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Peer review in mega journals compared with traditional scholarly journals – does it make a difference?

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Abstract
A Megajournal is an open access journal which publishes any manuscript which presents scientifically trustworthy empirical results, without asking about the potential scientific contribution prior to publication. Megajournals have rapidly increased their output and are currently publishing around 50,000 articles per year. We report on a small pilot study in which we looked at the citation distributions for articles in megajournals compared to journals with traditional peer review, which also evaluate the proposed ”contribution”. We found that elite journals with very low acceptance rates have far fewer articles with no or few citations, but that the long tail of articles with two citations or less was actually bigger in a sample of more selective traditional journals in comparison to megajournals. This indicates the need for more systematic studies, since the results raise a lot of questions as to how efficiently the current peer review system in reality fulfills its filtering function.

The ”Megajournal” has rapidly emerged as a new type of peer reviewed scholarly journal[1]. A Megajournal is an open access journal which publishes any manuscript which presents scientifically trustworthy empirical results, without asking about the potential scientific contribution prior to publication. Traditionally scientific journals use peer review not only to check for methodological trustworthyness, but also to determine if a manuscript offere a potential contribution to science[2]. The leading journals in many fields only accept a small share of manuscripts, whereas the majority of journals have less strict inclusion criteria. In practice the acceptance rate is a complex function of the norms of reviewers in the field in question, the journal's editorial policy and the journal's need to provide a steady flow of published articles in order to satisfy subscribers.

To qualify as a megajournal a journal also needs to have a very broad scope, such as all biomedicine or all social science, as well as a business plan to eventually publish several hundreds or thousands of articles per year. In practice it is difficult to launch a megajournal unless the publisher in question already has a strong brand, and megajournals tend to have moderate article processing charges, which are lower than the prices charged by scientifically leading OA journals or hybrid OA journals.

Björk in an earlier study identified 16 journals filling the criteria of a megajournal[3]. The total article volume in these rose very rapidly until 2013, but since then the growth has slowed down, in particular other journals have started to gain market shares from PLOS ONE. Several megajournal have quite rapidly been accepted for indexing in the web of science and have received reasonable impact factors. of the overall number of articles included in that index. The number of articles in megajournals constitutes around 10 % of the output of all reputable (DOAJ-indexed) OA journals, but almost 20 % of OA journals charging APCs. Since most of the leading megajournals mainly cover life science, their relative shares of the article output may be even higher for some fields. The number of articles in Web of science indexed megajournals, constitute around 3 % of all article indexed in that service.

In table 1 some data about the leading Megajournals are provided (the table is an updated version of data provided in the above article).

Table 1. Data about the leading megajournals. The article volumes for 2015 have been extrapolated from the situation of October 23r

	APC (USD)	Impact factor	2010	2011	2012	2013	2014	2015
PLOS ONE	1495	3.5	6913	13833	23441	31882	30054	30674
Scientific Reports	1495	5.1		211	800	2553	3941	9695
BMJ Open	1350	2.3		109	655	959	1037	1370
Springer Plus	1085	in2016			82	692	762	926
PeerJ	695	2.1				232	471	811
AIP Advances	1350	1.6		255	380	396	509	552
SAGE Open	195			44	113	225	217	427
G3	1950	2.5		65	257	250	272	332
Royal Society Open Science	1600						51	268
IEEE Access	1750					63	106	181
Biology Open	1350	2.4			143	162	137	174
FEBS Open Bio	1200	1.5		4	52	78	120	121
Journal of Engineering	1150					20	102	78
Elementa	1450					13	16	47
Heliyon	1250							25
Brill Open Humanities	655							0
Total number articles			6913	14521	25923	37525	37795	45656

For many big publishers megajournals fit nicely into a whole ecosystems of interrelated journals. Rather than converting existing journals to OA, a financially very risky venture, such publishers establish megajournals to tap into the stream of rejected manuscipts from their more selective top journals, in a system described as ”cascading reviews”.

The novel peer review of scientific soundness only whih is the cornerstone of megajournals, and the outcome of this review, is in focus in this article. It is in fact the combination of electronic only publication, open access and the APC revenue model which has enabled using this method. In traditional subscription publishing the publisher is committed to a steady flow of articles in quarterly, monthly etc issues. Hence the acceptance rate may often go down if the number of submissions grows, or the waiting time to be published grows. This is because the publisher has little economic incentive to increase the number of published issues. For megajournals the marginal cost of publishing an article is usually far below the marginal revenue and thus they have every incentive to increase the output.

Most traditional scholarly journals claim to conduct a peer review which in addition to the above scientific soundness also checks the elusive ”contribution” of manuscripts, and selects for publishing only manuscripts which are deemed

worthy of the attention of the journal's readership, scientifically and topic-wise. In practice this should lead to lower acceptance rates than in megajournals. If the peer review works according to the theory, that is in a unbiased way , it should also mean that all published articles in traditional should receive more citations, than the big tail of sound articles without a contribution published in megajournals.

