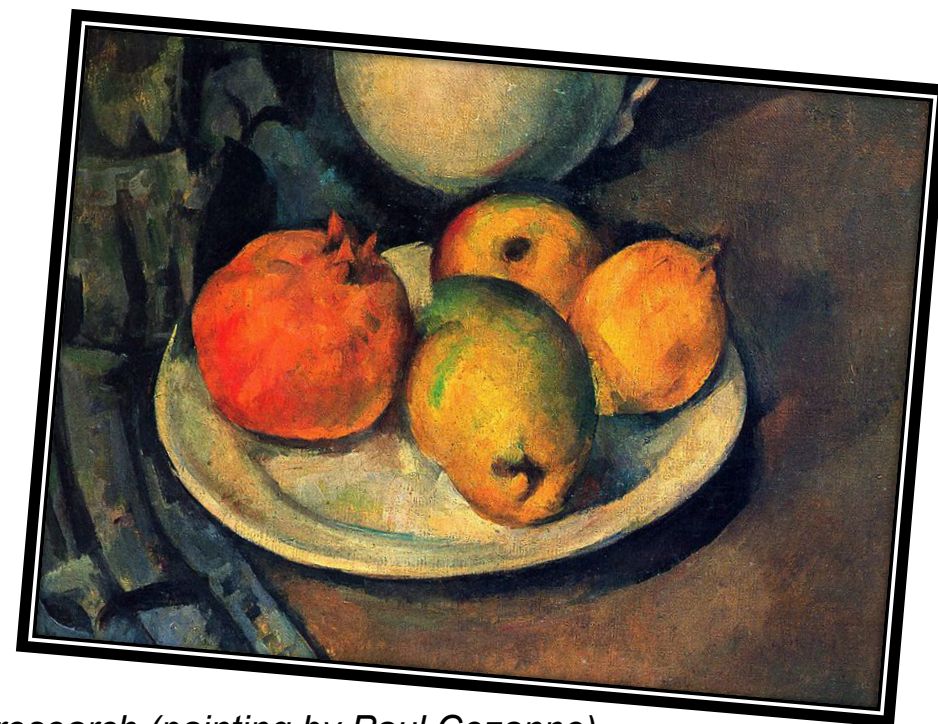


# Metrics without merits ...

*by Bertil F. Dorch, PhD, library director, astrophysicist*



Bertil F. Dorch  
8 April 2019



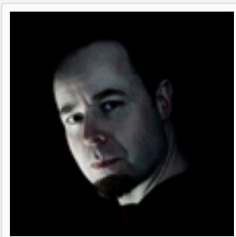
*Various unknown fruits of research (painting by Paul Cezanne).*

# Who am I?



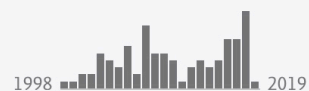
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**Research Output** 1998 — 2019

<b>49</b>	<b>7</b>	<b>6</b>	<b>4</b>	<b>24</b>
Journal article	Conference abstract for conference	Article in proceedings	Report	More



# Abstract ...

**Scholarly metrics and rewards are both part of the Open Science agenda**, and next generation and open metrics are perceived as necessary for supporting transparency in research: E.g. the EC Expert Group on Altmetrics conclude that *next generation metrics should be underpinned by an open, transparent and liked data infrastructure*, and similarly LIBER has formed an Innovative Metrics Working Group to discuss the role and actions of libraries in this respect.

In the context of Open Science metrics is often addressed as being related to **rewarding a particular Open scholarly practise** based on sophisticated evaluation and new metrics.

However, experience shows that great care needs to be taken in order for new metrics **not to introduce unwanted and unethical behaviour or to infringe freedom of research**.

To illustrate the potential danger of metrics actually working against the ideals of Open Science, **I present the results of recent studies into the gaming incentives of metrics**, and discuss possible pitfalls faced by libraries venturing into the business of developing and supplying metrics to research institutions.

# ... and outline

1. A note on Quantum mechanics 😊
2. Motivation: Metrics and the Open Science agenda
3. Examples of metrics and gaming
4. Discussion & conclusions

## References

- Wien, Dorch & Larsen (2017) *Scientometrics* **112**, 903.  
Dorch et al. (2018) *LIBER Annual Conference* 2018.  
Deutz et al. (2019) submitted.

