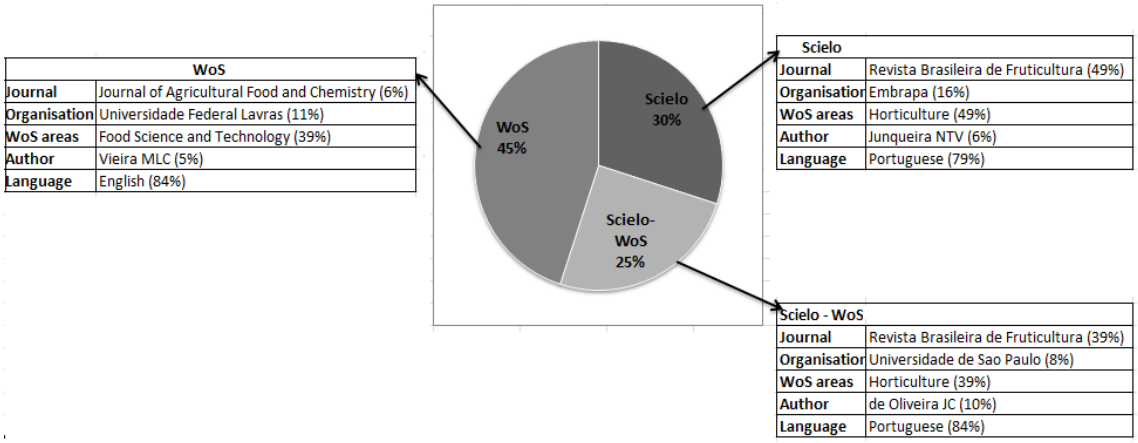
The interviewee pointed out possible thematic differences between the coverage of alternative JIS and mainstream JIS. In order to establish these differences, I compared the coverage of WoS and Scielo on passion fruit to see whether the papers covered by them differed and, if so, how. The title search I conducted for 'passion fruit or *Passiflora edulis*' from 2000 to 2010 in WoS and Scielo yielded interesting hints about its coverage. According to the search there were 465 papers covered by WoS or Scielo, of which 118 (25%) were covered by both databases. This meant that 75% of the papers appeared only in one of them: 210 papers (45%) were exclusive to WoS and 137 (30%) to Scielo. This distribution prompted the search for indications of thematic and other differences between JIS as pointed out by the interviewee.

In order to explore this, I analysed the three sets of JIS data (Scielo, WoS, and Scielo–WoS[48]) in terms of their subjects, journals included, authors, and organisations involved. Firstly, I listed the journals, authors, subjects, and organisations related to papers on passion fruit in each set. I then selected those with a higher frequency of papers to see the points of concentration, i.e. the most frequent journals, authors, subjects, and organisations. Based on this analysis, I found that WoS and Scielo had important differences on research about passion fruit. The most visible difference was on the main subjects covered that were related to passion fruit. Basically, the majority of papers on passion fruit covered by Scielo, including Scielo–WoS, were on its horticulture (49%). In contrast, the main focus of WoS was on food science technology of passion fruit – juice processing, pectin, and antioxidants extraction mainly. This accounted for 39% of the papers covered by it. In this sense, the foci of the databases yielded a difference in the knowledge available on passion fruit. While Scielo focused on its production, WoS was focused on its transformation.

The differences occurred also at the organisational, journal, authorial, and linguistic levels. For instance, Scielo showed the important contribution of Embrapa's research on production of passion fruit. Embrapa is a public institute whose mission is to develop a sustainable model of tropical agriculture for the Brazilian context. This organisation works on the production of food, fibres, and energy (Embrapa 2015). While it stands as the most productive organisation found in Scielo, its visibility in WoS is blurred. In WoS the organisation that predominates is the Universidade Federal Lavras. This meant that when searching for passion fruit in WoS, the work by Embrapa was invisible and the records returned by the search were partial. Indicators on passion fruit that ignore Scielo would also provide a partial view of the research on this fruit. The same observation also applied to journals, authors, and languages. Figure 6.3 below compares Scielo and WoS on the coverage of papers on passion fruit. The examples shown are the most productive in the number of papers in each set.

[48] This represents the intersection between Scielo and WoS in terms of journals covered.

Figure 6.3 Comparison between WoS and Scielo on passion fruit



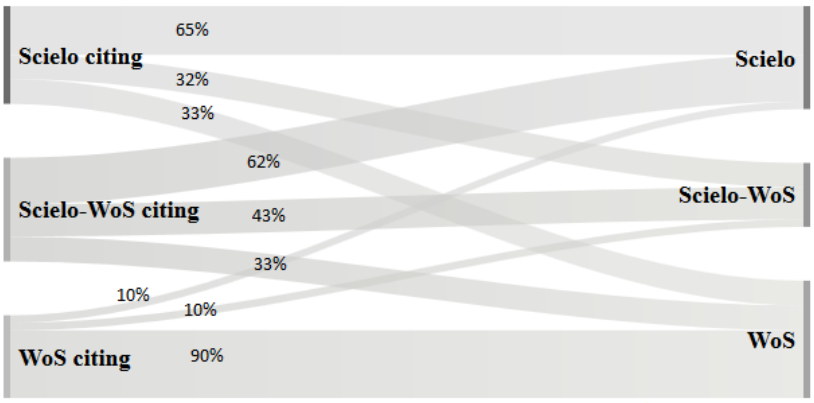
Source: own elaboration based on the Web of Knowledge[49]

The figure confirms that for the interviewee, who worked on the production of *Passiflora* plants, Scielo was a suitable source to acquire knowledge. In fact, the interviewee acknowledged the use of around 30% of his references from papers in Scielo and RedALyC. Interestingly, the dataset on passion fruit gathered for this analysis cite a similar percentage of references from Scielo as discussed below.

Based on the dataset collected, I identified 2,527 papers that cited the research on passion fruit. Of these papers, 70% cited research from WoS-indexed journals, 28% from Scielo-indexed journals, and 20% from journals covered by both. Overall, most of the papers published in WoS-indexed journals (90%) tended to cite papers in other WoS-indexed journals. Only 10% of the papers in WoS-indexed journals referenced Scielo-indexed journals, and 10% Scielo-WoS journals. However, the papers covered by Scielo used references from these sets more extensively. Specifically, 65% of papers published in Scielo journals referenced other Scielo journals and 33% referenced journals covered in both WoS and Scielo. Only 33% of papers published in Scielo journals referenced research on passion fruit covered by WoS. A similar pattern was seen in the papers published in journals covered by both WoS and Scielo. This is illustrated in figure 6.4.

[49] As mentioned earlier, Web of Knowledge is no longer in use, but at the time of the query this was the name of Thomson Reuters's database that included Scielo.

Figure 6.4 Patterns of citation of research on passion fruit in WoS and Scielo*



JIS of the paper	Papers citing Scielo	Papers citing Scielo-WoS	Papers citing WoS	Total citing papers
Scielo	169	84	86	260
Scielo-WoS	376	260	200	605
WoS	166	165	1495	1662
Total	711	509	1781	2527

*Citation direction is from left to right; one paper can cite different sets.

Source: own elaboration based on Web of Knowledge

This analysis shows the existence of two communities of researchers with diverse interests. The focus of one on production and the other on transformation may partly explain the few cross-citations between the sets. Despite this, the pattern suggests that there is knowledge in Scielo that is being used to address relevant issues: the production of an important fruit. This subject would be overlooked by using only WoS, while research about transformation of the fruit would be overlooked by using only Scielo. The interface Scielo–WoS provided some but limited records on production. In this sense, the case of passion fruit research shows that researchers find alternative JIS to be an important channel for their publications.

Another case from agricultural sciences is provided by research on the African oil palm. This plant is important especially for countries in the equatorial belt such as Colombia, Malaysia, Indonesia, Thailand, and Nigeria. Some organisations estimate that it generates more jobs per acre than any other large-scale crops such as soybeans (World Bank & IFC 2011, p. 15). Due to its economic importance, diseases that affect the plant have large consequences for the business. For this reason, research on oil palm is likely to have an

economic impact. Specifically, the plant is attacked by a disease called bud rot. It kills it completely, potentially leaving a big part of the crop unproductive. One of the main problems is that there is uncertainty about the cause of the disease. In Colombia, research on the oil palm has been carried out mainly through Fedepalma. This is an association of oil palm growers that conducts research through its institute Cenipalma. With regard to the disease, researchers at Cenipalma found evidence that bud rot is caused by a type of mould called *Phytophtora palmivora*.

An analysis of this research showed that it was first published in journals covered by alternative JIS. Chronologically, the findings began to be published by Cenipalma's researchers as communications to farmers in the magazine *Revista Palmas* (Sarria, Torres, Aya et al. 2008). This magazine is in the Latindex Catalogue. Subsequently, the researchers published their results in the Publindex-indexed[50] journal *Revista de Fitopatología Colombiana* in 2008 (Sarria, Torres, Vélez et al. 2008). In this publication they concluded that *Phytophtora palmivora* is directly related to bud rot. However, it was only in 2010 that the researchers published their results in the journal *Plant Disease* (Torres et al. 2010), which has been covered by WoS since 1980. When asked about the reasons why the results were published initially in journals not covered by WoS, one researcher said:

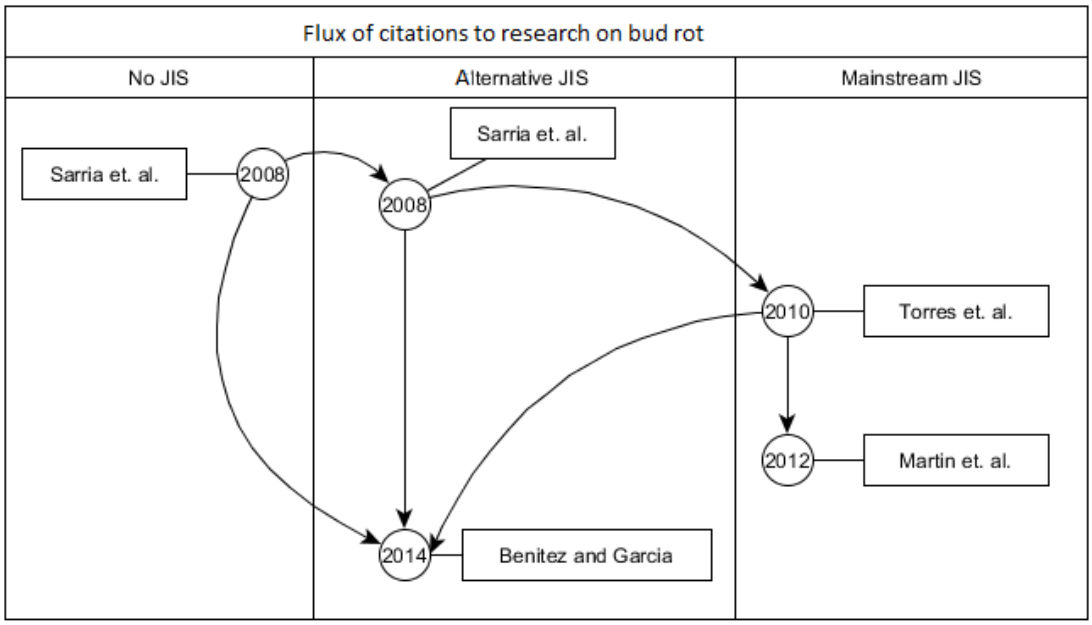
> In general, we do not have the pressure to publish in high impact journals and [therefore do not need to] spend years trying to publish in [the journal] *Science*. We tend to publish results faster, thinking of the sector that we are interested in. They have very specific problems to address.

