Analysis of national scientific domains in the Journalism discipline (Scopus, 2003-2019)

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Abstract

Although journalism has an important social impact, with contributions from multiple academic and professional fields, one can perceive a major deficit in terms of applying scientometric analyses that allow for an objective multidimensional radiography of scientific production, the identification of transnational collaboration networks, and the revelation of the position of the different countries. This work evaluated the evolution of national scientific domains of the discipline during the period 2003-2009, constructing a first relationships map that goes beyond the quantitative plane of production to reveal the dynamics and socio-political and geographical context of alliances in Journalism research. Scientific production in journalism increased during this period much faster than world scientific production. Three countries really capitalized the research: the United States, the United Kingdom, and Spain generated more than half of the total production, while at the same time being those that determined the entire structure of relationships involving the linguistic, geopolitical, and sociocultural (linked with professional and work practices) factors.

Keywords

Journalism, Scientometrics, Research Evaluation, International Collaboration, Scientific Excellence, Scopus.

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1. Introduction

On the one hand, Journalism has been studied, researched into, and critiqued worldwide by people from a wide variety of disciplines (Bromley, Tumber & Zelizer, 2001; Deuze, 2005; Deuze & Witschge 2018). Some authors have pointed out the existence of different theoretical and methodological approaches (Zelizer, 2004; De Beer & Merrill, 2004). There are, as Deuze (2005) indicates, five ideals associated with journalism:

- Public service.
- Neutrality, objectivity, justice and, therefore, credibility.
- Autonomy, freedom, and independence.
- Immediacy.
- Ethics and legitimacy.

On the other hand, at present all human activity, and Journalism in particular, finds itself affected by increasing globalization, understood as the growing communication and interdependence between the different countries around the world. Interrelatedness, which also extends across sectors and disciplines, has possible perverse consequences in Journalism such as intrusionism and citizen journalism. Furthermore, the digitization that fosters this communication and interrelatedness is also changing the communications media and therefore the profession of Journalist.

In today's knowledge-based society, scientific research is becoming increasingly important. For this reason, there is a constantly increasing demand for scientific assessment (Moed, 2017). This demand comes, in general terms, from Society which invests many resources and places great hopes in scientific research and, in particular terms, from the governments, research institutions, or funding agencies which have to oversee that scientific research. The production and impact of scientific research are multidimensional (Moed, 2020). Scientific production is multidimensional because it can be either publication-based or non-publication-based. And in turn, it can have different objectives: scientific-academic, such as scientific papers published in scientific journals; educational, such as courses on the Internet; economic, such as patents; and social or cultural, such as scientific advice.

Bibliometry/scientometry provides the methodology behind analysing scientific-academic research at the macro level from a multidimensional perspective through papers published in scientific journals. This makes the evaluation more objective and the only type that can be carried out on a large scale. Such evaluations are increasingly demanded by universities, funding agencies, government agencies, etc., in order to demonstrate the value of research and justify expenditures. Nonetheless, despite the growing demand for scientific evaluation, and specifically bibliometric/scientometric studies, these are not frequent for the discipline of Journalism. Journalism as a discipline has yet to be subjected to comprehensive bibliometric/scientometric study. This means that there has been no objective study of Journalism as an integral scientific discipline, and therefore that neither its evolution nor how it is structured are known in any objective way. The following paragraphs describe the most closely related ones that were found.

There are some gender studies that analyse feminine scientific production in journalism and mass communication (Blake, Bodle & Adams, 2004; Bodle, et al., 2011). These show that women's percentage of scientific production is greater than their percentage representation in faculties. Specifically, during the period 2001-2005 they had 38.7% of the production versus being 32% of the teaching staff they represented. Assistant professors were those who made the greatest number of contributions.

Journalistic citations of scientific papers have also been studied to determine the impact of science in the general media and to characterize science journalism. The analysis of journalistic citations has advantages over altmetrics since the press is the main producer of news as well as having the professional filter. Nonetheless, there are no journalistic citation databases similar to those of scientific citations (Cansino, 2018).

Lehmkuhl & Promies (2020) carried out a scientometric study, more specifically to analyse the distribution of journals and results in science journalism. In both cases, they found an exponentially truncated power law.

Xu & Lan (2020) developed a Scientometric Review of Automated Journalism covering the period 1990-2020. The three countries with the most prominent production were the United States, Germany, and Spain. The analysis of the keywords showed that it was a multidisciplinary field with the main participation of Journalism, Computer Science, and Automation. Segado-Boj (2020) carried out a Scientometrics study of social media and journalism from 2003 to 2017 from the Web of Science. The results showed that the number of papers on the subject had been increasing steadily since 2014. The United States, Australia, the United Kingdom, and Spain stood out as being the most productive countries.

Recently, and expanding the thematic scope somewhat, Trabadela-Robles et al. (2020) and Moreno-Delgado, Gorraiz & Repiso (2021) carried out studies of countries' scientific production in Communication, analysing both the quantity (number of papers published) and quality (scientific impact). While the former of those studies used the Scopus database, the latter used the WoS database, and, while the former was based on the standardized citation as an impact indicator, the latter defined a country impact factor in a similar way to the journal impact factor. The two studies reached compatible and quite similar conclusions.

Although they used different databases, the above two studies were based on the journal rankings of the databases they used. Specifically, in Scopus there is a Scientific Category labeled "Communication" which includes the journals that publish works on Communication, and idem with the WoS category labeled "Communication Studies". This greatly facilitates the selection of the data, but also implies a degree of imprecision/noise, since there are journals categorized in these categories that also publish works from other disciplines which are counted as being part of those categories.

The objective of the present work was to carry out a broad study into the scientific-academic production of the 27 main countries (at the macro level) in Journalism from a multidimensional perspective, paying especial attention to scientific collaboration. This was all to be able to answer the following questions:

- Given that Scopus combines both Journalism and other communication papers into a single category called “Communication”, how can we distinguish Journalism papers from the others? Doing so is necessary if we wish to calculate Journalism-specific metrics such as scientific production, impact, or international collaboration.
- How did the world production in Journalism evolve during the period 2003-2019?
- What are the features of scientific production in Journalism in the main countries, of its scientific impact, and of collaboration between the countries?
- Is there a relationship between scientific impact and international collaboration?
- What are the densest national scientific collaboration networks in Journalism?

2. Data and Method

The data were extracted from the SCImago Journal & Country Rank (SJ&CR) and the SCImago Institutions Rankings (SIR), platforms developed by the SCImago group based on the information included in the Scopus database (SCImago 2021a, 2021b). Elsevier's Scopus database (Hane, 2004 and Pickering, 2004) is one of the bibliographic databases that include a greater number of scientific journals and conferences. Despite only having offered its services for a short time, it has been the object of study and analysis in various research works (Archambault et al., 2009; Leydesdorff et al., 2010; Moya Anegón et al., 2007), and has been used in multiple scientometric studies (Gorraiz, Gumpenberger, Wieland, 2011; Jacso, 2011; Corera Álvarez, Moya-Anegón, 2009; Romo Fernández et al., 2011; Guerrero-Bote & Moya-Anegón, 2015).

In Scopus, SJ&CR, and SIR, documents and journals/conferences are classified by Thematic Areas and by Specific Thematic Areas or Categories. There are more than three hundred Specific Thematic Areas grouped into twenty-six Thematic Areas. In addition, there is the Multidisciplinary Thematic Area that contains multidisciplinary journals such as Nature or Science.

