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STI 2022 Conference Proceedings

Proceedings of the 26th International Conference on Science and Technology Indicators

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Citation: Doğan, G., Taşkın, Z., Kulczycki, E., & Pölönen, J. (2022). What makes top 20 JIF journals "top"?: Exploring characteristics of journals indexed in the Journal Citation Reports. In N. Robinson-Garcia, D. Torres-Salinas, & W. Arroyo-Machado (Eds.), *26th International Conference on Science and Technology Indicators*, STI 2022 (sti2242). https://doi.org/10.5281/zenodo.6906891

Collection: https://zenodo.org/communities/sti2022grx/

What makes top 20 JIF journals "top"?: Exploring characteristics of journals indexed in the Journal Citation Reports

Güleda Doğan[*], Zehra Taşkın[*], Emanuel Kulczycki[**] and Janne Pölönen[***]

[*] *gduzyol@hacettepe.edu.tr; ztaskin@hacettepe.edu.tr*
Department of Information Management, Hacettepe University, Ankara, Turkey

[**] *ztaskin@hacettepe.edu.tr; emek@amu.edu.pl*
Scholarly Communication Research Group, Adam Mickiewicz University, Poznań, Poland

[***] *janne.polonen@tsv.fi*
Publication Forum, The Federation of Finish Learned Societies, Helsinki, Finland

Introduction

Despite many studies revealing the drawbacks of journal-based or metric-based research evaluations, the scientific value of journals is still often determined by bibliometric indicators calculated by the formula based on the number of publications and citations in the last two years. It is well-known in the research assessment community that the Journal Impact Factor (JIF)—the most commonly used indicator—has important problems such as documents types and very short citation window (Chawla, 2018). Also, it does not consider disciplinary differences and skewness of citation distribution ('Read the Declaration', n.d.). When considering the skewed nature of citations, calculation methods, and disciplinary differences, JIF can easily be manipulated (Hickman et al., 2019; Taskin et al., 2021). Moreover, the average JIF has increased over the years in parallel with the value given to it and created a JIF inflation in science (Chawla, 2018). However, the high JIFs remain the main marketing tool for journals (e.g. CA: A Cancer Journal for Clinicians [@CAonline], 2021). Being the "top" journal in terms of JIFs is of great importance for the prestige of journals and their publishers.

The main aim of this on-going research is to reveal the factors that make the journals "top" according to the rankings based on JIFs. By "top" we mean the twenty highest ranked journals based on JIF (hereafter top 20 journals). This study and its future follow-up are conducted from the broad and narrow perspectives that are presented in Figure 1. The first step is an analysis of all journals indexed in Journal Citation Reports (JCR) in 2020 to determine the location and characteristics of the top 20 journals regarding subject categories, publishers, number of citations, cited and citing half-lives, number of citable items, and the share of articles in citable items. We call the approach in the first step as a broader perspective. In the second step, we narrow down the focus to the top and investigate in-depth top 20 journals in JCR 2020 (in terms of their JIF value), considering the change of ranks and subject categories in 1997–2020 JCR lists, publishers and publisher changes, types of journals (review journals and others), document types (review papers, research articles, and others), citation skewness and number of articles that provide impact factor advantage, number of authors and international collaborations, affiliations, whether funded or not, and funding agencies if funded.

Figure 1: Two different perspectives

In this paper, we present the results of the broader analysis which is the first step of the study. The study for the second step (narrower aspect) is on-going and will be subject of other paper. The main research question of this paper is "Are the top journals stand out among others in terms of all variables?" and we will adress the following questions to find an answer for the main question:

- Are they published in specific subject categories by oligopoly publishers?
- Are the number of citable items, total citations and share of articles in citable items for these journals higher?
- Do they have shorter cited and citing half-lives?

