

The new Norwegian incentive system for publication – from bad to worse

Kjetil K. Haugen
Faculty of Logistics
Molde University College, Specialized University in Logistics
Molde, Norway
Kjetil.Haugen@himolde.no
Phone: +47-99456006

Frode E. Sandnes*
Faculty of Technology, Art and Design
Department of Computer Science
Oslo and Akershus University College of Applied Sciences
Oslo, Norway
Frode-Eika.Sandnes@hioa.no
Phone: +47-67235003

JEL classification: I21, I28

Abstract

The new Norwegian system for calculation of publication credits is examined. The new system was launched due to criticism for penalizing collaborative research. It turns out that adverse incentive problems emerge as a result of this system change. We show by a simple case, that institutions will benefit (credit-wise) by adding more authors to a scientific publication. Even worse, the beneficial effect increases the more authors the paper has initially. Alternative cases indicate even stronger incentives for co-author maximization.

*Corresponding author: Frode-Eika.Sandnes@hioa.no

Keywords: Research, reward system, adverse incentive effects, Norway

1 Introduction

The Norwegian Scientific Index (NSI¹), and accompanying publication credit system, was introduced in 2006. The system has many interesting facets by itself. For instance, the system is light weighted regarding impact, only including two categories for journal quality. Furthermore, it provides direct financial effects for institutions through the so-called RBO system. Although this financial component, at least up to now, has been minor in total institutional budgets, it is still one of very few components institutions can change in the short run. As such, an institutions ability to produce measurable research through this system has grown to become a vital part of Norwegian academic institutional planning. However, our main concern in this article is a proposed change, meant to be implemented this year (2016). As a consequence, we will spend minimal space on further descriptions of the system.

Roughly, all academic publications, journal articles, proceedings and monographs are divided into 3 categories. Either, they do not give points (the publications are not accepted in NSI), or they are categorized as level 1 or 2, where level 2 is defined as “best”. Publications within each category are given points (or credits). As of today (again roughly), level 1 gives {0.7, 1.0, 3.0} points depending on publication type – conference proceeding, journal article or monograph, respectively. Level 2 gives {5.0, 8.0} for a journal article or a monograph. In general – at least that is presumably the ambition – the difference between level 1 and 2 is “quality”. For readers in need of more information on the system, the following two publications are both readable and helpful [?], [?]. The system itself is freely available on the web [?].

The proposed system change is not related to the system description above. It is related to how publication credits are divided between institutions and individuals dependent on author composition.

In section 2, a mathematical description of the old and the new systems is defined. A (very) limited literature review is given in section 3. Section 4 describes two cases and provides (based on the mathematical description in section 2) a simple mathematical analyses of possible incentive problems caused by the new system. Finally, based on the analysis in section 4, section 5 discusses and concludes.

¹NVI in Norwegian.

2 A mathematical description of the system

We define the following variables²:

A_L : Number of local (co-)authors (authors with affiliation at a given institution for a given article).

A_{NL} : Number of non-local (co-)authors (authors with affiliation outside the given institution) for the same given article).

pp : Publication credits (points) for the given publication based on quality and type – see section 1.

δ : Indicator variable ($\in \{0, 1\}$) used to pick various aspects of new and old system.

γ : Indicator variable ($\in \{0, 1\}$) used to pick various aspects of new and old system.

ipc : Institutional publication credits received by the given institution as a result of the given combination of authors.

Based on the above definitions, the following formula (1) describes all aspects of the old and new systems:

$$ipc = pp \cdot \left(\frac{A_L}{A_L + A_{NL}} \right)^{\frac{\delta+1}{2}} \cdot (1.3)^\gamma, \delta, \gamma \in \{0, 1\} \text{ and } \delta \cdot \gamma = 0 \quad (1)$$

If $\delta = 1$ and $\gamma = 0$, formula (1) returns:

$$ipc = pp \cdot \left(\frac{A_L}{A_L + A_{NL}} \right), \quad (2)$$

which precisely describes the old system. This version also defines a part of the new system, where all authors are local. In such a situation, $A_{NL} = 0$ and (1) degenerates to $ipc = pp$.

