Uses of the Journal Impact Factor in national journal rankings in China and Europe

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Abstract: This paper investigates different uses of the Journal Impact Factor (JIF) in national journal rankings and discusses the merits of supplementing metrics with expert assessment. Our focus is national journal rankings used as evidence to support decisions about the distribution of institutional funding or career advancement. The seven countries under comparison are: China, Denmark, Finland, Italy, Norway, Poland, and Turkey—and the region of Flanders in Belgium. With the exception of Italy, top-tier journals used in national rankings include those classified at the highest level, or according to tier, or points implemented. A total of 3,565 (75.8%) out of 4,701 unique top-tier journals were identified as having a JIF, with 55.7% belonging to the first Journal Impact Factor quartile. Journal rankings in China, Flanders, Poland, and Turkey classify journals with a JIF as being top-tier, but only when they are in the first quartile of the Average Journal Impact Factor Percentile. Journal rankings that result from expert assessment in Denmark, Finland, and Norway regularly classify journals as top-tier outside the first quartile, particularly in the social sciences and humanities. We conclude that experts, when tasked with metric-informed journal rankings, take into account quality dimensions that are not covered by JIFs.

Keywords: Journal Impact Factor, top-tier journals, journal ranking, expert assessment, cross-country study

Introduction

Despite various calls to limit its use, the Journal Impact Factor (JIF) is still employed for the assessment of individual career milestones not only by scientists, editors and publishers but also by science policymakers in Europe and China (Else, 2019). This practice has resulted in a series of well-organized reactions from scientific communities. First came the San Francisco Declaration on Research Assessment (2012), which was initiated by the American Society for Cell Biology and now has almost 22,000 signees across the world. Then, published in *Nature* in April 2015 by experts in bibliometrics and research evaluation, came the Leiden Manifesto for research metrics, an annotated list of ten principles to guide research evaluation (Hicks et al., 2015). Criticisms within this manifesto, which mainly concern the use of the JIF for the evaluation of individual researchers and their publications, have subsequently been supported by large-scale empirical evidence (Zhang et al., 2017).

Use of the JIF for the evaluation of *journals* has not been contested in the same way; however, alternative indicators for the same purpose have been proposed (Waltman, 2016). Therefore, this paper aims to investigate different uses of JIFs in national journal rankings across all fields, and to discuss the merits of supplementing journal metrics with expert assessment in this context.. We know from our earlier studies concerning scholarly publishing practices across the social

sciences and humanities in Europe (e.g., Kulczycki et al., 2020; Petr et al., 2021) and China (Zhang et al., 2021) that these practices (which may include publishing in books both in English and in domestic languages) are only partly covered by journals indexed in Web of Science. Hence, there is a need for supplementing metrics with expert assessment in these areas. There might be a need in other fields too to avoid the automation of journal rankings and include expert judgement of how the journals in a field contribute to research of good quality.

To investigate the use of JIF in the context of expert judgement, we have produced a cross-country comparison of national top-tier journal lists. All lists are used as evidence to support decisions about distribution of institutional funding or career advancement in seven countries— China, Denmark, Finland, Italy, Norway, Poland, and Turkey— and the region of Flanders in Belgium. Five of the lists cover all areas of research from humanities to engineering. The Italian list covers only the social sciences and humanities, while the Flemish list only covers STEM (Science, Technology, Engineering, and Mathematics) fields. As we shall see, the countries can be separated in two groups with regard to the use of journal evaluation performed by experts.

Publications in top-tier journals, identified often according to their JIF percentile, are used in research assessment as well as to distribute institutional funding based on research performance. Some national journal rankings, however, define top-tier journals independent of JIFs, but provide JIF as information for expert panels. There is no universal or absolute definition of what constitutes a "top-tier" journal, given that this depends on the context and purpose of the journal evaluation. In this study we investigate perceptions of the different "top-tier" classifications used in the seven countries through the lens of the JIF.

National journal rankings are tools designed to improve the research performance of researchers, institutions, and countries. Incentives for researchers to publish in the best publication channels have a long history both in China, Europe, and the United States (Franzoni et al., 2015, Nosek et al. 2012). Procedures for academic career advancement (usually towards tenured jobs) and grant applications have pushed researchers and their institutions to publish and support publishing in top-tier scholarly channels. In STEM (Science, Technology, Engineering, and Mathematics) fields, top-tier journals are most often those that have the highest JIFs, but in the humanities and some fields of social sciences, top-tier journals are not always indexed in Web of Science (WoS), which is a necessary but not sufficient condition for having a JIF. Nonetheless, in each field, researchers generally know a few, or even several journals that are perceived by their peers as 'top-tier' in a given field. For instance, in various STEM fields the journals *Cell, Nature,* and *Science* are classified as top-tier with high JIFs. However, in the humanities, one can indicate without using a JIF, that the journal *Annales. Histoire, Sciences sociales* is top tier in history, or that the journal *Elenchos Rivista di Studi Sul Pensiero Antico* is also top tier in the history of ancient philosophy. In some countries, publishing in such journals is a key step for academic recognition even if it is not a formal prerequisite for tenure. For instance, in Italy, having published in a top-tier SSH (Social Sciences and Humanities) journal *de facto* allows scholars to apply for a permanent position at a university. Those lacking this prerequisite may still apply if they possess a significant, but usually much higher, number of articles published by less renowned journals. On the other hand, for some countries, which assess journal levels using JIF, the lack of JIF for arts and humanities journals brings along interesting decisions for these journals. In Turkey, whose academic promotion and incentive system is based on JIF or JIF-based metrics, all arts and humanities journals indexed in WoS are counted as from the third or fourth JIF quartile (Taşkin, 2020). It means, in the Turkish promotion system, an arts and humanities journal can never be considered as top-tier. However, WoS-indexed arts and humanities journals are considered the best journals in these fields.

When the national journal ranking is not dependent on JIF or other journal metrics, an alternative concept of top-tier has to be used. This issue has already been confronted in 2005 in Norway, where the task of experts has been to identify peer-reviewed publication channels (basic level 1), as well as to indicate in each field the internationally leading outlets (level 2) characterized by "more

stringent requirements related to the originality and quality of submitted manuscripts" (Norwegian Association of Higher Education Institutions, 2004). For example, in Finland, top-tier (level 2) has been characterized as "international journals in which researchers from various countries publish their best research findings" or "leading Finnish- or Swedish-language publication channels which have a wide coverage of high-quality research on Finnish society, culture, or history" (Pölönen et al., 2021). Italy's rules on journal classification (that only apply to SSH disciplines) define 'A-class' journals as "journals acknowledged as excellent at the international level because of their stringent review procedures [and] their prestige and impact among the scholars in the relevant field" (according to article 4b of the Attachment B of the Ministerial Decree on the procedures for evaluating candidates to the National Scientific Habilitation, http://attiministeriali.miur.it/media/281128/dm_120.pdf). To balance the classification across disciplines, as explained in the Supplementary Table 1, the share of world article production in the field is used in Norway, Denmark and Finland to determine what share of journals in each discipline can be rated as top-tier (Pölönen et al., 2020). As in the case of JIF quartiles, the definition of a top-tier journal is not absolute but relative to other journals in the field.

Journal evaluation is a much-debated subject, including its appropriateness for different assessment contexts and purposes, as well as the limits and potential biases of both citation-based and expert opinion-based journal rankings. Many national rankings (Norway, Denmark, Flanders, Finland) have been evaluated and the issue of expert vs metrics-based journal evaluation has been addressed (e.g. Sivertsen & Schneider, 2014; Aagaard et al., 2014; Pölönen et al., 2021). Potential biases of expert panels can be adjusted by combining expert judgment with information derived from bibliometric analyses. Some countries (e.g., Denmark, Finland, Norway, Poland) form or use existing expert panels based on candidates identified by scientific communities and institutions. In Norway, journal evaluation has been entrusted to pre-existing academic bodies for professional and administrative development, while in Finland new panels have been formed (Pölönen et al, 2020). Since 2017, Italy's expert panels have been selected from candidates who apply in response to a public call for applications.

Additional criticisms concern the possible inadvertent effects of journal rankings, when used in assessments, on national languages, academic publication patterns, interdisciplinarity, paradigmatic pluralism and even academic freedom (Rafols et al., 2012). Such risks are not intrinsic to journal classification and are negligible as long as academic freedom is guaranteed and political interference in scholarship is considered unacceptable. The national journal rankings (or national journal lists) have been introduced into three categories of policy instruments: (1) scholarly journal lists for use in performance-based research funding systems, (2) scholarly journal lists for use in monetary reward systems, and (3) scholarly journal lists for use in academic promotion procedures.

The first category of instruments has been used, as of now, for over two decades by governments and ministries in several European countries that have established performance-based research funding systems (PRFSs). Again, PRFSs generally distribute block grants from the government to research institutions based on bibliometric indicators. One of the key elements of a PRFS is the national list of scholarly publications channels. For instance, Poland started to publish a national list of journals, for its PRFS in 1999, Norway in 2005, Flanders in 2008 (STEM only, 2010 for SSH), Denmark in 2009, and Finland 2012. National journal lists enable PRFSs to take into account the full diversity of journals across all fields, which is crucial especially for the SSH, but might also introduce various side effects and abuses. For example, a ranking designed to be used for institutional funding at a macro-level would be applied inappropriately as proxy for the quality of papers associated with the recruitment, promotion and funding of individual researchers. While journal rankings have been successfully implemented in countries that use them annually in accordance with a fixed funding formula (e.g., Norway, Flanders, Denmark, Finland and Poland), some countries (e.g., Australia and France) where evaluation agencies have employed lists to inform the expert-based performance assessment of units have stopped using them (Pölönen et al., 2020).