Therefore, in this case the researchers published in alternative JIS-indexed journals because of their proximity to the readership they wanted to reach and also because they do not have the pressure to publish in WoS-indexed journals. As a corollary, Cenipalma's research on bud rot has been cited by other papers covered by WoS (e.g. Martin et al. 2012) and Scielo (e.g. Benítez & García 2014). This shows that the original research published in alternative JIS has

[50] Publindex is a national JIS used by Colciencias to rank Colombian journals.

had an impact upon both alternative and mainstream JIS through different paths. The sequence described is shown in figure 6.5.

Figure 6.5 Flow of citations to research on bud rot*



* Beginning of arrow indicates paper referenced and end of arrow indicates referencing paper
Source: own elaboration based on the papers' references.

In this case, a need from the primary sector of the economy motivated research that was disseminated through media suitable for a community. Although the results of the research have global relevance, the primary motivation of the researchers to communicate them made them choose journals in alternative JIS. Here, the relevance of a specific research topic led to the publication of results through alternative JIS-indexed journals. This shows that there are cases in which alternative JIS precede mainstream JIS in diffusing content that is novel globally. In conclusion, the two examples illustrate that alternative JIS provide a repository for relevant knowledge that is not well covered in WoS – the passion fruit case – and knowledge of global relevance that precedes WoS in publication – the bud rot case.

Business and management

In a similar fashion, five of the researchers from business and management supported the utility of alternative JIS-indexed journals. However, the research domains mentioned in this discipline are different in kind from those analysed in

the agricultural sciences. Overall, the examples in agricultural sciences are on research related to the production of crops that are economically important for countries in the tropics. In contrast, in business and management the researchers interviewed observed that context constrains the scope of their generalisations. An interviewee said, 'I do not think that there are big administration theories. There are some generalisations, some empirical studies, but there are not many theories'. The point of this interviewee was that in business and management you need to study specific cases that often do not replicate findings in other settings. For instance, he said, 'businesses in Colombia are different from businesses in the US'. For this reason, for the interviewee, applying frameworks produced in certain countries to understand phenomena in other countries ignores the contextual differences. His publications address mainly the subject of innovation in Latin America. Given that most of his production is published in alternative JIS-indexed journals, this suggests that alternative JIS provide an alternative channel for such publications.

Furthermore, the common opinion of the researchers on business and management was that the national and regional settings are determinants for their research. Consequently, they felt that this kind of research would not be of interest to WoS-indexed journals. Along these lines, a junior researcher maintained that publishing in WoS-indexed journals implies changing the research. For her, 'you have to transform regional research into international research. If I work on Sincelejo [a region in Colombia], for instance, that is not interesting for Harvard, is it?' This implies that alternative JIS cover journals that are suitable for the publication of findings relevant to the regions studied. Similarly, a senior researcher emphasised that when he started doing research he wanted to 'produce knowledge about the Colombian entrepreneurial and managerial reality. We did not want to be the reproducers of foreign models, but to produce knowledge relevant to our country'. This relevance, for another senior researcher, is under threat when researchers try to publish all their papers in WoS-indexed journals. In his opinion, there is an idea that only WoS-indexed journals in the top citation quartiles can publish 'legitimate' knowledge.

The problem, for him, is that the subjects addressed in those journals are distant from the research interests of many researchers:

> OK, knowledge is advancing there. But knowledge never, especially in the social sciences, advances abstractly. There is always a link with reality. The questions are: what reality? What issues are studied? … Where do the questions arise from? Who poses the questions? They are questions posed by people who are concerned with society, but their society.

He provided an anecdote of a paper he had been trying to publish in a Colombian journals indexed by both Scielo and WoS. He said he had had difficulties publishing it in this journal, because of the question he was trying to address. Although the paper had not been rejected, the comments that worried him had been about his analytical framework. Specifically, he was studying the use of patents and R&D indicators to measure innovation in Colombia. In his study, he had criticised the use of these indicators because when used in Colombia, 'you can't find anything'. He had tried to show how companies in Colombia innovate through other means. In his opinion, 'if you want to know what happens here you have to forget that framework and assume that companies here do not innovate through R&D'. This researcher criticised the WoS-indexed journal for expecting the application of the R&D indicators framework to innovation in Colombia. Although he felt that there was more room for his research in journals indexed by alternative JIS, he had started to submit to WoS-indexed journals because of institutional pressures. This decision, he argued, may constrain his research to the use of certain theoretical frameworks that may be unsuitable for his area of interest.

The above shows that the perceptions of researchers about their subject are related to their publication decisions but at the same time are influenced by institutional pressures. To reiterate, the researchers interviewed said that alternative JIS-indexed journals allow the publication of research that is context-dependent. A senior researcher said that he had published a paper on equity in Colombia in a Scielo-indexed journal showing some results that looked surprising to American researchers. The American researchers had contacted him and questioned one of his results about women in Colombia having more access to jobs than women in the USA. 'I have to tell them that I am not making

up the data. … Colombia is a dynamic country. I tell them “Why don’t you come to Colombia, and you will realise that it is like that”’. In this case, a piece of research published in an alternative JIS-indexed journal facilitated a dialogue between research communities from different geographical areas, allowing a comparison of results that was context-dependent.

Chemistry

So far, the examples have shown the utility of alternative JIS in terms of subjects, focus, and context-dependent research. It is found in disciplines that are not well covered by WoS. Also, they are disciplines generally considered as ‘applied’ because of their direct use in solving practical problems. In contrast, chemistry is commonly seen as a ‘basic’ science, and it is better covered by WoS. For this reason, it suggests that in this discipline alternative JIS are not viewed as channels for publishing original research. An opinion of a junior chemist on alternative JIS illustrates this point:

> Scielo and other regional systems… let’s be honest that these databases are not very used globally, because researchers suppose that the quality is not going to be very good. And in a certain way they are right, especially in chemistry. Perhaps in social sciences and humanities they can be appropriate [because these JIS-indexed journals tend to be regional or local], but not in chemistry. Basic science is international, and international science has some clear criteria that are fulfilled by communities with tradition.

However, another chemist provided a contrasting argument. The case was pointed out to me by a senior researcher from a public university who works on phytochemistry – the study of chemicals derived from plants. This researcher focuses on the characterisation of Colombian flora. According to him, the impact factor plays an important role in his selection of journals: ‘If the impact factor is 5, it is very good to publish there. But it is very difficult. If it is 3, then it is OK’. However, he said that the WoS-indexed journals with high-impact factors in his discipline had stopped publishing ‘basic’ research: ‘If we show applicability, then it is accepted. Otherwise it is harder. They ask for a biological applicability … for instance, “this reduces dandruff”…’. The applicability that the researcher referred to is found in pharmacognosy, which is the study of medicine from natural sources and its findings are patentable in countries such as the USA. In

fact, the American Association for Pharmacognosy publishes the *Journal of Natural Products*, one of the journals in which the above researcher has published. It is a WoS-indexed journal that is in the top impact factor quartile in three WoS categories: pharmacology, medicinal chemistry, and plant sciences. In order to publish in journals with high-impact factors such as this, the researcher has to show the application of compounds to health. Unfortunately, the interviewee said that in many cases his research group does not have the expertise to test this, and in order to publish in journals with high-impact factor, he has had to collaborate with a researcher in an American institution.

> If the journal's impact factor is 5 or 6, then you need to associate with a star researcher. For instance, researcher Y. We publish with him because I give him my compounds and he says 'that substance might be useful to attack this disease'. He associates with us, but he demands that his institute goes first.

In this way, the interviewee increases his chances of publishing in a WoS-indexed high-impact journal. But not all researches find a clear application in industry. For this reason the researchers need to think about what to do with their results. According to this interviewee, 'there are some journals that still accept structures. For instance, the *Cuban Journal of Chemistry* … and other journals, such as *Nova* or the *Brazilian Journal of Chemistry*. As long as it is a good quality spectrometry and produces robust results'. Paradoxically, in this case it is basic science that finds a place in journals covered by alternative JIS. The researcher publishes in alternative JIS-indexed journals research that does not have an application in the pharmaceutical industry. The value that the researcher attributes to these publications is that they increment the knowledge of Colombian biodiversity. He also asserted that 'our papers fill a cognitive gap in the country. Very few people work on the species I work on'.

6.3.2.2 Accessibility through open access in non-English languages

The researchers interviewed were well aware of the value of access for the diffusion and construction of knowledge. A junior researcher on agricultural sciences, for instance, said: 'How is a paper of much relevance going to be used in the country if not many people read in English and students may not even have access to those databases?' In addition to the issue of language as a motivator for the development of alternative JIS as found in chapter 5, this

researcher's view suggests that the subscription price of WoS and WoS-indexed journals offers another reason. These subscriptions are not affordable for many organisations, even in upper–middle income countries such as Colombia. Besides, having access to paid databases does not grant their use because of the language (English) barrier. For instance, a senior researcher in business and management recalled that in her university 'faculties that had access to databases did not use them because nobody reads in English'. According to Education First's English Proficiency Index (Education First 2011), Latin America and Spain have a low proficiency, and Portugal a moderate proficiency[51]. Therefore, paid access and English language are significant barriers to access.

To illustrate this last point, from 2000 to 2010 WoS covered 18,525,023 documents[52]. Of these, 97% (17,907,046) were paid access and only 3% (617,977) open access. In the same way, 95% (17,594,067) of documents were in English, whereas less than 1% were in Spanish or Portuguese (101,124 and 39,675 respectively); 97% (17,066,458) of the papers in English required subscription. This means that most of the literature in WoS poses linguistic and financial challenges for a readership in Latin America, Spain, and Portugal. Therefore, open access and publishing in Spanish and Portuguese can be seen as measures to diffuse literature and scientific knowledge which may be incorporated into new research.