A particularity of Scopus is that, when including congresses specializing in certain disciplines, annual variations in the number of documents can be seen due to the fact that some congresses are held with a periodicity lower than annual.

The category "Communication" is found within the Thematic Area corresponding to Social Sciences, which comprises twenty-three Specific Thematic Areas (plus a miscellany of Social Sciences). The said Specific Thematic Area, as its name indicates, includes papers dedicated to Communication Sciences. The number of scientific journals/congresses included in the "Communication" category started at one hundred and seventeen in 2003, and reached four hundred and eleven in 2018 (3.5 times more). In the WoS/JCR there also is a "Communication" scientific category that started at forty-four journals in 2003, and doubled in 2018 to eighty-eight. It is clear that Scopus not only includes many more sources, but their number grew considerably more during the period.

Nonetheless, neither database has a category dedicated exclusively to Journalism. Because of this, we selected all the works from 10 publications which, given their title and scope, we determined as being dedicated exclusively to Journalism. Papers containing the term Journalism in the title, abstract, or keywords were also included. All those papers (15 166 during the period 2003-2019) form the set of Journalism papers (henceforth JSET). Table 1 lists the production of the journals that contain more than 10 papers and more than 20% of their production in the JSET. Publications that have 100% of their production in the JSET are in boldface. The papers from these journals account for 40% of the JSET. Of course, a large part of the JSET (58.45%) corresponds to papers published in journals included in the area of Communication, although this percentage was not constant, but increased from 36.63% in 2003 to 66.78% in 2019.

Table 1: Scientific journals/congresses with ten or more published works included in the set of journalism papers and which account for more than 20% of their production. The publications with 100% inclusion are in boldface. The columns give the number of papers selected annually, the totals, and the percentages of the production they represent.

Source Title	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	#	%
Journalism Studies	**25**	**27**	**38**	**54**	**62**	**57**	**51**	**54**	**51**	**53**	**56**	**60**	**53**	**63**	**88**	**136**	**138**	**1066**	**100**
Journalism	**23**	**22**	**23**	**23**	**39**	**33**	**71**	**43**	**59**	**59**	**66**	**55**	**65**	**63**	**77**	**91**	**205**	**1017**	**100**
Journalism Practice	**0**	**0**	**0**	**0**	**27**	**33**	**30**	**37**	**47**	**53**	**48**	**0**	**53**	**58**	**72**	**80**	**146**	**684**	**100**
Pacific Journalism Review	**0**	**0**	**23**	**32**	**24**	**29**	**37**	**34**	**22**	**24**	**27**	**19**	**29**	**27**	**22**	**26**	**18**	**393**	**100**
Digital Journalism	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**21**	**36**	**52**	**61**	**70**	**72**	**80**	**392**	**100**
American Journalism	**16**	**15**	**17**	**17**	**22**	**17**	**24**	**20**	**18**	**17**	**23**	**21**	**19**	**20**	**20**	**19**	**20**	**325**	**100**
African Journalism Studies	**0**	**0**	**0**	**0**	**0**	**0**	**11**	**10**	**18**	**18**	**25**	**19**	**44**	**30**	**22**	**28**	**17**	**242**	**100**
Brazilian Journalism Research	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**39**	**27**	**66**	**100**
Journalism history	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**24**	**24**	**100**
Australian Journalism Review	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**16**	**16**	**100**
Media and Jornalismo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	37	67	98.5
Mass Communication and Society	0	0	0	0	0	11	2	13	21	41	40	37	35	34	36	31	34	335	79.8
Journal of Applied Journalism and Media Studies	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	13	32	69.6
Journalism and Mass Communication Educator	6	10	11	11	11	13	10	10	12	14	10	16	18	21	18	21	25	237	66
Asia Pacific Media Educator	0	0	0	0	0	0	0	0	0	0	0	7	9	13	12	13	1	55	61.1
Journalism & communication monographs	3	1	2	5	4	6	7	1	2	3	1	2	2	2	2	0	2	45	60.8
Newspaper Research Journal	13	11	10	1	10	19	15	22	14	15	8	26	9	9	11	15	11	219	43.5
Estudios Sobre el Mensaje Periodistico	0	0	0	0	0	0	0	11	17	39	42	54	32	30	29	29	15	298	30.9
Journal of Media Ethics: Exploring Questions of Media Morality	0	0	0	0	0	0	0	6	4	3	7	5	6	10	2	4	4	51	27.7
Revista de Comunicación	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	8	14	25.9
International Journal of Press/Politics	5	2	4	2	5	6	4	6	8	7	12	7	8	10	7	11	3	107	25.4
Analisi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4	3	10	23.8
Medijska Istrazivanja	0	0	0	0	0	0	0	0	9	0	4	3	0	5	3	1	0	25	23.6
Nordicom Review	0	0	0	0	0	0	4	3	4	6	13	10	3	5	6	5	11	70	23.4
Journalism and Mass Communication Quarterly	3	6	3	5	3	6	4	8	4	4	6	11	21	28	31	7	13	163	22.6
Visual Communication Quarterly	0	0	0	1	0	0	0	1	0	1	0	1	3	11	15	15	13	61	22
Media and Communication	0	0	0	0	0	0	0	0	0	0	1	2	4	3	6	9	25	50	20.4

The data extracted for this work correspond to the twenty-seven most productive countries within this JSET of Journalism for the period 2003-2019. At the time of carrying out this study, reliable data for 2020 were not yet available. These countries are the ones that have published more than 115 papers during these sixteen years, and together accumulate 12 581 papers, which is almost 83% of the world production collected in this JSET. Twenty-seven countries, accounting for 83% of global production, seems to be a representative number to give a world vision as well as being manageable enough for a study like the present.

The indicators used to characterize scientific production in Communication were the following:

- Ndoc: Number of documents published in scientific journals included in the Scopus database.
- %Ndoc: Percentage of the documents in this JSET relative to the total scientific production of the country concerned.
- Cites per Document: Average citations per document. The citations depend greatly on how long the document has had to be cited. For this reason the evolution of this indicator is not evaluated.
- %Cited Documents: Percentage of documents cited. Like the previous indicator, this depends greatly on the time that the documents have had to be cited. Its evolution is therefore not evaluated.
- %International Collaboration: Percentage of the documents in whose byline there appear authors from different countries.
- RG: Number of documents published in scientific journals contained in Scopus in which an author of the relevant country has acted as Research Guarantor (RG, corresponding author) (Moya-Anegón et al., 2013).
- %RG: Percentage of documents published in scientific journals contained in Scopus in which an author of the relevant country has acted as Research Guarantor (corresponding author) (Moya-Anegón et al., 2013).
- Normalized Impact (NI): Average normalized citation received by each document, understanding this to be the ratio between the citations received by the document and the average cites of the documents of the same type, year, and Category (Rehn & Kronman 2008).
- Excellence10: Number of documents that are among the 10% most cited of the same year, type, and Category (Bornmann et al., 2012).
- %Excellence10: Percentage of documents that are among the 10% most cited of the same year, type, and Category (Bornmann et al., 2012).
- Excellence10 as RG: Number of documents that are among the 10% most cited of the same year, type, and Category in which an author of the relevant country has acted as Research Guarantor (corresponding author).
- %Excellence10 as RG: Percentage of documents that are among the 10% most cited of the same year, type, and Category in which an author of the relevant country has acted as Research Guarantor (corresponding author).
- Excellence1: Number of documents that are among the 1% most cited of the same year, type, and Category.
- %Excellence1: Percentage of documents that are among the 1% most cited of the same year, type, and Category.

