



## JOURNAL IMPACT FACTOR AND ACADEMIC ETHICS

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**Abstract.** This article provides an overview of cases wherein the journal Impact Factor was manipulated; and attempts explaining the possible causes thereof. The discussion is focused on the Lithuanian scientific community with some parallels drawn to a similar situation in China. The article argues that certain science administration practices may undercut the self-governance of science based on academic ethics.

**Keywords:** Impact Factor; citation; academic ethics; causes of misconduct; science policy.

### Introduction

In some countries, assessment of the research output produced by research institutions for the purpose of funding, award of positions, promotions, or national prizes tends to attach more weight to the number of publications in journals with high Impact Factor rather than to the quality of the performed research. The rationale for such practice can be explained by the claim stating that *all* publications in journals that have a high Impact Factor based on citation counts must also be of high quality despite of the fact that it was never proven. On the contrary, there is an increasing consensus (Adler *et al.* 2009) that:

- citation counts do not determine the quality of a journal, let alone the quality of a paper in the journal;
- the Impact Factor is a crude statistic, which does not separate types of citations;
- the Impact Factor is a flawed statistic because the distribution of citations among papers is highly skewed and refers to citations within the first two years after its publication;
- the database used to estimate the Impact Factor contains errors and includes a biased selection of journals.

The main problem with the Journal Impact Factor (JIF) is a possibility to manipulate its value. The article argues that a possibility to increase the citation count in an attempt to publish as many papers in journals with high JIF as possible, which is often referred to as the “publish or perish” culture, creates an initiative to break norms of scientific ethics. This topic is discussed in the paper.

The article mostly focuses on the use of paper counts and the JIF to evaluate scientific research in Lithuania. As there is no research data available on research quality that

would reveal effects of such practice, obvious facts and some random information has to be used. The third section of the article draws parallels with the situation in China, where a similar science administration practice is used. The fourth section describes a recently published case-study on the JIF manipulation in order to illustrate the extent of possible misconduct. The following section begins with some standard information about bibliometric indicators.

## **Journal Impact Factor**

The predecessor of the JIF was established around 1961 as a tool of scientometrics – the science of measuring and analysing science. The modern scientometrics originated from the work of Derek J. De Solla Price (Price 1963) and Eugene Garfield. The latter founded the Institute for Scientific Information, better known as ISI. Currently, the institute is owned by Thomson Reuters Corporation. The idea is to look at the count of citations and compare it to that of other papers in the field. More specifically, the JIF is defined as the  $A/B$  ratio, where  $A$  is the count of citations during a particular year to journal articles within the previous two years and  $B$  is the total number of research articles in the journal during those two years.

Since the JIF is based on citation counts, it is often suggested that a paper published in journals with a high JIF is more valuable than those published in journals with a low JIF. Garfield and ISI website are usually cited to support such argument. No sound statistical analysis was ever performed to show a relationship between science quality and JIF. On the contrary, the numerous problems with using JIF to evaluate research have long been recognised (see e.g. Seglen 1997).

As discussed below, one of the problems is a possibility to manipulate JIF. If it is possible to manipulate an indicator; thus, as soon as such indicator becomes a target, it loses the initial intent. This idea lies at the heart of the Goodhart's law in economics, which states that "any observed statistical regularity will tend to collapse once pressure is placed upon it for control purposes". Charles Goodhart formulated this law in a 1975 paper, in which he characterised the monetary policy of Margaret Thatcher based on suitable targets. However, the law applies in other areas as well. It can be argued that the Goodhart's law applies to the Journal Impact Factor (JIF) since it is often used to indicate the quality of science.

Bibliometric indicators and publication counts have been used in many countries for science research evaluation purposes. This phenomenon is referred to as "publish or perish" culture.

## **Responses to "publish or perish" culture**

It is reasonable to expect that as soon as the account of citations becomes an accepted measure of research quality in science policy, it may also become a target for scientists and alter their behaviour. Thus, a technical question remains, i.e. what kind of behaviour might help to enhance the account of citations.