Method

To achieve the aim of the study, we created a dataset, which covers metadata of 12,323 journals that are listed in JCR 2020. Since the new interface of Journal Citation Reports only allows downloading data for the first 600 journals, the old version was used to access and download the metadata for all journals in JCR 2020. To answer research questions, subject categories and publisher information were added to the dataset. OECD's six major fields (Clarivate Analytics, 2012) were used to classify journals regarding their subjects. If the journals belong to two or more different subject categories, the journals were considered multidisciplinary. To classify journals in terms of their publishers, we used Master Journals List of Web of Science (Web of Science Group, 2022). We consider Elsevier, Wiley-Blackwell, American Chemical Society (ACS), Springer Nature, Taylor & Francis and Sage as the big six "oligopoly publishers", as suggested by Larivière et al. (2015).

The data were analysed using JASP (https://jasp-stats.org/), which is an open-source statistical software. We used central tendency, quantiles and dispersion measures and boxplots to analyse the data.

Findings

Subject categories and publishers

One out of every four journals in JCR are Medical journals, and one is a Natural Sciences journal (see Table 1). Although the Humanities and Agricultural Sciences have the lowest number of journals in JCR, it should be noted that nearly one out of every five journals are from Social Sciences. This is an expected result since there is not a separate index for Humanities in JCR whereas one of the JCR indexes is for Social Sciences journals. There are 15 journals from Medical and Natural Sciences in top 20, but no journals from Humanities, Agricultural Sciences, and Social Sciences. While on average 37% of journals in JCR are published by the oligopoly publishers, these only publish about 19% of the Humanities journals.

Table 1. Distribution of all JCR journals and the top 20 by subject category

Subject category	N of all	% in all	N of top 20	% of journals by oligopoly publishers
Medical Sciences	3,128	25.4	9	33.4
Natural Sciences	3,062	24.9	6	36.1
Multidisciplinary	2,284	18.5	2	42.4
Social Sciences	2,187	17.7	0	40.1
Engineering & Technology	1,074	8.7	3	38.3
Agricultural Sciences	357	2.9	0	32.2
Humanities	231	1.9	0	18.6
Total	12,323	100.0	20	37.1

Table 2. Distribution of all JCR journals and the top 20 by oligopoly publishers

Publisher	N of all	% of all	N of top 20	% of top subject categories
Springer Nature	1,316	10.7	11	35 (Natural sciences) 21 (Medical sciences)
Wiley-Blackwell	1,177	9.6	1	27 (Medical sciences) 24 (Social Sciences)
Taylor & Francis	683	5.5	0	27 (Natural Sciences) 24 (Multidisciplinary)
Elsevier	681	5.5	0	29 (Natural Sciences) 26 (Multidisciplinary)
Sage	649	5.3	0	50 (Social Sciences) 25 (Medical Sciences)
ACS	61	0.5	1	41 (Multidisciplinary) 41 (Natural Sciences)
Total	4,567	37.1	20	25 (Medical Sciences) 25 (Natural Sciences)

