

Journal Metrics and Research Performance

Henk F. Moed

**Senior Scientific Advisor
Elsevier, Amsterdam, Netherlands**

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1 Citation indexes

2 Journal metrics

3 Combine indicators and peer review

4 Indicators can be manipulated

5 Journal metrics and research performance

6 Explore usage-based indicators

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Multi-disciplinary Citation Indexes

What is a citation index?

- **A bibliographical databases in which documents are indexed by means of citations / cited references**

Selection of source journals

The real problem is to “make the coverage as complete as possible by expanding it **beyond the core** of journals whose importance to a given field is obvious” (Garfield 1979)

How is the core expanded?

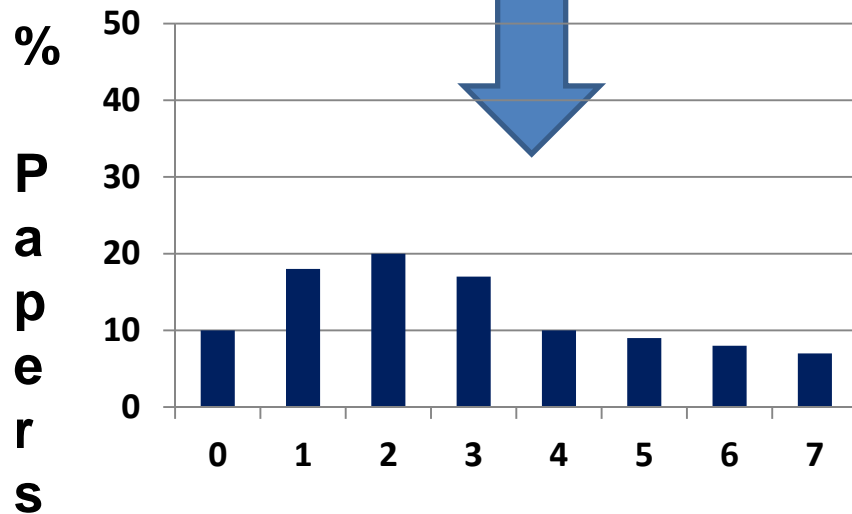
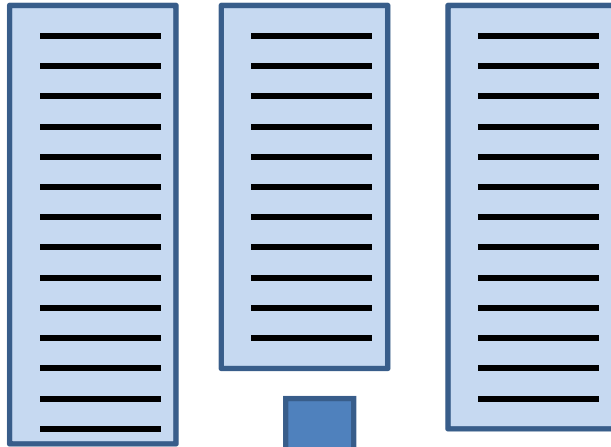
- **Garfield's criterion:** The frequency at which journals are cited in the source journals that are already included in the index
- **Assumption:** The number of times a journal's items are cited is an expression of its utility as communication medium
- → **Journal Impact Factor**

**Differences in citation potential
between subject fields**

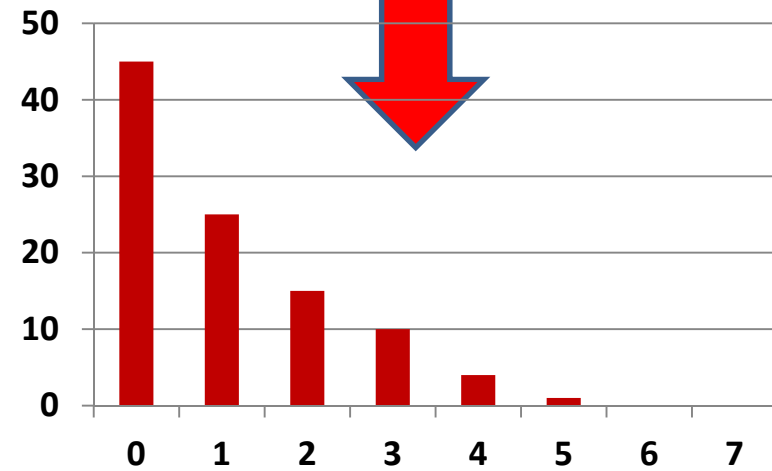
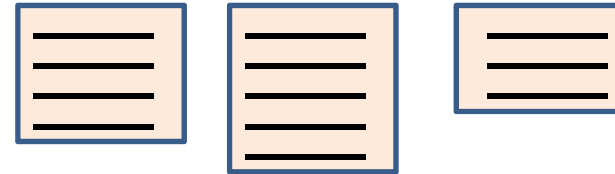
Differences in citation potential between fields