*There are ways of accumulating citations that have little to do with scientific value. The simplest way of circumventing the hurdle of productivity enhancement is the formation of citation cartels. One's account of citations can also be augmented without enhancing one's productivity by playing off one's power as an editor or referee. Why not suppress papers submitted for publication as long as the authors do not understand to whom they owe a citation? (Franck 1999).*

In case an author does not understand to whom he owes a citation, some journals explicitly state that “no reference to the *Name of Journal* indicates that this journal might not be the most natural or suitable outlet for your research”. Google search indicates that at least five journals currently contain this phrase in the section “Instructions for Authors”. Three of them: *Business, Management and Education*; *Journal of Civil Engineering and Management* and *Journal of Business Economics and Management* are co-published by Vilnius Gediminas Technical University, Lithuania. Another two journals that offer the same piece of advice to authors are: *International Journal of Management and Engineering Management*; and *Journal on Food System Dynamics*.

Far less officially, a list of papers published in *Transformations in Business and Economics* is circulated among potential authors suggesting to cite the papers from the list. As stated in an e-mail message (personal communication), dated as of 16 April 2009, the list was produced according to an agreement between Vilnius University Kaunas Faculty of Humanities and Kaunas University of Technology. According to another e-mail message (personal communication), dated as of 12 March 2009, a similar agreement exists between partners from *Inzinerine Ekonomika – Engineering Economics* journal and the above mentioned journals co-published by Vilnius Gediminas Technical University. This way, a quota of papers from suitable journals to be necessarily cited is suggested and an appropriate control of referees is used.

These facts illustrate the response to the science policy measures accredited in Lithuania. The methodology on funding of institutions adopted by the Lithuanian Ministry of Education and Science includes suitable formulas that measure a value of a publication depending on the JIF and based on publication counts. This solution provides institutions with a possibility to compete for scarce financial resources, hoping to increase international visibility and the number of high quality publications.

Journal editors have long been attempting to manipulate the JIF. Such cases were even criticised in public by such newspapers as *The Wall Street Journal* (see Begley, 2006). However, there is a striking difference in the degree of openness with which such manipulations are performed at present. It shows that the scientific community no longer believes it to be wrong; which is well illustrated by the above described e-mail message, which also explains that the agreement between journals is a response to the science policy (administration) which only counts citations.

Lithuania is not the only country, which administrates science with the help of financial instruments to foster scientific progress. The People's Republic of China is another country with a similar situation. Jufang Shao and Huiyun Shen from Zhejiang University College of Medicine describe the academic reward structure in China with some details:

*In China, the academic level of a university or an institution is evaluated mainly on the number of SCI [Science Citation Index] papers, EI [Engineering Index] papers, ISTP [Science and Technical Proceedings] papers, and the research grants it receives. ... Many universities and institutions use monetary rewards to encourage staff to publish more SCI, EI, and ISTP papers. The theory is simple and pure economics. Money motivates: pay people to publish in good journals and they' try to do so. Monetary rewards are the best; money is a universal reinforcer. Greed, pride, and envy will all work to get academics eagerly and enthusiastically publishing in the best journals. (Shao, Shen 2011).*

As an example, they also provide the following reward system in Zhejiang University. If a paper is:

- indexed in ISTP – EUR 65;
- indexed in EI – EUR 80;
- Impact Factor (IF) <1 – EUR 217;
  - 1 ≤ IF < 3 – EUR 325;
  - 3 ≤ IF < 5 – EUR 433;
  - 5 ≤ IF < 10 – EUR 542;
  - 10 ≤ IF – EUR 1520;
- published in *Science* or *Nature* – EUR 21710.

It seems that the clear and direct reward system is very effective. In 2008, the total of 270924 papers from China accounted for 11.5% of all papers and ranked second in the world (Shao, Shen 2011). However, the authors of the article see this as a problem since the outflow of good papers from China has become very common and tends to increase each year.