The second category, that is monetary reward systems at a national level, are implemented in various countries, among others, in China (until 2020, Zhang and Sivertsen, 2020), Mexico, Turkey, or Ukraine (Nazarovets, 2020, Quan et al., 2017). The main idea of such systems is to indicate a set of journals and to introduce monetary incentives for publishing in such journals. Only publications in those top-tier journals provide rewards because the aim of introducing this type of system is to increase the productivity of researchers by offering economic rewards and to increase the number of publications in international databases serving as a bibliometric source for various university rankings. Therefore, top-tier journals within the framework of monetary reward systems are defined primarily as journals indexed in WoS or Scopus – a fact that might have important consequences on incentives across all fields of sciences, because of the varying coverage of these databases.

The third category, which involves using rankings at a national level for academic promotion procedures, can be found, for example, in Italy (Ferrara & Bonaccorsi, 2016), Poland (Kulczycki, 2019) or Spain (Marini, 2018). In the framework of Italy's National Scientific Habilitation, the journal lists are used to set minimum thresholds of scientific output. If applicants for a habilitation have not authored at least a minimum required number of articles published in some of the journals included in those lists, their applications for academic promotion and/or recruitment to a permanent position cannot be considered. Since 2019, in Poland, articles published in journals, included in the national journal ranking have been used as criteria for both the PhD and habilitation procedures.

One of the biggest challenges to arise from a national journal ranking is the design of one list that fits all fields. In such circumstances, journals from both STEM and SSH would be assessed according the same or similar rules. Different countries have approached this challenge in various ways (see Supplementary Table 1). For example, ECOOM (the Flemish Centre for Research & Development Monitoring) maintains a separate journal list for the SSH (Verleysen, Engels & Ghesquière, 2014; available at www.ecoom.be/vabb), Norway, Denmark [1] and Finland rely principally on the judgment of expert-panels, who are informed also by bibliometric indicators; while Poland uses multiple bibliometric sources. Italy, on the other hand, uses journal lists only for the evaluation of the SSH. It is worth noting that, in science policy, balancing a journal ranking, (i.e., adequate selection of evaluation methods for a given field of science) is not always a priority. Sometimes the rankings are meant to be strong incentives for the internationalization of scholarly publications, which is why there is such a strong emphasis on journals with JIF regardless of the field. Moreover, global challenges (e.g., as per the sustainable development goals) require interdisciplinary approaches more and more. This can, in turn, impact the complexity of the scholarly landscape. Thus, it is increasingly difficult to categorize various journals as being relevant/critical to STEM or to the SSH.

This study investigates different uses of the JIF in national journal rankings and discusses the merits of supplementing metrics with expert assessment. We describe the results of a cross-country study that underscores a serious and growing problem for the general scientific community—i.e., the dominance of the JIF in national evaluation and research incentive systems. These systems are generally designed to improve the research performance of academics, institutions, and countries by increasing the number of articles published in top-tier journals. Although various calls have been made to displace the dominance of the Impact Factor in research assessments, this single indicator is extensively used not only by researchers, editors and publishers, but also—as our study shows—by national science policymakers in Europe and China.

[1] The Danish Ministry of Higher Education and Science announced on 3 December 2021 that the ranking of journals will no longer be employed as of 2022.

National journal rankings

We analyzed eight national rankings of scholarly journals: the CAS (Chinese Academy of Sciences) Journal Ranking List (China), the BFI (the Bibliometric Research Indicator) List of Series (Denmark), the Publication Forum Journal list (Finland), the ECOOM-WoS Journal List (Flanders, Belgium), the Ratings of scientific and class A journals (Italy), the Norwegian Register for Scientific Journals, Series and Publishers (Norway), the Polish Journal Ranking (Poland), and the TÜBİTAK Incentive Program for International Scientific Publications (Turkey). There are several journal rankings in China, the CAS Journal Ranking List is however one of the most influential lists, especially in STEM fields.

Five journal rankings (Denmark, Finland, Flanders, Norway, Poland) are used in national performance-based research funding systems, two serve as monetary reward systems (Poland, Turkey), and two (Italy, Poland) are used in academic promotion procedures like tenure at the national level. The CAS Journal Ranking List is used both in monetary reward systems (before 2020) and promotion procedures in China but implemented mainly locally; it only includes journals indexed in WoS. The number of journals listed range from 10,465 in Turkey to 29,469 in Finland.

We have identified two main approaches of constructing national rankings of scholarly journals: 1) metrics-based and 2) metrics-informed expert assessment. The first approach is used in China, Flanders (Belgium) and Turkey where the lists are based on the data and indicators obtained solely from the WoS. The other approach is used in Denmark, Finland, Italy, Norway and Poland. Data and indicators from the WoS as well as other sources are used as information by the experts responsible for creating the final versions of the national lists. These other sources include Scopus, the European Reference Index for the Humanities Plus (ERIH PLUS), the Directory of Open Access Journals (DOAJ), and Sherpa/Romeo.

It should be noted that the JIF is used in all eight rankings as one of the metrics (either as the key indicator or additional information for experts). However, with the metrics-informed expert assessment approach, the JIF is only one of many data sources used to provide a picture of academic publishing in scholarly journals. The journals are evaluated not only via bibliometric indicators but also by experts who evaluate or weight them according to their quality, visibility, and national science policy goals. In preparation for analyzing the lists in Denmark, Finland, Norway, experts are informed with suggestions about the journals and their quality from the research community. To some extent this applies in Italy too, where journal editors and (only for foreign-based journals) even individual scholars can submit journals for evaluation and request their inclusion in the lists. Only the CAS Journal Ranking List in China and the ECOOM-WoS Journal List in Flanders are composed without specific attention for the characteristics of journals in the SSH. However, the CAS list has included journals indexed in SSCI since 2019, and in addition, in China there are several national journals rankings for the SSH that evaluate domestic journals as well as a few English-language ones published by Chinese institutions (Huang et al., 2021). In Flanders, the ECOOM-WoS journal list is complemented by the ECOOM -VABB list of journals, series and publishers specifically introduced to cater for the SSH (Engels & Guns, 2018). To some extent, the Italian list (Ratings of scientific and class A journal) is similar to this ECOOM-VABB list because it covers only SSH fields.

Journals are weighted differently in funding and monetary reward systems. Differences across the journals in the list are expressed in various ways: it might be by points (e.g., 20, 40, 70, 100, 140, 200 like in Poland), levels (Level 1, Level 2 like in Norway) or tiers (A, B, C, and D like in Turkey; A-class versus 'scientific' journals in Italy's *de facto* two-tiered system). At the same time, in the evaluation / funding systems, outputs published in the journals are weighted. In the Finnish, Danish and Norwegian list the quality differentiation is indicated directly by level ratings, and

weighting in the funding system is based on this. For instance, in Finland article level 0 = 0.1-point, level 1 = 1 point, level 2 = 3 points and level 3 = 4 points.

In each analyzed ranking, one can identify journals classified as being top-tier. They are classified into the highest level (like in Finland or Norway), or according to tier (like in Turkey), or based on the highest number of assigned points (like in Poland or Flanders). The weighting of journals based on JIF percentiles over a ten-year time window leads to a set of top-tier journals in Flanders. In the Nordic lists the top journals can be identified directly by their assigned levels: Denmark (level 2&3), Finland (levels 2&3) and Norway (level 2). In Italy, too, A-class journals are considered to be 'top-tier' in their (sometimes narrow) fields. Also, in Poland, the highest number of points (200 p.) applies directly to the identification of top journals.

The share of top-tier journals in the rankings ranges from 2.6% in Poland up to 27.3% in Italy. In all lists, except the Italian one, the share of top-tier journals is top-down limited. For instance, in China top-tier journals can constitute 5% and in Poland 3% of journals in a given discipline but this share might be slightly changed by a panel decision. In Denmark, Finland and Norway, each panel can only nominate top journals representing at most 20 % of world production of research articles in the field. In Turkey, journals which have 3.0 or higher article influence score are classified in Tier D and defined as top-tier journals.

Supplementary Table 1 presents a comparison of eight rankings in four dimensions: (1) Overview and use of the list, (2) Assessment of journals, (3) Weights in funding / monetary reward systems, (3) and top-tier journals.

Methods

For the purpose of this study, we analyze the set of journals included in seven national rankings of scholarly journals, as well as subsets of top-tier journals. The Italian ranking has been excluded from the comparison because of the scale of multiple assignment of fields of science to journals which is different from other analyzed countries. For our analysis, we use the last editions of the lists available in December 2019, which may be a limitation of the study because the lists were changing over years. It should be highlighted that we compare national journal rankings that are either fully and only partly covered by WoS.

We have created a full-journal list (available on Figshare: https://doi.org/10.6084/m9.figshare.14150027) covering all top-tier journals from the seven national journal rankings retained for this analysis. This required merging the journal information, removing duplicate records, adding the missing ISSN, and checking the inconsistent information between different countries. In some countries, some journals are assigned to two or more fields and disciplines. To make our comparison possible, we have mapped various national classifications of journals to the OECD FORD classification (OECD, 2015). For Denmark, Finland, and Flanders, we have decided to add a 'Multidisciplinary' field because many journals have had multiple disciplines and fields assigned.

We have used the 2019 Journal Citation Reports to add information about the JIF of each top-tier journal and information about the Average Journal Impact Factor Percentile (AJIFP) which is based on the JIF Percentile. The AJIFP of a journal is the average of the JIF percentiles according to each WoS subject category in which the journal is classified. Thanks to this indicator a proper comparison across various fields of science is possible. Finally, we have analyzed 4,701 unique top-tier journals listed on seven national journal rankings.