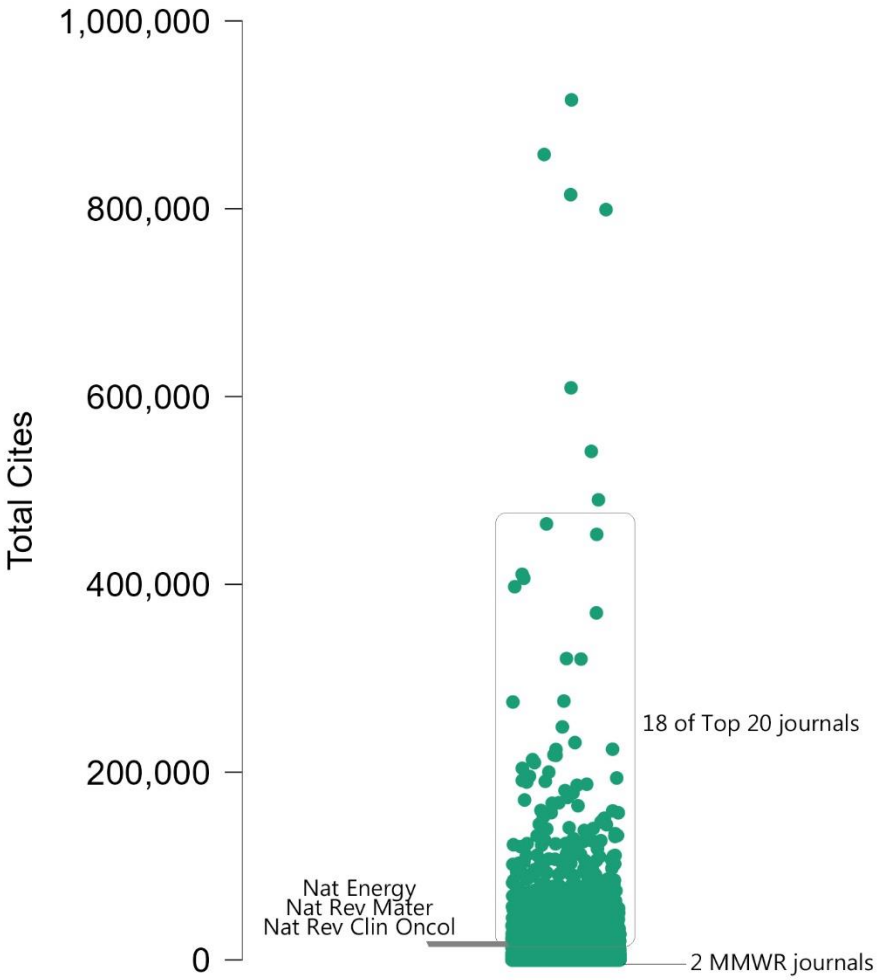
Table 2 presents the distribution of JCR journals by oligopoly publishers. Springer Nature has 11 out of top 20 journals and shares the title of having the highest number of journals in JCR with Wiley, which has one journal in top 20. Although, more than half of the (56%) Springer journals in JCR belong to the either Natural Sciences or Medical Sciences categories, Wiley has almost as many Social Sciences journals (24%) as Medical Sciences (27%) in JCR. The Wiley journal in top 20 (*CA-A Cancer Journal for Clinicians*) is from Medical Sciences category, and frequently publishes reviews and articles present general cancer statistics. Publisher of only 0.5% of journals in JCR, ACS is the publisher of one journal in top 20 (*Chemical Reviews*), which is a Natural Sciences review journal. Note those oligopoly publishers that do not have a top 20 journal (Taylor & Francis, Elsevier, and Sage) appear to have a density Social Sciences or Multidisciplinary journals besides Medical or Natural Sciences.

Citable items and citations

Total citations of 12,323 journals range from 1 to 915,939 (median 2,237) while it is between 3,288 and 464,376 (median 56,983) for top 20 journals as shown in Figure 2. The citations for the middle half changes between 902 and 6124. All top 20 journals except two (*MMWR Surveillance Summaries* and *MMWR Recommendations and Reports*) are located in highest 10% in terms of the total citations (17,973-464,376). It should be noted that these two journals

are reports, which are published by CDC (Centers for Disease Control and Prevention) since the beginning of 1980s, and they are indexed in JCR for the first time in 2020. 15 out of 20 top journals belong to the 5% of all journals that have citations above 29,006. In addition to the two MMWR journals, three Nature journals do not belong to the highest 5% group in terms of total citations (*Nature Reviews Clinical Oncology*, *Nature Energy* and *Nature Reviews Materials*, firstly indexed in JCR 2008, 2015 and 2016, respectively). It should also be noted that 7 out of 9 journals (except *CA-A Cancer Journal for Clinicians* and *Reviews of Modern Physics*) that are indexed in JCR from 1997 to 2020 without any interruption, are the highly-cited journals among top 20 (see Appendix 1).

Figure 2: Scatter of journals by total citations



The aforementioned 7 highly-cited journals also have the highest number of citable items (between 161 and 331) among top 20. The median for citable items in all JCR indexed journals is 81 (min. 0, max. 21,222) and more than half of the top 20 journals have citable items lower than the median. Two MMRW journals have 9 and 10 citable items, which locates them among the lowest 3% of all journals. *CA-A Cancer Journal for Clinicians* (33 citable items) and *Reviews of Modern Physics* (32 citable items) belong to the lowest 20% of journals in terms of the citable items. The half of the top 20 journals, all of which are Nature journals, have citable items between the interquartile range (41-173). It is worth mentioning that none of the top 20 journals are among the journals in the highest 10% in terms of citable items.