Molecular Biology

Reference lists



Mathematics

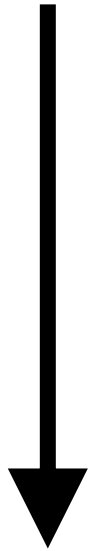


Number of received citations 

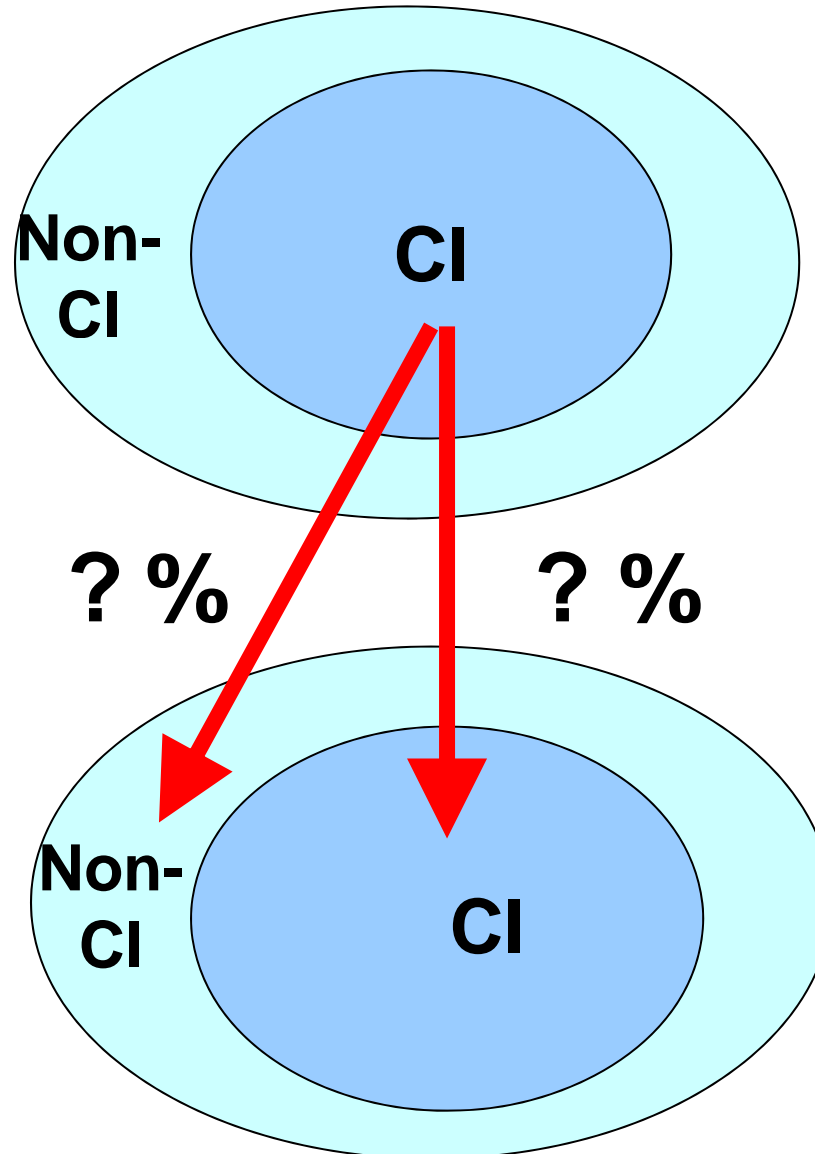
**Differences in
database coverage
between subject fields**

Coverage of journal-based citation index (CI)