Results

Top-tier journals across OECD fields and countries. Table 1 shows how the number of journals on the national rankings differs across counties. Finland has the highest number of journals (N=29,469) and Turkey the lowest (N=10,465). The highest number of top-tier journals is found in Finland (N=3,072) where these journals comprise 10.4% of all journals, while the lowest number is found for Turkey (N=385, 3.7% of all journals). Top tier-journals constitute the highest share of journals in Denmark (17.1%) and the lowest in Poland (2.6%).

Table 1. Number of all journals and top-tier journals in the journal rankings in seven countries

Country/ Region	Number of all journals in the country ranking	Number of top-tier journals	Share of top-tier journals
China	11,930	1,561	13.1%
Denmark	17,158	2,928	17.1%
Finland	29,469	3,072	10.4%
Flanders	12,202	715	5.9%
Norway	27,054	2,005	7.4%
Poland	29,034	750	2.6%
Turkey	10,465	385	3.7%

In 2018, China was declared the largest source of journal articles (Tollefson, 2018) and produced more journal articles indexed in Scopus than the US for the very first time. Supplementary Table 2 shows that this growth of Chinese scientific production is visible also in the increase of researcher articles between 2015 and 2019 (73% more articles in 2019 than in 2015). Moreover, over the same period the number of articles in top-tier journals has grown even more (87%). In other words, the number of articles in top-tier journals is increasing faster than all research articles. The Chinese case is unique and very different from the situation of Europe. In all countries, some growth of research articles is observed, but it is substantially smaller than in Chinese (from 15% in Turkey to 36% in Norway). Moreover, the growth of articles in top-tier journals, comparing 2015 and 2019, is almost the same as the growth of articles in non-top-tier journals with a significant exception of the Turkish case (-22%).

However, there is one limitation to our approach: we use one edition of top-tier journals for the whole period. Thus, to analyze whether or not there are some unexpected variations in the number of publications in top-tier journals, we have also calculated how many top-tier journals researchers published in each year/country and how many of papers were published in 142 top-tier journals included in all seven country lists by researchers affiliated in a given country. The results of this investigation are presented in Supplementary Table 3.

Table 2 shows how many of the total of 4,701 top-tier journals are classified in one or more countries. 142 (3.0%) of the 4,701 top-tier journals are listed in all seven national journal rankings. 38.7% of the journals are present in only one of the rankings.

Table 2. Number of journals considered to belong to the top tier in a given number of countries.

Number of countries	Number of journals	Share of total number of journals in seven countries
1	1,820	38.7%
2	987	21.0%
3	951	20.2%
4	396	8.4%
5	239	5.1%
6	166	3.5%
7	142	3.0%
Total	4,701	100.0%

Table 3 shows how many journals on a given national ranking are present in one or more national rankings. For instance, 270 journals on the Chinese ranking are included only in that ranking, but 307 journals from Chinese ranking are present also in three other countries. 142 journals (all with JIF) are indexed at all seven national rankings. Supplementary Table 4 lists these journals.

Table 3. Number of journals classified as top-tier in selected countries.

Number of countries	China	Denmark	Finland	Flanders	Norway	Poland	Turkey
1	270	695	532	40	217	62	4
2	219	571	746	69	317	44	8
3	232	824	889	74	754	63	17
4	307	338	375	99	301	131	33
5	230	202	224	151	175	146	67
6	161	156	164	140	99	162	114
7	142	142	142	142	142	142	142
Total number of top-tier journals in country ranking	1,561	2,928	3,072	715	2,005	750	385

Journals with JIFs as top-tier journals. 3,565 (75.8%) of the 4,701 top-tier journals have a JIF in the JCR 2019. Table 4 shows that in Turkey 100% of the top-tier journals are JIF journals. A similar case is observed in China (99.9%) and Flanders (99.0%). The lowest shares are in Denmark (77.5%), Finland (76.1%), and Norway (76.4%).

Table 4. Share of top-tier journals with a Journal Impact Factor in the journal rankings in seven countries

Country/ Region	Top-tier journals with Journal Impact Factor	All top-tier journals	Share of top-tier journals with Journal Impact Factor
China	1,559	1,561	99.9%
Denmark	2,269	2,928	77.5%
Finland	2,337	3,072	76.1%
Flanders	708	715	99.0%
Norway	1,532	2,005	76.4%
Poland	669	750	89.2%
Turkey	385	385	100,0%

In China, there are 2 top-tier journals without a JIF (none is published in Chinese). In Denmark, there are 659 top-tier journals without JIF (28 are Danish journals), in Finland, 735 top-tier journals without JIF (28 are Finnish journals), in Flanders 7 top-tier journals without JIF (none are Belgian journals), in Norway, 473 top-tier journals without JIF (7 are Norwegian journals), in Poland, 81 top-tier journals without JIF (none are Polish journals). All top-tier journals in Turkey have a JIF.

Table 5 shows the share of journals with a JIF across major OECD fields. Some journals were classified in more than one OECD field (e.g., in both 'Social Sciences' and 'Humanities and the arts'). In such cases, we counted them in multiple categories. In almost all cases, the share of JIF journals is close to 100%. However, in the case of the 'Humanities and the arts' in Finland and Norway, the share at around 30% is substantially lower than in other countries and fields. This is related to the fact that journals that are only indexed in the Arts & Humanities Citation Index do not receive a JIF, as well as the inclusion of non-WoS-indexed journals in these countries.

Table 5. Share of top-tier journals with a JIF across OECD fields (in relation to top-tier journals in country)

OECD field / Country	China	Denmark	Finland	Flanders	Norway	Poland	Turkey
Natural sciences	99.7%	95.3%	96.4%	99.0%	98.6%	99.2%	100.0%
Engineering and technology	100.0%	90.9%	99.2%	99.2%	100.0%	98.1%	100.0%
Medical and health sciences	99.6%	98.9%	98.6%	97.7%	99.1%	98.4%	100.0%
Agricultural and veterinary sciences	98.8%	100.0%	100.0%	97.9%	100.0%	100.0%	N/A
Social sciences	100.0%	80.2%	89.3%	100.0%	91.7%	95.1%	100.0%
Humanities and the arts	100.0%	50.6%	34.4%	100.0%	28.6%	60.5%	N/A
Multidisciplinary	N/A	25.3%	100.0%	100.0%	N/A	N/A	N/A

Note: The top-tier journals of CAS (China) are selected from the SCIE in WoS, so the journals assigned to the SSH fields are due to multiple WoS category allocations, e.g., MEDICAL HISTORY is assigned to "History & Philosophy of Science" (A&HCI), "HEALTH CARE SCIENCES & SERVICES" (SCIE), and "HISTORY & PHILOSOPHY OF SCIENCE" (SCIE & SSCI). This phenomenon also cannot be ignored in other national journal lists.

Figure 1 shows the value of the AJIFP for top-tier journals with JIF and for each country. We found that the analyzed countries represent two groups. The first group of countries—that is China, Flanders, Poland and Turkey—classified journals as being top-tier mostly within the first quartile (above 75 percentile) and only a few journals with AJIFP lower than 50. The other group of countries—that is Denmark, Finland, and Norway—classifies various journals as being top-tier. Although the median is above the first quartile (as in the case of the first group of countries), many journals with a low AJIFP are considered to be top-tier.

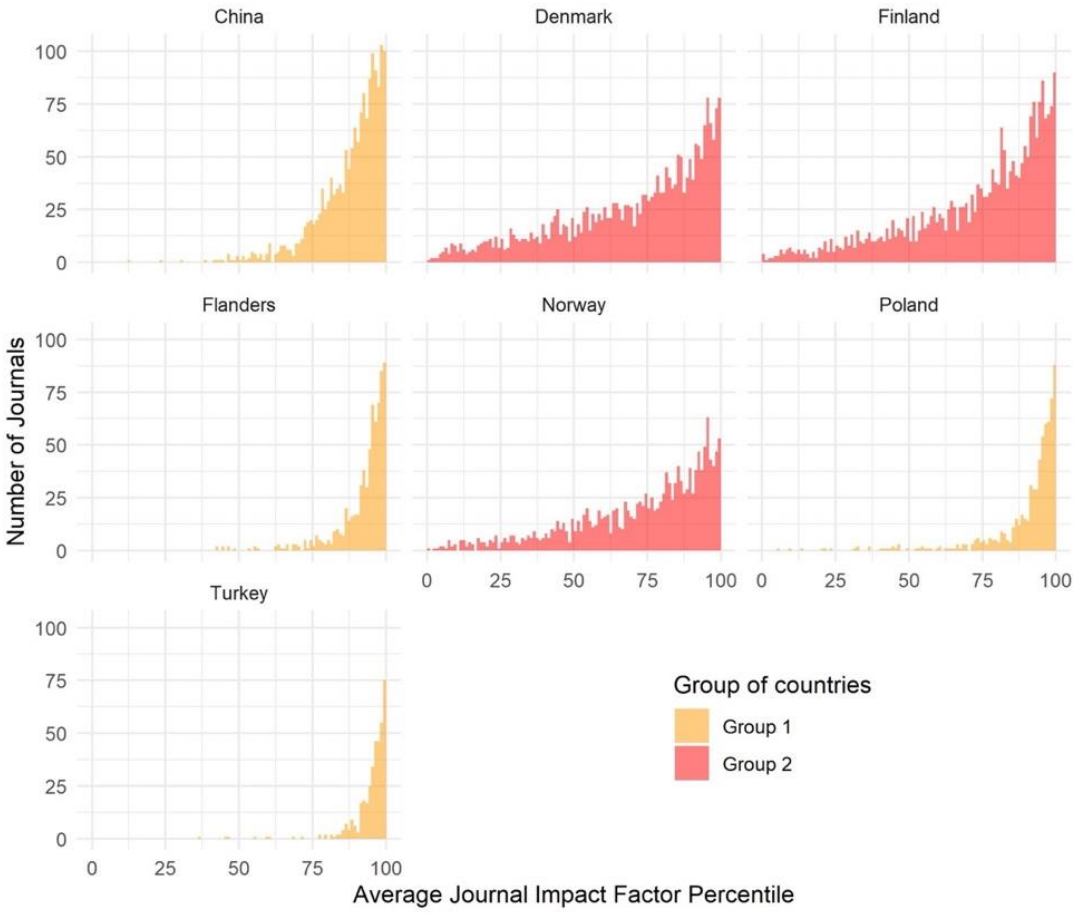

Fig 1. Distribution of the Average Journal Impact Factor Percentile for top-tier journals with a Journal Impact Factor across countries