# A note on: Quantum mechanics

$$|\psi\rangle = \sum_i c_i |\phi_i\rangle$$

*Any state is a super-position  
of possible states*

$$i\hbar \frac{d}{dt} |\Psi(t)\rangle = \hat{H} |\Psi(t)\rangle$$

*A measurement collapses the  
possibilities to just one state*



*Is the researcher dead or alive as a  
cat caught in a box: Ocelot in Paay.*

# Motivation for this talk: Metrics and the Open Science agenda

# Metrics and the Open Science agenda

New and innovative metrics and rewards are presently discussed as part of Open Science, and next generation metrics are considered necessary for supporting the transparency in research and Open Science practises, e.g.:

- The EC Expert Group on Altmetrics conclude that *next generation metrics should be underpinned by an open, transparent and liked data infrastructure*.
- LIBER has formed an Innovative Metrics Working Group to discuss the rôle and actions of libraries wrt. Open Science metrics and rewards. Headed by Prof. Charlotte Wien (cf. the two previous talks).

*An observation:*

Research evaluation metrics can contain both **direct incentives** by design – and indirectly lead to **emerging strategies** for “gaming”.

- Current problems: Retractions, failure of peer review, citation cartels, ghost authorships, predatory publishing all pose problems to the the existing scholarly communication system.
- Worry: Are there hidden danges to research integrity related to a new Open Science reward system by unwanted **gaming** behavior wrt. metrics related to e.g. meritation, prestige etc