Citing/Source



Cited/Target

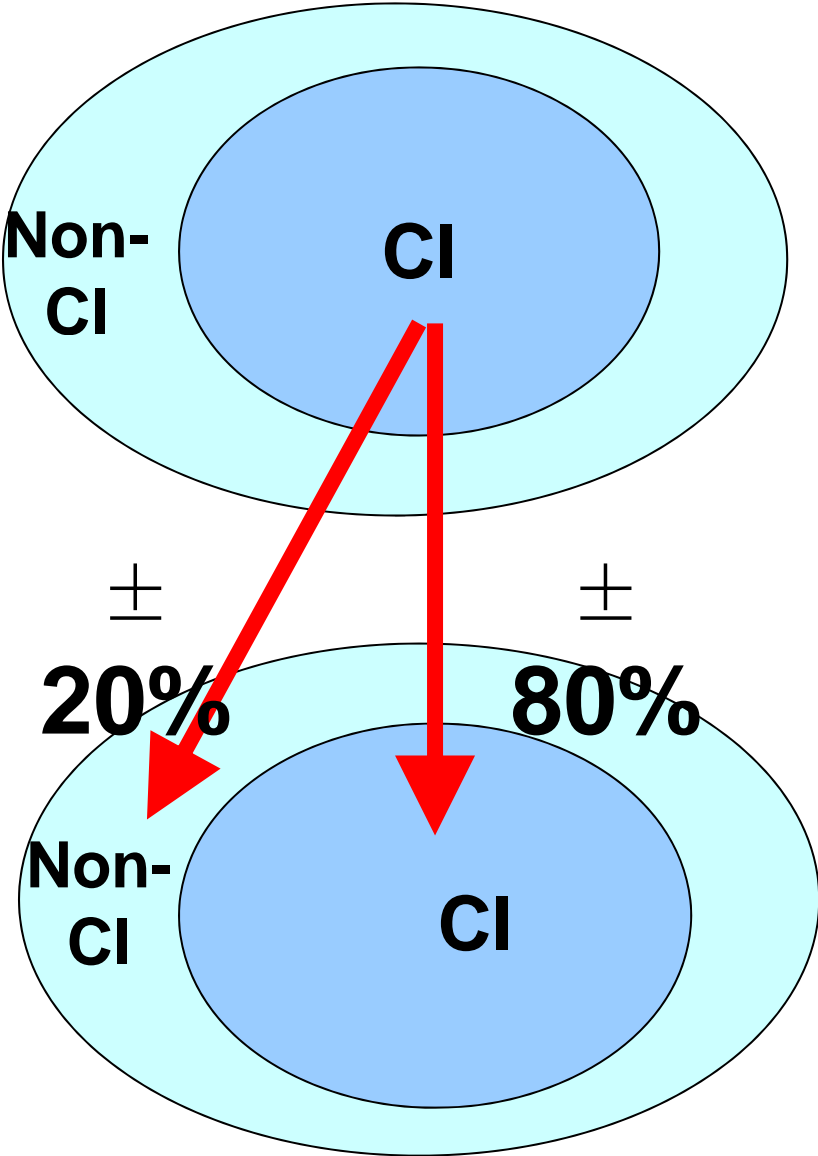


Science

Citing/Source

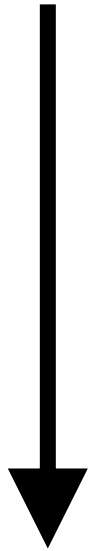


Cited/Target

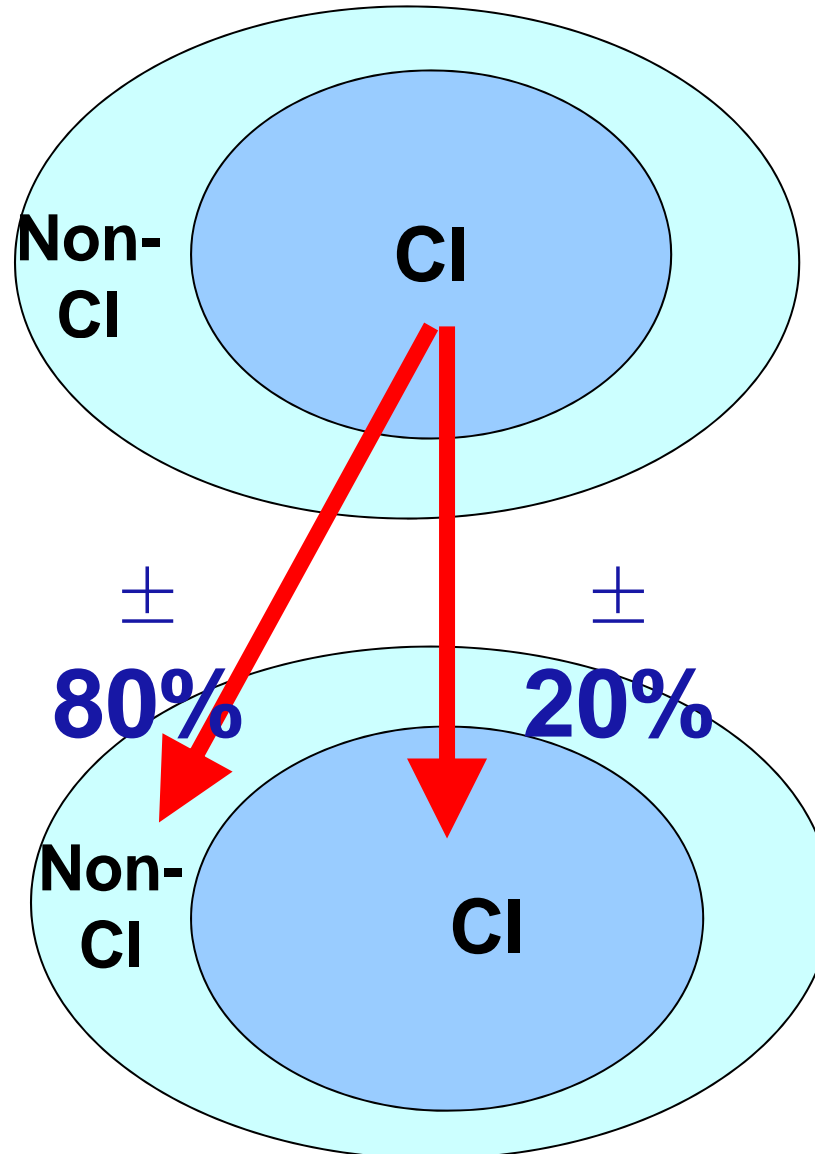


Humanities

Citing/Source



Cited/Target



CI coverage by field

Journals



Books,
proceedings

<u>EXCELLENT</u> (>80%)	<u>GOOD</u> (60-80%)	<u>FAIR</u> (40-60%)	<u>MODERATE</u> (<40%)
Biochem & Mol Biol	Appl Phys & Chem	Mathematics	Other Soc Sci
Biol Sci – Humans	Biol Sci – Anim & Plants	Economics	Humanities & Arts
Chemistry	Psychol & Psychiat	Engineering	
Clin Medicine	Geosciences		
Phys & Astron	Soc Sci ~ Medicine		

Web of Science versus Scopus

CWTS / SCImago Studies

Scopus is a genuine **alternative** to WoS

[CWTS, Study for HEFCE, 2007]

- Scopus tends to include all **science** journals covered by the WoS (papers \geq 1996)
- And Scopus contains some 40 % **more** papers
- Scopus is **larger and broader** in terms of subject and geographical coverage
- Web of Science is **more selective** in terms of citation impact

Scopus journals **not covered in WoS tend to show