A similar problem may occur in Lithuania. Since very few Lithuanian journals have sufficiently high JIF, the tendency among Lithuanian scientists is to publish their papers outside the country. Under such circumstances, Lithuanian journals have to either close the journal or try to increase its JIF by any means.

A different type of problems that arise from the use of JIF as a measure of quality has recently been spelled out by Nai-Xing Wang, a professor at the Technical Institute of Physics and Chemistry in Beijing:

*The biggest problem remains the obsession with journal Impact Factors. Generally speaking, articles in journals with high Impact Factors are judged to appeal most readers, but not every paper published in a high-impact-factor journal is high quality, and papers published in lower-ranked journals are never worthless. Yet some administrators in China take a very crude approach: high-impact-factor publications mean excellent work (Wang 2011).*

The obsession seems to be very similar to that in Lithuania. Since Nai-Xing Wang is a researcher in organic chemistry, he sees the following effects of this situation in his favourite subject:

*If a high Impact Factor is the only goal of chemistry research, then chemistry is no longer science. It is changed to a field of fame and game. There are other*

*effects too. Administrators in almost every university and research institute like to evaluate researchers by their papers at the end of each year. As a result, chemists often choose easy research topics that can be written up inside a year. There are still some chemistry projects that last five years, but they are rare. Some topics are finished and written up inside six months. It is not unusual for a professor to publish ten papers in a year. And the outcome of a single project is usually split into several parts to produce more papers, which individually offer less information to readers (Wang 2011).*

It is of no surprise that “the pressure to rack up publications in high-impact journals could encourage misconduct” as another article in *Nature* provides the following information from China:

*However, several sources revealed to Nature that roughly one-third of more than 6000 surveyed across six top institutions admitted to plagiarism, falsification or fabrication. Many blamed the culture of jigong jinli – seeking quick success and short-term gain – as the top reason for such practices, says Zeng Guopin, director of the Institute of Science Technology and Society at Tsinghua University in Beijing who was involved in running the survey. The second most-cited cause is bureaucratic interference in academic activities in China. Most academic evaluation – from staff employment and job promotion to funding allocation – is carried out by bureaucrats who are not experts in the field in question, says Fang Shimin, a US-trained biochemist who runs a website called ‘New Threads’ that exposes research misconduct in China. “When that happens, counting the number of publications, rather than assessing the quality of research, becomes the norm of evaluation”, he says (Qiu 2010).*

In Lithuania, academic evaluation – from staff employment and job promotion to funding evaluation – is carried out by scientists rather than bureaucrats. However, the rule remains the same, i.e. counting the number of publications. This rule became so natural to most members of Lithuanian academic community that nobody even thought of changing it, when it recently became redundant. This clearly shows that vanity is a second nature to most of us.

While this section illustrates the “publish or perish” culture in Lithuania and China, the next one shows that similar phenomenon exists in other countries as well.