Figure 2a and 2b show the AJIFP for top-tier journals and OECD field (except auxiliary 'Multidisciplinary' field) for two groups of countries identified and presented in Figure 1. In China, Flanders, Poland and Turkey (Figure 2a), there are almost no journals assigned to the humanities and arts. Moreover, for other fields of science, the overwhelming majority of the top-tier journals is in the first quartile of Average Journal Impact Factor Percentile. In Denmark, Finland and Norway (Figure 2b), top-tier journals with JIF come from across the full range of Average Journal Impact Factor Percentiles.

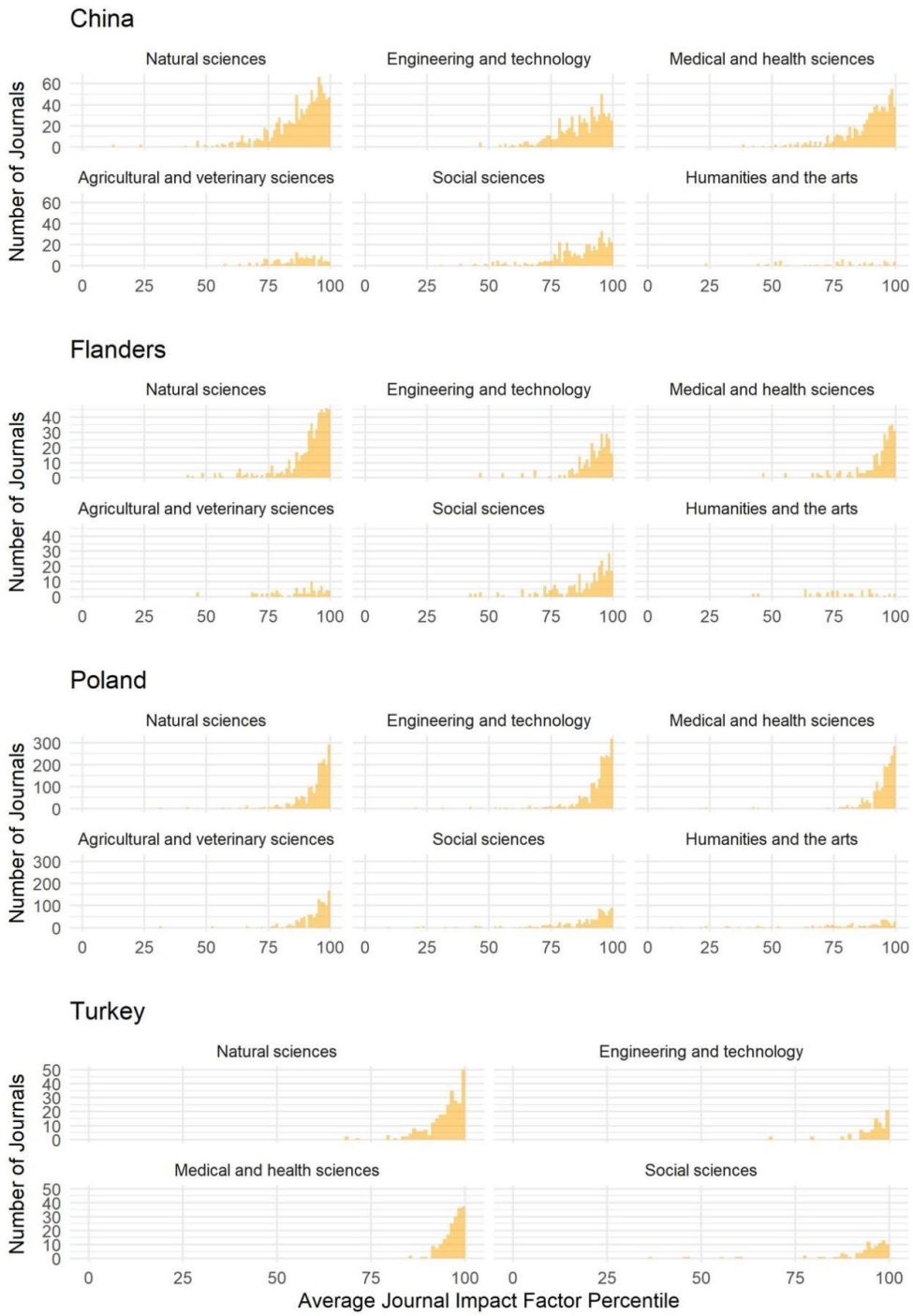

Fig 2a. Distribution of the Average Journal Impact Factor Percentile for top-tier journals with a Journal Impact Factor across OECD fields for China, Flanders, Poland, and Turkey.

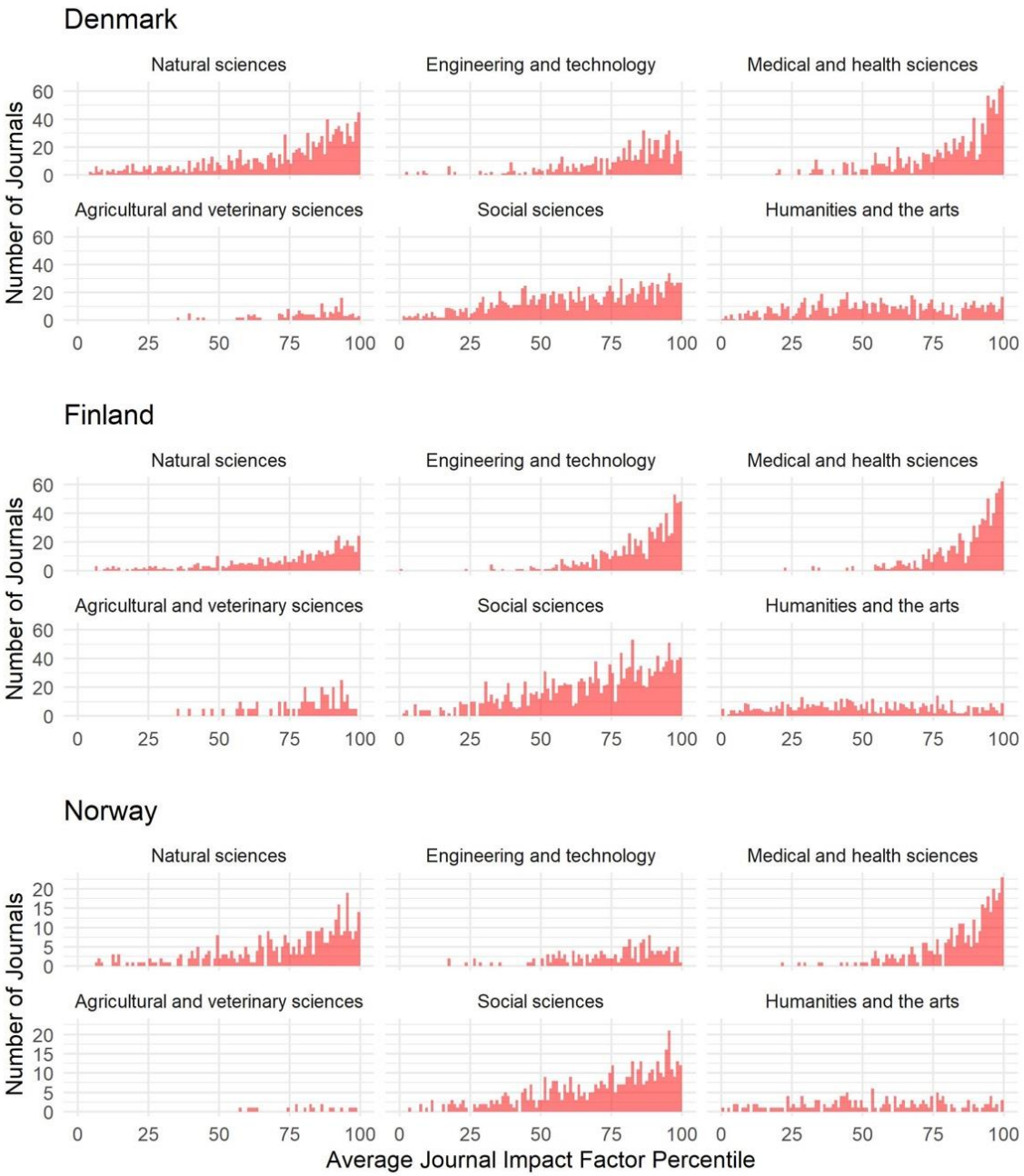

Fig 2b. Distribution of the Average Journal Impact Factor Percentile for top-tier journals with Impact Factor across OECD fields for Denmark, Finland, and Norway.