(SCImago-CWTS case study on oncology):**

- Lower **citation rates**
- More dispersion among publishers **countries**
- More in non-English **languages**
- More **recently** founded between 1996-2006
- More often **freely available** online
- More **nationally** oriented

A great challenge

- Combine an **international** with a **national** citation index in an intelligent way

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Journal metrics in Scopus

1. **SNIP = Source normalized Impact per paper**
2. **SJR = SCImago Journal Rank**

**ISI/JCR Journal Impact Factor
of journal J for year T**

**Citations in year T to items published in J in
years T-1 and T-2**

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**Number of “citable” items published in J in
years T-1 and T-2**

**SNIP corrects for disparities in
citation potential among fields**

SNIP: Base concept

SNIP =

A journal's 'Raw' Citation Impact

Citation potential in its subject field

A journal's raw impact per paper (in 2008)

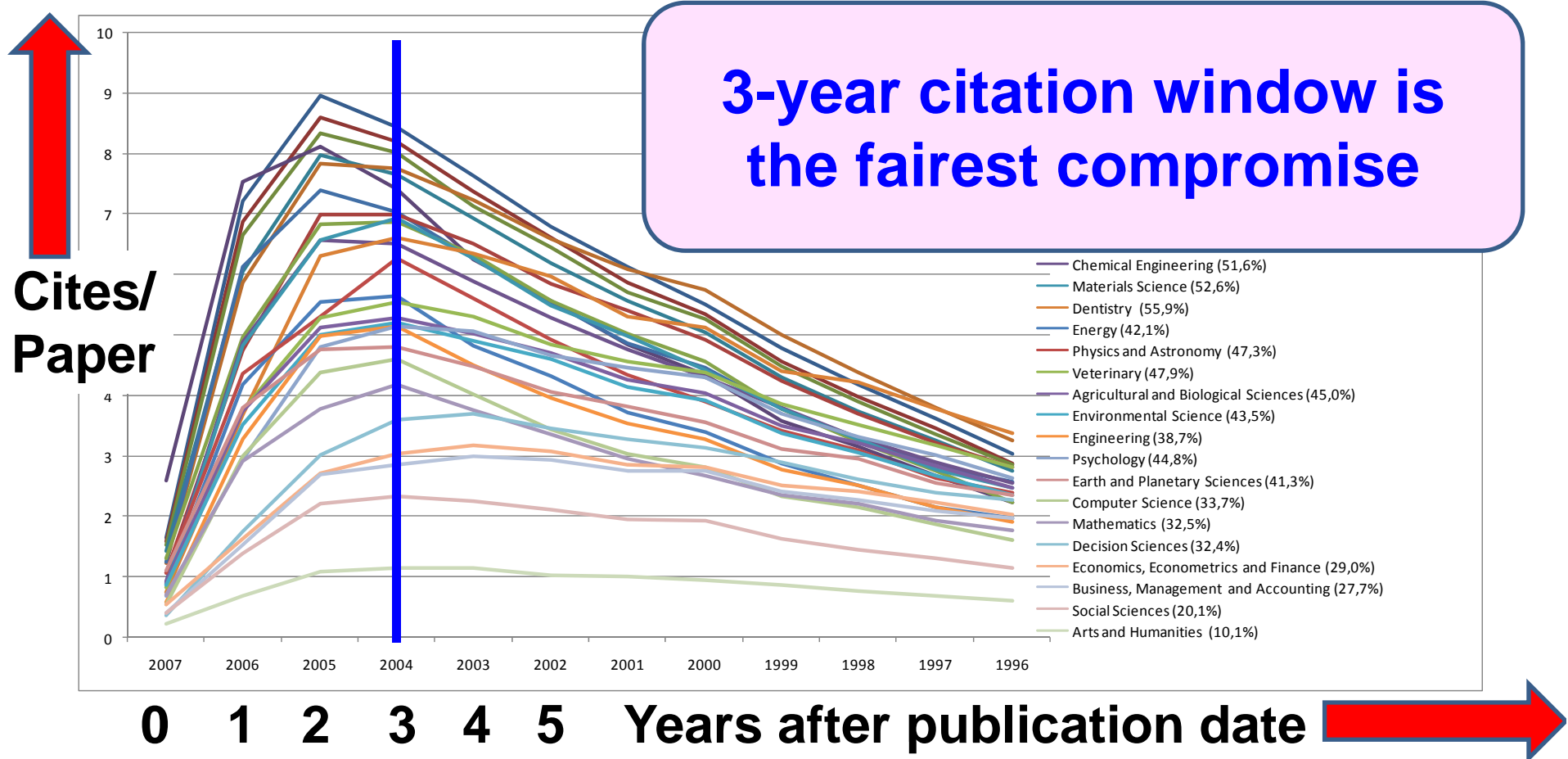
**# Citations in 2008 to its papers
published in 2005-2007**