Björk[3] has reported acceptance rates of between 51-69 % for megajournals. In one of the few more systematic studies of acceptance rates across disciplines Sugimota et al [4] found averages ranging between 30-46%, depending on discipline, for journals overall, and between 37 and 57 for OA journals. Top journals in most fields tend to have acceptance rates below 20 % and for instance Nature has reported 7 %[5]

In a highly simplistic view way the difference in acceptance rates between the average journals and the megajournals (around 20 %) could be assumed to consist of methodologically sound articles lacking in contribution, which would not have been accepted in journals using the stricter traditional peer review. This would imply that megajournals should have a bigger tail of uncited papers than comparable average journals.

In practice peer review is far from perfect, and also many scholarly journals are competing fiercely for manuscripts to fill the biannual, quarterly and monthly issues. There is a body of research on scholarly peer review[6], which points at severe problems with bias and arbitraryness[7]. Ex-ante judgements by two or three reviewers of contribution is not necessarily in full correlation with the ex-post judgement of impact by readers as witnessed by the amount of readership and in particular citations.

At the same time many articles in megajournals, despite the lower acceptance threshold have, offer contributions to scholarship according to readers who cite these. Many authors may choose to submit articles to megajournals which they might think could have passed the review also in more selective journals, because they appreciate the speed from submission to publication and the open accessibility of the megajournals[8]. One can actually provocatively ask if the end result in terms of filtering is so much different for megajournals compared to the vast majority of scholarly journals ? Highly selective top journals in different fields, with acceptance rates of 5-20 % are of course a different story, but they are a small minority.

One way to get some answers to this complex question would be to look at citation patterns for published articles. Citations are not necessarily the same as scholarly contribution, but they are useful proxy for it, since its possible to get comparable citation counts, at least for journals indexed in either either Web of Science of Scopus. A number of studies have looked into the distribution of citations to articles in journals (see for instance Radicci et al[9]) and found that citations over all the articles published in individual journals as well as in whole scientific fields tend to follow regular statistical patterns, with a few highly cited articles providing a lot of citations and with long tails of articles with no or very few citations. While such studies have looked at the overall distribution over articles, what would in this context be of interest is looking at the share of

articles with no or few citations (often selfcitations), which could be claimed to have offered no contributed recognised by other researchers.

Setting up a systemic study along these lines would be very difficulty, in particular in terms of setting up a control group for the megajournals (there are few comparable journals with equally broad scope in the life sciences). Nevertheless we decided to do a small test with just a few journals (we've noted their 2 year impacts factors in parenthesis,) We choose the two biggest Megajournals, PLOS ONE (3.2) and Scientific Reports (5.6), which also have published articles for a sufficiently long period for the citation counts. For comparison we chose two highly selective journals from PLOS: PLOS Biology (9.3) and PLOS Medicine(14.4), which combined cover the same areas as PLOS ONE, The OA journal Nature Communications (11.4) as well as the subscription journal Proceedings of the National Academy of Sciences, PNAS (9.7), which has a big yearly volume of around 3,000 articles, and which makes all articles OA after a half year embargo.

In stead of trying to find a sample of suitable less selective biomedical journal to compare with, and in view of the readership of Learned Publishing we chose to look at three leading information Science journals (in terms of impact factors), Journal of informetrics (2.4), Scientometrics (2.2) and Journal of the American Society for Information Science and Technology, JASIST (1.8),). All of these are subscription journals, but probably available to most scholars in information science via their libraries.

In order to compare the citation distributions of the journals we used citations data from Scopus, where we downloaded citations counts for all articles published in the selected journals during 2011–2013. We combined the data for PLOS Biology and Medicine. Noncitable objects such as editorials and reviews were excluded, using the filtering mechanism in Scopus. The data was retrieved in June 2015 allowing a minimum of 1,5 years time for the articles to collect citations. The cumulative distribution function curves for each journal are plotted in Figure 1.

Visually the results are quite striking. The four selective journals (all with impact factors between) have rather similar citation distribution curves, except for the fact that PLOS biology&medicine have a clearly higher share of articles with zero citations. The distribution curves for the three information science journals look very similar to the curves for the megajournals.