Discussion and conclusions

In this paper we have analyzed the different uses of the JIF in journal rankings and show how different approaches lead to different results in terms of top journals in different fields of science. A total of 3,565 (75.8%) of the 4,701 unique top-tier journals from our dataset were identified as having a JIF, and 55.7% of these belong to the first JIF quartile. Among the countries included in our analysis, we see two markedly different approaches. In China, Flanders, Poland and Turkey top-tier journals are primarily identified via the JIF. Practically all top-tier journals in Turkey (100%), China (99.9%), and Flanders (99.0%) have a JIF. This percentage is somewhat lower for

Poland (89.2%). Moreover, the vast majority of top-tier journals in these countries belong to the first JIF quartile.

According to the Leiden Manifesto (Hicks et al., 2015), the best way to use metrics such as the JIF is to employ it in connection with subject committee assessments; a process often referred to as expert assessment informed by metrics. With a stronger community-curated assessment of journals it is possible to represent a more comprehensive journal landscape. Ideally, such communities should be cross-national and reflect a combination of regional, national and international communities that all engage in this process (e.g., Hojnik, 2021). The assessment of journals should be informed on the basis of multidimensional information, including also the integrity and transparency of their editorial and peer-review operations, and taking into account the value they actually add to research, scholarly communication, and open science (Haustein, 2012; Wouters et al., 2019).

The combination of metrics and expert judgement might be better than either of the two alone, particularly now with the growth of a journal market based on the article processing charges. It is important to remember that the San Francisco Declaration on Research Assessment (DORA) (American Society for Cell Biology, 2012) is not against the use of the JIF for journal evaluation, but opposes its use for evaluating individual researchers and articles. In general, citation indicators for journals can be valid, depending on the coverage of the database and reference practices in the field (Garfield, 2006).

Scholarly journals are the main research infrastructure for evaluating and communicating new results. Therefore, academic communities should be involved in the governance and assessment of this important infrastructure. Whilst there is no perfect example, our eight countries indeed have *national journal evaluation systems with disciplinary expert panels* representing their academic communities. The systems are either organized by academia (Denmark, Finland, Norway) or by intermediary autonomous bodies (China, Flanders, Italy, Poland, Turkey).

Both advantages as well as challenges are associated with using expert panels. The most obvious advantage is the avoidance of relying exclusively on indicators, but this approach can also limit industry dominance as well as political intervention. By examining the degree to which the journal evaluation systems of our countries agree on the same top-ranked journals, we found that China, Flanders, Poland, and Turkey, all have top-tier journals that belong mainly to the first Impact Factor quartile. In Denmark, Finland, and Norway, the ranking of journals is much less dependent on the JIF. When journals from STEM fields are only taken into consideration, the rankings tend to converge between all countries indicating that experts in these fields agree more or less with rankings based on JIFs. Still, in the Nordic countries a larger proportion of the top-tier journals belong to the second, third and even fourth Impact Factor quartile (Figure 2b). Moreover, the Nordic journal rankings in STEM include a small percentage of top-tier journals without a JIF, indicating that also in these fields experts now and then consider quality dimensions not captured by JIF of crucial importance in view of journal rankings.

This lesser skew towards journals with a high JIF and the inclusion of journals without a JIF is even more pronounced for the social sciences (Figure 2b and Table 5). This illustrates that some kind of journal hierarchy in the social sciences may exist (Giles & Garand, 2007), yet seem not to be properly represented by a ranking based the JIF. In the humanities, the situation is clearer in the sense that while in Denmark, Finland and Norway many journals without a JIF and journals from across the whole spectrum of Impact Factor percentiles are represented, the Chinese, Flemish and Turkish journal rankings we studied have a poor representation of the humanities. Clearly, the identification of top-tier journals in the humanities cannot be based on JIFs, which is why Poland decided to expand its journal ranking particularly in the case of the humanities. From the humanities perspective it is an important limitation that JIF is not calculated for journals included in the Arts & Humanities Citation Index, unless they also happen to be included in the

Social Sciences Citation Index or the Science Citation Index Expanded. This means that only a small share of mainly STEM or social sciences-oriented humanities journals have a JIF.

Overall, the main advantages of expert-based journal evaluation are found in the SSH fields, where a JIF-based journal ranking is able to cover only part of the leading journals. This due to the fact that the SSH journal landscape tends to be more fragmented than STEM fields, and includes a large variety of relatively small theoretically, methodologically and topically specialized and contextualized outlets publishing in different languages. Our analysis (Table 5) shows that in Norway, Denmark and Finland a considerable share of top-tier journals in the social sciences, and the vast majority in the humanities, do not even have a JIF. Hojnik (2021) found that 56 (40%) of 141 top-tier journals in the field of law in Finland (including level 2 and 3) are not included in WoS or Scopus. Hojnik indicates that within the WoS journals published by US law schools are recognized as international despite their strong national orientation. Here, he concludes that "until the WoS selection criteria are more attuned to European legal scholarship, (…) peer review-based rankings can complement the JIF-based rankings by evaluating the quality of those law journals that are sidelined by WoS" (p. 275). Furthermore, SSH research is to a large extent published and cited in books. Expert-based evaluation, however, can be employed also to assess and/or rank book publishers and book series (Zuccala et al., 2021), as in Norway, Denmark, Finland, Poland, and Flanders; in this study we chose to focus only on journal rankings.

One important question is the usefulness of expert-based journal rankings in the STEM fields, where JIF-based evaluation covers most of the relevant publications and citations. Our analysis of the national journal rankings in Norway, Denmark and Finland shows that the vast majority of top-tier journals have a JIF (Table 5); however the experts in the field do not fully agree with the JIF ranking order in identification of top-tier journals (Figure 2b). In the Nordic countries expert panels have been provided several journal metrics, including the JIF, to help them estimate and discuss the relative impact and esteem of journals in an international context. In principle, the expert-panels could have produced their top-tier list directly based on the JIF. But, in practice, even for STEM fields, the expert panels typically find that some journals are not to be counted among the leading international outlets despite a high JIF, and vice versa.

There are several reasons for these discrepancies with the JIF (Pölönen et al., 2020). Firstly, the JIF varies between larger and smaller disciplines and specialties, and experts may aim to produce a more balanced top-tier ranking across disciplines and sub-disciplines, recognizing leading outlets also from smaller areas. Secondly, experts may also want to better recognize journals publishing original research compared to review journals, which typically have higher than average JIFs. Thirdly, even in STEM, journals associated with some other field (such as bio and health sciences) may rank higher in the JIF than the core journals in the discipline. Finally, the expert may also want to rectify potential biases in the JIF ranking order related to basic vs. applied, theoretical vs. empirical, or qualitative vs. quantitative orientation of journals. Overall, expert-assessment is a useful complement to a JIF-based journal evaluation, also in STEM. Of course, the involvement of experts in the journal evaluation process depends also on the trust that agencies producing national rankings have in the academic communities, but also on the purported use and goals of the journal ranking.

For China, Flanders, and Turkey, our observed convergence of journal rankings is predictable: each of these journal rankings are JIF-based and only include journals that are also indexed in the WoS. This reliance on the WoS only is and has been experienced as a problem in these particular countries. Flanders introduced a WoS-based funding model for its universities in 2003 (Debackere & Glanzel, 2008). After protests from academics within the SSH, a supplementary bibliographic database for these fields of research was introduced in 2008. For this purpose, an expert panel assesses journals, series and publishers, but this procedure has not been extended to journals covered by the WoS (Engels & Guns, 2018). China has seven major journal rankings, and only the one we used in this study is limited to the WoS (Huang et al., 2020). The other six

journal rankings also include domestic journals and are partly based on qualitative expert assessment. These other rankings are becoming more important after China decided to shift away from relying on a WoS-dominated quantitative research evaluation system (Zhang & Sivertsen, 2020). Thus far, Turkey has no alternative to its WoS-based system. However, problems related to the exclusion or lack of recognition of locally relevant journals, as well as a general imbalance in the representation of disciplines have been addressed (Taşkin, 2020). Cases of JIF manipulation have been recorded, even though articles published in these journals continued to receive monetary support until they were finally excluded from the WoS.

With the exception of Turkey, all of the countries featured in our study apply criteria beyond the coverage of WoS or Scopus in order to evaluate journals. This allows more room for social sciences and humanities journals and for locally relevant journals in general. Still, WoS journals are ranked relatively higher in the Polish system (Korytkowski & Kulczycki, 2019), which explains why this country shows a higher degree of agreement with the other WoS-based systems. Journal inclusion in WoS or Scopus is not given specific credit within the Nordic journal rankings, but this information is given to panels, and citation indicators are also used if available (Sivertsen, 2018). Nevertheless, journal assessments are primarily focused on the quality, reputation, integrity and transparency of their editorial and peer-review operations, including their contributions to research, scholarly communication, and open science (Pölönen et al., 2020). Italy follows the same principle, in that qualitative assessments in its evaluation for journals are made by expert panels in the social sciences and humanities (Ferrara & Bonaccorsi, 2016).

None of the journal rankings that we study in this paper are without challenges or drawbacks. Like many other forms of research evaluation, disciplinary expert panels are sometimes criticized for their biases and lack of transparency (Aagaard et al., 2015; Kulczycki & Rozkosz, 2017). It has also been suggested that the expenses needed in order to establish and maintain expert panels /committees could be significantly minimized if indicators were directly used instead (Saarela et al., 2016; Saarela & Kärkkäinen, 2020). We conclude that Journal Impact Factors are often highly influential in national journal rankings, in particular in determining top-tier journals in STEM. Nonetheless, independent expert assessment informed by metrics results in the identification as top-tier journals of journals belonging to lower AJIFPs or without a JIF, particularly in the SSH. Hence metrics-informed expert assessment alters and complements metrics-based journal rankings, particularly for journals in the SSH. Measurements and perceptions of journal quality lead to a diversity of rankings, each with their merits and limitations, as our paper illustrates.