Papers published in 2005-2007

**Similar to Thomson Journal Impact
Factor..... but with one cited year extra**

Why one cited year extra?

To which years are citations made in 2007 directed?



Source: Felix de Moya

SNIP =

A journal's raw impact per paper

**peer
reviewed
papers only**

Citation potential in its subject field

**A field's
frequency &
immediacy
of citation**

**Database
coverage**

**Journal
scope,
focus**

**Measured
relative to
database
median**

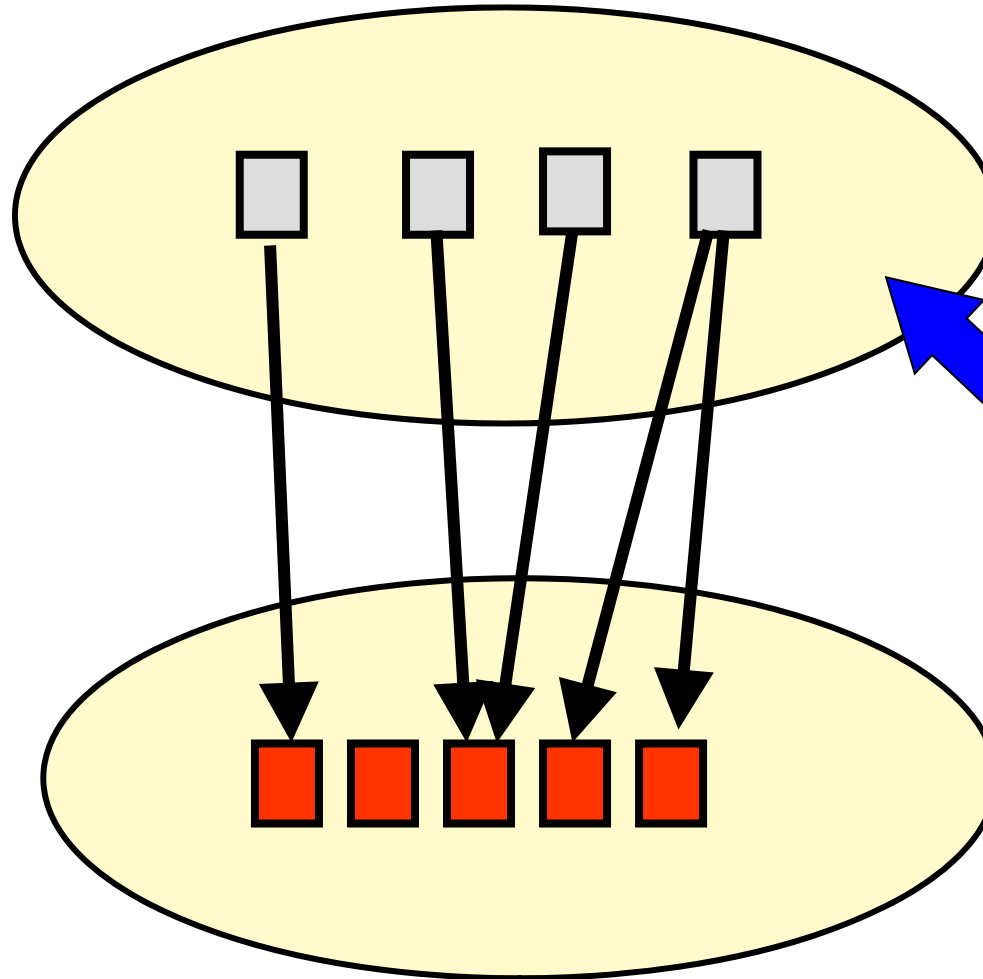
A journal's subject field

=papers citing the journal

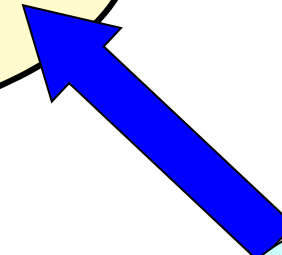
**Citing
papers**



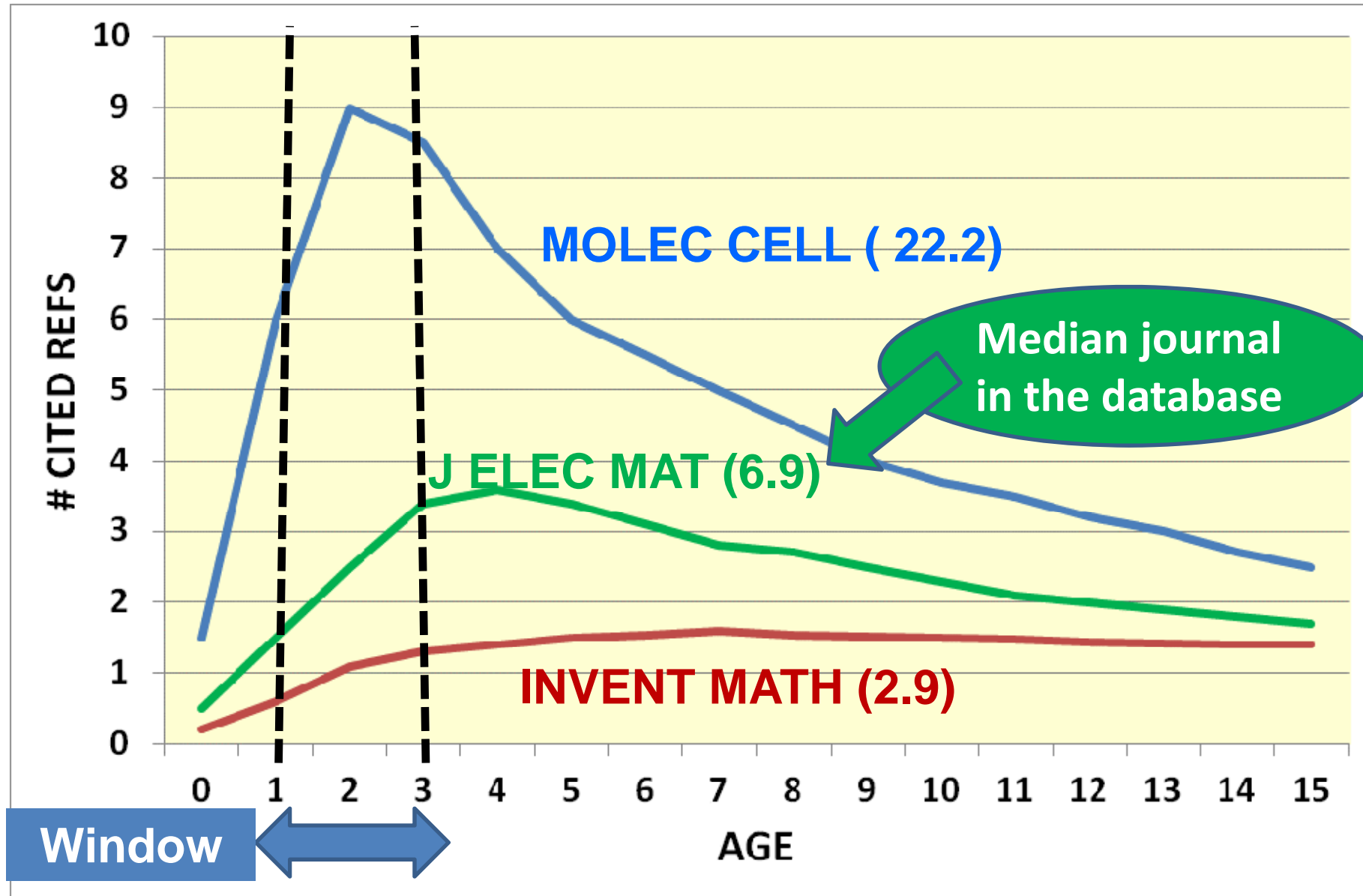
**Target
journal
papers**



**journal's
subject
field**



Citation Potential for 3 journals



Relative citation potential: examples (2009)

Journal	In journal's subject field	
	Citation Potential	<u>Relative Citation Potential</u>
INVENT MATH	2.9	0.42 (=2.9/6.9)
J ELEC MATER	6.9 (=median)	1.00 (=6.9/6.9)
MOLEC CELL	22.2	3.23 (=22.2/6.9)

Example 1 : Molec Biol vs. Mathematics

<i>Journal</i>	<i>RIP</i>	<i>Cit Pot</i>	<u><i>SNIP</i></u> (= <u><i>JIF</i></u> / <u><i>Cit Pot</i></u>)
INVENT MATH	1.5	0.4	<u>3.8</u>
MOLEC CELL	13.0	3.2	<u>4.0</u>

Example 2: Social Sci vs. Biol & Med Sci

<i>Journal</i>	<i>RIP</i>	<i>Cit Pot</i>	<u><i>SNIP</i></u>
J GERONTOL - A (Biol & Med Sci)	3.7	2.0	<u>1.8</u>
J GERONTOL - B (Psych & Soc Sci)	2.7	1.2	<u>2.3</u>

**Example 3: Applied mathematics:
new vs. classical subfield**

<i>Journal</i>	<i>RIP</i>	<i>Cit Pot</i>	<u><i>SNIP</i></u>
Int J Nonlinear Sci & Numer Simulat	4.2	2.0	<u>2.1</u>
Commun Partial Differential Equat	1.1	0.5	<u>2.1</u>

Strong points of SNIP

- Takes into account a journal's **scope**
- Allows **cross-subject** comparisons
- Is **independent** of an a priori subject categorization
- Can be calculated for **general** journals
- Less potential for **gaming**
- Accounts for differences between **and within** journal subject 'categories'

**SJR weights citations according
to 'prestige' of citing source**

SJR=Scimago Journal Rank

How SJR is calculated

- The idea of **recursion** is essential
- Step by step, SJR **weights citations** in one step according to the SJR of the citing journal in the previous step
- Under certain conditions this process **converges**
- in the end a citation from a source with **high** SJR is **worth more** than a citation from a source with low SJR

1. SJR OR SNIP?

Journal impact factors tend to measure mainly topicality if not popularity

Citation impact and topicality should be assessed separately



Focus on SNIP and its components

2. SJR OR SNIP?

Citations from Nature
and other top
journals should
receive more weight

Weighting citations
according to
prestige is a key
requirement



Focus on SJR

3. SJR OR SNIP?

Citation rates and database coverage also differ between journals in the same field

This requires a tailor-made definition of a journal's subject field



Focus on SNIP

4. SJR OR SNIP?

Why try to
eliminate the
'topicality' factor?