- %Q1: Percentage of papers that are published in journals that are within the first quartile in their scientific categories according to the SJR indicator. This indicator reflects the effort made by the countries to disseminate their scientific results.
- Rate of Change (RC): To see the evolution of the above indicators in this period, a (seven-year-interval) rate of change was calculated from the variation between the average of the first three years (2003-2005) and that of the three years (2010-2012). The year 2013 was not used because the citations of that year cannot be considered stable at the time the data were retrieved.

In this study, all these indicators have been applied to the scientific production included in the Journalism JSET defined above. That is, the Normalized Impact of a country refers to the Normalized Impact of its scientific production in JSET, the Excellence10 as RG of a country refers to its Excellence10 as RG in the JSET, etc.

3. Results

The world scientific production in Journalism (JSET of Journalism) has increased greatly in parallel with the explosion of Journalism itself that has occurred in recent decades (Ramonet, 2011). This is an evolution that corresponds to the increase in the Communication discipline (Trabadela-Robles et al., 2020). Furthermore, "in general terms, the countries that allocate more economic resources to science not only produce more, but also produce with greater impact" (Moya Anegón, 2021).

As reflected in Figure 1, global production in Journalism has had a constant rate of evolution in the last decade and a half: it has gone from 344 documents in 2003 to 1782 in 2019, which represents an increase of 418% with a 25% average annual increase (24.59%). Eight out of ten papers published during the period 2003-2019 correspond to the twenty-seven countries under study (with 12 581 articles registered) in a strongly ascending curve that reproduces the same peaks as world scientific production (2005, 2010, and 2015).

To put this important increase in scientific production in Journalism into context, it is necessary to take into account the parallel increase that has occurred in the global field of Communication, driven by technological changes, the emergence of the so-called webs 2.0 and 3.0 and the generalization of new forms of communication such as social networks (Trabadela et al., 2020), as well as the consequent increase in journals by 251% registered in Communication, and the greater coverage of Scopus in all these subjects as research activity has increased and matured.

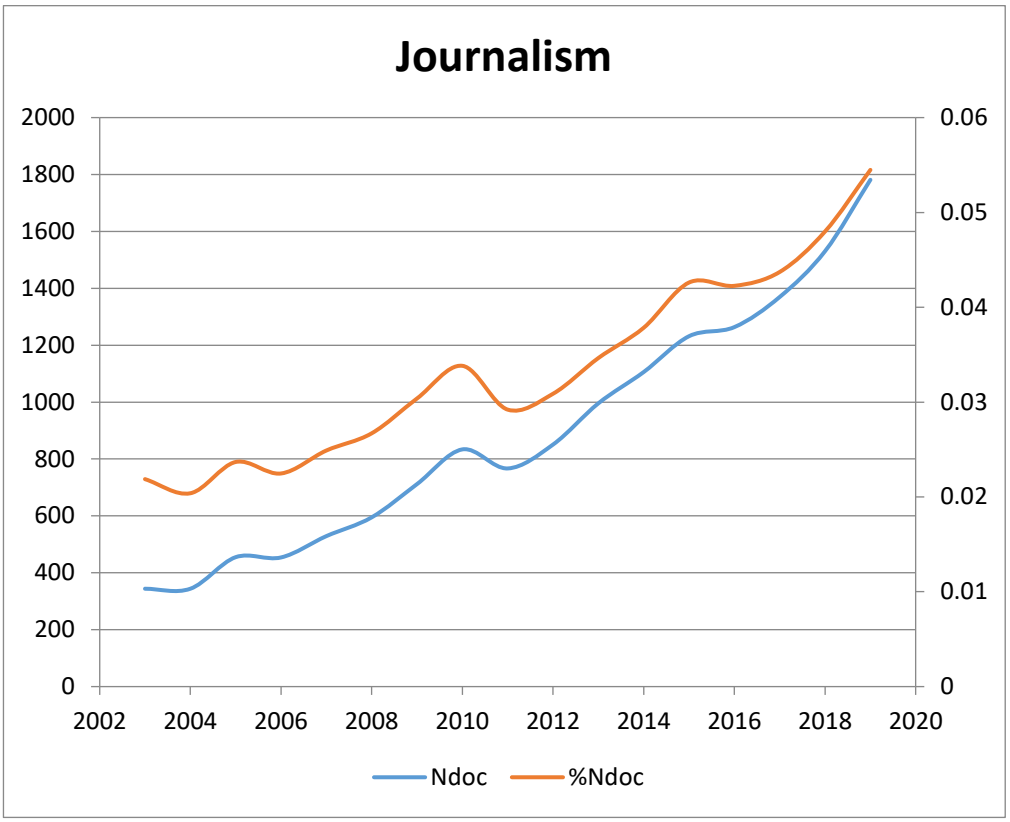

Figure 1: Production of Journalism (JSET) during the period 2003-2019, both in number of papers and in percentage with respect to the total world scientific production.

When the production in Journalism is compared with the rest of the world production, it can be observed that it rose from 0.022% to 0.054%, which represents an increase of 149% with respect to world production, i.e., an 8.8% average annual growth. Analysing the evolution of the graph, one can see that the behaviour of the increase has not been monotonous. The greatest fluctuation occurred in 2010, with the rest of the oscillations being almost stagnations, which stand out more in the percentages of the world production. In any case, it can be concluded that it is a discipline that has experienced a very notable increase in the last decade and a half. Specifically, Journalism production has grown at a much higher rate than world scientific production.