One interesting possibility for follow-up research might hence be to test to what extent papers in journals that are flagged as top journals effectively become papers with high scholarly impact as measured through citations. Indeed, given that different countries flag different journals as top journals, it would be interesting to ascertain to what extent such journals actually publish highly regarded and impactful scholarly articles from authors based in those different countries.

Data availability

The data on top-tier journals can be found here: https://doi.org/10.6084/m9.figshare.14150027

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Acknowledgments

The work of E.K. was financially supported by the National Science Centre in Poland [Grant Number UMO-2017/26/E/HS2/00019]. The work of Y. H. and L. Z. was supported by the National Natural Science Foundation of China [Grant numbers 72004169, 71974150]. The work of Y. H., R.G. and T.C.E.E. was supported by the Flemish Government through its funding of the Flemish Centre for Research & Development Monitoring (ECOOM); the opinions expressed in this paper are their own and not necessarily those of the Flemish Government.

Author contribution

E.K. and Y.H. designed the study. E.K. and Y.H. analyzed the data, and constructed the figures. E.K., Y.H., A.A.Z., T.C.E.E, A.N., R.G., J.P., G.S., Z.T., L.Z. wrote the manuscript. All authors created the datasets, read, and revised the manuscript.

Supplementary Material

Uses of the Journal Impact Factor in national journal rankings in China and Europe

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Supplementary Table 1. Characteristics of national rankings of scholarly journals in seven European countries and China.

Characteristics / Country	*China*	*Denmark*	*Finland*	*Flanders*	*Italy*	*Norway*	*Poland*	*Turkey*
				Overview and use of the ranking				
Name of the ranking	CAS Journal list	BFI List of Series	Publication Forum	ECOOM-WoS Journal List	Ratings of scientific and class A journal	The Norwegian Register for Scientific Journals, Series and Publishers	Polish Journal Ranking	TÜBİTAK Incentive Program for International Scientific Publications (UBYT)
Number of journals	11 930	17 158	29 469	12 202	21 677	27 054	29 034	10 465
Use of ranking	To provide reference data for administrators and researchers to evaluate the influence of international academic journals	An element of the performance-based model for distribution of the new block grants for research to universities.	List of journals provides a channel-based quality index of peer-reviewed publications used by the Ministry of Education and Culture for allocating 13% of core-funding annually to Finnish universities	Publications in journals on the list are used to calculate some parameters in the funding allocation scheme.	In the framework of Italy's National Scientific Habilitation, the journal lists are used to set minimum thresholds of scientific output	Primarily used as an authority list in the Current Research Information System in Norway (Cristin) and in the Norwegian Publication Indicator (NPI), which is used in direct funding of research institutions in Norway.	It is a science policy instrument used in the Polish performance-based research funding system and in the career assessment (Ph.D. and Habilitation degrees)	Giving incentive to the scholars to raise the number of publications in high-quality journals.
Used in a national performance based-research funding system at institutional level	No	Yes	Yes	Yes	No	Yes	Yes	No
Used in a national monetary reward system at individual level	No (but YES in some university)	No	No	No	No	No	No	Yes
Used in a national academic promotion procedure at individual level	No (but YES in some university)	No	No	No	Yes	No	Yes	No
Time framework	Annual	Level 1 publications added yearly, Level 2 reassigned every second year, Level 3 is assigned every fourth year.	New journals added annually, top tier updated every 4 years	Annual	The ranking is updated usually every four months.	Continuously	Irregular (mostly biannually)	Annual
Only peer review journals	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
				Assessment of journals				
Method	Metrics	Informed Expert Assessment	Informed Expert Assessment	Metrics	Informed Expert Assessment	Informed Expert Assessment	Informed Expert Assessment	Metrics
Experts are informed with suggestions from the research community	N/A	Yes	Yes	N/A	Yes	Yes	No	N/A
SSH specificity	No	Yes	Yes	No	Yes	Yes	Yes	Yes (just for arts and humanities)

Characteristics / Country	*China*	*Denmark*	*Finland*	*Flanders*	*Italy*	*Norway*	*Poland*	*Turkey*
Bibliometric data	Web of Science	Web of Science; Levels of Norwegian and Finish rankings; Sherpa/Romeo; Ulrich's Periodicals Directory	Web of Science; Scopus; Levels of Danish and Norwegian rankings; ERIH Plus; DOAJ, Sherpa/Romeo	Web of Science	Web of Science; Scopus	Web of Science; Scopus	Web of Science; Scopus; ERIH Plus	Web of Science
Using Journal Impact Factor	Yes	Yes, but only to inform experts	Yes, but only to inform experts	Yes	Yes, but only to inform experts	Yes, but only to inform experts	Yes	Yes
Weights in funding / monetary reward systems								
Outputs weighted differently	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Basis for weighting journals	Based on journal levels	Based on journal levels	Based on journal levels	Based on journal levels	N/A	Based on journal levels	Based on journal levels	Based on journal levels
Weight	The weights can vary in different institutions, and there is not a consistent weighting	Level 1 = 1 point; Level 2 = 3 points; Level 3 = 5 points	Level 3 = 4; Level 2 = 3; Level 1 = 1; Level 0 = 0.1	From highest to lowest segment, the weights are: 10 - 6 - 3 - 2 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 0.5 - 0.5 - 0.1 - 0.1 - 0.1 - 0.1	N/A	Level 1 = 1; Level 2 = 3	20 (the lowest), 40, 70, 100, 140, 200 (the highest)	A (the lowest), B, C, D (the highest)
Top-tier journals								
What determines how many journals can be "top-tier"?	Top 5% of journals in each discipline is called "Level 1 journals" (by JIF), but due to the limited coverage of "Level 1 journals", CAS extended its definition of "top journals" by including 10% journals from "Level 2 journals" (by indicator of total citations)	The distribution between the levels is based on the world production. Each journal has a number associated with it called world production, which is a calculation of the average number of scientific publications in the journals per year.	In each panel, level 2 and 3 journals can account for at most 20 % of world production of all level 1-3 journals, and level 3 journals at most 5%.	Given the calculation method, ~5% of journals in a given field are 'top-tier'. However, given that the ranking in the field where a journal scores highest 715 out of a total of 12202 journals (5,86%) are assigned to the top tier.	Not limited	Share of 20 % the world's article production in the journal (not of journal titles).	3% of journals in a given discipline. This share might be slightly changed by a panel decision.	Journals which have 3.0 or higher article influence score. The 385 of 10465 journals might be considered as top-tiered.
Top-tier journals	Yes. By the journal impact factor and total citation.	A top-tier journal is identified by the highest weight	Level 2 and 3 journals can be identified as top-tier journals	A top-tier journal is identified by the highest weight	Top-tier journals are identified as 'A-class'. Expert panels assess which journals are to be identified as 'A-class'.	Defined by Level 2 criteria: Of top international prestige and within 20 % of the articles in the field.	A top-tier journal is identified by the highest weight	Officially, there is no 'top-tier journal' category but journals with 3.0 or higher article influence score are considered as top-tiered journals and council gives top number of incentives to the authors of these journals.

Supplementary Table 2. Number of top-tier journals in which researchers published and number of publications in 142 top-tier journals.

Country/ Region	2015		2016		2017		2018		2019		Number of top-tier journals in which research published in 2015-2019
	Number of top-tier journals in which researchers published	Number of publications in 142 top tier-journals (indexed in all 7 countries)	Number of top-tier journals in which researchers published	Number of publications in 142 top tier-journals (indexed in all 7 countries)	Number of top-tier journals in which researchers published	Number of publications in 142 top tier-journals (indexed in all 7 countries)	Number of top-tier journals in which researchers published	Number of publications in 142 top tier-journals (indexed in all 7 countries)	Number of top-tier journals in which researchers published	Number of publications in 142 top tier-journals (indexed in all 7 countries)	
China	1 303	5 814	1 332	5 841	1 368	6 133	1 359	8 274	1 401	8 005	1 561
Denmark	1 544	1 506	1 598	1 505	1 603	1 562	1 613	1 809	1 683	1 769	2 928
Finland	1 468	636	1 513	647	1 501	617	1 566	699	1 622	715	3,072
Flanders	460	1 071	464	1 045	456	993	485	1191	491	1 309	715
Norway	1 092	792	1 127	796	1 128	849	1133	1 032	1 204	923	2 005
Poland	280	882	308	830	312	766	316	874	351	885	750
Turkey	119	969	134	663	138	620	139	863	136	727	385

Supplementary Table 3. Number of research articles in SCIE&SSCI&AHCI, and the number of research articles published in corresponding national top-tier journals with JIF.