If $\delta = 0$ and $\gamma = 0$, formula (1) returns:

²To avoid too much mathematical notation, all variables are defined under the assumption that a given institution and article is examined. That is, a more general and “correct” definition would be to add institution and article subscripts for all variables. For instance; $A_L^{i,j}$ would then be Number of local (co-)authors for article i at institution j .

$$ipc = pp \cdot \sqrt{\frac{A_L}{A_L + A_{NL}}}. \quad (3)$$

(3) describes the new system, when all non-local authors are affiliated at Norwegian institutions.

If $\delta = 0$ and $\gamma = 1$, formula (1) returns:

$$ipc = pp \cdot \sqrt{\frac{A_L}{A_L + A_{NL}}} \cdot 1.3 \quad (4)$$

In (4), the final part of the new system is described. Now, $A_{NL} > 0$ and at least one of the non-local authors are affiliated at a foreign³ institution.

3 Literature

Incentives in general are, and has been, a very hot topic in modern economic theory. Hence, this research tradition is extensive. As a consequence, a fair amount of work related to economic incentives in education (typically related to salary and bonus) exists. There are also some interesting papers of a more interdisciplinary type, discussing subjects similar to our's – see for instance [?], [?], [?], [?], [?], [?].

However, two⁴ articles [?], [?] of a more general nature are by us (the authors) considered especially important. A simple interpretation of these articles may perhaps be: If one plans to use incentive mechanisms (financial reward or punishment, which in fact the system we discuss do), one thing seems clear. If output (in this case research quality) is hard to measure, one should be significantly more cautious when introducing such systems than in situations where output is easier to measure. Finally, a Norwegian contribution [?] discusses many of the same problems we discuss here, although in a much more practical and less scientific manner.

Research quality is definitely hard to measure. We can count publications, categorize them in A or B journals, compute as many publication credits, h-indices or citations we like⁵. Still, in surprisingly many cases, research nobody ever mentioned or cited has a tendency to pop up many years (sometimes more than 50) later; suddenly being both understandable and imperative. As a consequence, metric systems meant to measure research

³Non-Norwegian

⁴The second one is a response to many incentive managers response to the first article – all can be found in the same issue of *Harvard Business Review*.

⁵Research has produced more or less successful attempts – see [?], [?], [?], [?], [?], [?]

quality today should be introduced and (especially) used with extreme care. Many researchers would state that a randomized reward/punishment mechanism may be as good a financial distribution system as any other given such an understanding of research and future research quality.

4 Cases

In two forthcoming subsections, two practical cases are introduced, aiming to show what kind of incentive problems the new system may induce. Both cases are based on unethical behaviour by authors. If one has a belief that all researchers keep all ethical codes⁶ strictly, these cases are (of course) of no interest. However, many cases, even recent (see for instance the so-called “Macchiarini scandal” [?], indicate that academic scholars are like most others, sometimes both tempted to as well as actually acting on the border of ethical correctness.

4.1 Case 1 – incentives to add foreign authors to a single article

Case 1 is defined as follows: we assume that a certain article originally has $A_L = A$ ⁷ local authors only. As shown previously (section 2), the old and the new system produces the same institutional publication credits, in this case:

$$ipc = pp \tag{5}$$

Suppose now, that all authors A agree on including a foreign author as another co-author. In such a case, institutional publication credits are (by formula (1)) calculated as:

$$ipc = pp \cdot \sqrt{\frac{A}{A+1}} \cdot 1.3 \tag{6}$$

Now, the following inequality is interesting to investigate:

$$pp < pp \cdot \sqrt{\frac{A}{A+1}} \cdot 1.3 \tag{7}$$

⁶Nowadays, most scholars would reckonize the Vancouver protocol [?] as a reasonable set of rules for ethical conduct.

⁷We drop the L subscript to simplify notation.

This inequality (7) tells under which number of local authors it is profitable (*ipc*-wise) to choose an extra foreign author. After some simple algebra, inequality (7) can be rewritten as:

$$A > \frac{1}{(1.3)^2 - 1} \approx 1.4493, \quad (8)$$

which means that it is beneficial for the institution to add a foreign author to the paper if the original paper has at least 2 authors⁸.

