

Categoría: Congreso Científico de la Fundación Salud, Ciencia y Tecnología 2023

ORIGINAL

Business science: Overproduction, self-citations and Article processing charge (APC)

Ciencias empresariales: Sobreproducción, autocitas y tasa por tratamiento de artículos (APC)

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Citar como: Luiz Pinto A, Shirshahi S, Varmazyar R, González-Valiente CL. Ciencias empresariales: Sobreproducción, autocitas y tasa por tratamiento de artículos (APC). Salud, Ciencia y Tecnología - Serie de Conferencias 2023; 2:444. <https://doi.org/10.56294/sctconf2023444>

Recibido: 06-06-2023

Revisado: 05-08-2023

Aceptado: 07-10-2023

Publicado: 08-10-2023

ABSTRACT

Business science is a field that has been facing some challenges recently, especially when it comes to overproduction (hyperprolific), excessive self-citations, and charging for publications in open-access journals. To shed light on these issues, a recent study was conducted based on three cases. The first case focused on super-producing authors, where an advanced search strategy was used to identify the ten most productive authors in Brazil in the last five years. The study found that these authors published a paper on average every 2,68 days, a staggering rate. Interestingly, these authors had a direct relationship and published their articles in collaboration, always in the same journal. The papers all dealt with RIFM fragrance ingredient safety assessment, and while they were typical mass production, the citations were very low. The second case examined self-citations, where a research group published 15 papers in the last five years, with seven of them published in a journal that the group had purchased. The analysis found that two of the most representative authors in the research group obtained a significant number of self-citations. Finally, the study looked at the costs associated with publishing in open-access journals. The analysis found that some journals charge many publishing fees for accessing and indexing on platforms, which can be a significant barrier to disseminating research. Overall, these cases highlight the challenges faced by the science industry and the need for measures to ensure fair and transparent practices.

Keywords: Periodicals as Subject; Science; Dissemination; Research; Information Access.

RESUMEN

La ciencia empresarial es un campo que se enfrenta últimamente a algunos retos, especialmente en lo que se refiere a la sobreproducción (hiperprolífica), el exceso de autocitas y el cobro por publicar en revistas de acceso abierto. Para arrojar luz sobre estas cuestiones, se ha realizado un estudio reciente

basado en tres casos. El primer caso se centró en los autores superproductores, donde se utilizó una estrategia de búsqueda avanzada para identificar a los diez autores más productivos de Brasil en los últimos cinco años. El estudio descubrió que estos autores publicaban un artículo cada 2,68 días de media, un ritmo asombroso. Curiosamente, estos autores tenían una relación directa y publicaban sus artículos en colaboración, siempre en la misma revista. Todos los artículos trataban de la evaluación de la seguridad de los ingredientes de fragancias RIFM y, aunque eran los típicos de producción masiva, las citas eran muy escasas. En el segundo caso se examinaron las autocitas, en las que un grupo de investigación publicó 15 artículos en los últimos cinco años, siete de ellos en una revista que el grupo había comprado. El análisis reveló que dos de los autores más representativos del grupo de investigación obtuvieron un número significativo de autocitas. Por último, el estudio examinó los costes asociados a la publicación en revistas de acceso abierto. El análisis descubrió que algunas revistas cobran muchas tasas de publicación por el acceso y la indexación en plataformas, lo que puede suponer un obstáculo importante para la difusión de la investigación. En general, estos casos ponen de manifiesto los retos a los que se enfrenta la industria científica y la necesidad de medidas que garanticen prácticas justas y transparentes.

Palabras clave: Publicaciones Periódicas como Asunto; Ciencia; Difusión; Investigación; Acceso a la Información.

INTRODUCTION

Scientific development takes many forms, such as production in high impact journals, consolidated research groups, prestigious institutions with financial backing and quality media. However, some actions have translated the doubt about this development. Among these actions we find our approach to research, mass production, abuse of self-citation and abusive charging of publication fees.

Academia mass production

Mass production, which once for almost everyone rang the bell of the industrial revolution and seemed like a vocabulary term referring to mere industrial or business concepts, has dramatically come closer to scientific outcomes recently. Academic productions have always been accountable for representing the dedication of the holder to the subject.⁽¹⁾ Consequently, it has been abundantly compelling for researchers to pinpoint their names in the beloved major by publishing as many papers as they can. Nowadays, nonetheless, in the realm of scientific inquiry, a multitude of dynamics shape the landscape of knowledge production.