Figure 3: Scatter of journals by citable items

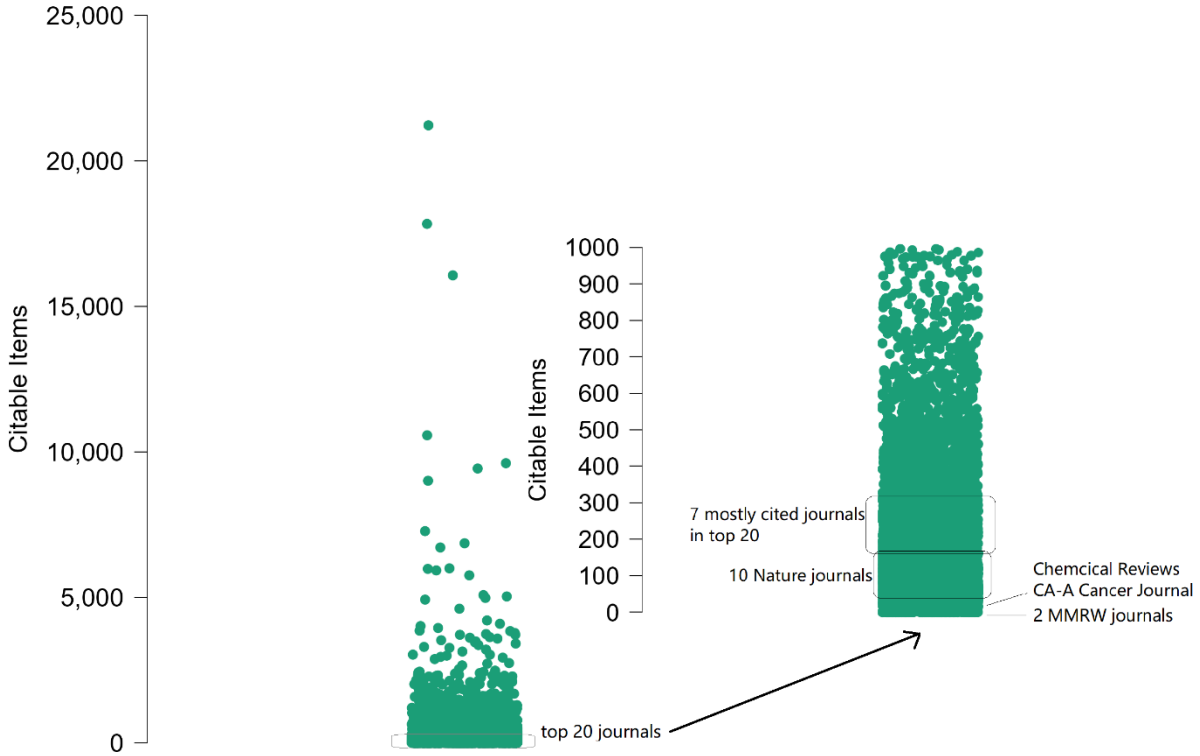
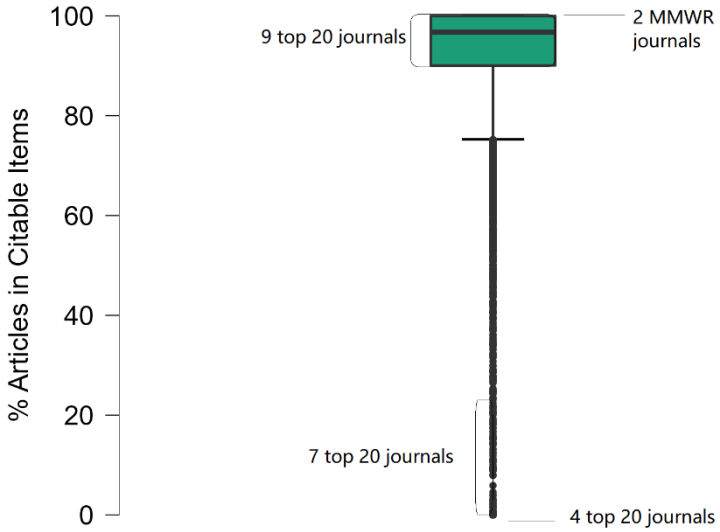