This is particularly widespread in the review articles that researchers publish in alternative JIS-indexed journals. They can synthesise and gather information from different databases. A review covered by an alternative JIS (Barragán et al. 2005) illustrates this point. In it, the authors explicitly listed the databases from which they had taken the information, namely Medline, Science Direct, Hinari, Proquest, and Scielo (Barragán et al. 2005, p. 82). Of those used, only Medline and Scielo were open access. The rest were subscribed sources. In addition to this, the paper was published in Spanish. Approximately 96% of its

[51] The study is based on two million respondents and is not statistically controlled. Other reports, such as those based on the TOEFL, are based on smaller samples and have also statistical flaws. The report by Education First is based on the biggest sample of test takers and is used by the British Council in their estimation of English proficiency in the world.

[52] The search was conducted through WoS search interface by year, and afterwards through filtering by open-access.

references, however, came from English language sources. Here, in terms of incorporation of bibliographic references, the authors synthesised a set of closed access literature published in English in an open access paper published in Spanish. In terms of diffusion, the authors made this synthesis freely available to Spanish readers.

The importance of open access papers in non-English languages can also be seen in their use in the classroom and in the introduction of PhD students to academic publications. This was mentioned by researchers from the three disciplines. For instance, a senior researcher in chemistry said that lately he had started publishing in Scielo journals to initiate his doctoral students into academic publishing. The advantage is that they can write and communicate with editors and peer reviewers in Spanish. In addition to this, alternative JIS are used for teaching both at the undergraduate and postgraduate levels. As a junior researcher from agronomy highlighted, ‘there is no point in having ten papers in *Nature*, if that research is not even known by students in universities’. The words of a senior researcher in business and management confirm the perception that research is relevant for education: ‘I didn't want to publish in the best journals, but [in] something that could be useful to Colombian teachers’. A junior researcher from the same discipline expanded on how his research published in alternative JIS-indexed journals is used in his lectures: ‘I tell my students: look, you can download my publications from this website’.

As Scielo and RedALyC provide open access to the papers covered, this research can be widely distributed and used. For a senior researcher in agricultural sciences, the fact that papers in Scielo can be searched from Google searches helps to widen their reach and to foster robust research: ‘When you search through Google, you can access Scielo articles. That can be seen as a stimulus to publish good research, because your paper is visible globally’. In all cases, given that the papers are published in Spanish or Portuguese, and that they are open access, RedALyC and Scielo become useful mechanisms to reach non-English speakers in countries that cannot always afford expensive databases. Also, they allow researchers to use their articles in their roles as lecturers and supervisors. Finally, papers in Scielo and

RedALyC – which can be searched using Google – will likely help to increase their global readership.

6.3.2.3 Facilitation of new areas of study

Apart from access, researchers talked about areas that can emerge from publications in alternative JIS-indexed journals. An example is seen in the case of the nascent field of Latin American business history, which emerged as a sub-discipline of business history. This case was referred by an interviewee. Initially, Latin American business history was inspired by the works of American and British authors, and then it evolved into a sub-discipline in which the main scholars are Latin American researchers (Davila 2013, p. 109). Most of the literature on the subject published in journals, as shown by Davila (2013), is mainly available through alternative JIS. Of the 35 papers on Latin American business history, only ten appeared in journals indexed by WoS, in special issues. This means that around 71% of the papers on the subject are not visible through WoS. In this sense, an important amount of literature that forms the history of an entire sub-discipline is available through alternative JIS. In this case, Latin American researchers learned from the British and American pioneers (Davila 2013) who arguably had more access to mainstream JIS-indexed journals. However, the process of adaptation and modification yielded an assimilation of knowledge that facilitated the formation of a distinctive field visible through alternative JIS.

A senior researcher in business and management explained why he thought that alternative JIS can facilitate the emergence of new areas of study. For him, the value of alternative JIS and the journals covered by them is that they are more open to new questions and ways of presenting results. He thought that although some of the questions can be very intuitive, at least they generate new ideas that cannot always be published in mainstream JIS-indexed journals. For instance, the interviewee referred to strict guidelines on the methodology as a barrier to the publication of these ideas in mainstream JIS-indexed journals. Besides, he thought that alternative JIS-indexed journals allow for more flexibility in the structure of the papers:

> You know the standards: hypothesis, model, variables, all the conventions that are an international standard in most papers, which are OK, but one could treat the topics in a different way… for instance in the *Journal of Arts Management*, in which I have already published some things. Also in national journals, like the journal *Innovar*, that has opened certain topics. Or in a journal from the Philippines, which allows diversity of perspectives. When you want to publish in the journals with the highest impact factor, the methodologies are much stricter.

Similarly, some researchers use alternative JIS to introduce subjects, concepts, or methods published in WoS-indexed journals to a community that is not well acquainted with them. These papers can motivate others to start areas of research new to the region. For instance, a researcher in agricultural sciences explained that she published the first paper in Colombia to use 16S ribosomal RNA sequencing in an alternative JIS-indexed journal. It is a method to compare and identify bacteria, usually to produce phylogenies and is important for medical microbiology and biotechnology. The aim of the interviewee was to introduce the method to the country, to show that researchers in Colombia are capable of studying ground-breaking issues. She said that after the publication of the paper other Colombian researchers adopted the method and its introduction through an alternative JIS-indexed journal had the purpose of motivating other researchers.

Finally, the case of a researcher from business and management shows that knowledge published in alternative JIS-indexed journals can be a starting point for research programmes. During this researcher's PhD she developed a framework based on sociobiology (Wilson 2000) to study organisations, with an application to production chains[53]: 'When I did my PhD there was only one study using this approach. When we started publishing and going to congresses, people started to become interested in the topic in other countries, despite [being] written in Spanish'. She has published her papers only in journals covered by alternative JIS. When asked why, she said:

> Most Colombian journals [on business and management] are multidisciplinary. For instance, *Innovar* has different topics within business and management,

[53] All the stages of making a product, considered together (*Cambridge dictionaries online 2016)*

> whereas international journals are much more specific in the topics addressed. We sent a paper to a [WoS-indexed] journal and the journal was clear in saying that they don't publish on our topic. They do not disregard what we do, but it is more difficult to get accepted in those journals.

The research that she has published in alternative JIS-indexed journals has been used to start a research programme in her university. A product of this research programme was a book published in 2012, in which she has compiled her studies and the work of some of her students (Montoya & Montoya 2012).

6.4 Conclusions of the chapter

In this chapter I have described how, through my interviews, I found that there are two views on the journals covered by RedALyC and Scielo. The first is that they are training arenas to acquire skills to publish in WoS-indexed journals; the second is that journals in alternative JIS are of equal importance to journals in WoS in terms of the knowledge contained. Based on the interviews, the exploration of publication patterns, and examples suggested by the interviewees, I have found that alternative JIS-indexed journals:

(1) allow the publication of original research;
(2) are used as training for researchers to publish in WoS-indexed journals;
(3) serve as vehicles to introduce concepts, methods, etc.;
(4) introduce PhD students to academic publishing in their own language;
(5) help to support and expand lectures;
(6) make available open access papers that incorporate bibliographic references from paid journals;
(7) bring closer knowledge in English to Spanish speakers;
(8) stimulate new areas of study.

The above can be understood as reasons for the growth of alternative JIS that will be further examined in the next chapter. Table 6.3 shows the number of respondents for each reason.

Table 6.3 Reasons for publishing in alternative JIS-indexed journals

Reason	#	Discipline*			Organisation		Experience		Gender	
		Agr	B&M	Chem	Public	Private	Junior	Senior	F	M
1	15	7	5	3	9	6	5	10	3	12
2	13	5	4	4	9	4	6	7	2	11
3	11	3	5	3	5	6	3	8	6	5
4	8	1	6	1	6	2	4	4	2	6
5	8	0	5	3	6	2	5	3	5	3
6	7	4	3	0	3	4	3	4	3	4
7	6	2	2	2	3	3	3	3	3	3
8	6	1	5	0	5	1	1	5	2	4

* Agr = agricultural sciences; B&M = business and management; Chem = chemistry.

Source: own elaboration based on classification of researchers' responses.

Chapter 7. Discussion

7.1 Introduction

This chapter discusses the findings from the quantitative and qualitative analyses of JIS in chapters 3 to 6. To reiterate, the JIS examined are Scielo, RedALyC, WoS, and Scopus. Scielo appeared in 1998 and RedALyC in 2002, based on a project that can be tracked down to 1997 (see chapter 3). WoS started in 1964 with the SCI and Scopus appeared in 2004. Although Scopus is included in the analyses, the emphasis in this thesis is on WoS because it was the only multidisciplinary citation JIS at the time RedALyC and Scielo started, and it remains arguably the most influential JIS on bibliometrics and research policy. Throughout this thesis I have referred to WoS and Scopus as mainstream JIS, and to RedALyC and Scielo as alternative JIS. The former are commercial citation databases which are used in influential rankings and research evaluations that have an impact upon the production and steering of research globally. The latter are non-commercial databases supported by public funds and communities of interest, which comparatively have a less salient role in benchmarking and evaluations (See chapter 1).

In section 7.2 I discuss the insights into the emergence of alternative JIS. In section 7.3 I present the analysis of the reasons why researchers publish in alternative JIS-indexed journals. Both parts contribute to understanding the emergence and growth of alternative JIS. In section 7.4 I discuss the findings in the context of the framework for this research, which is based on the concepts of universalism and particularism; I also explain the theoretical and empirical contributions of this thesis. In section 7.5 I discuss policy implications of the findings.

7.2 Why did alternative JIS emerge in light of the dominance of WoS?

In chapters 1 and 2 I showed the limitations to our current understanding of the emergence of alternative JIS, and posed the question, ‘why did alternative JIS emerge in light of the dominance of WoS?’ In chapters 2 and 3 I showed that there are two competing explanations. The first is that alternative JIS were

developed to cover journals that do not meet editorial and scientific impact criteria required by WoS; the second is that alternative JIS emerged to cover geographical, linguistic, and disciplinary gaps produced by biases in the journal coverage of WoS. Both explanations have in common the observation that the exclusion of certain journals from WoS preceded the emergence of alternatives. The different reasons for this exclusion, however, suggest different motivations for the emergence of alternative JIS.