# Examples: Two studies at SDU



*Dr. Bertil*



*Prof. Charlotte*



*Dr. Evgenios*



*Dr. Daniella*

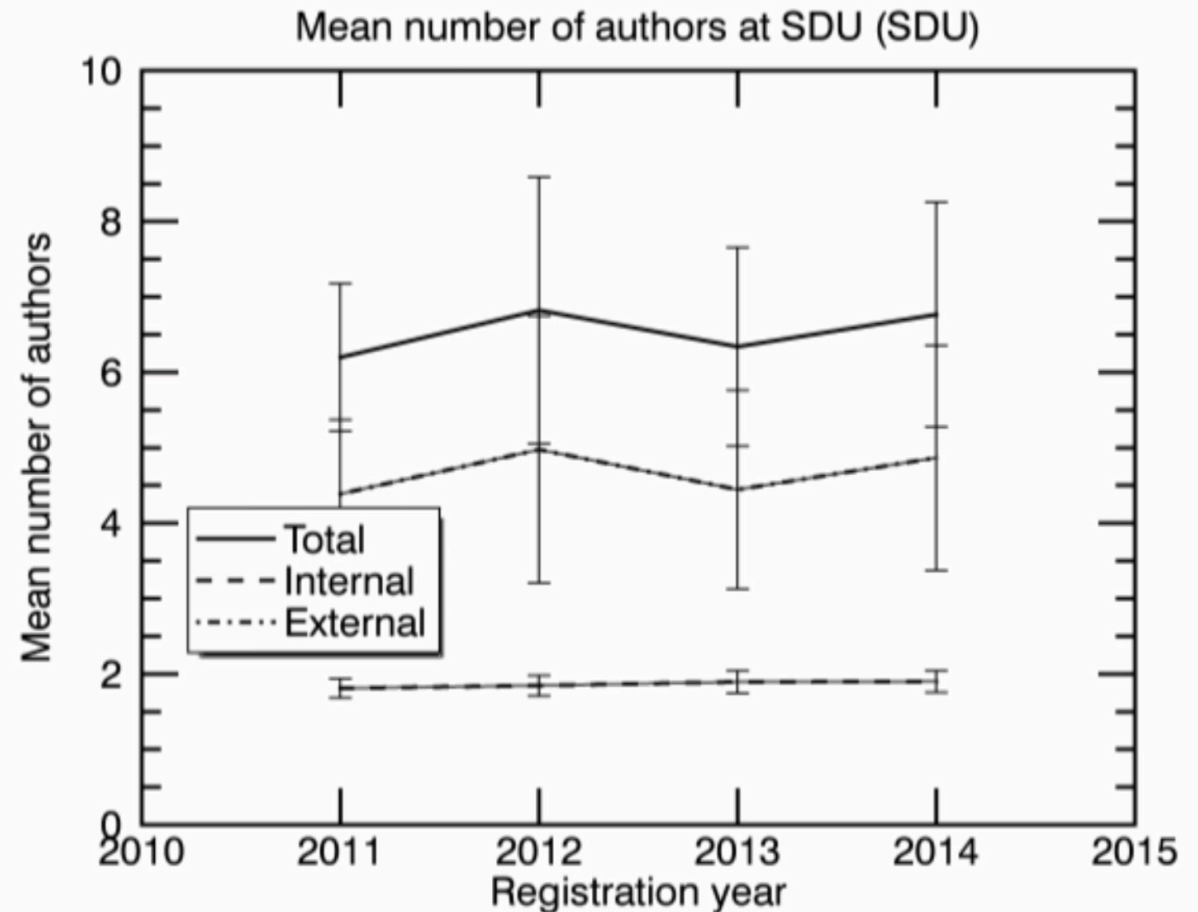


*Dr. Dorte*

# Example 1: The Nordic BFI metric

A complex non-citation based metric: Part of the funding of universities.

- Case: The scheme awards points based on the number of publications in certain journals. Includes a 25 % **direct incentive** for collaboration (co-authoring).
- Context: Collaborative articles get more citations than single author articles: even more so for cross-institution collaborations.
- Ansatz: The BFI contains both direct and indirect incentives for authors to increase number of authorships.
- Study: Evolution of co-authorships at SDU
- Question: Do authors game the BFI metric?
- Result: No gaming, but opposing incentives.