The proliferation of super-producing authors (hyperprolific), individuals who generate an extraordinary volume of research output within remarkably condensed timeframes, has emerged as a subject of increasing scrutiny. Within this study, we present a comprehensive analysis of ten preeminent authors who have collectively contributed an astonishing number of papers and other contributions over a span of five years. This phenomenon, however, is not a mere problem and can highly likely increase the possibility of plagiarism⁽¹⁾ and the dubious quality of scientific research.

Self-citation

Citations may serve as a sign of the importance, value, focus, visibility, or immediate influence of a work in the academic community, a way to measure contributions.⁽²⁾ A sizeable portion of all citations, though, are self-citations. It simply refers to the act of authors citing their own earlier works. This phenomenon can be attributed to a number of motivations, such as the progressive nature of a researcher's research journey, the desire for personal validation, and the realization that self-citation is a tactical and persuading tool in the pursuit of prominence and authoritative standing in the field of scientific discourse.^(3,4) Recognizing one's own contributions serves to validate the importance of one's

own ideas and expertise within the academic community while also serving as a monument to the ongoing evolution of knowledge. Arguably, the number of authors in a publication is positively correlated with the number of self-citations.⁽⁵⁾ Also there are no huge differences between self-citations and citations of others.⁽⁶⁾

In this inquiry, we delve into the intricate realm of self-citation practices, shedding light on a research group that habitually cites its own body of work. The analysis encompasses 15 publications within the span of five years, with a notable concentration of seven papers featured in a journal affiliated with the research group. Of particular interest are two prolific authors within this cohort.

Article Processing Charges (APCs)

An essential method for funding open access (OA) scientific publishing is article processing charges (APCs).⁽⁷⁾ It would be seen closely as equal to the subscription fee in peer-reviewed journals, allowing OA to operate.⁽⁸⁾

This study scrutinizes the economic dimensions of scientific publishing through an examination of APCs. By focusing on data derived from the OpenAPC platform, we illuminate the financial implications associated with publishing in open-access journals. Our analysis hones in on the ten journals that reaped the highest APC revenues in the year 2022. This exploration unveils a diverse spectrum of charges levied for publication, access, and indexing, thereby providing critical insights into the evolving economic model underpinning scholarly dissemination.

Collectively, these investigations offer a multi-dimensional panorama of contemporary scientific production, prompting critical reflections on the evolving nature of scholarly inquiry, its dissemination, and the economic underpinnings that sustain it. The ensuing discourse seeks not only to delineate the contours of these phenomena but also to stimulate a broader conversation on the imperatives that govern the pursuit of knowledge in our modern era.

This study delves into three critical facets that collectively highlight a shifting paradigm within the world of scientific research. Specifically, we examine the phenomenon of super-producing authors, the prevalence of self-citation practices, and the implications of Article Processing Charges (APCs) on open-access publishing.

Literature Review

The business of science is a problem, especially when it comes to overproduction, excessive self-citations, and charging for publications in open-access journals. There is a critical question that is of great importance to universities, funding agencies, and scientists who must compete for research money. The question is: who among the many researchers is most likely to bring about a new era of scientific breakthroughs? Currently, citations are the primary means of evaluating a scientist's productivity and impact. However, there is growing concern over the use of excessive self-citations to build sustainable careers in science. Incorporating superfluous self-citations is an easy way to boost scholarly impact and visibility, which are necessary for moving up the academic ladder. This behavior is likely to increase, given the recent rise in popularity of web-based citation analysis tools. Therefore, new metrics centered on transparency need to be developed to curb this form of self-promotion. If left unchecked, excessive self-citations can have a negative impact on the scientific workforce, the way we publish new knowledge, and ultimately, the course of scientific advancement.⁽⁹⁾

Citation metrics assess scientific research, but adjustments are needed for accuracy. Self-citations are often handled poorly. The authors argue for the visibility of self-citation data within the academic community for a more open understanding of research impact. Academic researchers often use self-citations to establish their expertise and advance their careers. However, this practice has raised concerns about the accuracy of citation metrics. A recent study found that self-citations make up 5 % of

total citations,⁽¹⁰⁾ highlighting the need for greater transparency in self-citation data within academic circles.⁽¹¹⁾