Topicality is a
manifestation of
journal
performance



Use SJR

Conclusion

- **There is no such thing as the perfect, single, journal metric**

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**The future of research assessment
exercises lies in the intelligent
combination of
metrics and peer review**

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

**Journal metrics should account
for 'free' citations (and usage)**

Base journal metric

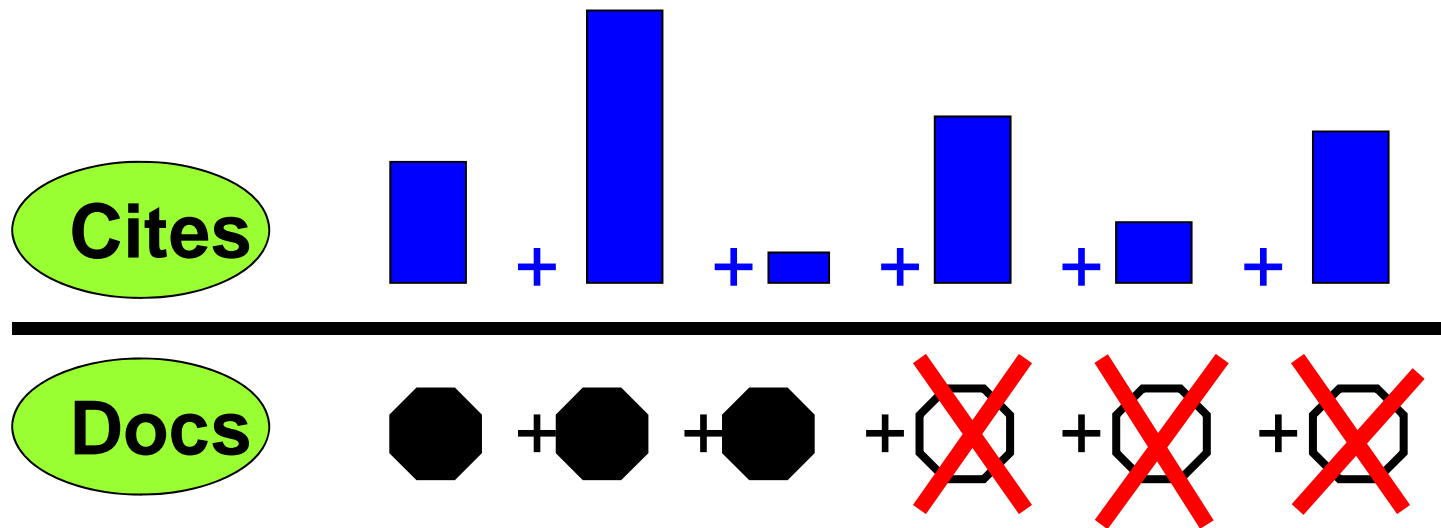