Country/ Region	2015			2016			2017			2018			2019			*Comparison*		
	All	**top-tier**	**Share**	**All**	**top-tier**	**Share**	**All**	**top-tier**	**Share**	**All**	**top-tier**	**Share**	**All**	**top-tier**	**Share**	**Increase of all documents (between 2015 and 2019)**	**Increase of top-tier documents (between 2015 and 2019)**	**Difference between increase of top-tier Documents and all Documents and increase of**
China	306 530	84 677	27.62%	338 960	94 900	28.00%	375 299	109 559	29.19%	433 274	133 783	30.88%	531 761	158 067	29.73%	73%	87%	13%
Denmark	23 394	9 206	39.35%	25 143	9 906	39.40%	26 032	9 990	38.38%	27 014	10 646	39.41%	29 526	11 714	39.67%	26%	27%	1%
Finland	15 589	7 148	45.85%	16 646	7 436	44.67%	16 513	7 440	45.06%	17 222	7 778	45.16%	19 128	8 600	44.96%	23%	20%	-2%
Flanders	18 497	2 852	15.42%	19 099	2 814	14.73%	19 525	2 868	14.69%	20 516	3 180	15.50%	21 908	3 397	15.51%	18%	19%	1%
Norway	15 833	5 431	34.30%	17 159	5 921	34.51%	18 264	6 038	33.06%	19 181	6 611	34.47%	21 461	7 293	33.98%	36%	34%	-1%
Poland	32 206	2 038	6.33%	33 726	2 110	6.26%	33 741	2 181	6.46%	35 649	2 298	6.45%	39 577	2 461	6.22%	23%	21%	-2%
Turkey	36 708	1 159	3.16%	39 207	922	2.35%	35 930	886	2.47%	36 560	1 155	3.16%	42 397	1 078	2.54%	15%	-7%	-22%

Note: All document means the publications indexed in SCIE&SSCI&AHCI, Top-tier Documents indicates the publications are in the top-tier journals with WoS JIF. For Flanders, we included the publications of the five universities (KU Leuven, Ghent University, University of Antwerp, Vrije Universiteit Brussel, Hasselt University), their university hospitals, and the Strategic Research Centers.

Supplementary Table 4. The list of 142 journals which are classified as top-tier journals in all seven national rankings. The journal information is extracted from InCites Journal Citation Reports.

WoS Title	Publisher	Publisher countries	Average Journal Impact Factor Percentile	JIF 2019
ACADEMY OF MANAGEMENT JOURNAL	ACAD MANAGEMENT	UNITED STATES	95.216	7.525
ACADEMY OF MANAGEMENT REVIEW	ACAD MANAGEMENT	UNITED STATES	96.974	8.365
ACTA MATHEMATICA	INT PRESS BOSTON, INC	SWEDEN	96.154	2.458
ADMINISTRATIVE SCIENCE QUARTERLY	SAGE PUBLICATIONS INC	UNITED STATES	96.424	8.304
ADVANCED FUNCTIONAL MATERIALS	WILEY-V C H VERLAG GMBH	GERMANY	95.326	16.836
ADVANCED MATERIALS	WILEY-V C H VERLAG GMBH	GERMANY	97.829	27.398
ADVANCES IN PHYSICS	TAYLOR & FRANCIS LTD	UNITED KINGDOM	93.478	16.375
AMERICAN ECONOMIC JOURNAL-APPLIED ECONOMICS	AMER ECONOMIC ASSOC	UNITED STATES	96.381	5.034
AMERICAN JOURNAL OF HUMAN GENETICS	CELL PRESS	UNITED STATES	94.663	10.502
AMERICAN JOURNAL OF POLITICAL SCIENCE	WILEY	UNITED STATES	98.066	4.271
AMERICAN JOURNAL OF PSYCHIATRY	AMER PSYCHIATRIC PUBLISHING, INC	UNITED STATES	96.964	14.119
AMERICAN JOURNAL OF RESPIRATORY AND CRITICAL CARE MEDICINE	AMER THORACIC SOC	UNITED STATES	95.356	17.452
AMERICAN JOURNAL OF SOCIOLOGY	UNIV CHICAGO PRESS	UNITED STATES	95	3.232
AMERICAN POLITICAL SCIENCE REVIEW	CAMBRIDGE UNIV PRESS	UNITED STATES	96.961	4.183
AMERICAN SOCIOLOGICAL REVIEW	SAGE PUBLICATIONS INC	UNITED STATES	99	6.372
ANNALS OF INTERNAL MEDICINE	AMER COLL PHYSICIANS	UNITED STATES	96.667	21.317
ANNALS OF MATHEMATICS	ANNALS MATHEMATICS, FINE HALL	UNITED STATES	98.923	3.918
ANNALS OF NEUROLOGY	WILEY	UNITED STATES	94.7	9.037
ANNALS OF STATISTICS	INST MATHEMATICAL STATISTICS	UNITED STATES	86.694	2.65
ANNALS OF SURGERY	LIPPINCOTT WILLIAMS & WILKINS	UNITED STATES	99.286	10.13
ANNALS OF THE RHEUMATIC DISEASES	BMJ PUBLISHING GROUP	UNITED KINGDOM	95.313	16.102
ANNUAL REVIEW OF ASTRONOMY AND ASTROPHYSICS	ANNUAL REVIEWS	UNITED STATES	99.265	33
ANNUAL REVIEW OF FLUID MECHANICS	ANNUAL REVIEWS	UNITED STATES	99.081	16.306
ANNUAL REVIEW OF SOCIOLOGY	ANNUAL REVIEWS	UNITED STATES	99.667	6.4
BEHAVIORAL AND BRAIN SCIENCES	CAMBRIDGE UNIV PRESS	UNITED KINGDOM	98.189	17.333
BIOLOGICAL PSYCHIATRY	ELSEVIER SCIENCE INC	UNITED STATES	95.789	12.095
BIOLOGICAL REVIEWS	WILEY	UNITED KINGDOM	98.387	10.701
BLOOD	AMER SOC HEMATOLOGY	UNITED STATES	99.342	17.794
BRAIN	OXFORD UNIV PRESS	UNITED KINGDOM	96.354	11.337
BULLETIN OF THE AMERICAN METEOROLOGICAL SOCIETY	AMER METEOROLOGICAL SOC	UNITED STATES	98.387	9.384
CANCER CELL	CELL PRESS	UNITED STATES	97.771	26.602
CELL	CELL PRESS	UNITED STATES	99.531	38.637
CELL HOST & MICROBE	CELL PRESS	UNITED STATES	98.498	15.923
CELL METABOLISM	CELL PRESS	UNITED STATES	97.972	21.567
CELL STEM CELL	CELL PRESS	UNITED STATES	97.728	20.86

WoS Title	Publisher	Publisher countries	Average Journal Impact Factor Percentile	JIF 2019
CIRCULATION	LIPPINCOTT WILLIAMS & WILKINS	UNITED STATES	99.434	23.603
CIRCULATION RESEARCH	LIPPINCOTT WILLIAMS & WILKINS	UNITED STATES	97.486	14.467
CLINICAL INFECTIOUS DISEASES	OXFORD UNIV PRESS INC	UNITED STATES	93.271	8.313
COMMUNICATIONS ON PURE AND APPLIED MATHEMATICS	WILEY	UNITED STATES	94.803	2.676
CURRENT BIOLOGY	CELL PRESS	UNITED STATES	92.449	9.601
DEVELOPMENTAL CELL	CELL PRESS	UNITED STATES	93.171	10.092
DUKE MATHEMATICAL JOURNAL	DUKE UNIV PRESS	UNITED STATES	94.615	2.194
EARTH-SCIENCE REVIEWS	ELSEVIER	NETHERLANDS	99.25	9.724
ECOLOGICAL MONOGRAPHS	WILEY	UNITED STATES	95.562	7.722
ECOLOGY LETTERS	WILEY	UNITED KINGDOM	96.746	8.665
ECONOMETRICA	WILEY	UNITED KINGDOM	94.289	3.992
ELIFE	ELIFE SCIENCES PUBLICATIONS LTD	UNITED KINGDOM	95.161	7.08
EMBO JOURNAL	WILEY	UNITED STATES	91.292	9.889
EUROPEAN HEART JOURNAL	OXFORD UNIV PRESS	UNITED KINGDOM	98.913	22.673
EUROPEAN RESPIRATORY JOURNAL	EUROPEAN RESPIRATORY SOC JOURNALS LTD	UNITED KINGDOM	94.531	12.339
EUROPEAN UROLOGY	ELSEVIER	NETHERLANDS	98.235	18.728
GENES & DEVELOPMENT	COLD SPRING HARBOR LAB PRESS, PUBLICATIONS DEPT	UNITED STATES	91.813	9.527
GENOME BIOLOGY	BMC	UNITED KINGDOM	96.451	10.806
GENOME RESEARCH	COLD SPRING HARBOR LAB PRESS, PUBLICATIONS DEPT	UNITED STATES	96.37	11.093
GLOBAL CHANGE BIOLOGY	WILEY	UNITED KINGDOM	97.361	8.555
GUT	BMJ PUBLISHING GROUP	UNITED KINGDOM	97.159	19.819
HEPATOLOGY	WILEY	UNITED STATES	93.75	14.679
IEEE COMMUNICATIONS MAGAZINE	IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC	UNITED STATES	96.834	11.052
IEEE COMMUNICATIONS SURVEYS AND TUTORIALS	IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC	UNITED STATES	99.562	23.7
IMMUNITY	CELL PRESS	UNITED STATES	99.057	22.553
INTERNATIONAL JOURNAL OF EPIDEMIOLOGY	OXFORD UNIV PRESS	UNITED KINGDOM	96.632	7.707
INTERNATIONAL ORGANIZATION	CAMBRIDGE UNIV PRESS	UNITED STATES	98.796	5
INVENTIONES MATHEMATICAE	SPRINGER HEIDELBERG	GERMANY	97.692	2.986
JAMA INTERNAL MEDICINE	AMER MEDICAL ASSOC	UNITED STATES	96.061	18.652
JAMA NEUROLOGY	AMER MEDICAL ASSOC	UNITED STATES	97.794	13.608
JAMA PSYCHIATRY	AMER MEDICAL ASSOC	UNITED STATES	98.988	17.471
JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION	AMER MEDICAL ASSOC	UNITED STATES	98.485	45.54
JNCI-JOURNAL OF THE NATIONAL CANCER INSTITUTE	OXFORD UNIV PRESS INC	UNITED STATES	95.287	11.577
JOURNAL OF ALLERGY AND CLINICAL IMMUNOLOGY	MOSBY-ELSEVIER	UNITED STATES	95.805	10.228
JOURNAL OF APPLIED PSYCHOLOGY	AMER PSYCHOLOGICAL ASSOC	UNITED STATES	92.702	5.818