The first explanation is based on the work of Eugene Garfield, founder of WoS. He argued that 'the significant scientific literature appears in a small core of journals' (Garfield 1996). According to him, this core was composed of around 150 journals that 'account for half of what is cited and a quarter of what is published in WoS' (Garfield 1996). The concept of core journals has been used to determine and justify the coverage of WoS. Basically, the aim of WoS is to select a portion of scientific journals characterised by their high scientific impact and their compliance with 'high' editorial standards (Garfield 1985; see chapter 3 for the principles on which WoS is built). 'High' editorial standards include peer review, publication of original content, timeliness, among others; scientific impact is related to number of citations received by the papers in those journals. I have considered these characteristics as universalistic: they could be achieved by any journal regardless of its language, discipline, or country of publication. Within this rationale, the journal coverage of WoS is objective and for this reason the exclusion of journals is seen as justified. The emergence of alternative JIS could therefore be an attempt to index those journals with lower scientific impact and inadequate compliance with editorial standards, i.e. non-core journals.

The view that journals in alternative JIS fail to pass the editorial standards and to have the scientific impact expected is usually reproduced in personal opinions. For instance, an influential blogger asserted that Scielo is a 'publication favela' (Beall 2015), and a respondent to one of the interviews considered the creation of alternative JIS unfruitful 'rebellious acts', meaning that they can only index small journals without a 'tradition, a history', and because of this they are a 'lost cause'. In the same way, research evaluation policies that accord a much higher score to publications covered by WoS

reinforce this view. Moreover, world university rankings based on the information contained exclusively in WoS, and more recently in Scopus, reinforce the view that they are 'the' global cognitive authorities on scholarly publications. This means that they are trusted to certify scientific literature globally. An expectation underlying this trust is that they will apply universalistic criteria for their selection. This implies that geographical, disciplinary, linguistic, and other ascribed features of journals should not be related to their selection for coverage (Garfield 1985; Testa 2011; Thomson Reuters 2015).

However, as explained in chapter 3, there is another explanation for the emergence of alternative JIS. Founders of RedALyC and Scielo have argued that the coverage of WoS is biased, meaning that the journals are not only evaluated according to their editorial quality and scientific impact (universalistic criteria). According to this argument, the place of publication of a journal, its language, and its discipline (particularistic criteria) favour or hinder its inclusion in WoS. If the coverage of WoS is biased (i.e. particularistic), then it could be reasonable to expect the emergence of alternative JIS to counteract these biases by indexing those journals excluded from WoS. Therefore, alternative JIS could have emerged as a response to particularism in the coverage of WoS.

In chapter 4 I presented empirical evidence that supported the view that the coverage of WoS is related to some universalistic criteria and some particularistic criteria. The significant explanatory variables for inclusion into WoS are *scientific impact* and *journal age* – universalistic variables – and *country* and *discipline* –particularistic variables. According to the definition of universalism, *country* and *discipline* should not have any effect on coverage by WoS. Therefore, the results showing a relation between particularistic variables and coverage by WoS can be interpreted as indications of biases. From this perspective, the explanation that alternative JIS emerged to remedy biases of WoS is supported. This does not mean that the coverage of WoS can be explained only by biases. The significant coefficients of *scientific impact* and *journal age* indicate that some universalistic variables also play a role. For this reason, the evidence provided in chapter 4 only shows why some researchers have questioned the objectivity of WoS, and that the argument advanced by

founders of RedALyC and Scielo – that the coverage of WoS is biased and alternative JIS remedy those biases – has some support in the data.

In chapter 5 I expanded the scope of the analysis to understand better the coverage of WoS and Scopus in relation to the emergence of alternative JIS. Doing a global analysis, I presented evidence that there is an over-representation of journals published in the USA, the UK, and the Netherlands. These countries host some of the biggest publishing houses in the world, which suggests that the coverages of WoS and Scopus mirror the geographic market of these publishers (Larivière, Haustein & Mongeon 2015). The dominance of English language and the natural sciences in the journal coverage of both mainstream JIS is also clear, thus supporting the argument based on the particularism of WoS in Chapter 4.

Correspondingly, many other countries, languages, and disciplines are under-represented. In comparison to the USA, the UK, and the Netherlands, other American and European countries such as Canada, Germany, France, and Finland show lower coverage. These countries have smaller publishing industries as compared to the top three. However, these countries are still more widely covered than countries in Latin America, Spain, and Portugal. This confirms that journals produced in Latin America, Spain, and Portugal have a disadvantage in comparison to journals produced in Western and Northern Europe and Northern America even when compared to countries that are not home to the dominant publishing houses.

Some examples show the disadvantages for certain journals in WoS. For instance, Cuban journals are completely absent from WoS, despite examples showing that there are Cuban journals with h-Index and age equal to, or above, other journals covered by it. This is the case of the *Revista Cubana de Salud Pública*. This journal is 18 years old and has an h-Index[54] of 14 (6 points above average in medical and health sciences). WoS indexes 41 journals with equal or lower h-Index. Other cases could be mentioned, such as the case of Brazilian journals that despite having higher average h-Index than journals produced in Spain have lower odds of being indexed. This applies also to journals in the

[54] All information on h-Index was obtained from Google Scholar.

social sciences. They have lower probability of being indexed by WoS as compared to journals in the natural sciences, despite similar indicators on h-Index, age, and editorial standards (see chapter 4). A similar concentration is seen in Scopus, even though it offers a wider coverage than WoS (chapter 5). In conclusion, there are asymmetries in the coverage of journals. In particular, the poor coverage of journals from Latin America, Spain, and Portugal was constant during the emergence and further growth of RedALyC and Scielo.

The empirical analyses in chapters 4 and 5 help to further support the narrative explanations found in chapter 3 and serve as a means of better understanding the rationales behind the two explanations offered in chapter 3. There I showed that Eugene Garfield and others have defended the concentration of WoS on the basis of objectivity. In contrast, founders of RedALyC and Scielo have maintained that these alternative JIS are an attempt to address the phenomenon of 'lost science' (Gibbs 1995) – a term used to describe scientific research that is excluded from WoS because of biases in their selection of journals. Rather than concluding that the coverage of WoS is exclusively determined by geographical, disciplinary, and linguistic biases, the quantitative results suggest that the perception of particularism in the coverage of WoS is a reasonable argument based on indications of coverage. Based on this argument, founders of RedALyC and Scielo saw opportunities to develop alternative JIS with the expectation of filling perceived gaps of coverage produced by the concentration of WoS on certain countries, disciplines, and languages.

In summary, the main finding to the question 'why did alternative JIS emerge in light of the dominance of WoS?' is that alternative JIS emerged initially from a perception of biases in the coverage of WoS. This perception was seen as a problem, but also as an opportunity to promote scientific research produced in Latin America that was not included in WoS-indexed journals (Cetto & Hillerud 1995b; Russell & Macias-Chapula 1995). I have arrived to this interpretation from three lines of evidence:

(1) A documentary and literature review in which different arguments were analysed, and which provided two competing explanations for the

emergence of alternative JIS (chapter 3). The first considered them as databases for non-core journals, journals that fail to pass universalistic criteria required by WoS; the second is that alternative JIS were a response to geographical, linguistic, and disciplinary biases of WoS.

(2) A study of the relationship between coverage by WoS and universalistic and particularistic variables. The results showed that inclusion of journals in WoS is related to universalistic and particularistic characteristics of the journals. The results were used as a way of understanding and corroborating the findings in chapter 3 on what motivated the development of alternative JIS.

(3) A study of the concentration of coverage in WoS and Scopus as seen in the sets of journals covered from specific regions, disciplines, and languages. The results showed that WoS and Scopus are concentrated in certain countries, in the English language, and on certain disciplines at the global level. Journals from Latin America, Spain, and Portugal, in Spanish and Portuguese, and on disciplines other than the natural sciences are under-represented as compared to other regions, languages, and disciplines. This gave an overview of the mainstream JIS coverage conditions under which the alternative JIS RedALyC and Scielo emerged.

Although the above evidence provides an understanding of the initial reasons for the development of alternative JIS, it does not help to explain their sustained growth. Specifically, Scielo and RedALyC have shown a significant increase in the number of journals, documents covered, and number of readers of papers in non-English languages. For instance, in 2015 RedALyC had 435,186 papers available, and Scielo 573,525. In Scielo Brazil, 78% of downloads were of papers in Portuguese, whereas 16% were of papers in English. This means that there is a growing production of information in non-English languages that is published in and read from journals contained in Scielo and RedALyC. The next section discusses the second research question of this thesis.

7.3 Why do researchers publish in journals indexed by alternative JIS?

To recapitulate, in the previous section I discussed two possible explanations for the emergence of alternative JIS. Based on quantitative and documentary

evidence, I arrived at the conclusion that a perception of biased coverage of WoS allowed more opportunities for their emergence than simply lack of coverage. However, to understand the sustained growth of alternative JIS shown by the number of documents covered since their foundation I considered the question 'why do researchers publish in journals indexed by alternative JIS?' In chapter 6 I showed the results of a case study in Colombia in agricultural sciences, business and management, and chemistry. From it I found eight reasons (summarised in section 6.4) that help to explain why researchers publish in journals indexed by alternative JIS, which will be discussed later in this section. The eight reasons found in chapter 6 can be grouped into three main categories for the sustained growth of alternative JIS. I refer to them as 'training', 'knowledge-gap filling', and 'knowledge bridging'.

7.3.1 Training

Training is based on the argument that alternative JIS-indexed journals are 'transit stations' towards WoS-indexed journals or training arenas for initiation into publication. There are two bases for this argument:

- **First, alternative JIS are used as training for researchers to publish in WoS-indexed journals.** The experience gained by publishing in alternative JIS-indexed journals increases the skills of researchers so that they can publish in WoS-indexed journals. The papers they publish in alternative JIS-indexed journals incorporate this feedback, which contributes to improving the robustness of other papers that will be submitted to WoS-indexed journals in English.
- **Second, they are also used to introduce PhD students to academic publishing in their own language.** Researchers encourage PhD students to look for literature and to publish papers in alternative JIS-indexed journals as part of their development as academics. This is different from the point above in that the aim is not to publish in WoS-indexed journals, but to initiate new researchers into publishing. Doctoral students also get acquainted with the peer-review system, regardless of their success in publishing or their future publication patterns.

Drawing from the above two points Scielo and RedALyC are seen as a means, whereas WoS is seen as the goal. This perception comes from the idea that there is a sequential publishing pattern in a researcher's career: from non-indexed through alternative JIS to mainstream JIS-indexed journals. This is a universalistic understanding of publication in which mainstream JIS are seen as filters for the scientific research of best quality in the world. Consequently, from this perspective, alternative JIS appear to be less important than mainstream JIS. For this reason, some researchers send their 'best' contributions to journals indexed by WoS or Scopus and their 'second best' papers to alternative JIS-indexed journals because they see less value in the latter. These papers add to the number of documents covered by alternative JIS, contributing to their growth, but are perceived as having less worth than those published in mainstream JIS.