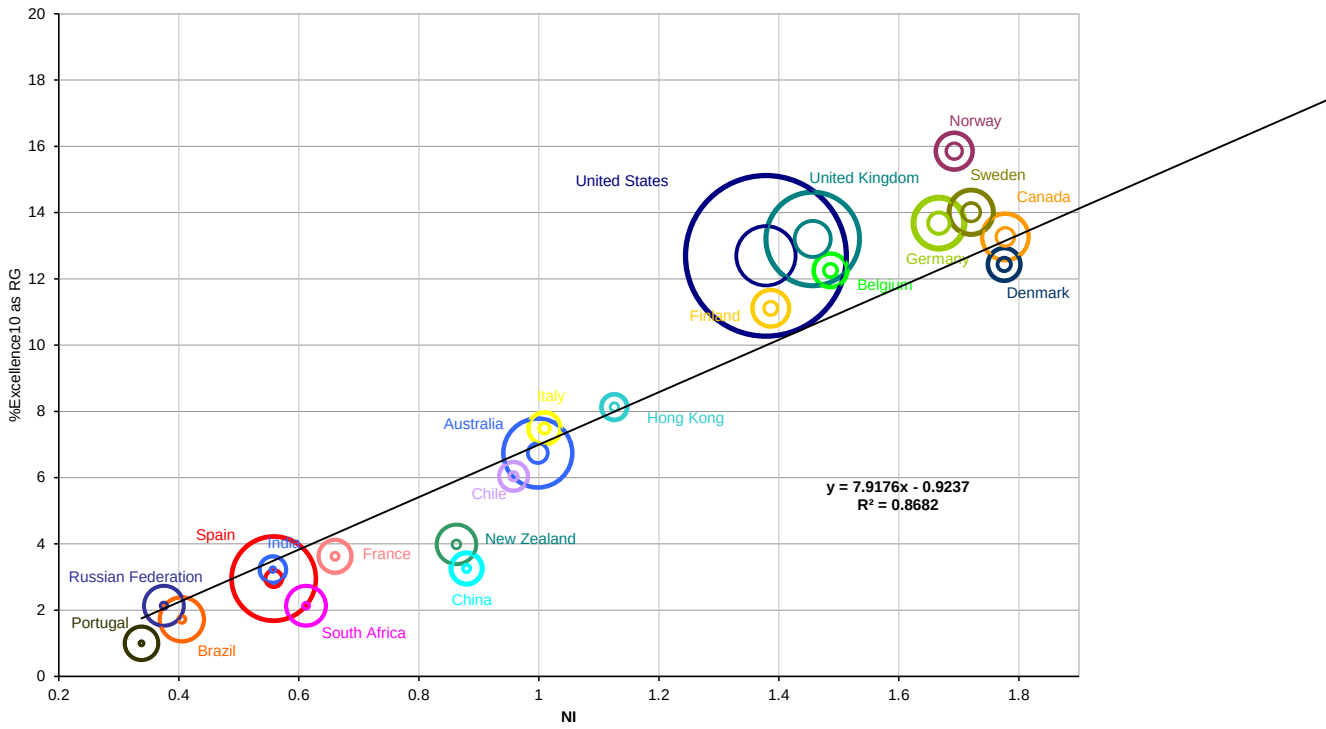

Figure 2: %Excellence10 as RG vs Normalized Impact for the 27 countries with the greatest output. The concentric circles represent four Ndoc parameters for each country – respectively, Ndoc, RG, Excellence10, and Excellence10 as RG, all corresponding to Journalism (JSET).

The correlation between the normalized Impact and the % Excellence as RG of the twenty-seven most productive countries in Journalism is clearly evident in Figure 2 ($R^2 = 0.86$), with a rate slightly greater than that registered globally in Communication ($R^2 = 0.80$).

By means of the positions and concentric circles, the map shows the Ndocs of the countries under study, RG, Excellence10, and Excellence10 as RG. Reproducing also what was the case with Communication, it shows that intensive international collaboration does not take place in this area. Hence there is very little difference between Ndoc and RG, as neither is there between Excellence10 and Excellence10 as RG.

Tables 2 and 3 are designed to provide detail on the correlations between the different countries. The former clearly shows the solo leadership position of the United States, with production volume almost triple that of the United Kingdom (the second country in the ranking), and easily triples the third (Spain). When adding together the activity of the United States, the United Kingdom, and Spain as the top ranked in scientific research about Journalism worldwide (7580 papers), this is more than half of the total production of the twenty-seven countries under study (13 892 papers).

Table 2: Ndoc, %Ndoc, Cites per Document, %Cited Documents, %International Collaboration, RG, %RG, and Normalized Impact, of the twenty-seven most productive countries, and the rates of variation of the triennium 2016-2018 compared with the triennium 2003-2005.

Country	Ndoc	% RC	%Ndoc	% RC	Cites per document	% Cited documents	% International Collaboration	% RC	RG	% RC	% RG	% RC	Normalized Impact	% RC
United States	4695	167.57	0.05	84.34	12.07	76.59	11.67	157.61	4453	155.99	94.85	-4.33	1.38	-5.08
United Kingdom	1598	286.67	0.05	131.39	12.43	77.97	19.34	121.98	1470	254.46	91.99	-8.33	1.46	7.20
Spain	1287	2760.00	0.10	1227.23	4.11	55.48	14.22	-53.85	1196	2728.57	92.93	-1.10	0.56	-24.96
Australia	860	637.50	0.07	197.33	7.98	73.95	16.74	-16.71	793	700.00	92.21	8.47	1.00	-25.87
Germany	497	615.38	0.02	338.79	10.68	72.84	38.03	34.54	393	600.00	79.07	-2.15	1.67	55.55
Canada	392	224.14	0.02	86.44	15.99	74.74	24.74	77.39	348	223.08	88.78	-0.33	1.78	-9.57
Netherlands	376	505.56	0.04	228.05	16.20	82.98	33.24	32.11	312	411.76	82.98	-15.49	2.30	-30.64
Sweden	364	415.79	0.06	180.50	13.97	81.87	26.92	93.88	305	412.50	83.79	-0.64	1.72	-54.06
Brazil	348	1671.43	0.04	446.78	3.21	37.64	16.67	58.06	319	1471.43	91.67	-11.29	0.40	-79.42
Russian Federation	281	7050.00	0.03	2904.48	2.30	26.69	9.61	100.00	270	7000.00	96.09	-0.70	0.38	35.85
South Africa	281	1000.00	0.10	231.45	5.23	68.33	20.64	100.00	256	911.11	91.10	-8.08	0.61	-10.28
New Zealand	276	158.33	0.12	25.88	8.91	61.23	10.14	325.80	263	145.83	95.29	-4.84	0.86	-46.36
Norway	246	611.11	0.08	179.08	9.03	80.08	30.89	75.78	210	477.78	85.37	-18.75	1.69	12.82
Finland	243	1380.00	0.08	753.20	11.73	79.01	26.75	100.00	211	1160.00	86.83	-14.86	1.39	-17.97
Belgium	204	1100.00	0.04	539.10	10.70	71.08	30.39	0.00	175	1425.00	85.78	27.08	1.49	12.77
Portugal	200	7600.00	0.07	2111.49	2.33	36.50	18.50	100.00	181	6700.00	90.50	-11.69	0.34	-78.16
Denmark	193	1400.00	0.05	542.32	12.67	80.83	29.02	100.00	163	1125.00	84.46	-18.33	1.78	557.19
France	193	61.54	0.01	1.88	4.50	55.96	24.35	426.19	169	19.23	87.56	-26.19	0.66	892.03
Italy	187	983.33	0.01	444.31	7.40	62.03	31.02	100.00	156	833.33	83.42	-13.85	1.01	-76.02
China	184	1575.00	0.00	276.78	6.90	63.59	45.65	61.19	142	1766.67	77.17	11.44	0.88	1295.53
Israel	176	350.00	0.05	202.80	19.05	83.52	15.34	100.00	162	400.00	92.05	11.11	1.94	-19.68
Switzerland	169	1700.00	0.03	799.18	14.37	84.62	47.93	-48.61	120	1533.33	71.01	-9.26	2.14	168.81
Chile	149	5400.00	0.10	1362.79	6.86	63.76	37.58	100.00	126	4300.00	84.56	-20.00	0.96	67.49
Austria	129	1800.00	0.04	837.70	15.90	71.32	55.81	78.95	86	1750.00	66.67	-2.63	2.30	-56.51
India	124	950.00	0.01	137.38	3.58	44.35	20.16	-42.86	106	900.00	85.48	-4.76	0.56	-62.55
Hong Kong	123	675.00	0.04	312.19	9.98	82.11	47.97	-9.68	94	666.67	76.42	-1.08	1.13	-17.98
Singapore	117	533.33	0.04	176.07	12.74	81.20	51.28	73.68	85	550.00	72.65	2.63	3.07	64.59

Table 3: Excellence10, %Excellence10, Excellence as RG, %Excellence as RG, Excellence1, %Excellence1, and %Q1, of the twenty-seven most productive countries, and the rates of variation of the triennium 2016-2018 compared with the triennium 2003-2005.