WoS Title	Publisher	Publisher countries	Average Journal Impact Factor Percentile	JIF 2019
JOURNAL OF CLINICAL INVESTIGATION	AMER SOC CLINICAL INVESTIGATION INC	UNITED STATES	98.201	11.864
JOURNAL OF CLINICAL ONCOLOGY	AMER SOC CLINICAL ONCOLOGY	UNITED STATES	98.156	32.956
JOURNAL OF EXPERIMENTAL MEDICINE	ROCKEFELLER UNIV PRESS	UNITED STATES	96.068	11.743
JOURNAL OF FINANCE	WILEY	UNITED STATES	98.709	6.813
JOURNAL OF FINANCIAL ECONOMICS	ELSEVIER SCIENCE SA	SWITZERLAND	97.848	5.731
JOURNAL OF HEPATOLOGY	ELSEVIER	NETHERLANDS	98.295	20.582
JOURNAL OF MANAGEMENT	SAGE PUBLICATIONS INC	UNITED STATES	97.724	8.852
JOURNAL OF MARKETING	SAGE PUBLICATIONS INC	UNITED STATES	86.513	5.266
JOURNAL OF PERSONALITY AND SOCIAL PSYCHOLOGY	AMER PSYCHOLOGICAL ASSOC	UNITED STATES	94.531	6.315
JOURNAL OF POLITICAL ECONOMY	UNIV CHICAGO PRESS	UNITED STATES	97.453	5.504
JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY	ELSEVIER SCIENCE INC	UNITED STATES	98.188	20.589
JOURNAL OF THE AMERICAN MATHEMATICAL SOCIETY	AMER MATHEMATICAL SOC	UNITED STATES	99.538	5.413
JOURNAL OF THE AMERICAN SOCIETY OF NEPHROLOGY	AMER SOC NEPHROLOGY	UNITED STATES	94.706	9.274
JOURNAL OF THE EUROPEAN MATHEMATICAL SOCIETY	EUROPEAN MATHEMATICAL SOC	GERMANY	90.391	2.19
JOURNAL OF THE ROYAL STATISTICAL SOCIETY SERIES B-STATISTICAL METHODOLOGY	WILEY	UNITED KINGDOM	96.371	3.965
LANCET	ELSEVIER SCIENCE INC	UNITED KINGDOM	99.091	60.39
LANCET INFECTIOUS DISEASES	ELSEVIER SCI LTD	UNITED KINGDOM	99.457	24.446
LANCET NEUROLOGY	ELSEVIER SCIENCE INC	UNITED KINGDOM	99.755	30.039
LANCET ONCOLOGY	ELSEVIER SCIENCE INC	UNITED KINGDOM	98.566	33.752
MIS QUARTERLY	SOC INFORM MANAGE-MIS RES CENT	UNITED STATES	93.266	5.361
MOLECULAR BIOLOGY AND EVOLUTION	OXFORD UNIV PRESS	UNITED STATES	94.531	11.062
MOLECULAR CELL	CELL PRESS	UNITED STATES	96.718	15.584
MOLECULAR PSYCHIATRY	NATURE PUBLISHING GROUP	UNITED KINGDOM	96.475	12.384
MOLECULAR SYSTEMS BIOLOGY	WILEY	UNITED STATES	91.414	8.991
NANO LETTERS	AMER CHEMICAL SOC	UNITED STATES	89.998	11.238
NATURE	NATURE PUBLISHING GROUP	UNITED KINGDOM	99.296	42.779
NATURE BIOTECHNOLOGY	NATURE PUBLISHING GROUP	UNITED STATES	99.038	36.553
NATURE CELL BIOLOGY	NATURE PUBLISHING GROUP	UNITED KINGDOM	96.154	20.042
NATURE CHEMICAL BIOLOGY	NATURE PUBLISHING GROUP	UNITED STATES	96.801	12.587
NATURE GENETICS	NATURE PUBLISHING GROUP	UNITED STATES	99.157	27.605
NATURE GEOSCIENCE	NATURE PUBLISHING GROUP	UNITED KINGDOM	99.75	13.566
NATURE IMMUNOLOGY	NATURE PUBLISHING GROUP	UNITED STATES	98.428	20.479
NATURE MATERIALS	NATURE PUBLISHING GROUP	UNITED KINGDOM	99.461	38.663

WoS Title	Publisher	Publisher countries	Average Journal Impact Factor Percentile	JIF 2019
NATURE MEDICINE	NATURE PUBLISHING GROUP	UNITED STATES	99.284	36.13
NATURE METHODS	NATURE PUBLISHING GROUP	UNITED STATES	99.351	30.822
NATURE NANOTECHNOLOGY	NATURE PUBLISHING GROUP	UNITED KINGDOM	98.555	31.538
NATURE NEUROSCIENCE	NATURE PUBLISHING GROUP	UNITED STATES	99.449	20.071
NATURE REVIEWS NEUROSCIENCE	NATURE PUBLISHING GROUP	UNITED KINGDOM	99.816	33.654
NATURE STRUCTURAL & MOLECULAR BIOLOGY	NATURE PUBLISHING GROUP	UNITED STATES	95.302	11.98
NEURON	CELL PRESS	UNITED STATES	97.978	14.415
NEW ENGLAND JOURNAL OF MEDICINE	MASSACHUSETTS MEDICAL SOC	UNITED STATES	99.697	74.699
ORGANIZATION SCIENCE	INFORMS	UNITED STATES	55.973	2.782
ORGANIZATIONAL RESEARCH METHODS	SAGE PUBLICATIONS INC	UNITED KINGDOM	91.664	5.705
PERSONNEL PSYCHOLOGY	WILEY	UNITED STATES	93.961	6.548
PHYSICS REPORTS-REVIEW SECTION OF PHYSICS LETTERS	ELSEVIER	NETHERLANDS	98.235	25.809
PLANT CELL	AMER SOC PLANT BIOLOGISTS	UNITED STATES	92.845	9.618
PLOS BIOLOGY	PUBLIC LIBRARY SCIENCE	UNITED STATES	91.403	7.076
PLOS MEDICINE	PUBLIC LIBRARY SCIENCE	UNITED STATES	95.455	10.5
PROCEEDINGS OF THE IEEE	IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC	UNITED STATES	97.18	10.252
PROGRESS IN ENERGY AND COMBUSTION SCIENCE	PERGAMON-ELSEVIER SCIENCE LTD	UNITED KINGDOM	98.655	28.938
PROGRESS IN MATERIALS SCIENCE	PERGAMON-ELSEVIER SCIENCE LTD	UNITED KINGDOM	98.885	31.56
PROGRESS IN NEUROBIOLOGY	PERGAMON-ELSEVIER SCIENCE LTD	UNITED KINGDOM	94.301	9.371
PSYCHOLOGICAL BULLETIN	AMER PSYCHOLOGICAL ASSOC	UNITED STATES	99.498	20.838
PSYCHOLOGICAL METHODS	AMER PSYCHOLOGICAL ASSOC	UNITED STATES	96.739	8.43
PSYCHOLOGICAL REVIEW	AMER PSYCHOLOGICAL ASSOC	UNITED STATES	94.119	6.844
PSYCHOLOGICAL SCIENCE	SAGE PUBLICATIONS INC	UNITED STATES	93.841	5.367
PUBLICATIONS MATHEMATIQUES DE L IHES	SPRINGER HEIDELBERG	FRANCE	99.231	4.25
QUARTERLY JOURNAL OF ECONOMICS	OXFORD UNIV PRESS INC	UNITED STATES	99.866	11.375
REPORTS ON PROGRESS IN PHYSICS	IOP PUBLISHING LTD	UNITED KINGDOM	95.882	17.032
REVIEW OF ECONOMIC STUDIES	OXFORD UNIV PRESS	UNITED KINGDOM	95.845	4.89
REVIEW OF ECONOMICS AND STATISTICS	MIT PRESS	UNITED STATES	94.977	4.345
REVIEW OF EDUCATIONAL RESEARCH	SAGE PUBLICATIONS INC	UNITED STATES	99.81	8.327
REVIEW OF FINANCIAL STUDIES	OXFORD UNIV PRESS INC	UNITED STATES	95.647	4.649
REVIEWS OF GEOPHYSICS	AMER GEOPHYSICAL UNION	UNITED STATES	99.412	21.449
REVIEWS OF MODERN PHYSICS	AMER PHYSICAL SOC	UNITED STATES	99.412	45.049
SCIENCE	AMER ASSOC ADVANCEMENT SCIENCE	UNITED STATES	97.887	41.846
SIAM REVIEW	SIAM PUBLICATIONS	UNITED STATES	99.808	11.431

WoS Title	Publisher	Publisher countries	Average Journal Impact Factor Percentile	JIF 2019
STRATEGIC MANAGEMENT JOURNAL	WILEY	UNITED STATES	88.829	5.463
SYSTEMATIC BIOLOGY	OXFORD UNIV PRESS	UNITED STATES	91.176	10.408
TRENDS IN COGNITIVE SCIENCES	ELSEVIER SCIENCE LONDON	UNITED KINGDOM	98.44	15.218
WORLD POLITICS	CAMBRIDGE UNIV PRESS	UNITED STATES	82.562	2.5
WORLD PSYCHIATRY	WILEY	ITALY	99.663	40.595