Although 13 researchers supported this view, 15 others argued that they publish in alternative JIS-indexed journals because they are valuable publication venues for the communication of scientific knowledge (see reason (1) in table 6.3). Some CV and interview observations support this idea. Basically, the publication patterns of researchers do not only exhibit a sequential trend from non-indexed journals through alternative JIS-indexed journals to mainstream JIS-indexed journals, as shown in figures 6.1 and 6.2. Researchers publish in alternative JIS- and mainstream JIS-indexed journals throughout their career. Additionally, the interviews provided rich information about the research that is contained in alternative JIS. Based on the interviews and other data sources, I found that alternative JIS contain scientific research on subjects not available or not well covered by WoS and that they serve as a link between knowledge contained in WoS and communities that do not have access to it. This can be seen in two characteristics which I refer to as knowledge-gap filling and knowledge bridging.

7.3.2 Knowledge-gap filling

Knowledge-gap filling is the coverage of knowledge that is neglected or not found in WoS. Examples from business and management, agricultural sciences, and chemistry showed that:

- **Alternative JIS allow the publication of research that is not well covered or not found in WoS-indexed journals**. In particular, these JIS are providing a space for the publication of distinctive original research. Chapter 6 gave examples from the three disciplines analysed: research that is context-dependent such as Latin American business history or the conceptualisation and application of alternative indicators that allow the understanding of innovation in countries with low patenting and R&D activity; distinctive subjects such as the production of passion fruit, and research on diseases affecting the cultivation of oil palm; and certain disciplinary areas that have been displaced by others, such as the case of botany that has become less popular than pharmacognosy in high impact factor WoS-indexed journals.

It is possible to think, then, that there are other knowledge gaps that alternative JIS are filling, such as biodiversity (Arbeláez-Cortés 2013) and research on the production of rice (Rafols, Ciarli & Chavarro 2015) which are worth exploring. Therefore, alternative JIS-indexed journals offer a place for the publication of scientific knowledge beyond the boundaries of WoS-indexed journals, and potentially beyond Scopus-indexed journals as well.

7.3.3 Knowledge bridging

By knowledge bridging I mean that alternative JIS provide a link between articles covered by mainstream JIS and a community with limited or no access to it. These articles are published in journals produced in the UK and the USA, in English, which require payment for access to their papers. Examples from chapter 6, such as the use of business and management papers in the classroom, or the linguistic differences between Scielo and WoS in publication of research on passion fruit (figure 6.4), suggest mechanisms through which knowledge bridging is achieved. I refer to these mechanisms as 'knowledge adaptation', 'knowledge diffusion', 'teaching', 'business model conversion', and 'multilingual referencing', and describe each of them below.

- **Knowledge adaptation**. This happens when certain concepts or methods are transformed to fit a different context from the original. The study of business history in Latin America, for instance, is conducted

through the adaptation of the concepts of business history in high-income countries to low- and middle-income countries. Later on in its development, this adaptation resulted in a differentiated discipline called Latin American business history.

- **Knowledge diffusion**. This occurs, for instance, when a concept, methodology or technology that is not novel in mainstream JIS-indexed journals is introduced into a region and shared with that community. This can incentivise research on that subject in a region, as in the case of the introduction of 16S ribosomal RNA sequencing to Colombia, described in chapter 6.
- **Teaching**. This is mainly the use of research listed in alternative JIS for teaching or learning-related activities. This partly overlaps with training, but the difference is that in teaching the main purpose is to discuss and learn the ideas in publications indexed by alternative JIS, not to train students to publish in academic journals.
- **Business model conversion**. This happens when a researcher publishes open access papers that incorporate bibliographic references from paid journals. For instance, in certain documents such as review papers, researchers synthesise literature in mainstream JIS-indexed journals and make it available for readers who cannot afford access to mainstream JIS-indexed paid journals.
- **Multilingual referencing**. This is when researchers publish in non-English languages and incorporate references from journals in English and other languages. This is observed in the incorporation of English-language references into research published in Spanish or Portuguese available through RedALyC and Scielo. For instance, when papers in Spanish incorporate references from papers in English, they communicate part of that knowledge in English to Spanish speakers. This is mainly seen in literature reviews.

A combination of knowledge adaptation and knowledge diffusion can stimulate new areas of study. As shown in chapter 6, Latin American business history emerged from personal interactions with American and British researchers on business history, and currently has grown into a new area of study. It required

to adapt concepts from American and British business history to a different region and to diffuse those concepts to a mainly Spanish and Portuguese speaking community. Over time, knowledge adaptation and diffusion allowed Latin American business history to become a discipline on its own. It is mainly published in Spanish and the majority of papers circulate in alternative JIS-indexed journals (Davila 2013). From this perspective, alternative JIS serve as a bridge to bring closer the knowledge produced by perceived distant communities[55], with the potential to start novel avenues of research. In conclusion, training towards the use of mainstream JIS-indexed journals (especially WoS), knowledge-gap filling, and knowledge bridging, are reasons for the sustained growth of alternative JIS.

7.4 Contributions

7.4.1 Contribution to theory

This thesis contributes to the studies of particularism and universalism in science. It addresses the relationship between universalism, particularism, and the evaluation of science. In this regard, the first research question 'why did alternative JIS emerge in light of the dominance of WoS?' confirms that both universalism and particularism are involved in the evaluation of science, specifically in the evaluation of academic journals for coverage by JIS. This means that the universalistic evaluation of journals is an ideal. In practice, particularistic criteria such as geographical, disciplinary, and linguistic features of the journals are also involved in their appraisal. Recognising that particularism is part of the evaluation of academic journals can help to gain a better understanding of the value of journals produced in geographies, disciplines, and languages that are not dominant.

[55] Although a thorough analysis of this is beyond the aims of my thesis, 'distance' has been pointed out by researchers and is present in the words that they use to compare JIS. Namely, they use words related to space and identity to make distinctions. For instance, they talk about 'here' and 'there', and 'us' and 'them'. 'Here' is usually used by researchers to mean Scielo- and RedALyC-indexed publications, and 'there' WoS- and Scopus-indexed publications. 'Us' means researchers in Colombia or a wider proximate region and 'them' researchers, editors, or journals closer to coverage by WoS. There are other similar words, such as 'ours' and 'theirs', and 'this' and 'that'. The exact boundaries of these distinctions are imprecise, but they signal a perceived position of otherness – perhaps in relation to a perceived 'centre'.

The value of journals indexed by alternative JIS can be seen in the examination of the second research question, ‘why do researchers publish in alternative JIS-indexed journals?’. Alternative JIS incorporate two opposing but complementary motivations for their development: the expectation of researchers to participate in WoS-indexed journals; and their interest in producing knowledge that does not fit the thematic scope of those journals. On the one hand, alternative JIS offer a means to acquire skills to publish in WoS-indexed journals. In the perception of some researchers, WoS is considered a synonym for ‘quality’. This is reinforced by economic incentives and RES. On the other hand, alternative JIS cover research that fills knowledge gaps, and they provide a connection with knowledge in mainstream JIS-indexed journals. Although the first motivation supports the universalistic idea that the most significant literature resides in WoS (Garfield 1996), knowledge-gap filling and knowledge bridging suggest that there is complementarity between alternative and mainstream JIS – which particularism helps to explain.

Specifically, knowledge-gap filling and knowledge bridging by alternative JIS provide two main insights. The first is that alternative JIS can make available novel research results that escape the coverage of mainstream JIS. The second, shown by knowledge bridging, is that alternative JIS are not isolated from mainstream JIS. It can be argued that there is a flow of knowledge between them that is presented in the bibliographies of papers. If scientific production is seen as a cumulative process of certification of new knowledge (Merton 1973b), then, based on the above insights, alternative JIS are part of it. Therefore, alternative JIS cannot be seen just as publication favelas (Beall 2015). Instead they form part of continuous research programmes (see, for instance, the oil palm example in chapter 6), contain novel scientific knowledge often important for professional practices – e.g. in business, medicine or agriculture in particular places – and can help to start new areas of research, as discussed earlier. In other words, particularism helps to understand that alternative and mainstream JIS are complementary. Therefore, the knowledge-gap filling and knowledge bridging functions of alternative JIS make them beneficial to the communication of scientific knowledge.

In summary, my contributions to the studies on particularism and universalism in science are: (1) both universalism and particularism are related to the evaluation of journals for coverage. For this reason, universalistic evaluation of journals for coverage is an ideal that is not reflected in the actual practice of evaluation; and (2) the universalism attributed to mainstream JIS can affect the identification, dissemination, and utilisation of scientific knowledge published in journals outside their coverage. Instead, acknowledging their particularism helps to understand the value of alternative JIS, which is represented in their knowledge-gap filling and knowledge bridging functions.

7.4.2. Empirical contributions

The first research question, 'why did alternative JIS emerge in light of the dominance of WoS?', contributes empirically to analyses of coverage. Previous studies have focused only on the number of journals covered by JIS in order to reach conclusions about biases. Some of these studies include Braun, Glänzel & Schubert (2000), Archambault et al. (2006), Moya-Anegón et al. (2007), Wagner and Wong (2012), and Aguado-López et al. (2014). Based on this kind of coverage analysis, the authors have claimed that WoS is either balanced or unbalanced. This is a common way to approach coverage, and I have built on these studies to describe the extent of coverage of WoS and Scopus in chapter 5.

However, looking at coverage from the above perspective alone is insufficient. The reason is that the balance in coverage is only one part of the debate. The other part is about the rationales behind it. This is represented in the criteria used to select journals. For Garfield, the coverage of WoS is unbiased because it is based on strict criteria applied objectively to every journal in its collection (Garfield 1997). His argument is that the coverage offered by WoS is a reasonable outcome resulting from objective filters (Garfield 1997; Testa 2011). For this reason, analysing the relationship between each of the variables *editorial criteria*, *scientific impact*, *discipline*, *country*, and *language*, and inclusion of journals by WoS adds depth to the debate: it confronts claims of universalism and particularism in the coverage of WoS. In chapter 4 I empirically examined whether the coverage offered by WoS is related to the application of universalistic criteria; my results indicate that both universalistic

and particularistic criteria are related to the coverage of WoS. The relevance of this finding is that it complements the arguments presented in chapter 3, showing that the combination of quantitative and qualitative evidence helps to interpret coverage analyses.

The second research question, 'why do researchers publish in alternative JIS-indexed journals?', shows examples of research that is especially important in regions that need to promote the utilisation of knowledge to solve pressing social needs, and yet is excluded or not widely covered by WoS. The case study provided some examples. To reiterate, a user of WoS wanting to do a literature review or a bibliometric analysis on oil palm research, passion fruit production, or Latin American business history research, will not be able to identify a good number of papers (see chapter 6). Using WoS the user will only have a partial idea of the subjects. At the same time, the fact that these subjects are not well covered by WoS-indexed journals can make researchers lose interest in them and focus only on the subjects that fit WoS-indexed journals. In this way, the concentration of the coverage of a JIS on specific subjects can affect the effective perception and utilisation of scientific knowledge that is relevant for some communities, such as the Colombian or other communities.