Furthermore, if (7) is rewritten as:

$$1 < \sqrt{\frac{A}{A+1}} \cdot 1.3 \Rightarrow 1 < \frac{A}{A+1} \cdot (1.3)^2 \quad (9)$$

Then,

$$\frac{d}{dA} \left[\frac{A}{A+1} \cdot (1.3)^2 \right] = \frac{(1.3)^{2^2}}{A+1} > 0 \quad (10)$$

and

$$\frac{d^2}{dA^2} \left[\frac{A}{A+1} \cdot (1.3)^2 \right] = -2 \cdot 1.3^2 \frac{1}{(A+1)^4} < 0 \quad (11)$$

which indicates that for any number of local authors ($A_L = A$), it is beneficial to add an extra foreign author (first derivative positive) but the effect is diminishing (second derivative negative), meaning that it is relatively less “profitable” to add an extra foreigner if the number of local authors is high compared to low. The full image is shown in Figure 1, where the left and right hand side of inequality (7) is plotted in the same diagram.

As Figure 1 indicates, the effect of adding an extra foreign author is biggest when the number of local authors are small, and already at 9 local authors, the institutional publication credits moves from 1,0 to $(1 \cdot \sqrt{\frac{9}{10}} \cdot 1.3 \approx) 1.23$ or a 23% increase. Some readers may feel that 9 or 10 authors⁹ of a single article are an unrealistic author number. This is definitely not the case. See for instance [?], [?], [?].

⁸In fact, it is more complex than this, as the system allows a single author to have more than one affiliation. Hence, a situation with 1.45 authors may actually be practically feasible. However, such cases are not analysed further here.

⁹Average number of authors of a scientific article varies significantly between disciplines. In medicin for instance or physics, 9 to 10 authors are not big numbers. In economic theory or mathematics, 10 authors are considered a big number.

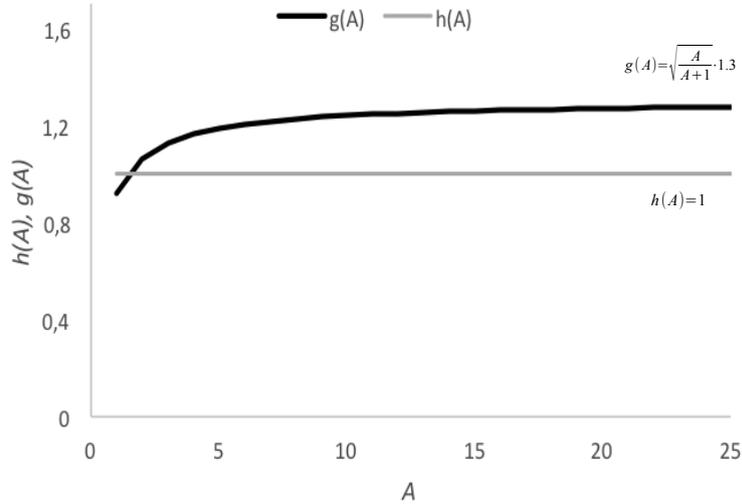


Figure 1: A plot of publication credits with a single new foreign author ($g(A)$) vs. a case with only local authors ($h(A)$).

Obviously, the system has equal incentive effects on the individual level. If we consider the simplest case – all local authors only have local affiliation – the crucial inequality can (on the individual level) be written as:

$$\frac{1}{A} \cdot pp < \frac{1}{A} \cdot pp \cdot \sqrt{\frac{A}{A+1}} \cdot 1.3 \quad (12)$$

Surely, nothing changes as multiplication with A ($A > 0$) produces the original inequality (7), and individual incentives are just as strong as institutional incentives.

4.2 Case 2 – incentives as a result of combining more than one article

One may be misled to believe that the factor 1.3 is the only problem with the new system. This is definitely not the case. Also the square root may lead to tempting unethical incentives – both at the institutional and individual level.