### **Further examples of JIF manipulation**

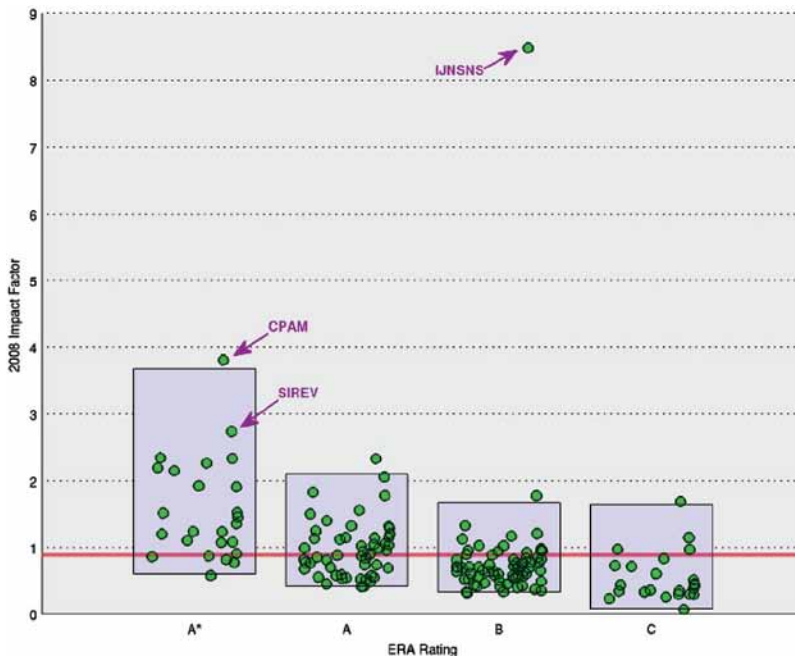
This section presents the example from the article by Arnold and Fowler, 2011, which illustrates an extreme case of manipulation with JIF. It shows how *The International Journal of Nonlinear Science and Numerical Simulation* (IJNSNS) succeeded to dominate the Impact Factors of all journals in the category “mathematics, applied”. This journal took the first place in the JIF charts in years 2006, 2007, 2008 and 2009. However, the reputation of this journal was never near the top of its field. In 2008, IJNSNS had an Impact Factor of 8.91 in ISI Journal Citation Reports. The second and third highest Impact

Factors, *Communication on Pure and Applied Mathematics* (CPAM) and *SIAM Review* (SIREV), have Impact Factors of 3.69 and 2.80, respectively, in the same year. These two journals have a reputation for the highest excellence.

One strange thing in this case in particular is a clearly huge gap between the first and the second places in the JIF ranking for the same category of journals. The second strange thing is a completely opposite picture provided by the evaluation based on expert judgment. Namely, The Australian Research Council supplied such evaluation, listing quality ratings for over 20000 peer reviewed journals across disciplines and from all over the world. The assigned quality rating is one of the four values:

- A\* one of the best in its field;
- A very high quality;
- B solid, though not outstanding, reputation;
- C the rest, that is those which do not meet the criteria of the higher tiers.

This rating was used in 2010 for the Excellence in Research Australia (ERA) assessment initiative. The ERA list included almost all 175 journals assigned a 2008 Impact Factor by JCR in the category “mathematics, applied”. The vertical line of Figure shows the Impact Factor in each of the four rating tiers displayed on the horizontal line. One can see that the highest JIF owner – the TJNSNS journal – is in the third category B of ERA rating. While journals with the second and third highest JIF – CPAM and SIREV – are in the first category A\* of the ERA rating.



From Arnold, Fowler 2011

The question is how to explain the differences between the two rankings.

First of all, to answer this question, look at who cites IJNSNS most. The first three top-citing authors (within the two-year window) are:

- editor-in-chief of the journal Ji-Huan He with 243 cites;
- member of the editorial board D. D. Ganji with 114 cites;
- regional editor Mohamed El Naschie with 58 cites.

Together the first three top-citing authors made for 29% of all citations of IJNSNS. For comparison, the top three citers of SIREV contributed 7, 4, and 4 citation percent, respectively, accounting for less than 12% of all counted citations, and none of these authors is involved in the editing the journal. The top three citers of CPAM contributed 9, 8, and 8 citation percent, respectively, contributing about 7% of total citation, and did not belong to the editorial board.

Secondly, one can look at how citations are distributed in time between 2000 and 2007. Note that the JIF for 2008 depends on citations received for papers published in 2006 and 2007. One can see that out of all citations for the period between 2000 and 2007, most citations of IJNSNS are concentrated within the two-year window (2006 and 2007). Namely, 71.5% citations of IJNSNS, 16% citations of CPAM and 8% citations of SIREV.