Wien, Dorch & Larsen (2017) *Scientometrics* 112, 903



# Example 1: No effect/gaming for institutions

Scientometrics (2017) 112:903–915

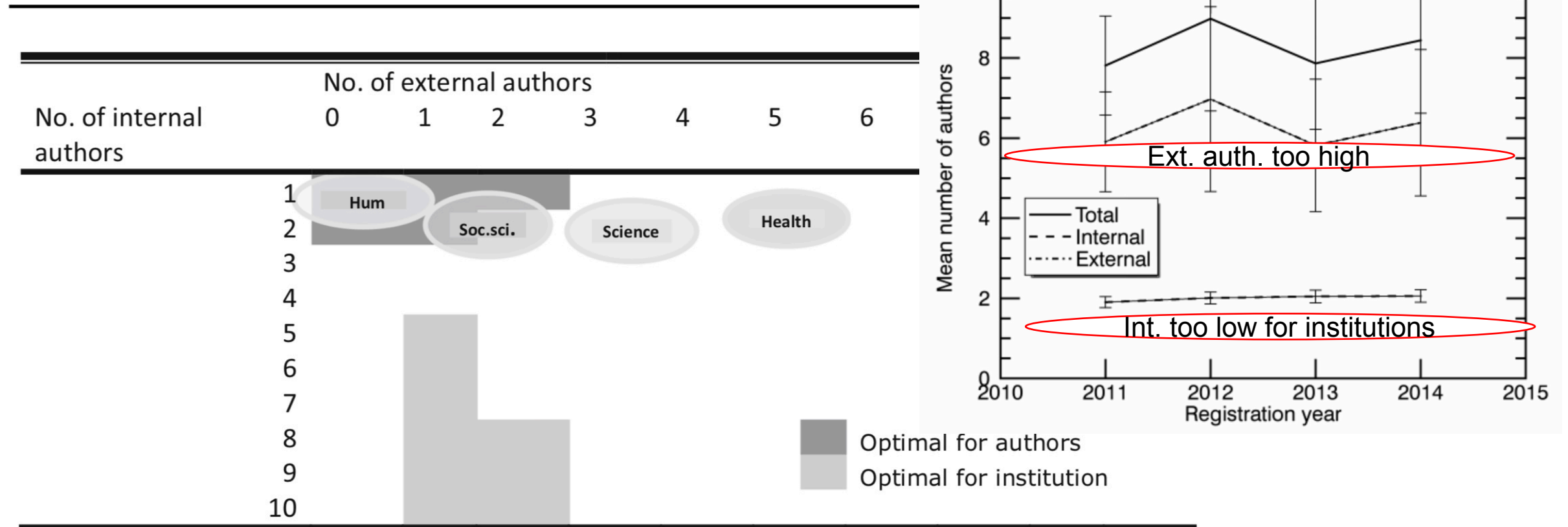


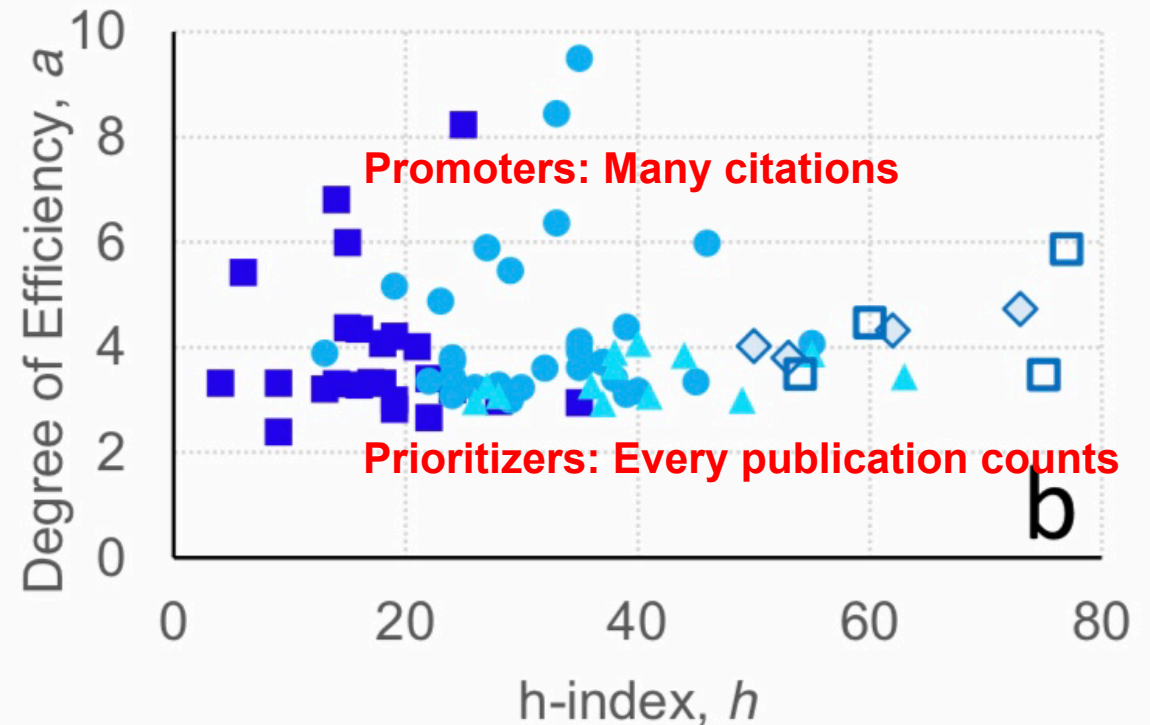
Fig. 6 Optimal and actual distribution of authors from the four main areas

# Example 2: The h-index

A simple citation based metric for individuals.

- Case: The  $h$ -index is used as an impact indicator for individual authors.
- Context:  $h$  cannot exceed the number of publications, regardless of the total number of citations. It is necessary to increase the number of publications to increase  $h$ .
- Ansatz: Researchers optimize their publishing strategies to increase  $h$ .
- Study: The  $h$ -index of clinical researchers
- Question: Do researchers game  $h$  ?
- Result: Different strategies (games) emerge.