Let us examine the following setting. Two Norwegian scholars (affiliated at institutions A and B have written one paper each, ready for publication.

assume now that instead of publishing this work individually, they look at a collective solution; in this case, being co-authors of each others papers. Given the original (and highly ethical) “solution”, both institutions would achieve pp publication credits. However, the new (and somewhat unethical) “solution” gives institution A , $pp \cdot \sqrt{\frac{1}{2}}$ from the paper written by the scholar at institution A , but also the same from institution B . The math is simple (for any of the institutions);

$$pp < pp \cdot \sqrt{\frac{1}{2}} + pp \cdot \sqrt{\frac{1}{2}} \Rightarrow 1 < 2\sqrt{\frac{1}{2}} \Rightarrow \frac{1}{4} < \frac{1}{2} \text{ which of course is true.} \quad (13)$$

One does not have to stop here. Adding a foreign (free-riding) author (without an additional article) has the following consequence: Each of the two Norwegian academic institutions get publication credits:

$$2 \cdot pp \cdot \sqrt{\frac{1}{3}} \cdot 1.3 \quad (14)$$

which is even more beneficial (publication credits-wise) than the previous “solution” as:

$$2 \cdot pp \cdot \sqrt{\frac{1}{3}} \cdot 1.3 > 2 \cdot pp \cdot \sqrt{\frac{1}{2}} \Rightarrow \sqrt{\frac{1}{3}} \cdot 1.3 > \sqrt{\frac{1}{2}} \Rightarrow (1.3)^2 > \frac{3}{2} \quad (15)$$

or $1.69 > 1.5$ which clearly is true.

5 Discussion and conclusions

This article has shown, by the aid of some simple examples (named Cases in the text), that the new system for calculation of publication credits in Norway, has its sides. A system which opens up for customization of the author list on an article to reach more credit than a single author would produce for an institution, can not be neither good nor sensible.

Some of us claim that too many papers already have too many authors – se for instance [?], [?]. After all, research and its credibility is to some extent actually dependent on actual authors that may answer actual questions regarding the content of research papers. The probability of increased free-riding is of course an expected outcome of such a system. That is, to change a system into a version which in all dimensions add value to more article authors seems like an extremely bad idea.

We have limited information related to the decision process underlying this change, but it seems very unlikely that anybody who has a simple course in modern economic theory has had anything to do in this process. The solution is simple. Move back to the original system, and if one wants more national or international collaboration, reward or punish in a separate process, outside the system for calculating publication credits.

Of course, if one believes (like we) that real good research today, either is baffling or highly controversial, it will most probably not be published today, at least not in high ranked journals. It will hence not be cited (today) or give any author or journal impact. As a consequence, introducing metric systems (today) to try to measure what is good or bad research (tomorrow) must be a bad idea, leading to rewarding mediocre research and punishing (potentially) good research. Unfortunately, it seems hard for the new public managers of today's academia to understand such a simple argument.

Surely, an incentive system rewarding more collaboration, both national as well as international can have real positive effects. Some researchers may indeed choose to substitute both local co-authors with national non-locals or foreign ones without any purpose of maximising publication credits. In an empirical setting, the problem is perhaps to separate individual scholar motives. However, if Norwegian journal articles suddenly start emerging with single foreign co-authors or unusual pairing of authors, some natural suspicion should lead to a critical judgement of reasons for such a development, and perhaps also, a critical review of whether this system needs redesign.