Citations to all docs

Citable docs

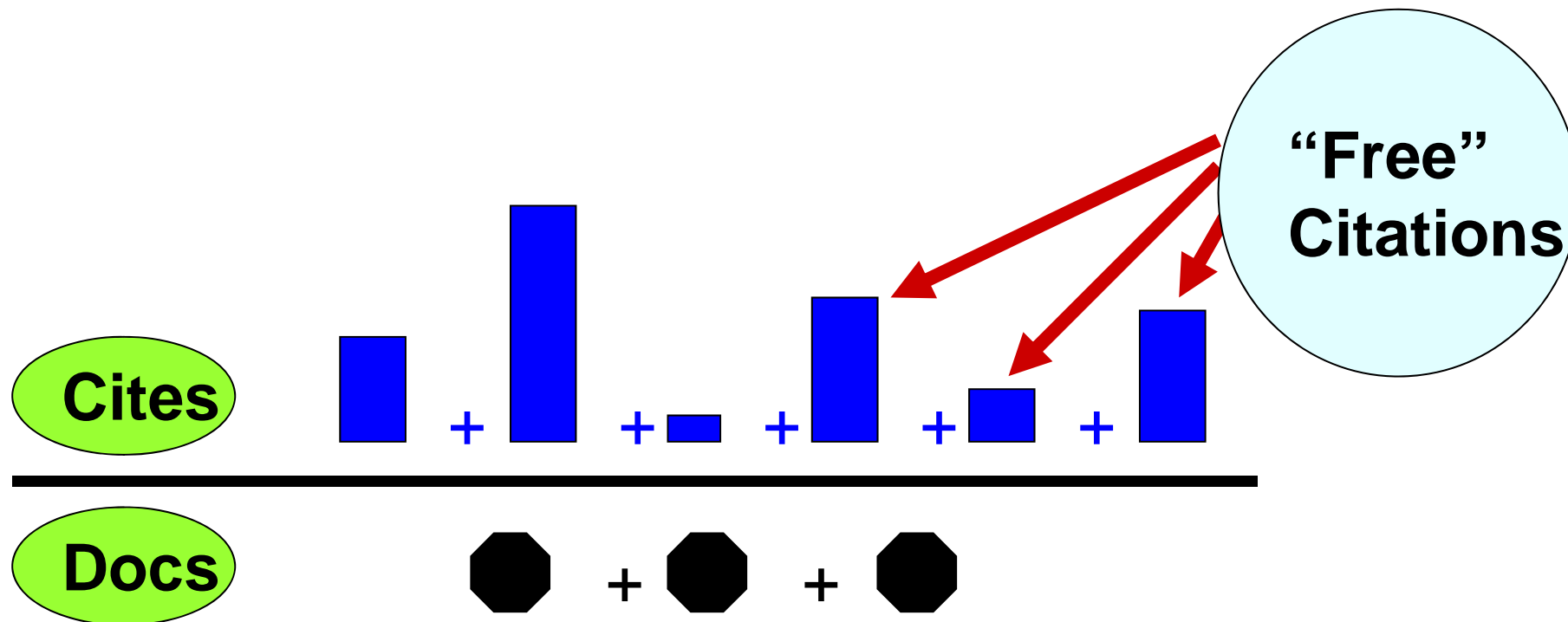
Citable vs. non-citable docs

Citable documents	“non-citable” documents
	
Articles	Letters
Reviews	Editorials
	Discussion papers

The problem of "free" citations - 1



The problem of “free” citations - 2

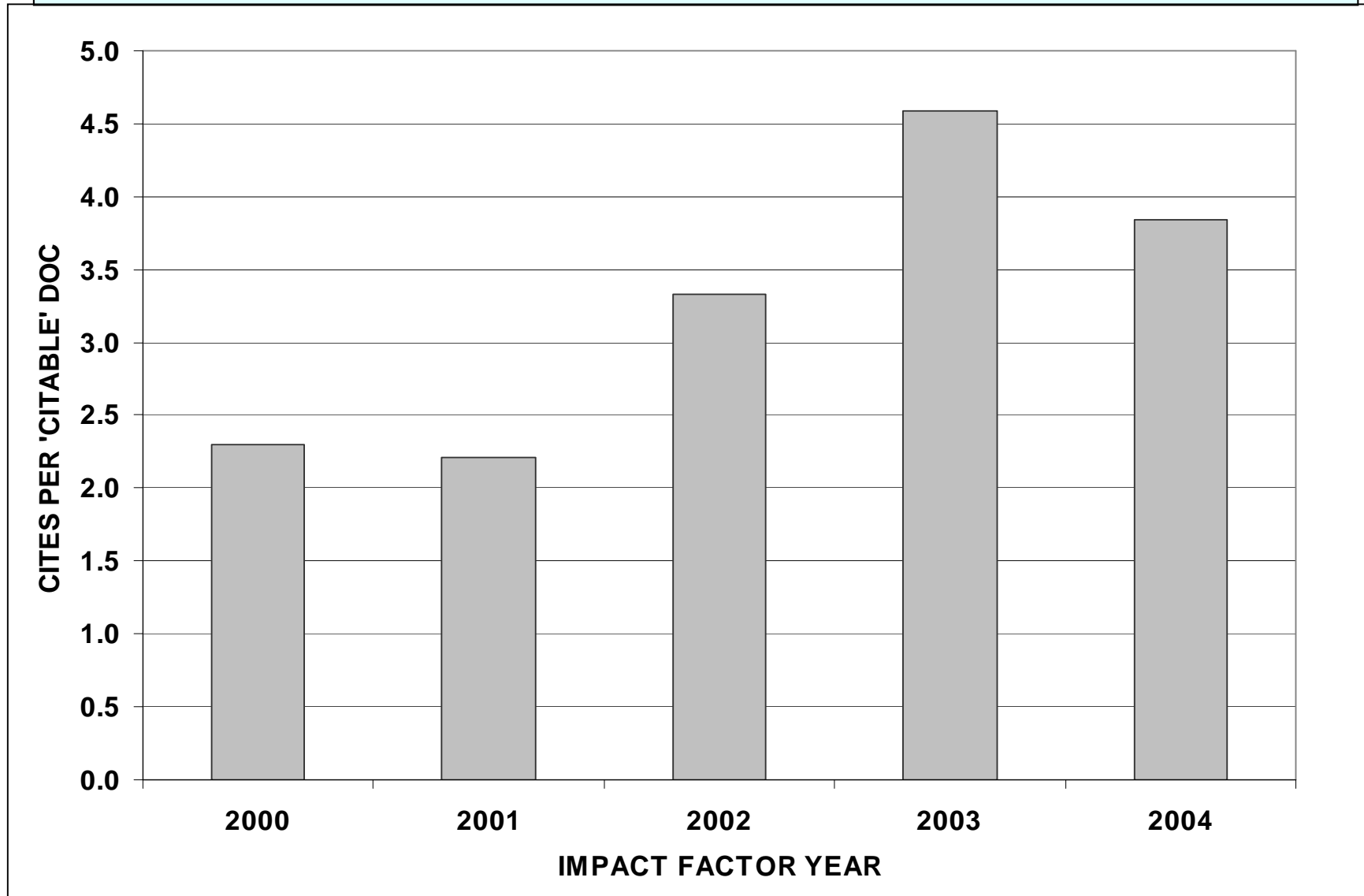


Effects of editorial self-citations upon journal impact factors

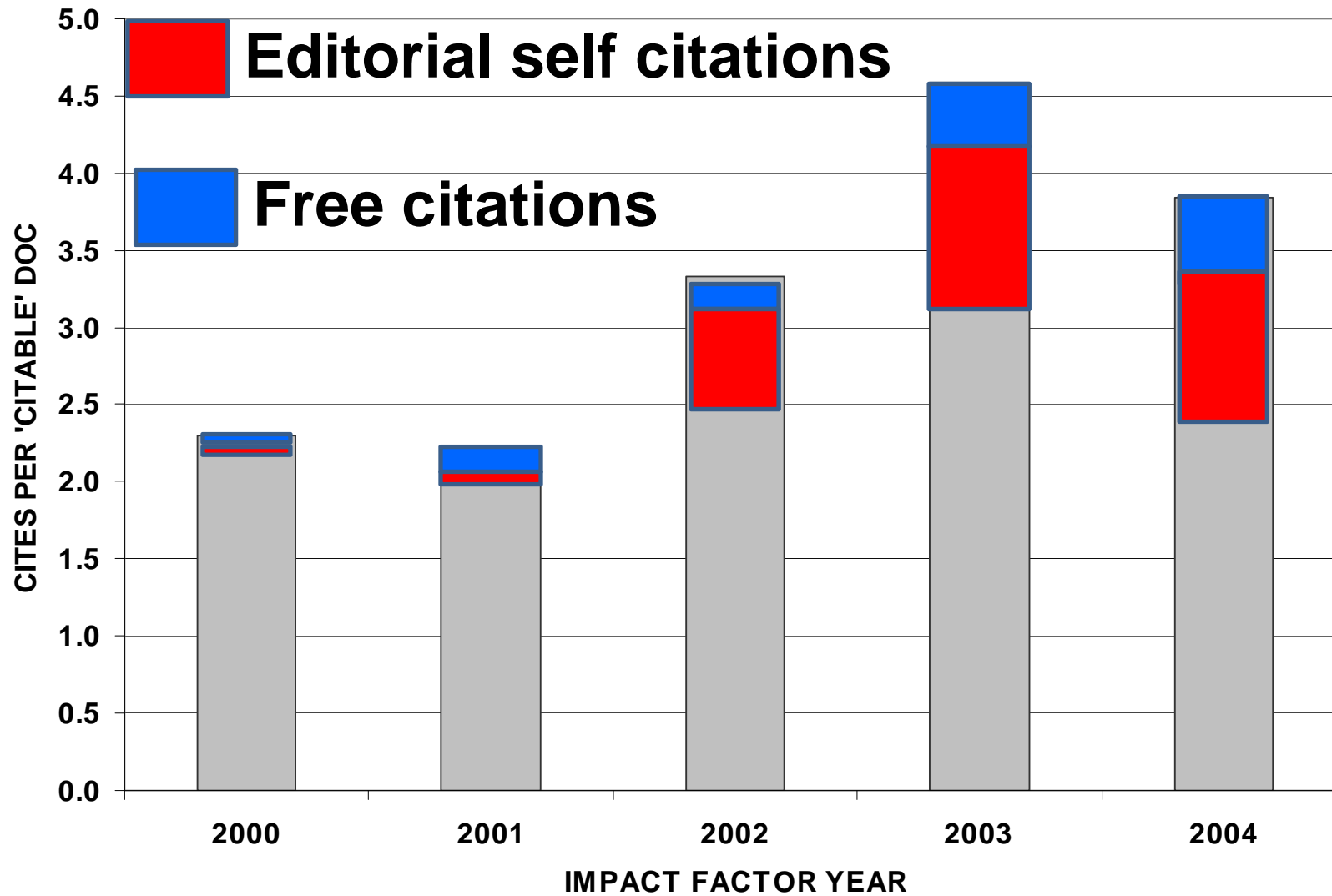
[Reedijk & Moed, J. Doc., 2008]