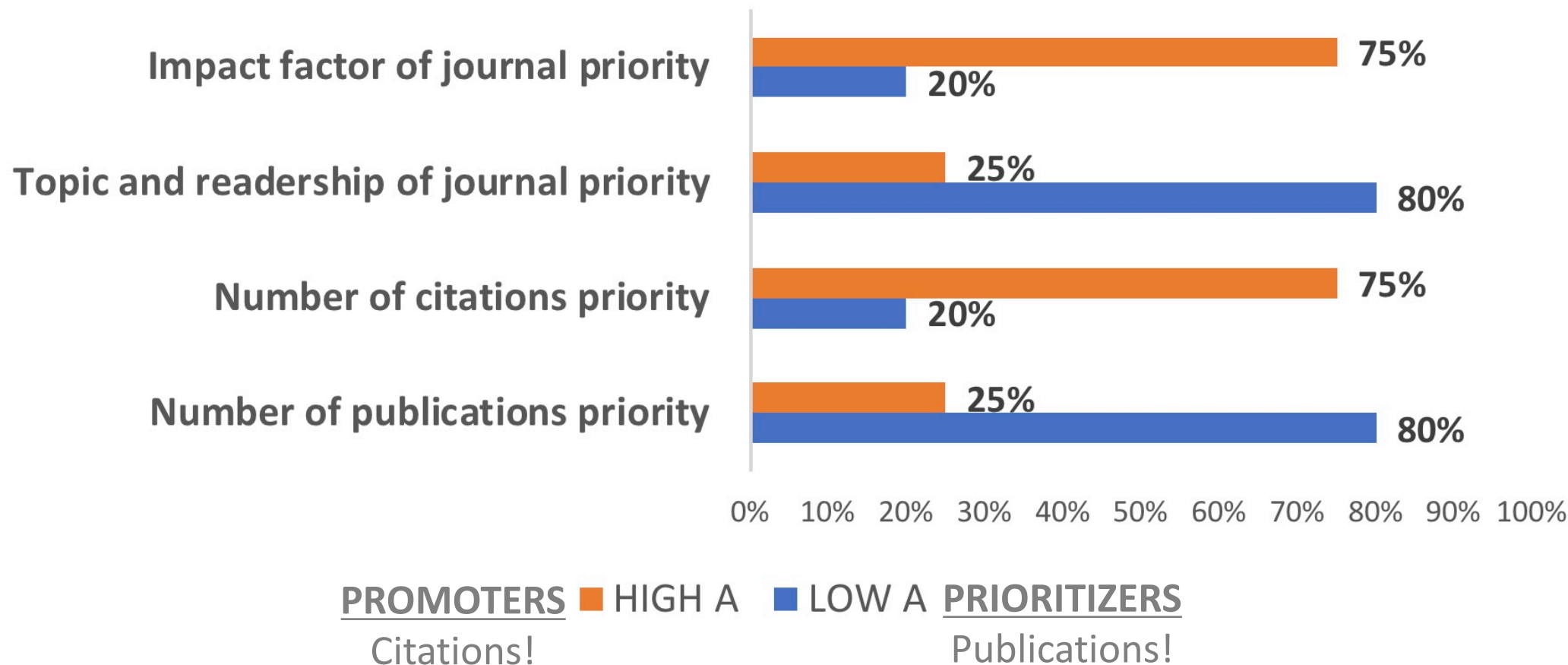
$$N_{c,tot} = ah^2$$



Dorch et al. (2018), LIBER Annual Conf. 2018, Lille.  
Deutz et al. (2019) submitted to *PLOS One*.

# Example 2: Prioritizers and promoters

## FACTORS AFFECTING EFFECTIVENESS



# The point: Discussion & Conclusions

# Discussion & conclusions

*Two examples of metrics with incentives:*

## **Example 1: BFI (complex, non-citation based)**

There is *no* evidence that the direct incentive lead to a (desired) change in behavior (for institutions).

Rather publication strategies favour individuals, but only for some topic areas – others don't seem to pay attention to the metric.

## **Example 2: h-index (simple, citation based)**

There *is* evidence that two different publication strategies emerge for the same metric. (One seems more efficient at very large metric values).

*Gross generalization ...*

- Even in case of metrics with **direct incentives**, alternative, hidden or indirect incentives can lead to murky results or ineffective incentives.
- Different **emerging** publication strategies can address the same metric.
- Non-citation based research assessment could present a more attractive type of non-incentive metric *because* citations are the main interest of gamers.

# The message?

*In my opinion:*

- Metrics are generally implemented without any **scientific merit**. Sure, their consequences are studied, but metrics are born out of management, not science method...
- Experience shows that great care needs to be taken in order for metrics not to introduce unwanted and unethical behaviour or to infringe freedom of research (cf. DORA, The Leiden Manifesto, cf. talk by Sarah Slowe)
- Gaming is natural and not necessarily bad if the incentive to play the game is beneficial to the integrity and impact of science
- Complicated metrics are harder to game and could reduce the effectiveness of both gaming and incentives – ie. they are “honest metrics”

When developing new / innovative metrics, rewarding e.g. Open Science, care should be taking not to introduce unwanted behavior:  
**Responsible metrics!**

New metrics should be a scientific enterprise – like developing a drug or building a bridge: Constructed to be **fit for purpose!**

# The End: Thank you!