As the importance of academic publications continues to grow for career advancement, self-citation is likely to become an even more prominent aspect of research. Tracking self-citation trends across various journals and disciplines over the past 50 years has revealed a significant increase in self-citations. Yet, there is still ongoing debate regarding the reliability of these citations. A comprehensive study analyzed 3517 Highly Cited Researchers to determine their self-citation patterns across 21 fields. The results yielded a graphical method for identifying instances of exceptional self-citation rates. It's important to note that co-authors also reap benefits from such practices, and their work should be considered no less valid than that of a self-citer. By removing research papers with inflated citation counts resulting from egregious self-citation, we can effectively communicate disapproval to offenders and improve the overall quality of the research information system.⁽²⁾

A recent study delved into self-citation trends within the computer science domain, identifying five distinct patterns. The research revealed that self-citations can artificially inflate scientific impact and adversely impact metrics such as author impact factor and H-Index, if entirely disregarded in the total number of received citations. The study employed regression-based prediction models to accurately forecast self-citations influence on future H-Index scores.⁽¹²⁾

Attached to the fact of citations and self-citations, there is another interesting phenomenon in current science, which is the hyperprolific of scientists, where it is represented by an abnormal scientific production that is impossible to be real. A clear example is from a researcher at the University of Vigo, in Spain, specializing in Food Technology (Meat), who published around 176 papers in 2022.⁽¹³⁾

High productivity (hyperprolific) became a relevant element for institutions, especially in the global range of production and scientific activity. In relation to this,⁽¹⁴⁾ a study was developed with the 1 000 most productive authors in Scopus between 2000 and 2016 and a survey was carried out with some of the main authors (265 authors, without the Chinese and Koreans), where they will send an email to these authors to find out how they managed to publish a high number of works per year. Interestingly, 81 authors answered that they achieve abnormal production by doing: "hard work; love of research; mentoring of many young researchers; leadership of a research team, or even many teams; extensive collaboration; work in multiple areas of research or essential services; availability of extensive and adequate resources and data; culmination of a great project; personal values such as generosity and sharing; growth experiences; and sleep only a few hours a day." The big problem is that publishing 72 jobs per year means 1 job every 5 days. It is impossible to achieve that in normal scientific development. Even for areas that bring together many authors, such as in the field of physics, that is abnormal.

However, it is likely that they have stopped addressing the results more fully, where they suggest that not only productivity analyzes should be performed but also use of research activities (measured in terms of citations).⁽¹⁵⁾

The suggestion is that to create a regular productivity database you must also take into account the impact that the authors add to the area or science. That is represented by quotes.

Another contribution was a study in the field of Computer Science, where they investigated publications from 2010 to 2020 in the DBLP repository.⁽¹⁶⁾ They created a method in relation to the editing of journals and the productivity of the authors; where this happens very frequently (authors who only publish in a single journal), there is a great possibility of a scientific anomaly occurring. The view that many publications by an author are in the same journal makes sense with our proposal, and we believe that this relationship is very significant for the identification of hyperprolific authors.

This phenomenon has become constant in some parts of the world. For example, in Spain, many institutions have benefited from hyperprolific authors, where they improve their indexes in the webometric ranges,⁽¹⁷⁾ in a study where they analyzed the authorship patterns of researchers, aiming to identify the productivity and impact of the country's scientific elite, where they compared Google Scholar

data with that of the Web of Science, the percentage in which authors sign with the first author, and the degree of highly productive authors (hyperprolific). In the study, they identified that the most adept authors of high productivity processes without impact and in almost always the same journals were from the Social Sciences and Humanities, but they warn that in the case of experimental physics, the excessive number of authors also has an aspect of super-billing scientific productivity.

Another relevant aspect is the collection of scientific articles in open-access journals. This type of behavior is the third element that we are going to revisit in this study, where it is a normal practice of private journals (or multidisciplinary publishers, such as Elsevier, Pinguin, and Springer, among others), but in open access journals it is a bit contradictory.

Even knowing that many journals do not have funding to publish their publications, the added value can be very high for content that is said to be free and open access. Almost always, the journals that remain 100 % free are from public institutions and from developing countries, where the institutions maintain all the publishing costs, but that is not sustainable in the long term.

Outside of this scope of public institutions, there are many mixed organizations that use the name of open access journals to control a brutal investment market,⁽¹⁸⁾ even associate these organizations with supposed predatory magazines.