Thirdly, one can look at the numbers of self-citations for the three journals. In 2008, IJNSNS provided 102, or 7%, of its own Impact Factor citations. The corresponding numbers are 1 citation, or 0.8%, for SIREV and 8 citations, or 2.4%, for CAPM. The self-citation differences are similar for other years as well. However, the greatest number of IJNSNS citations came from *Journal of Physics: Conference Series*. Namely, a single issue of that journal provided more than 20% of its Impact Factor. It was the proceedings of a conference organized by IJNSNS editor-in-chief Ji-Huan He at his home university. The second most citing journal for IJNSNS was *Topological Methods in Nonlinear Analysis*, which contributed 14% with all citations coming from single issue. This was a single issue with Ji-Huan He as the guest editor. Similarly, many other citations of IJNSNS came from journals and papers in which the editor of IJNSNS had some sort of influence.

As it was mentioned at the beginning of the section, this is an obvious and extreme example of JIF manipulation. However, there is no reason to believe that this is the exceptional case. There are reasons to suspect that there are many more cases of manipulation which are not as obvious and thus much more difficult to detect. There is some statistical evidence showing that large increases and decreases in JIF within one year are due to self-citation of journals (Campanario 2011). The cumulative effect could destroy accuracy of the indicator and this is why scientometrics should worry about using JIF and other bibliometric indicators as a measure of quality of science.

## Conclusions

To draw proper conclusions from such examples we should pay more attention to what we think science is and what is required for the scientific community to work better. Here we would like to recall the description of science recently suggested by Lee Smolin

in his book *The Trouble with Physics*. Roughly speaking, he concludes that scientific activity means drawing conclusions from incomplete information (Smolin 2006: 299). This is the reason science needs mechanisms that would protect us from making too many errors. Such mechanism is ensured through academic ethics.

*Adherence to an ethic,(...) serves as the fundamental corrective within the scientific community* (Smolin 2006: 301).

It should also be mentioned that often academic ethics is related to plain plagiarism alone. From this point of view, JIF manipulation may not look like a big deal but rather a mere response to a specific administrative practice. However, in addition to plagiarism, fabrication and falsification there is a huge area of misconduct, which is sometimes referred to as questionable research practice (Steneck 2006). This practice includes improper authorship, dual submission, salami slicing, redundant publication, improper citation and many other related actions. Clearly, JIF manipulation is a part of questionable research practices since it aims at changing the system of rewards in science. JIF manipulation also illustrates a change of motivation in scientific work. One is attempting to change some bibliometric indicators, rather than seek to improve a research quality.

What can be done to reduce the motivation of people to play with numbers? If resources are not available to employ referees and one has to rely on statistics, then as many different types of indicators as possible should be used. However, there is no final solution since people will always come up with new tricks to maximise their scores. Therefore, if a methodology on funding of institutions and universities is required, one needs to create a sound assessment rather than rely on statistics that are inherently unfair and easy to manipulate. The real change would happen with a shift in science policy, giving up administration of science and encouraging self-organization of science, which means that we have to believe in rationality of our scientific community.

Thus, if more weight is given to paper count and a single bibliometric indicator rather than quality of science, administration practices can add to deterioration of academic ethics.

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## ŽURNALO CITUOJAMUMO RODIKLIS IR AKADEMINĖ ETIKA

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**Reikšminiai žodžiai:** cituojamumo rodiklis, citavimas, akademinė etika, etikos pažeidimo priežastys, mokslo politika.

**Rimas NORVAIŠA.** Prof. habil. dr. Vilniaus universiteto Matematikos ir informatikos instituto vyriausiasis mokslo darbuotojas ir Ekonometrijos katedros profesorius. Pagrindinė mokslinių tyrimų sritis – šiurkščiųjų funkcijų ir tokių funkcijų erdvėse veikiančių netiesinių operatorių analizė. Šiuo metu yra Lietuvos mokslininkų sąjungos pirmininkas.

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