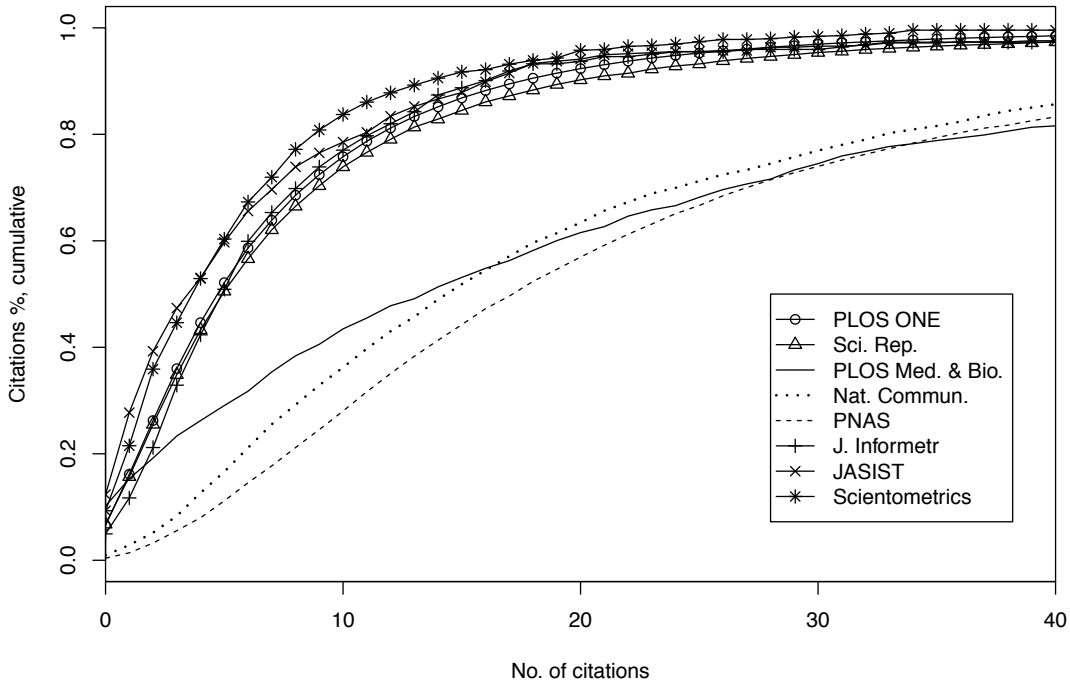

Figure 1. Cumulative frequency of citations for the studied journals.

Furthermore we looked more closely at the proportion of articles with less than two citations in each journal. These could be thought of as representing the long tail of articles with little or no contribution. A more detailed scrutiny might also reveil that part of these are selfcitations. In table 2 the shares of articles with very few or no citations are shown. We don't know why PLOS Medicine&Biology have as much as 10 % non cited articles, but a possibility is that some types of articles which in practice are not research articles might appear such in the data.

Table 2. Percentage of articles with two or fever citations per journal.

Citations	0	1	2	≤2
JASIST	12,3	15,4	11,5	39,3
Scientometrics	9,3	12,2	14,4	35,9
PLOS ONE	6,5	9,6	10,1	26,2
Sci. Rep.	6,8	8,9	9,8	25,5
J. Informetr.	5,0	6,8	9,5	21,2
PLOS Med. & Bio.	10,2	5,1	3,9	19,2
Nat. Commun.	1,0	1,9	2,3	5,2
PNAS	0,4	1,0	1,8	3,2

Too many conculsions cannot be drawn from our very limited convenience sample. For one thing the megajournals, being OA, might offer a small citation advantage compared to the subscription journals. Nevertheless drawing on the previous work of Chatterjee at al[10], which found that the citation distribution of general and elite journals were quite distinctly different, we found that the outcome for the megajournals seems quite similar to traditional journals in the same impact factor range, and that both of these journal categories differ clearly from the ”elite” journals we compared to.

As more data accumulates we hope other researchers would become interested in this topic and a carry out a systematic study. The basic data is already available via the citation indexes.

So if the end result of the peer review system is quite the same for mega journals as for the average traditional journals would’t this type of peer review by scientific trustworthyness be desirable for both authors and readers. A substantial share of manuscipts rejected in the first journal submitted to eventually find an alternative journal where they are published. And often the second choice journal need not even be less selective, it can just be a question of which editors and peer reviewers happen to be in control. From the authors’ viewpoint as well as from other academics’ viewpoint, both as readers and reviewers, this is a waste of resources and time.

So why aren’t megajournals increasing their market shares faster, as predicted a couple of years ago[1]. There could be three reasons for this. Firstly megajournals can only function as OA journals and are highly dependent on the development of that market segment, in particular the authors or their funders willingness to pay APCs. Secondly as the journals grow in volume to several thousand manuscripts per year it may become increasingly difficult to recruit motivated reviewers, since this type of review is intellectually less stimulating compared the traditional one. Also the benefit for the unpaid reviewers in terms of networking and increased social capital may be less than in reviewing for niche journals not to mention top journals in their field. Thirdly and perhaps most

importantly researchers may be willing to include one or two megajournal articles in their publication lists, but need to show up a balanced portfolio including also publications in elite journals and niche journals in their CVs, in order to be competitive for appointments and grants. It symptomatic that PeerJ which started out by a membership payment scheme geared to multiple publishing, now has also started to offer a traditional APC.

This article is purposefully a bit provocative, but we believe we are asking a highly relevant question. If in fact the outcome and leaving it to the readers to determine the contribution doesn't make much difference, compared to the vast majority of journals, this could have big concesequences for how peer review evolves in the future.

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