Another study reviewed 787 journals between the years 2000 and 2011, looking at changes in journals' drive to earn revenue from publishing, where many journals from commercial publishers say their journals are open access but not on the diamond model (which It's all open). These editors represent more than 49 % of the total evaluated, according to research data.⁽¹⁹⁾

It is worth telling that we do not believe that income for publication is a problem in the scientific environment, but there are journals that charge astronomical values, such as the 122 966 Euros that Scientific Reports journal has achieved with its papers in the year 2023, source of the OpenAPC generated by journals, organizations, and the publication model.⁽²⁰⁾

With these three analysis challenges, we have carried out our research and its contributions to the scientific community, which believes that science can be better represented in the open-access model.

METHODS

This study is based on three cases to represent that something bad is happening with the world of science production, especially super-producing authors, excessive self-citations, and charging for publications in open access journals.

For the overproduction, we carried out an advanced search strategy in a database (Web of Science) with the expression by country (CU=Brazil), with selection of all possible bases (Science Citation Index Expanded; Social Science Citation Index; Arts & Humanities Citation Index; Conference Proceedings Citation Index - Science; Conference Proceedings Citation Index - Social Science & Humanities; Book Citation Index - Science; Book Citation Index - Social Science & Humanities; Emerging Source Citation Index; Current Chemical Reactions, and, Index Chemicus), date of the last five years (until September 7, 2023) and selecting the 10 most productive authors in the refinement part. As an analysis and graphics resource, we use VosViewer analysis software.

Regarding the analysis of self-citations, we have carried out an investigation in the Web of Science database by a research group, which in the last 5 years has signed n=15 works with the group's Affiliation (AF), where the authors appear in the authors. It is relevant to mention that we sought to identify self-citations, but what happens with the database that only identifies internal self-citations, that is, only in journals indexed in the database, and does not identify self-citations from research groups? Well, this is a way to circumvent the system. From there, we have concentrated on recovering things from the group and identifying self-citations from friends and self-citations, which can be very complex and extensive in the analysis.

In this technique, we use a graph generation system, replacing the authors with numbers, leaving only the two main authors cited as (Authors A and B) and the research group as Citing Group and Cited Group. For the representation, we use Excel transformation software for .net, which will later be represented in VosViewer for the generation of the graph.

As a last case of science as an economic business, we have the cost of publishing in some scientific journals. That's called APC (article processing charges), and your publication rates can vary greatly.

In the analysis that we have carried out, it was on the OpenAPC platform, which does not seem to have much open access, since they are journals with more or less open access and that charge a lot of fees, whether in publishing, accessing, or indexing on platforms. We conducted research by publisher, with journal refinement and used a filter for year of publication (2022), selecting only the 10 journals that earned the most with APC.

The good thing about this platform is that the data is generated by OpenAIRE in collaboration with the Universität Bielefeld, and the data is reliable and updated by year or by study period. Beyond the data, it also generates its own graph in a treemap or table.

RESULTS

As explained in the development part, this study is based on three ways of explaining how science is much more for business than for the development of humanity. That is why we are going to present the three forms.

Storytellers with super production

In the universe that we have drawn from the 10 most productive authors, the first 9 have n=661 papers in 5 years, and one author has n=660 papers. If we do a very simple calculation for the period studied, these authors publish a paper every 2,68 days. Let's say that it is impossible and unsustainable to maintain that type of productivity for a long time, and that I do not consider that to be science; it is something else.

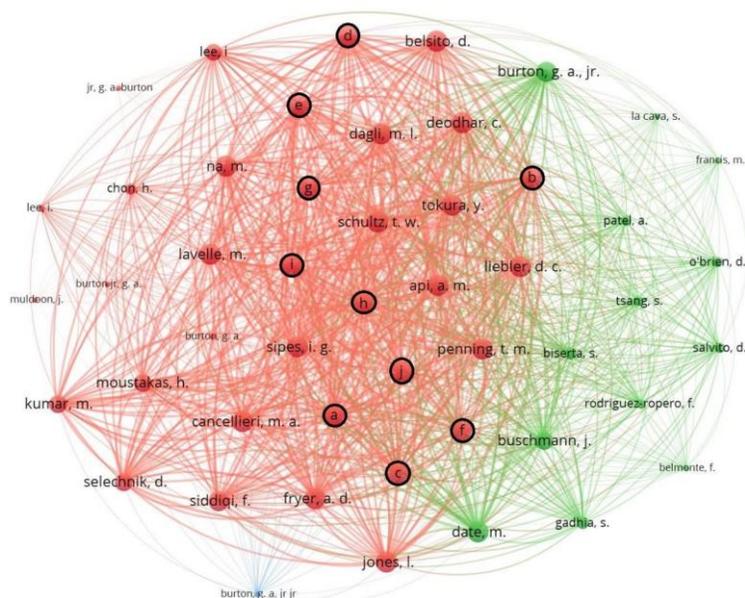


Figure 1. Hyperprolific author network

Another relevant element is that the 10 authors have a direct relationship; they published the papers in collaboration and always in the same journal (Food and Chemical Toxicology). A curious fact about this

The group's practice is strange because it always has the papers signed collectively and represents the aforementioned statements of its majority partners as the most representative in the system.