Country	Excellence10	% RC	% Excellence10	% RC	Excellence10 RG	% RC	% Excellence10 RG	% RC	Excellence1	% RC	% Excellence1	% RC	%Q1	% RC
United States	656	175.81	13.97	3.08	596	153.33	12.69	-5.32	78	171.43	1.66	1.44	50.35	75.45
United Kingdom	249	242.11	15.58	-11.52	211	200.00	13.20	-22.41	20	100.00	1.25	100.00	56.70	71.51
Spain	59	850.00	4.58	-66.78	38	500.00	2.95	-79.02	6	100.00	0.47	100.00	25.33	379.02
Australia	79	300.00	9.19	-45.76	58	850.00	6.74	28.81	7	100.00	0.81	100.00	44.30	54.58
Germany	92	1650.00	18.51	144.62	68	1150.00	13.68	74.73	12	100.00	2.41	100.00	56.34	61.53
Canada	65	300.00	16.58	23.40	52	433.33	13.27	64.54	13	0.00	3.32	-69.15	51.02	62.67
Netherlands	103	366.67	27.39	-22.94	81	266.67	21.54	-39.45	13	300.00	3.46	-33.95	64.36	103.67
Sweden	67	100.00	18.41	-61.22	51	225.00	14.01	-36.99	7	-100.00	1.92	-100.00	56.87	63.41
Brazil	12	200.00	3.45	-83.06	6	0.00	1.72	-94.35	2	100.00	0.57	100.00	15.23	-9.68
Russian Federation	10	100.00	3.56	100.00	6	100.00	2.14	100.00	2	100.00	0.71	100.00	17.08	100.00
South Africa	9	100.00	3.20	100.00	6	100.00	2.14	100.00	0	100.00	0.00	100.00	23.13	127.27
New Zealand	14	-66.67	5.07	-87.10	11	-66.67	3.99	-87.10	2	100.00	0.72	100.00	23.91	16.13
Norway	50	750.00	20.33	19.53	39	500.00	15.85	-15.62	4	100.00	1.63	100.00	60.98	125.00
Finland	37	1300.00	15.23	-5.41	27	1000.00	11.11	-25.68	3	100.00	1.23	100.00	44.44	-42.57
Belgium	37	1200.00	18.14	8.33	25	800.00	12.25	-25.00	3	100.00	1.47	100.00	58.33	79.17
Portugal	5	100.00	2.50	100.00	2	100.00	1.00	100.00	0	100.00	0.00	100.00	15.50	100.00
Denmark	38	100.00	19.69	100.00	24	100.00	12.44	100.00	6	100.00	3.11	100.00	66.32	43.33
France	12	100.00	6.22	100.00	7	100.00	3.63	100.00	0	100.00	0.00	100.00	25.39	48.57
Italy	24	250.00	12.83	-67.69	14	50.00	7.49	-86.15	0	100.00	0.00	100.00	40.11	-32.31
China	13	100.00	7.07	100.00	6	100.00	3.26	100.00	2	100.00	1.09	100.00	44.02	97.01
Israel	35	450.00	19.89	22.22	29	450.00	16.48	22.22	3	100.00	1.70	100.00	71.59	22.22
Switzerland	45	100.00	26.63	100.00	26	100.00	15.38	100.00	4	100.00	2.37	100.00	62.13	27.78
Chile	16	100.00	10.74	100.00	9	100.00	6.04	100.00	2	100.00	1.34	100.00	30.20	100.00
Austria	28	900.00	21.71	-47.37	17	500.00	13.18	-68.42	4	100.00	3.10	100.00	58.91	-10.53
India	6	0.00	4.84	-90.48	4	0.00	3.23	-90.48	0	100.00	0.00	100.00	25.81	-61.90
Hong Kong	13	300.00	10.57	-48.39	10	100.00	8.13	100.00	1	100.00	0.81	100.00	70.73	-22.58
Singapore	33	1200.00	28.21	105.26	21	100.00	17.95	100.00	6	100.00	5.13	100.00	60.68	57.89

On the opposite side of the ranking are Singapore, Hong Kong, and India. Nonetheless, for the rate of variation registered between the two three-year periods analysed, precisely India and Hong Kong (together with Italy) are the countries that experienced the most marked increases.

By considering %Ndoc, one can see the effort that each country dedicates to research in Journalism. The JSET accounts for 0.04% of world scientific production, although there are countries like New Zealand with a percentage three times higher, followed by countries such as Spain, South Africa, and Chile with 0.10%. On the opposite side, one has China with 0.003%, and France, Italy, and India with 0.01%.

If focus is put on indicators of quality, such as cites per document and international collaboration, an important shift in leadership can be observed in favour of countries such as Israel, the Netherlands, Canada, Austria, and Switzerland in the first case, and Austria, Singapore, Hong Kong, Switzerland, and China in the second.

With the lowest levels of the entire group in terms of cites are countries that occupy discrete positions in the classification such as Russia, Portugal, Brazil, or India, as well as Spain. This shows how a significant volume of production does not always entail a greater impact of this research. One can observe how Spain falls from third place in production to twenty-third. Neither does it improve substantially in international collaboration, where it even registers a fall of more than 53% (the largest drop in the group together with India and Switzerland) between the two triennia of the comparative analysis (2003-2005/2016-2018).

During the period of analysis, Austria, Singapore, Hong Kong, Switzerland, and China registered the highest data in terms of the percentage rate of international collaboration, although France, New Zealand, the United States, and the United Kingdom showed a more marked rate of variation.

The situation of Spain's weakness can be observed more intensively in Table 2 in which the indicators related to leadership and excellence are analysed. Compared with the United States and the United Kingdom, who manage to retain the top positions in Excellence10, Spain falls from third place to eighth, behind the Netherlands (3), Germany (4), Australia (5), Sweden (6), and Canada (7). At the opposite extreme, with the worst data in Excellence10, are Portugal, India, and South Africa – a general radiography that consolidates the Excellence as RG.

Likewise, the indicator that reflects the production with the greatest impact, with the highest level of excellence (Excellence1 with papers that are in the top 1% of the same type, year, and category) confirms the situation of the United States, the United Kingdom, and the Netherlands at the top of the ranking, although Canada is in fourth place instead of Germany which drops one position and just slightly displaces Australia.