Finally, this part of the thesis extends the work of Velho (1985), Gibbs (1995), Guédon (2001), Meneghini, Mugnaini and Packer (2006), Aguado-López et al. (2014), and other researchers who have discussed the coverage of mainstream JIS and the role of alternative JIS. Specifically, the findings in chapter 6 have revealed concrete examples of research that is excluded from WoS, and add to the coverage analyses in chapters 4 and 5.

Summarising, my empirical contributions are twofold.

(1) The thesis has extended analyses of coverage by JIS to include:

(a) a quantitative study of the rationales behind the selection of journals, done through a regression analysis to test the relationship between editorial criteria, scientific impact, country, language, and discipline of the journals and coverage by WoS;

(b) a qualitative analysis to further investigate and triangulate the reasons for the emergence and growth of alternative JIS, implemented through a documentary review, interviews, CV analysis and database searches, elaborated in chapters 3 and 6.

(2) This study has also presented new insights into the reasons for the emergence and development of alternative JIS: alternative JIS emerged from a perception of particularism in the coverage by WoS, which was seen as an opportunity to remedy those biases. Their sustained growth is supported by their role in knowledge-gap filling, knowledge bridging, and partly as training towards improvement in the ability to publish in WoS-indexed journals.

7.5 Policy implications

The insights of this thesis may be of interest to research assessment exercises that use JIS as indicators for ranking of journals, individuals, and universities. Alternative JIS emerged to give recognition to science that does not fit the main disciplinary, geographical, and linguistic foci of WoS.

In research assessment the scores given to publications in journals covered by mainstream JIS such as WoS and Scopus are usually higher than those given to publications in alternative JIS. This is for the reasons rehearsed in this thesis, for instance, quality. In research assessment exercises in which publications form a major component, researchers are generally assessed by the number of papers weighted by a score attached to the JIS covering them, with the mainstream JIS usually being given a higher weighting than the alternative JIS. By way of example, a researcher showed me a simulation model of his future publications in order to achieve high scores in the national research assessment exercise and in his faculty. Simplifying his model, if a paper published in RedALyC scores 1 and a paper in a WoS-indexed journal scores 3, then 3 papers in RedALyC are equivalent to 1 paper in a WoS-indexed journal. According to this scale, different JIS are treated as if they differed only in scores. The content of the papers is removed from the equation, and what matters is only the scores.

However, the findings in this thesis provide evidence that alternative JIS grow in part because they cover knowledge gaps of mainstream JIS. Specifically, examples from agricultural sciences, business and management, and chemistry show that some research is not well covered by WoS, while it is better captured by alternative JIS. These findings pose some problem to thinking about JIS as merely differing in quality, however it is measured. At the same time, alternative JIS serve as bridges to knowledge found in mainstream JIS-indexed journals. Therefore, research assessment exercises may need to incorporate the recognition of difference and complementarity of the knowledge in alternative JIS. This need is expressed by current demands from the scientific community for better approaches to the assessment of science[56].

The consideration of direction, distribution, and diversity in science and technology has emerged as an important topic (STEPS Centre 2010). The emergence and development of alternative JIS show that these properties have to be taken into account in research assessment as well, if a more inclusive and encompassing development of science is desired. In terms of direction, the neglect of certain knowledge evidenced in the coverage of mainstream JIS shows that alternative JIS are a means to disseminate research that would be otherwise less visible. Regarding distribution, the geographical, disciplinary, and linguistic concentration of mainstream JIS is expanded by the coverage of alternative JIS. Finally, acknowledging the complementarity between different JIS will benefit the diversity of scientific research, fostering research in areas that can benefit from the inclusion of scientific knowledge published in languages and subjects that are not central to the coverage of mainstream JIS. In this way, research with the potential to be socially relevant would not be hindered by the lack of inclusion into some communication systems. In regions such as Latin America, the utilisation of research is particularly needed to face pressing social demands.

However, one of the challenges faced by alternative JIS with respect to their recognition as cognitive authorities is the perception of some researchers that

[56] See, for instance, the forthcoming conference on indicators on ‘Peripheries, frontiers, and beyond’ to be held in València, Spain, in 2016. http://www.sti2016.org [last accessed 5 July 2016].

they do not provide enough quality assurance of the journals included. In this regard, one of the most important hurdles to overcome for alternative JIS to become more widely used in research evaluation and policy-making is to gain credibility among policy-makers and researchers as quality systems for the selection of journals. In this thesis, I have shown that journals in alternative JIS do not necessarily have less scientific impact and lower editorial standards than journals in WoS (chapter 4). Besides, I have shown the value of alternative JIS in filling knowledge gaps and serving as knowledge bridges. These are reasons to implement a more informed inclusion of alternative JIS in research assessments. This is in line with current demands for a better use of indicators (Hicks et al. 2015), and for opening up research assessments (Rafols, Ciarli et al. 2012) to the plurality of scientific knowledge. Based on my findings, it can be argued that there is research that is better covered by alternative JIS than by mainstream JIS, and that alternative JIS can also cover new areas of research. This can open up research assessment and policy-making to the knowledge that is neglected when focusing only on journals covered by mainstream JIS. By opening up discussions on the value of alternative JIS, their role in research assessment might increase, and thus gain more support from researchers and funders.

The following are some suggestions from researchers on how alternative JIS could improve their credibility and usefulness.

(1) More types of publications should be covered. Up to now, only journals and to a lesser extent books have been covered. While the usefulness of this cannot be denied, the importance of other documents such as grey literature or more technical literature should mean an expansion of the readership of alternative JIS, for instance, farmers in agricultural sciences and managers in business and management.
(2) The outcomes of evaluation of journals should be made transparent. Currently, these outcomes are not available for any JIS studied in this thesis. This means that journal evaluation is a black box. In order to give assurance of the selection process, alternative JIS could make publicly available the evaluations of the journals covered. In this way, the application of criteria for inclusion could be checked by users and policy-makers, providing evidence

in case of possible biases. This requires the consent of publishers and editors, but the progress made by Latindex on the publication of the editorial criteria fulfilled by each journal in its catalogue shows that it is possible.

(3) The formal evaluation of journals needs to be expanded. The evaluation of journals for inclusion needs more emphasis on content. If alternative JIS want to show their value, they need to understand the uniqueness of the knowledge contained within them, as shown by the examples in this thesis. A step in this direction is shown by Scielo Brazil. In addition to conventional editorial standards, since 2015 it has conducted assessments of the scientific merit of the journals through opinions of at least two researchers who work on the subjects of the journal applying for inclusion. In this way, Scielo collects and evaluates perceptions of the quality of the papers and the value of the journal for the Scielo Brazil collection, among other things (Scielo Brazil, 2015, p. 22). This kind of initiative could facilitate alternative JIS being used to rationalise journals, for example, to highlight journals that could be merged because they publish very similar papers, or to demonstrate the need for new journals on subjects that are not well covered by any JIS.

7.6 Conclusions of the chapter

In this chapter I have discussed insights related to the research questions ‘why did alternative JIS emerge in light of the dominance of WoS?’ and ‘why do researchers publish in alternative JIS-indexed journals?’ I also discussed the findings in the context of the literature on particularism and universalism on science. The main insights are given below.

(1) Alternative JIS emerged as a response to a perception of particularism in coverage by WoS. This was seen as an opportunity to cover geographical, disciplinary, and linguistic gaps produced by the concentration of WoS.

(2) Researchers submit papers to alternative JIS-indexed journals because:

    (a) these journals are treated in some cases as training arenas or stepping stones towards publishing in WoS-indexed journals (training);

    (b) they publish new knowledge not covered or not sufficiently covered by WoS (knowledge-gap filling);

    (c) they bring knowledge in mainstream JIS-indexed journals closer to a community with limited access to it (knowledge bridging).

The findings contribute to coverage analyses and to a wider debate on particularism and universalism. Empirically, this thesis expands coverage analyses by including an examination of the criteria for coverage, and a triangulation with documents produced by the founders of two important alternative JIS. Conceptually, it contributes to two important debates in the sociology of science: whether particularism is involved in the evaluation of science; and what are the effects of particularism on the spread of scientific knowledge. These debates have been addressed by sociologists of science, but they have focused mainly on peer review of papers and career progression. In this thesis I have extended the analysis of universalism and particularism to JIS as cognitive authorities on descriptions and evaluations of scientific research.

Regarding the debate on whether particularism is involved in the evaluation of science, the results show that the selection of journals for coverage by WoS is related to both particularistic and universalistic characteristics of the journals. This supports the hypothesis by Merton that both particularism and universalism influence evaluation processes.

Regarding the debate on whether the spread of scientific knowledge is affected by particularism, the Mertonian sociologists of science have maintained that the diffusion of scientific research is not significantly affected by it. This is because important knowledge will be produced and communicated regardless of who

produces it (Merton 1973a, p. 458). The finding that alternative JIS fill knowledge gaps of WoS and can cover new areas of research – as shown by examples in agricultural sciences, business and management, and chemistry – demonstrate that limitations in the coverage of mainstream JIS can hinder the spread of scientific knowledge. Hence, universalism is an ideal of science, not a reality. From a more particularistic view of science, using alternative JIS through their functions of knowledge-gap filling and knowledge bridging can improve the communication, recognition, and utilisation of research that has the potential to address pressing social demands.

Chapter 8. Conclusion

In this thesis I have analysed the reasons for the emergence and growth of alternative JIS against the dominance of WoS. I have argued that these reasons help better understand the formation of new JIS as cognitive authorities on descriptions and evaluations of scientific research. In this chapter I present a summary of the thesis, indicate some limitations, and suggest avenues for future research.

8.1 Findings

The research questions are: 'why did alternative JIS emerge in light of the dominance of WoS?' and 'why do researchers publish in journals covered by alternative JIS?' The first question was answered through a set of qualitative and quantitative analyses. In chapter 3, documentary and literature reviews revealed two competing explanations. The first is that alternative JIS emerged to cover non-core journals – journals that fail to pass the scientific impact and editorial standards required by WoS – and it assumes a universalistic evaluation of journals by WoS. The second explanation is that alternative JIS emerged as a response to geographical, linguistic, and disciplinary biases in the coverage of WoS – and this explanation assumes particularism in the coverage of WoS.