Self-citation can be used in science. There's nothing that says an author or group cites their participants, but overuse is what makes the whole system strange.

In our case, author A self-cited $n=1,27$ for each paper represented in the analysis, while author B self-cited $n=2$ for each paper published. That is more than the representation that ⁽⁵⁾ reported for the analysis of Norway, between the years 1981 and 1996. The relevant point of the comparisons is that the self-citations, outside of the context, are normal quotes and underrepresented by other authors. It is evident that the group self-cites to improve its indexes and not to represent the scientific improvement of a field or area of knowledge. It is like a cycle to improve visibility in order to inflate the representativeness and importance of the scientific scene.

Charges for publishing in open access journals

The third analysis carried out, in the context of science as a business, addresses the charging for the publication of articles in open access journals. It is not that we think it is prohibited or illegal, but it is clear that scientific control is secondary in some cases, such as the one represented in figure 3, where many open access journals had very high income in 2022.

Measure:	Sum	Number of Articles	Mean Value	Standard Deviation	
					Download as: CSV JSON
Journals (3870 entries*)	Sum	Number of Articles	Mean Value	Standard Deviation	Percentage
Journal A	€1.941.690	378	€5.137	€827	4.10%
Journal B	€1.592.077	805	€1.978	€181	3.36%
Journal C	€1.041.429	538	€1.936	€378	2.20%
Journal D	€795.874	305	€2.609	€580	1.68%
Journal E	€715.566	263	€2.721	€488	1.51%
Journal F	€709.498	321	€2.210	€333	1.50%
Journal G	€708.294	402	€1.762	€284	1.50%
Journal H	€524.329	253	€2.072	€411	1.11%
Journal I	€515.393	300	€1.718	€384	1.09%
Journal K	€477.021	180	€2.650	€495	1.01%
+ view small values					
Total	€47.353.914	22718	€2.084	€958	100%

Figure 3. APC of journals

In this model, the 10 journals with the highest profitability (2022) were selected, where there were variations in the number of works published and also a varied value in the sale of each article. For the analysis, we have the total sum of each magazine, the number of articles, the average sales per article, the standard deviation of sales, and the percentage of financial profitability of the system.

It does not require much effort to analyze the fact that the process is a business and that the publication of open-access journals is just a curtain for the negotiations of commercial publishers. It is also clear that in this business, the authors do not earn any participation; on the contrary, it is likely that they pay to publish, the institutions they represent pay for access to their work, and the governments that finance the business. Research pays for the access that these journals have on large platforms, such as Web of Science and Scopus.

Unfortunately, the three types of analysis we report in these results are constant and increase the revenue of commercial publishers every day. This is why some institutions began to boycott publishers and large information access platforms.⁽²²⁾

CONCLUSIONS

The results of the present study highlight the concerning issue of self-citation, which can be a tool for authors to artificially inflate their scientific impact. The study reveals that self-citations, if completely removed from total received citations, can significantly affect AIF and H-Index values, which are widely used to evaluate an author's research performance. The findings of this study corroborate those of previous research which also pointed out the potential dangers of self-citation.⁽¹²⁾ The authors of the present study note that while self-citation can be used to credit an author's own work, it can also be manipulated to artificially boost their scientific impact.

Another important finding of the study is the commercialization of publishing articles, particularly in open access journals. The study highlights the growing trend of using open access journals as a source of income, which can lead to a lack of emphasis on scientific research and advancement. The study's authors point out that some open access journals prioritize profits over research, which can undermine the credibility of scientific research. The findings of the present study align with another study that also found that some open access journals are more interested in earning revenue than promoting science.⁽²³⁾

The present study underscores the need for a fair and transparent evaluation of research performance, one that takes into account the quality and originality of the research rather than the number of citations. The authors call for greater scrutiny of self-citation practices and the commercialization of publishing articles to ensure the integrity of scientific research and promote a more objective measure of research performance.

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FINANCING

No hay financiación.

CONFLICT OF INTEREST

Ninguno.

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