References

- [1] B. M. Allan and R. G. Fryer Jr. The power and pitfalls of education incentives. Technical Report DISCUSSION PAPER 2011-07, The Hamilton Project, 1775 Massachusetts Ave., NW Washington, DC 20036, September 2011.
- [2] ATLAS and CMS Collaborations (5154 authors). [Combined Measurement of the Higgs Boson Mass in \$pp\$ Collisions at \$\sqrt{s} = 7\$ and 8 TeV with the ATLAS and CMS Experiments](#). *Phys.Rev.Lett.*, (114), 2015.
- [3] ATLAS Collaboration (2883 authors). [Observation of a new particle in the search for the Standard Model Higgs boson with the ATLAS detector at the LHC](#). *Physics Letters B*, 716(1):1–12, 2012.
- [4] International Human Genome Sequencing Consortium (2933 authors). [Initial sequencing and analysis of the human genome](#). *Nature*, (409):860–921, 2001.
- [5] J. Bar-Ilan. Which h-index? – A comparison of WoS, Scopus and Google Scholar. *Scientometrics*, 74(2):257–271, 2008.
- [6] C. Boletsis. Level 1 & level 2 publications – norwegian scientific index. <http://blog.boletsis.net/level-1-level-2-publications-norwegian-scientific-index/>. Accessed: 2016-04-13.
- [7] G. Boulton. University rankings: Diversity, excellence and the European initiative. *Procedia - Social and Behavioral Sciences*, (13):74–82, 2011.
- [8] ICMJE International committee of medical journal editors. Recommendations for the conduct, reporting, editing, and publication of scholarly work in medical journals. <http://www.icmje.org/icmje-recommendations.pdf>. Accessed: 2016-03-14.
- [9] E. L. Deci, R. Koestner, and R. M. Ryan. Extrinsic rewards and intrinsic motivation in education: Reconsidered once again. *Review of Educational Research*, 71(1):1–27, 2001.
- [10] M. Enserink. Swedish academy seeks to stem 'crisis of confidence' in wake of Macchiarini scandal. <http://www.sciencemag.org/news/2016/02/swedish-academy-seeks-stem-crisis-confidence-wake-macchiarini-scandal>. Accessed: 2016-04-15.

- [11] R. Fernandez. Why incentives don't work in education – or the business world. <https://www.flickr.com/photos/opensourceway/4862920379>. Accessed: 2016-04-15.
- [12] NSD Norwegian Centre for Research Data. Publication channels. https://dbh.nsd.uib.no/publiseringsskanaler/Forside?request_locale=en. Accessed: 2016-04-13.
- [13] J. E. Frantsvåg. The idiosyncratic reader. <https://jefrantsvag.wordpress.com/2015/02/05/the-norwegian-accreditation-system-for-scientificscholarly-journals/>. Accessed: 2016-04-13.
- [14] A. Goldstein. Too many authors. <http://berkeleysciencereview.com/too-many-authors/>. Accessed: 2016-03-14.
- [15] Kjetil K. Haugen. Could demanding a presentation of the paper be the solution? https://www.researchgate.net/publication/298342919_Could_demanding_a_presentation_of_the_paper_be_the_solution. Accessed: 2016-03-14.
- [16] J. E. Hirsch. [An index to quantify an individual's scientific research output](#). *Proceedings of the National academy of Sciences of the United States of America*, 102(46):16569–16572, 2005.
- [17] T. Jones, S. Huggett, and J. Kamalski. [Finding a way through the scientific literature: indexes and measures](#). *World neurosurgery*, 76(1):36–38, 2011.
- [18] A. Kohn. Alfie Kohn responds. *Harvard Business Review*, 71(6):48–49, 1993.
- [19] A. Kohn. Why incentive plans cannot work. *Harvard Business Review*, 71(5):54–60, 1993.
- [20] S. Marginson and G. Rhoades. Beyond national states, markets, and systems of higher education: A glonacal agency heuristic. *Higher Education*, (43):281–309, 2002.
- [21] A. Mas-Colell. The european space of higher education: Incentive and governance issues. *Rivista Di Politia Economica*, pages 1–27, 2003.
- [22] L. I. Meho and K. Yang. Impact of data sources on citation counts and rankings of LIS faculty: Web of Science versus Scopus and Google

- Scholar. *Journal of the american society for information science and technology*, 58(13):2105–2125, 2007.
- [23] D. Neal. Designing incentive systems for schools. In M. G. Springer, editor, *Performance Incentives. Their Growing Impact on American K-12 Education*, pages 149–170. Brookings Institution Press, Washington, D.C., 2009.
- [24] F. E. Sandnes. Hvordan melke tellekanter i 2016 (in Norwegian). <http://khrono.no/debatt/hvordan-melke-tellekanter-i-2016>. Khrono Student paper at Oslo and Akershus University College of Applied Sciences, Norway: Accessed: 2016-03-14.
- [25] V. Torra and Y. Narukawa. The h -Index and the Number of Citations: Two Fuzzy Integrals. *IEEE Transactions on Fuzzy Systems*, 16(3):759–797, 2008.