Figure 4: Boxplot for the share of articles in citable items



The share of articles in citable items is lower than 90% only for a quarter and lower than 78% for one-tenth of the journals. Note that it is not available for 140 journals, 271 journals have no article among the citable items and all citable items are articles for almost 30% of all journals (3,525). The situation for top 20 is quite different from the main picture. Although the nine journals in top 20 have between 74%-100% articles as citable items, it is lower than 24% for the other 11 journals where all eight Nature Reviews[1] journals and three other review journals

[1] Nature Reviews Immunology (24%), Nature Reviews Clinical Oncology (19%), Nature Reviews Drug Discovery (10%), Nature Reviews Cancer (4%), Nature Reviews Materials (1.5%), Nature Reviews Microbiology (1.5%), Nature Reviews Genetics (0.0%), Nature Reviews Molecular Cell Biology (0.0%)

(*Chemical Reviews* with 0.42% articles, *Chemical Society Reviews* and *Reviews of Modern Physics* with no articles) locate. Only for two MMRW journals, share of articles in citable items is 100%. As shown on boxplot in Figure 4, 11 top journals are outliers in terms of the share of articles in citable items.

Cited and citing half-lives

The distribution of the journals according to their cited and citing half-life was analysed on the basis of subject categories (see Figure 5 and Figure 6). The subject categories are more similar in terms of their cited half-life (Figure 5). However, they differ by citing half-life values. The Humanities journals have the widest range of citing half-life values (Figure 6). Multidisciplinary journals and Natural Sciences journals follow.

Figure 5: Cited half-life of journals by subject category

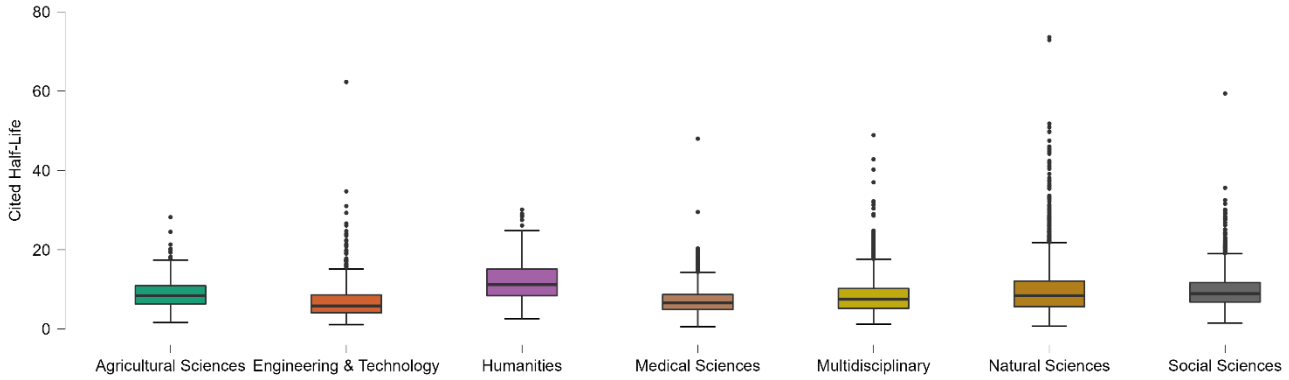
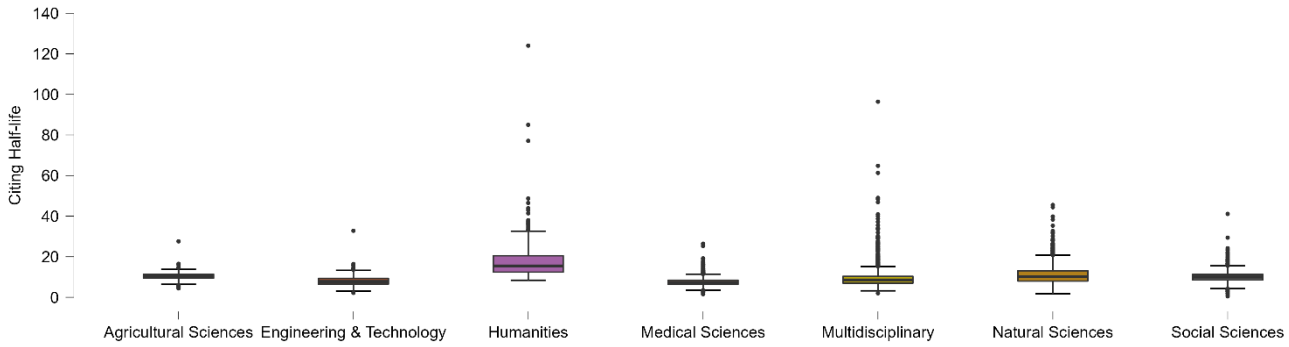