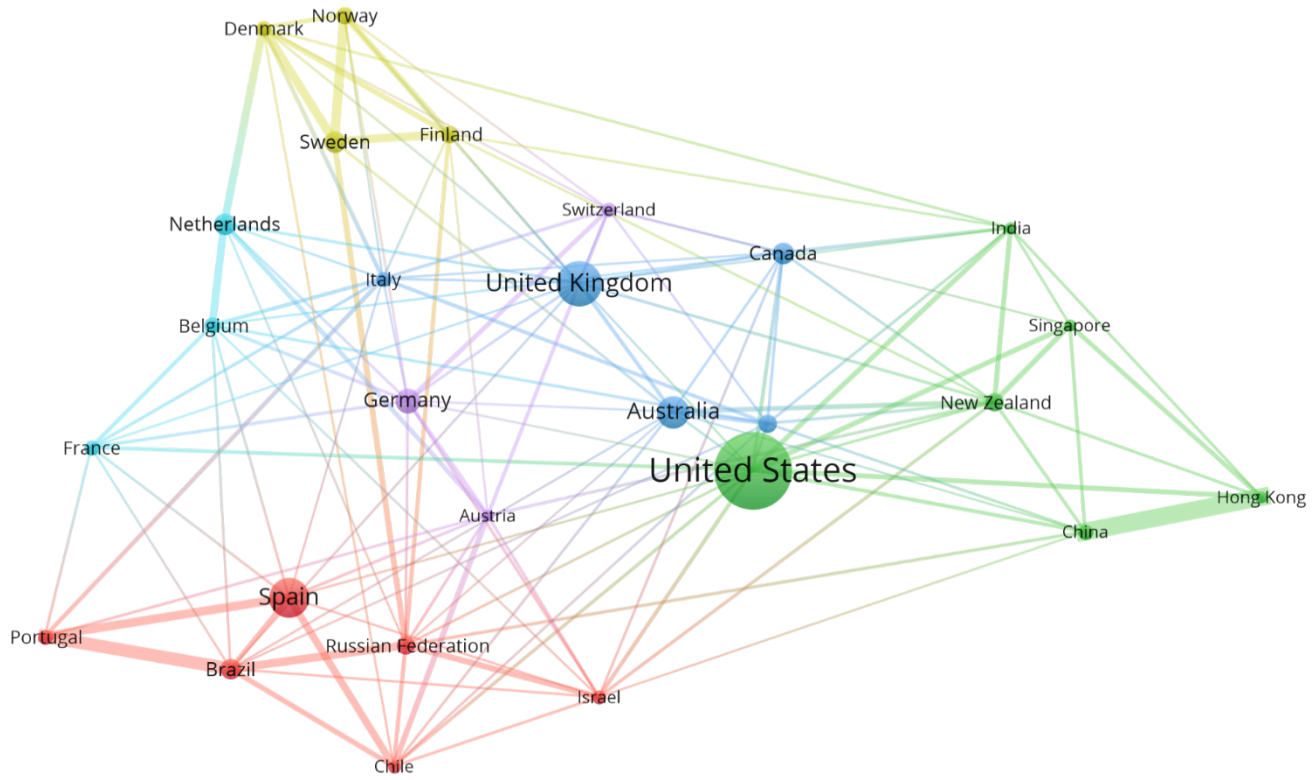

Figure 3: Web of scientific collaboration among the twenty-seven countries. Made with Vosviewer. The colours correspond to the clusters (the North American – green, the Luso-Hispanic – red, and the British – blue, the Nordic – yellow, the Central European – sky-blue, and the Germanic – purple).

The web of collaboration among the twenty-seven countries that monopolize the scientific production on Journalism worldwide (Figure 3) is the most meaningful and broadest scope graph in terms of interpretation and inference regarding geopolitical alliances and shared interests in the media sector from the perspective of journalistic research.[1]

At a first level of analysis, a map of relationships can be observed that is led by three large clusters (the North American – green, the Luso-Hispanic – red, and the British – blue) as intense foci of scientific collaboration from which three other well-defined clusters emerge (the Nordic – yellow, the Central European – sky-blue, and the Germanic – purple).

Looking at production and leadership, one can make a second reading of the graph in which the United States is positioned against five clusters linked to Europe,

[1] VOSviewer (Van-Eck; Waltman, 2010; Waltman; Van-Eck; Noyons, 2010) was used for the network's configuration. The map and clustering (marked with colours) were designed using as link weight the quotient of the ratio of the corresponding documents and the probability calculated from each country's Ndoc: the ratio between the actual collaboration and the probable collaboration given the sizes. This weight has also been used for the thickness of the links. The size of the nodes is proportional to the Ndoc. Left as parameters in the layout are 2 in attraction and 1 in repulsion, and in clustering 0.80 in repulsion, 3 in Min. cluster size, and Merge small clusters has been left ticked. The map shows the links with weight greater than 0.5 because there were very few links that represent levels of collaboration higher than would be expected by chance.

which, in turn, connect with Latin America, Russia, and Israel. This would be the United States as against all the others.

Thirdly, bearing in mind the tradition of research into Journalism research, with the North American and British schools being leaders at an academic and professional level in the history of the journalist profession itself, a structure of relationships can be identified in terms of production, centrality, and leadership marked by the United States and the United Kingdom compared with the four European clusters. It is thus significant that, despite Brexit, British research occupies such a prominent place in comparison with the structure of the most collaborative clusters in the current EU (with Spain as the main focus of the Luso-Hispanic group). This would be the United States and the United Kingdom as against all the others.

Unlike the map of relationships in Communication, where the United States has a very focused position, in this case it shares a leading role with the United Kingdom and Spain to such an extent that the British have greater links than could be expected with countries neighbouring the United States such as Canada, and it is Russia which most marks the relationships with Israel. Another remarkable comparative singularity is the position of the United Kingdom: as the second world scientific producer in Communication, here it also occupies a strategic place of relationships but in the cluster that conforms with Commonwealth countries. Australia is maintained, but not New Zealand, which has a more intense relationship with countries in the orbit of the United States.

It is striking that the Central European cluster does not have direct strong relationships with the United Kingdom cluster (the connection occurs through Italy and Germany), and that, at the same time, there is a strong connection of France with the United States cluster.

The cluster led by Spain has strongly marked peculiarities: Spain reflects an investigative power in Journalism similar to the United Kingdom, and is the country that leads production with Latin America in which Brazil and Chile are the main foci. Portugal occupies a prominent place, which corresponds to the historical context of the two countries, and it also strengthens the connection with Brazil, reflecting the shared past of these two countries. Russia and Israel enter this cluster because of the strong link they have with each other and with Brazil.

The cases of Russia and Israel also have a singular reading – the connection between them as a reflection of their own geostrategic and political connection during the Putin era, as well as Russia also being positioned as the main actor in relations towards Brazil and Chile.

Table 4: International collaboration links that are greater than was to be expected from size.