Chapters 4 and 5 provided quantitative evidence towards a further understanding of the reasons for the emergence of alternative JIS. In chapter 4 I tested the relationship between universalistic and particularistic variables and coverage by WoS. A regression analysis indicated that the universalistic variables *scientific impact* and *journal age*, and the particularistic variables *country* and *discipline* were significantly related to coverage by WoS. According to universalism, the evaluation of scientific research and researchers should be based on objective impersonal criteria. This means that features such as country of origin and other characteristics of the knowledge producer should not affect outcomes of evaluations. In this way, country and discipline of the journals should not be significantly related to coverage by WoS. For this reason, the significant relationship between country and discipline, and coverage by WoS indicate particularism in WoS. However, the results are not conclusive in that the coverage of WoS can be explained only by particularism, as some

universalistic variables also had significant coefficients. The results only provided empirical evidence that helps explain why some researchers have questioned the objectivity of WoS, and that the argument advanced by founders of RedALyC and Scielo (biases in the coverage of WoS) has some support from the data.

To provide an understanding of the coverage conditions under which alternative JIS RedALyC and Scielo emerged, in chapter 5 I examined the global coverage of WoS and Scopus. My results show that the coverage of WoS and Scopus is highly concentrated on journals from the UK, the USA, and the Netherlands. The dominance of English and the natural sciences is also apparent. In contrast, journals produced in Latin America, Spain, and Portugal have a lower coverage. Journals published in Spanish and Portuguese and in disciplines other than the natural sciences also have a lower coverage. These coverage conditions have remained quite constant, as shown by time series analyses. Chapters 3 to 5 indicate perceptions of biased coverage in WoS are meaningful and are likely to have encouraged the emergence of alternative JIS.

The above helps to explain the emergence of alternative JIS, but it does not explain their growth. This was researched through the second research question ‘why do researchers publish in alternative JIS?’ This question was answered through a qualitative case study in Colombia based on a set of 30 interviews of researchers from agricultural sciences, business and management, and chemistry, working for private and public universities and research institutes. In addition to the interviews, analysis of CVs to explore publishing patterns, database queries, and attendance at editorial workshops and science and technology conferences helped to corroborate and expand the empirical data from interviews.

The analysis in chapter 6 showed that the growth of alternative JIS is related to three main uses of journals in alternative JIS: ‘training’ (serving as training arenas for researchers to publish in mainstream JIS-indexed journals), ‘knowledge-gap filling’ (filling knowledge gaps of mainstream JIS), and ‘knowledge bridging’ (linking knowledge in mainstream JIS with a community with limited access to it). Training can be explained in part by a universalistic

perspective on science, according to which the science with the best quality resides in WoS. Knowledge-gap filling and knowledge bridging, however, are better explained by a particularistic view of science, in which certain knowledge escapes the coverage of mainstream JIS-indexed journals.

8.2. Contributions

8.2.1 Theoretical contribution

The thesis contributes to the sociology of science, specifically to the analysis of universalism and particularism. Universalism is the judgement of scientific contributions based on pre-established impersonal criteria; and particularism the judgement of scientific contributions based on personal features of the knowledge producers, such as country of origin and language (Merton 1973a, pp. 270–272). These concepts are studied in this thesis in relation to the production, communication, and evaluation of scientific research (Long & Fox 1995, p. 46), and their effects on the spread of scientific knowledge (Cole 1989, p. 60). The study of the emergence and growth of alternative JIS addresses these two issues by analysing the coverage of JIS and its relationship with universalism and particularism. In this thesis, universalism is understood as the inclusion of journals in JIS based on editorial standards and scientific impact; and particularism as the inclusion of journals on the basis of their country of publication, language, and discipline.

By analysing the coverage of WoS, I found that its coverage is significantly related to *scientific impact* – using h-Index as a proxy – *journal age*, *country*, and *discipline* of the journals. This means that two particularistic variables play a role in the probability of being indexed by WoS. Importantly, editorial criteria did not show a significant relationship with coverage in the most robust model. Therefore, in relation to the debates mentioned, it can be argued that both particularism and universalism are related to the coverage of WoS, supporting the notion that ‘universalistic and particularistic standards might be concretely involved in the actual process of evaluation’ (Zuckerman & Merton 1971, p. 86; see also Cole & Cole 1973, p. 37), in this case, in the evaluation of journals for inclusion into WoS.

Additionally, I found that the concentrated coverage of WoS can exclude original research that is only available in or better covered by alternative JIS. This is also likely to occur with Scopus, because it exhibits a similar concentration of coverage to WoS (chapter 5). This means that mainstream JIS hinder the effective perception and utilisation of certain research by users who rely only on mainstream JIS for literature searches and research evaluation. Alternative JIS fill these gaps in the coverage of mainstream JIS (knowledge-gap filling) and provide a link between articles covered by mainstream JIS and a community with limited or no access to it (knowledge bridging).

In summary, this thesis contributes to the sociology of science by showing that both particularism and universalism are involved in journal inclusion in WoS, and not only universalism as suggested by Garfield (1985). This finding suggests that particular characteristics such as discipline or country of publication can hinder the utilisation of research because of exclusion from mainstream JIS.

8.2.2 Empirical contribution

Empirically this thesis contributes to coverage analyses. The literature on this subject has focused mainly on descriptions of the extent of journal concentration by different JIS, reaching conclusions about biases based on these descriptions. In this thesis I expanded conventional analyses with the quantitative examination of the criteria for coverage. This bibliometric analysis is a novel attempt to test the coverage of WoS. Its results are triangulated with documentary evidence produced by founders of RedALyC and Scielo. Moreover, I undertook an interview programme that elicited the reasons for the use of non-mainstream journals and thus explained the growth of alternative. In this way, my investigation has expanded the conventional coverage analysis with a study about the characteristics of journals and coverage, and by qualitative insights from documentary reviews, interviews, and analyses of illustrative cases.

8.3 Policy implications

The findings reveal that alternative JIS are not just databases for non-core journals, in the sense that could be deduced from Garfield’s concept of core

journals. Instead, the uses of journals in alternative JIS for knowledge-gap filling and knowledge bridging show that they contain distinctive original research and can stimulate new areas of study. This shows that they are complementary to mainstream JIS.

Based on this complementarity, research evaluation exercises could incorporate ways to include alternative JIS by taking into account their role in knowledge-gap filling and knowledge bridging. However, the revelation that some researchers consider alternative JIS as training arenas means that alternative JIS still need to gain the confidence of both researchers and policy-makers as sources of 'quality' research. Researchers did suggest some ways in which alternative JIS could increase confidence: making publicly available the evaluation outcomes of the journals covered by Scielo and RedALyC, and developing ways to include in their evaluation criteria the assessment of the contents of the journals. With regards to usefulness, they also suggested that alternative JIS could try to index more types of documents, such as technical and grey literature. This could expand their readership, reaching for instance managers and farmers so that alternative JIS could be more widely used as information resources. In this way they could increase and make more visible their complementarity to mainstream JIS and have a wider impact on society.

8.4 Limitations

This study makes use of databases for quantitative research and also qualitative sources such as primary documentation and interviews. Therefore, some limitations in the data and the inference methods made from them have to be considered. I have classified them into 'scope of the results' and 'causality'.

8.4.1 Scope of the results

In chapter 4 I used a database called Latindex, which reveals the editorial standards of journals in Latin America, Spain, and Portugal. I used this database for the analysis because it is the only database to my knowledge that shows detailed editorial criteria for each journal in its catalogue. Other catalogues, such as the ISSN database and Ulrich's, cover many more journals from all over the world, but do not provide the fine-grained details of the editorial criteria found in Latindex, which were necessary for my study. For this reason,

the results in chapter 4 apply to journals produced in Latin America, Spain, and Portugal only. A comparison between these journals and journals produced in Northern and Western Europe or the USA would have allowed the analysis of more regions, including those traditionally favoured by the coverage of WoS.

Regarding the Colombian case study in chapter 6, some of its characteristics allow an extrapolation of the results to other countries with a similar production of journals and lower coverage by WoS. As explained in the chapter, Mexico, Chile, Brazil, and Argentina exhibit these characteristics. It is likely that a more comprehensive study of those countries or of countries in the Middle East and Africa could have revealed more insights into the reasons for publishing in alternative JIS-indexed journals. However, the time and resources for PhD research have constrained my study to only one country. Fortunately, I was able to interview researchers from three different disciplines, in different organisations, and with varying levels of research experience. This allowed me to account for the diversity of research that is covered by alternative JIS which helped me, in some way, to mitigate the lack of comparison between Colombia and other countries.

8.4.2 Causality

In chapter 4 I used a logistic regression in order to test the relationship between the variables *scientific impact*, *editorial standards*, *country*, *discipline*, and *language* of the journals, and coverage by WoS. Ideally, regression analysis should help to infer causality between the explanatory variables and the outcome – in this case being covered by WoS. However, as *scientific impact* is represented by the proxy of citations, and citations can be boosted when a journal is covered by WoS, the regression has a problem of endogeneity. After unsuccessfully trying to gather citations before the journals in the sample were indexed by WoS, I had to include the *age* of the journals along with their *h-Index*. Even so, the problem of endogeneity means that a causal relationship cannot be inferred from *scientific impact* and coverage by WoS. For this reason, throughout the thesis I talk about relationship, and not cause.

8.5 Future research

The findings in this thesis mean that additional studies, related to the concept of JIS as cognitive authorities in science, are warranted. Below I suggest three possible ways to further the research in this thesis: two are to do with knowledge (section 8.5.1) and the third to do with coverage (section 8.5.2).

8.5.1 Identifying and documenting knowledge-gap filling and knowledge bridging

Knowledge-gap filling and knowledge bridging are two mechanisms that make alternative JIS complementary to WoS and Scopus. Through knowledge-gap filling, alternative JIS cover topics neglected in mainstream JIS. Through knowledge bridging, alternative JIS create a link between knowledge in mainstream JIS-indexed journals and communities with poor access to it. International research collaboration could help to identify and document knowledge gaps filled by alternative JIS and also other ways in which knowledge bridging happens in different countries and disciplines.

Some of the research that is poorly covered by mainstream JIS can be seen in studies on the content of articles. For instance, Yeung – an editor of *Environment and Planning A* – searched for documents in top geography journals in the SSCI and classified the documents according to the country that had been studied. In his sample he found that 'there are more empirical publications on the USA than on all other countries and regions combined' (Yeung 2001, pp. 3–4). He urged researchers to produce more papers on other geographical areas. In another paper, Arbeláez-Cortés found 'strong biases in taxonomic, geographic, and subject coverage' (Arbeláez-Cortés 2013, p. 2875) in the papers on Colombian biodiversity published in WoS-indexed journals: 75% of the papers were on animals. This is an important result given that Colombia is a highly diverse agricultural and horticultural country. Additionally, he found that the number of papers on subjects such as conservation and genetic diversity was low. The author wondered if papers on these important subjects appear in journals covered elsewhere. In addition, Rafols, Ciarli and Chavarro (2015) found that WoS and Scopus under-represent the research on rice related to production, plant characteristics, and diseases. This research is especially relevant for small farmers and local markets.