Figure 6: Citing half-life of journals by subject category



Although the cited half-life of Natural Sciences journals has a wide range (0.70-73.6), all six top 20 Natural Sciences journals have cited half-life values within the inter quartile range (5.6-12.1), where half of all JCR journals locate. Note that all of these six journals are review journals. The placement of top 20 Natural Sciences journals regarding the citing half-live values differ. Five of them have citing half-life between 5.3 and 7.6, among the journals in the lowest 20% group according to their citing half-life values. The cited and citing half-life distribution of Medical Sciences journals in top 20 are similar to Natural Sciences. Nine Medical Sciences journals in top 20 have cited half-life between 3.3 and 9.3, five of them locate in the middle half. Unlike this, all citing half-life values except one journal are in the lowest quarter (lower than 6.4).

Two out of three Engineering & Technology journals in top 20 are in the second 10% with the lowest cited half-life (cited half-life is 3.1 and 3.5). The other one has a cited half-life of 7.4

which is higher that the median value (6.9). Citing half-life values for Engineering & Technology journals are between 4.6 and 5.1 that makes them locate among the lowest 7% of all journals. Middle half of the Multidisciplinary journals have cited half-life values within the range of 5.2 and 10.2, and two Multidisciplinary journals in top 20 have their values in this range (7.4 and 7.7). However, these two journals are in the lowest 6% regarding their citing half life values that are 4.4 and 5.4.

Discussion

The aim of our research is to answer the question why top journals are "top". This paper presents the results of the first step of our research, in which we investigated whether or not the top journals stand out among 12,323 journals in the JCR 2020 list in terms of various factors such as publishers, citable items.

The results showed that top 20 journals stand out in terms of their subject categories and publishers. At this point, it would seem that the subject category is more decisive than the publisher. Considering the Springer Nature example, publishers that stand out in the top 20 have more publishing activities in the subject categories that have more top 20 journals. Although the top 20 journals are located in the highest 5% of all JCR journals in terms of the number of total citations, except five review journals their distribution by citable items differs greatly. Especially for the review journals, the number of citable items is at the lower end of the distribution. It should be noted that more than half of top 20 journals locate as outliers among all journals in terms of the share of articles in citable items. This is mainly due to high density of review journals in top 20.

The behaviour of journals regarding cited and citing half-life is different. They generally locate in the boundaries of middle half of all JCR journals in terms of cited half-life. However, they are in the first shortest quartile of citing half-life. Note that the five journals in top 20 from Engineering & Technology and Multidisciplinary subject categories have shortest citing half-life in comparison with the other JCR listed journals in these disciplines.

We aim to investigate top 20 journals more deeply in the on-going second step of this research project considering the previous JCR years, and to understand the reasons for the location of top 20 journals among all JCR journals. In this second step, JCR 2020 top 20 journals' change of ranks, subject categories, and publishers between 1997-2020, types of journals and documents, citation skewness and number of articles that provide impact factor advantage, number of authors and international collaborations, affiliations, and funding information will also be considered.

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