Country	Country	Ndoc	NI	Weight
China	Hong Kong	22	0.93	5.45

Brazil	Portugal	9	0.40	3.84
Sweden	Norway	21	3.22	2.70
Spain	Portugal	13	0.76	2.53
Sweden	Denmark	12	2.68	2.50
Brazil	Russian Federation	5	7.52	2.36
Sweden	Finland	13	1.00	2.35
Netherlands	Denmark	16	3.85	2.23
Netherlands	Belgium	24	2.93	2.16
Spain	Chile	22	2.14	2.09
Norway	Finland	10	1.77	1.82
Russian Federation	Israel	2	15.71	1.67
Sweden	Russian Federation	4	0.73	1.60
Chile	Austria	9	5.35	1.58
New Zealand	Singapore	2	0.28	1.48
Finland	Denmark	5	1.52	1.47
Brazil	Chile	7	5.99	1.46
United States	Singapore	30	2.58	1.42
United States	India	16	1.20	1.39
Spain	Brazil	17	2.24	1.38
New Zealand	India	1	0.56	1.36
United States	Hong Kong	27	1.45	1.35
Australia	New Zealand	5	1.22	1.33
Germany	Switzerland	28	3.00	1.28
Netherlands	Austria	15	1.52	1.27
Norway	Denmark	6	2.31	1.26
Hong Kong	Singapore	3	0.53	1.25
Portugal	Italy	3	0.65	1.17
Australia	South Africa	8	0.73	1.16
Russian Federation	Finland	2	0.15	1.13
Denmark	Italy	5	1.54	1.13
Russian Federation	Chile	2	15.71	1.11
Germany	Austria	21	3.01	1.11
United States	Israel	19	6.80	1.07
Belgium	France	4	0.28	1.05
Belgium	Italy	7	2.52	1.02
Canada	India	3	1.88	1.02
United States	China	36	1.91	1.01
United Kingdom	Australia	41	2.23	1.01
United States	Canada	45	4.73	1.00
United States	France	19	1.57	1.00

Table 3 presents the data of all the links whose weight is greater than unity, i.e., whose frequency is greater than what would be expected given their size. The data is arranged in descending order based on this weight. This weight is that shown in the previous figure by the thickness of the links. The most outstanding collaborations in this regard are those of neighbouring countries such as China and Hong Kong, Sweden

and Norway, Spain and Portugal, etc. There also stand out other cultural links such as those corresponding to Brazil and Portugal, Spain and Chile, etc.

Nonetheless, the links that stand out by weight are not those of the greatest volume. Those with the greatest volume usually correspond to the countries with the greatest production. Thus, the link with the greatest volume is the one corresponding to collaborations between the United States and Canada, the United Kingdom and Australia, the United States and China, etc.

Looking at the impact of the links, one observes that the majority (25 out of 41) have a greater impact than that of the participating countries. This is consistent with what has been observed in other work about international scientific collaboration. The impact of the Russian Federation's collaborations with Israel, Chile, or Brazil stands out, although the number is very small. The United States' collaborations with Canada and Israel stand out because of their impact and size.

4. Conclusions and Discussion

Scientific production in Journalism, with the analysis of the twenty-seven countries that have led the research in the last sixteen years, must be understood as a reflection of the dynamics that are being observed in the media system itself at a global level. Globalization and digitization now mark professional strategies in an increasingly fluid environment (Bauman, 2003), and, from the academic perspective, the borders are becoming blurred (Trillo, 2021). These have traditionally marked the separation between the three main branches of Information Sciences (Journalism, Advertising and Public Relations, and Audiovisual Communication), while now there is an interdisciplinary approach to realities as complex as communicative phenomena (from Sociology and History to Political Economy, Ethics, Philosophy, and Law, passing through Linguistics or Semiotics) in which tensions typical of communication converge with those of a social, political, economic, cultural, and technological ilk.

From a structuralist perspective, the axis of current research about the media system, it is also increasingly necessary to understand that we are moving in an environment in which "everyone is related to everyone (or on the way to being so)" and "we are faced with a totalizing situation" that refers to a "mediatic spiderweb" (Reig, 2010; 2011) dominated by large conglomerates where journalism comes into play together with geopolitical factors and actors completely unrelated to the traditional media playing-board. "Communication-journalism", as Reig puts it, "is just one more economic and articulated activity, just another part of the primary power within a macrostructure called the market economy. In its essence, it is not even a second power (Ramonet, 2011), nor a counter-power, nor a fourth estate (Edmund Burke), but instead the basic tool with which socioeconomic power creates, consolidates, or attempts to create and consolidate minds and behaviour" (Reig, 2011: p. 55).

Such reflections are necessary because they provide the context, the framework for interpretation, of what the scientific production in Journalism has been during the

period analysed here (2003-2019). This comes to coincide with the development of the media in the era of the Internet and social networks in an interactive, hypertextual, and multimedia ecosystem (Orihuela, 2015) where the users' role becomes strategic as they evolve from being passive readers to demanding and participatory prosumers (Gillmor, 2004). Professional journalism then faces the challenge of regaining the trust and credit of its public, understanding that the borders delineating the traditional media's public, the purchaser, and the voter are becoming ever more blurred.

The final image projected by this first scientific radiography of journalism production worldwide is revealing in that it shows the historical situation of the discipline. These go from its youthfulness and scant consistency in the academic field to its dependence on the socio-political, geographic, and even linguistic environment, passing through the limited attention and consideration given to it in the context of Social Sciences and of Sciences in general. We are facing a situation moreover that does not differ from its own evolution in the professional field (where intrusionism continues to be one of the biggest problems), in which regulated higher education has forced it to go through a long and complicated process to be recognized as a university degree versus the old school of thought which understood Journalism to be a trade.

The aforementioned dynamics of digitization and globalization, which have marked the evolution of science over recent decades in parallel with economic and social changes, have only accentuated this starting situation. The global production evaluated in this study (from 2003 to 2019) increased by 418% (25% per annum on average – a rate much greater than that of world scientific production) and is included within the thriving field of Communication, a field that is increasingly conditioned by and focused on the technological development imposed by the Internet and social networks.

Proof of this is the starting point of this research: the two large scientific databases (Scopus and WoS) do not even include a specific category for "Journalism". This clearly contrasts with the projection of and growing interest in the discipline at a social level, its impact on public opinion, and the role of the profession of journalist as a barometer of democratic health in different countries. The interference of the big technological giants as new players in the media system (very prominently Google, Facebook, and Amazon) and the audiovisual evolution of the sector itself with the explosion of digital television platforms (with Netflix as a disruptive factor) represent an intensification of its hybrid and cross-cutting nature. A consequence is the difficulty in settling on a frame to contain the discipline. That a large part of the Journalism JSET (58.45%, with an increase from 36.6% to 66.8%) corresponds to papers from the Communication area is further objective evidence for these observations.

The map of relationships between countries brings to light the dynamics of scientific collaboration in the field of Journalism, firstly by identifying which are the countries that lead research globally, and secondly by allowing one to detect the most intense collaboration clusters. Three countries really capitalize the research: the United States, the United Kingdom, and Spain. They generate more than half of the total production at the same time as being the ones that determine the entire structure of

relationships. Spain, unlike the United States and the United Kingdom, reaches a lower level of scientific impact. This combination of high production and low impact may be due to the success of including Spanish-language journals in the database, but at the same time the failure to overcome the language barrier that limits the impact of non-English-language papers.

Research in Journalism reflects the weight of the communities of interests that are structured around the linguistic, sociocultural (linked to professional and working practices), and geopolitical factors. (As can be seen in the analysis of the results, the trajectory of relationships between countries clearly influences the constitution of the different clusters.)

From this perspective, a final critical reflection can be made – that this is a scientific domain with an incipient conceptual development that has still to reach the maturity of other fields of knowledge. It is therefore still unable to create transversal knowledge capable of overcoming the aforementioned exogenous conditioning factors, which have to be added to the limitations and weaknesses of the discipline.

Also revealing is the particular position that the United Kingdom occupies with its privileged connection with Europe and the United States, its major investment in science, robust system of scientific publication, and power to attract research talent. Before the official declaration of Brexit, the map of international scientific collaboration (in this case in Journalism) already confirmed the nation's position closer to the United States, Australia, and Canada than to other European countries. And this in face of a Europe that is presenting itself as a counterweight to Anglo-American scientific production in Journalism, but with a historical weakness – there is no European cluster as such (the construction of the EU in the context of science and research stands out as another pending challenge).