Overall, the examples above and those found in this thesis suggest that there is a variety of subjects that could be published in alternative JIS-indexed journals. Although some researchers have started to suggest that alternative and mainstream JIS are complementary (Vélez-Cuartas, Lucio-Arias & Leydesdorff 2015, p. 44), more systematic studies are needed in order to unveil those knowledge gaps that alternative JIS are covering and that have the potential to solve pressing social demands and needs.

Secondly, knowledge bridging opens up opportunities to understand the role of alternative JIS in the flow of knowledge. By studying their role as knowledge bridges, it should be possible to gain insight into the introduction and adaptation of concepts, methodologies, and technologies that are new to the readership of alternative JIS-indexed journals. In particular, research on knowledge bridging could produce insights into the emergence of new areas of research such as the example given in this thesis, Latin American business history research.

8.5.2 Explaining the coverage of WoS

Although there is some research that has investigated this issue, such as the work by Wouters (1999) or studies compiled by Garfield, Cronin and Atkins (2000), there is a need to explain the current coverage of WoS. The geographical, linguistic, and disciplinary concentration of WoS could be due to the circumstances surrounding its beginnings in the USA. The SCI started with three citation indexing projects conducted by Eugene Garfield on chemistry and health in 1960, and genetics in 1962 (Thomson Reuters 2014d) which could explain its heavy concentration on the natural sciences. In addition, the development of the SCI could have been influenced by the support that the USA government had given to US information systems so that they could compete against the USSR's scientific communication system in the 1960s (Wouters 1999, p. 62; Garfield 2007, p. 8,). This could have determined its path during the following years, especially regarding literature produced in English in the USA and the UK[57]. As Garfield recalled:

[57] Garfield's ISI was named after the Soviet VINITI, the All-Union Institute for Scientific and Technical Information.

> Few of you will have forgotten our national shock when Sputnik was launched by the Russians in 1957. Our covert and overt intelligence capabilities were challenged then too. Everyone was studying Russian then. In 1964 I and others testified before Congressional Committees on the need for improving our information activities (Garfield 2007, p.8).

Many other factors could have influenced the current configuration of WoS. For instance, price and market demand. It can be argued that the majority of customers for the citation indices were for a long time mostly located in affluent areas, which may overlap with the most concentrated regions shown in this thesis. The ISI and then Thomson Reuters may have had little incentive to include countries with few customers (Moravcsik 1985), until its competitor Scopus entered an expanding market for countries not traditionally covered by WoS (Leydesdorff, Moya-Anegón & Guerrero-Bote 2010, p. 353). Other issues such as the influence of main publishing houses, the computing technology used to codify the records, which for a long time only accepted English American National Standards Institute (ANSI) codification, among others, could explain the current coverage of WoS.

These working hypotheses are intended to suggest that particular events, choices, motivations, technologies, business strategies, etc., could have markedly affected the coverage of WoS. Therefore, the study of the coverage of WoS in relation to its history could help forge a better understanding of its development beyond its emergence from the concept of citations (Wouters 1999). A more comprehensive approach to its history could shed light on the relationship between the development of cognitive authorities on science and factors such as business, technology, and the USA’s international policies.

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Annexes

Annex 1

Test of assumptions of logistic regression (chapter 4)

Linearity

The numeric variables were tested for the assumption of linearity of the logit (table A1.1). The logs of the variables are not significant, showing that the assumption is not violated.

Table A1.1 Test of linearity of numeric variables

	Coefficient	Std. E	Error	t
(Intercept)	-0,371	0.1076	-3,45	**<0.001**
h-Index	0.25	0.12	2.06	>0.05
journalAge	0.08	0.04	1.88	>0.05
Log h-Index	-0.03	0.04	-0.944	>0.05
Log journalAge	-0.02	0.001	-1.623	>0.05

Model choice

In addition to the pseudo-R^2 measures, the selection of the model was done through the use of the reduction in -2LL. Table A1.2 shows the models, the -2LL (column Resid. Dev), and the significance of the models.

Table A1.2 Choice of models based on reduction of -2LL

Model*	Resid. Df	Resid. Dev	Df	Deviance	P-value
1	1352	1177.7	1	141.701	**<0.001**
2	1323	1010.4	14	91.703	**<0.001**
3	1327	1008.1	-4	2.59	>0.05

*1. WoS ~ Editorial standards + h-Index + Journal age.
2. WoS ~ Editorial standards + h-Index + Journal age + Language + Discipline + Country + Type of publishing organisation + Type of journal.
3. WoS ~ HighQ + h-Index + Journal age + Language + Discipline + Country + Type of publishing organisation + Type of journal.

Multicollinearity

Finally, multicollinearity was tested by using the VIF test, which shows how much the estimation of coefficients is inflated by multicollinearity. The VIF test shows that multicollinearity is not a concern as none of the values of the statistic is greater than 10 (model 2 data in table A1.3 and model 3 data in table A1.4).

Table A1.3 VIF test for multicollinearity (model 2)

Variables	VIF	Df	Tolerance VIF^(1/(2*Df))
PeerRes	1.19	1	1.09
ExAu	1.04	1	1.02
EdOp	1.24	1	1.11
Regul	1.13	1	1.06
AbsKeyLang	1.16	1	1.07
h5index	1.38	1	1.17
journalAge	1.16	1	1.07
typePubClean	1.23	2	1.05
discipline	2.14	6	1.06
language	2.22	3	1.14
typeOrgClean	1.89	4	1.08
Country	3.48	14	1.05

Table A1.4 VIF test for multicollinearity (model 3)

Variables	VIF	Df	Tolerance VIF^(1/(2*Df))
h5index	1.38	1	1.18
journalAge	1.16	1	1.08
typePubClean	1.22	2	1.05
discipline	2.06	6	1.06
language	2.12	3	1.13
typeOrgClean	1.85	4	1.08
country	3.33	14	1.04
HighQ	1.19	1	1.09

Annex 2

Classification of Ulrich's disciplines into Frascati Field of Science and Technology

The following list shows the disciplines that were classified into the Frascati Field of Science and Technology classification (in bold).

Agricultural sciences

Agriculture, Animal welfare, Fish and fisheries, Food and food industries, Gardening and horticulture, Pets, Veterinary science.

Arts and humanities

Antiques, Art, Arts and handicrafts, Biography, Ceramics, Classical studies, Dance, Folklore, Humanities: comprehensive works, Interior design and decoration, Jewellery, Leisure and recreation, Linguistics, Literary and political reviews, Literature, Museums and art galleries, Music, Native American studies, Philately, Philosophy, Photography, Religions and theology, Theatre.

Engineering and technology

Aeronautics and space flight, Architecture, Building and construction, Cleaning and dyeing, Communications, Computers, Electronics, Energy, Engineering, Fire prevention, Heating, Housing and urban planning, Instruments, Leather and fur industries, Machinery, Metallurgy, Mines and mining industry, Packaging, Paints and protective coatings, Paper and pulp, Patents, Petroleum and gas, Plastics, Printing, Rubber, Technology: comprehensive works, Textile industries and fabrics, Transportation, Water resources.

Medical and Health sciences

Alternative medicine, Handicapped, Health facilities and administration, Lifestyle, Medical sciences, Men's health, Occupational health and safety, Physical fitness and hygiene, Public health and safety, Social services and welfare, Women's health.

Natural sciences

Astronomy, Beauty culture, Biology, Birth control, Chemistry, Conservation, Drug abuse and alcoholism, Earth sciences, Environmental studies, Forests and forestry, Geography, Gerontology and geriatrics, Mathematics, Meteorology, Metrology and standardization, Nutrition and dietetics, Palaeontology, Pharmacy and pharmacology, Physics, Sciences: comprehensive works, Sound recording and reproduction.

Social sciences

Abstracting and indexing services, Advertising and public relations, Anthropology, Archaeology, Asian studies, Bibliographies, Business and economics, Children and youth, Civil defence, Clothing trade, Computers, Consumer education and protection, Criminology and law enforcement, Education, History, Home economics, Homosexuality, Hotels and restaurants, Journalism, Labour unions, Law, Library and information sciences, Men’s studies, Occupations and careers, Political science, Population studies, Psychology, Public administration, Publishing and book trade, Social sciences: comprehensive works, Sociology, Sports and games, Statistics, Travel and tourism, Women’s studies.

Annex 3

Topic guide for interview programme

The purpose of this interview programme was to answer the research question: why do researchers publish in journals indexed by alternative JIS? The topics addressed were 1) reasons to publish research; 2) explanation of the publication patterns of researchers in terms of JIS; 3) use of Scielo, RedALyC, WoS, and Scopus in research; 4) the 'value' of Scielo, RedALyC, WoS, and Scopus for their publications; 5) the future of JIS, and any recommendations or comments. Previous to the interview, there was a preliminary data gathering and analysis of the publication patterns of each researcher. The general profile of each researcher was built from the following information:

- Nationality
- Gender
- Age bracket
- Participation in research teams.
- Collaborative publishing: affiliations of the researcher's co-authors.
- Subjects of the researcher's publications, based on their publication records from CVLAC.
- University where the researcher obtained PhD qualification, date, and country.
- Sector of the organisation that employs the researcher: private or public.
- List of publications. For each publication, the JIS that covered the journal in which it was published (Scielo, RedALyC, WoS, Scopus).

The topic guide is presented below:

(1) Please, briefly explain your research subject. Why is it important?
(2) What are the reasons that motivate you to publish?
(3) How do you define ‘contribution to knowledge’?
(4) How do you choose the journals to which you submit your papers?
(5) What motivates you to publish in those journals?
(6) To which journal are you planning to submit your next article? What is it about? Why this journal?
(7) How do you search for literature for your research?
(8) Do you know any of the following JIS?
    a. RedALyC
    b. Scielo
    c. Web of Science
    d. Scopus
(9) How often do you use each of them? Why do you use or not use them?
(10) Are there differences in the literature you find in the different JIS? If so, what are the differences? If not, what makes you choose a paper for your bibliography?
(11) How often do you cite literature found through Scielo and RedALyC?
(12) Are you planning to submit papers to journals indexed by any of the Journal Indexing Systems mentioned above in the near future? Why are you submitting to any of them?
(13) According to your definition of ‘contribution to knowledge’, please indicate your papers in which that contribution is more significant and the ones in which that contribution is less significant.
(14) Do you have any ideas about the future of alternative JIS, their value for research and policy-making, and recommendations for their future development?