5. References

Archambault É, Campbell D, Gingras Y, et al. (2009) Comparing bibliometric statistics obtained from the Web of Science and Scopus. Journal of the American Society for Information Science and Technology 60(7): 1320-1326. https://doi.org/10.1002/asi.21062

Bauman Z (2003) Modernidad líquida. Buenos Aires: Fondo de Cultura Económica de Argentina.

Blake K and Bodle JV and Adams EE (2004) A fifteen-year census of gender and journal productivity. Journalism & Mass Communication Educator 59(2): 156-170.

Bodle JT, Burriss L, Farwell T, et al. (2011) Gender and journal scholarship in mass communication: How well are women doing? A twenty-year content analysis. Journalism & Mass Communication Educator 66(2): 117-133.

Bornmann L and Moya-Anegón F and Leydesdorff L (2012) The new excellence indicator in the World Report of the SCImago Institutions Rankings 2011. Journal of Informetrics 6(2): 333–335. http://dx.doi.org/10.1016/j.joi.2011.11.006

Bromley M and Tumber H and Zelizer B (2001) Journalism education. Journalism 2(3): 251-254.

Casino G (2018) Press citation: The impact of scientific journals and research articles on news media. El profesional de la información 27(3): 692-697.

Corera-Álvarez E and Moya-Anegón F (2009) Chemistry in Spain: bibliometric analysis through Scopus. Chemistry Today 27(6): 61-64.

De Beer AS and Merrill JC (2004) Global Journalism: Survey of International Communication. New York: Longman.

Deuze M (2005) What is journalism? Professional identity and ideology of journalists reconsidered. Journalism 6(4): 442-464.

Deuze M, and Witschge T (2018) Beyond journalism: Theorizing the transformation of journalism. Journalism 19(22): 165-181.

Gillmor D (2004) We the media. Grassroots journalism by the people, for the people. Sebastopol: O'Reilly Media

Gorraiz J and Gumpenberger C and Wieland M (2011) Galton 2011 revisited: a bibliometric journey in the footprints of a universal genius. Scientometrics 88(2): 627-652. https://doi.org/10.1007/s11192-011-0393-y

Guerrero-Bote VP and Moya-Anegón F (2015) Analysis of scientific production in food science from 2003 to 2013. Journal of food science 80(12): R2619-R2626. http://doi.org/10.1111/1750-3841.13108

Hane PJ (2004) Elsevier announces Scopus service. Information today. http://newsbreaks.infotoday.com/nbreader.asp?ArticleID=16494

Jacsó P (2011) The h-index, h-core citation rate and the bibliometric profile of the Scopus database. Online Information Review 35(3): 492-501. https://doi.org/10.1108/14684521111151487

Lehmkuhl M and Promies N (2020) Frequency distribution of journalistic attention for scientific studies and scientific sources: An input–output analysis. PLoS ONE 15(11). https://doi.org/10.1371/journal.pone.0241376

Leydesdorff L and Moya-Anegón F and Guerrero-Bote, VP (2010) Journal maps on the basis of Scopus data: A comparison with the Journal Citation Reports of the ISI. Journal of the American Society for Information Science and Technology 61(2): 352–369. https://doi.org/10.1002/asi.21250

Moed HF (2017) Applied evaluative informetrics. Berlin: Springer International Publishing.

Moed HF (2020). Appropriate Use of Metrics in Research Assessment of Autonomous Academic Institutions. Scholarly Assessment Reports 2(1). http://doi.org/10.29024/sar.8

Moreno-Delgado A and Gorraiz J and Repiso R (2021). Assessing the publication output on country level in the research field communication using Garfield's Impact Factor. Scientometrics 126(5). https://doi.org/10.1007/s11192-021-04006-w

Moya-Anegón F, Chinchilla-Rodríguez Z, Vargas-Quesada B et al. (2007) Coverage analysis of Scopus: A journal metric approach. Scientometrics 73(1): 53-78. https://doi.org/10.1007/s11192-007-1681-4

Moya-Anegón F (2021) Producción e impacto científico en el mundo. SCImago Lab 21. https://www.scimagolab.com/blog/2021/produccion-e-impacto-cientifico-en-el-mundo/

Moya-Anegón F, Guerrero-Bote VP, Bornmann L et al. (2013) The research guarantors of scientific papers and the output counting: A promising new approach. Scientometrics 97: 421–434. https://doi.org/10.1007/s11192-013-1046-0

Orihuela JL (2015) Los medios después de internet. Barcelona: Editorial UOC.

Pickering B (2004) Elsevier prepares Scopus to rival ISI Web of science. Information world review 200. http://140.234.252.185/c/articles/12723322/elsevier-prepares-scopus-rival-isi-web-science

Ramonet I (2011) La explosión del periodismo: de la comunicación de masas a la masa de medios. Madrid: Clave Intelectual.

Rehn C and Kronman U (2008) Bibliometric handbook for Karolinska Institutet. Karolinska Institutet University Library. Version 1.05. http://dx.doi.org/10.13140/RG.2.1.1480.9447

Reig R (2010) La telaraña mediática. Cómo conocerla, cómo comprenderla. Salamanca: Comunicación Social Ediciones y Publicaciones.

Reig R (2011) Los dueños del periodismo. Claves de la estructura mediática mundial y de España. Barcelona: Gedisa.

Romo-Fernández LM, López-Pujalte C, Guerrero-Bote VP et al. (2011) Analysis of Europe's scientific production on renewable energies. Renewable Energy 36(9): 2529-2537. https://doi.org/10.1016/j.renene.2011.02.001

SCImago (2021a) SJ&CR—SCImago Journal & Country Rank. http://www.scimagojr.com

SCImago (2021b) SIR—SCImago Institutions Rankings. http://www.scimagoir.com

Segado-Boj F (2020) Research on social media and journalism (2003-2017): a bibliometric and content review. Transinformação 32: e180096.

Trabadela-Robles J, Nuño-Moral MV, Guerrero-Bote VP et al. (2020) Analysis of national scientific domains in the communication field (Scopus, 2003–2018). El Profesional de la Información 29(4). https://doi.org/10.3145/epi.2020.jul.18.

Trillo M (2021) The Digital Realm Blurs the Lines Between Journalistic and Corporate Communication: The Rubik's Cube as a Metaphor for New Global Strategies. In: Olvera-Lobo, MD (coord.) Innovative Perspectives on Corporate Communication in the Global World. Hershey, PA: IGI Global.

Van-Eck NJ and Waltman L (2010) Software survey: VOSviewer, a computer program for bibliometric mapping. Scientometrics 84(2): 523-538. https://doi.org/10.1007/s11192-009-0146-3

Waltman L and Van-Eck NJ and Noyons, ECM (2010) A unified approach to mapping and clustering of bibliometric networks. Journal of Informetrics 4(4): 629-35. https://doi.org/10.1016/j.joi.2010.07.002

Xu Z and Lan X (2020) A Scientometric Review of Automated Journalism: Analysis and Visualization. Journal of Physics: Conference Series 1684(1): 012127.

Zelizer B (2004). Taking journalism seriously: News and the academy. California: Sage Publications.