- Editorial self-citations: A journal editor cites in his editorials papers published in his **own** journal
- Focus on '**consequences**' rather than 'motives'

Case: ISI/JCR Impact Factor of a Gerontology Journal (published in the journal itself)



Decomposition of the IF of a Gerontology journal



One can identify and correct for the following types of strategic **editorial** behavior

- Publish '**non-citable**' items
- Publish more **reviews**
- Publish 'top' papers in **January**
- Publish '**topical**' papers (with high short term impact)
- Cite your journal in your **own** editorials
- Excessive journal **self-citing**

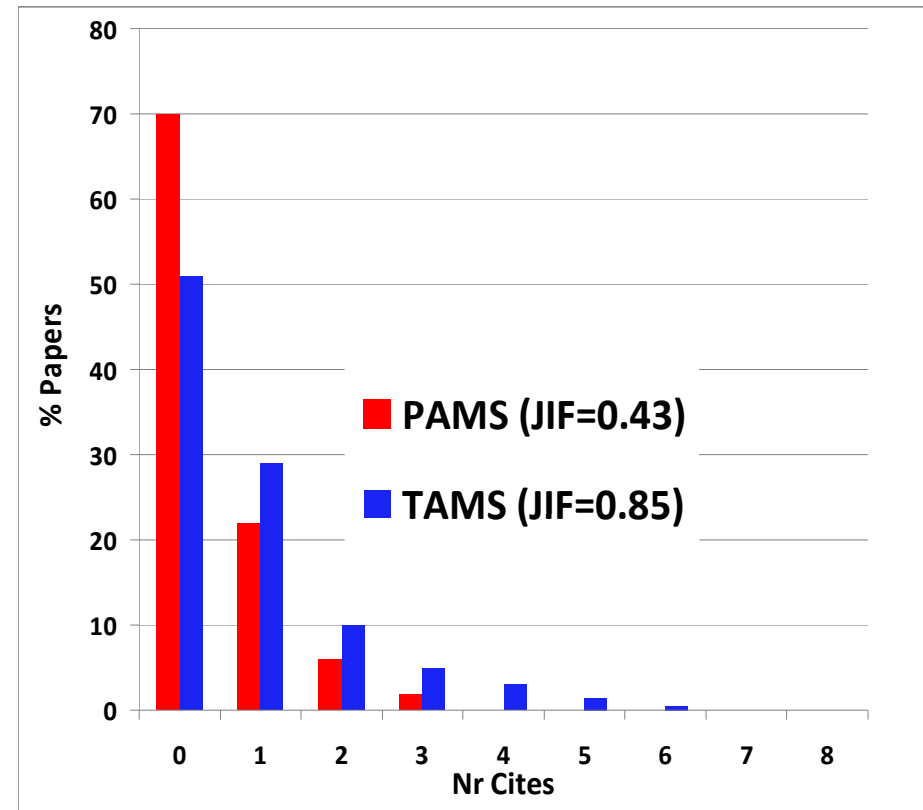
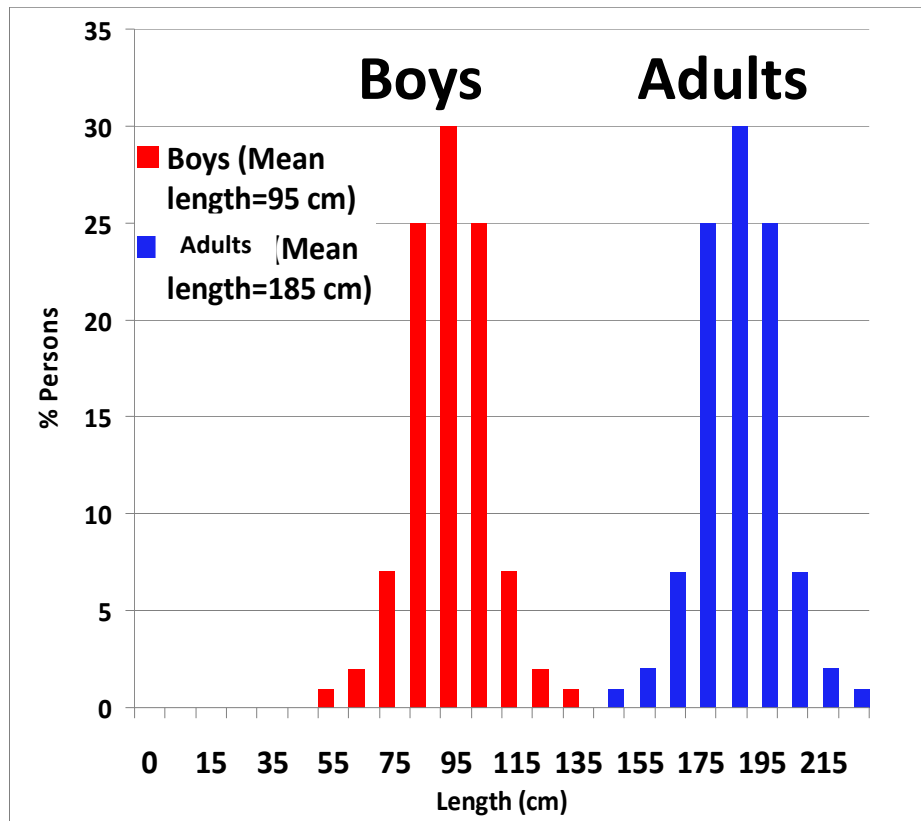
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**Journal impact measures
are **no** good predictors
of an individual paper's
actual citation impact**

**Partly based on International Mathematical
Union's Report 'Citation Statistics' (2008)**

Normal vs. skewed distributions



What is the probability that

a randomly selected boy
is at least as tall as a
randomly selected adult?

Av. Length: Boys 85 cm; Adults: 185 cm

**Almost
zero**

a randomly selected PAMS paper
is cited at least as often as a
randomly selected TAMS paper?

JIF: PAMS: 0.43; TAMS: 0.85

62 %

**Institutional research assessment
should apply indicators of
actual citation impact and
adequate benchmarking**

Field-Normalised Citation Impact

The average citation rate of a unit's papers

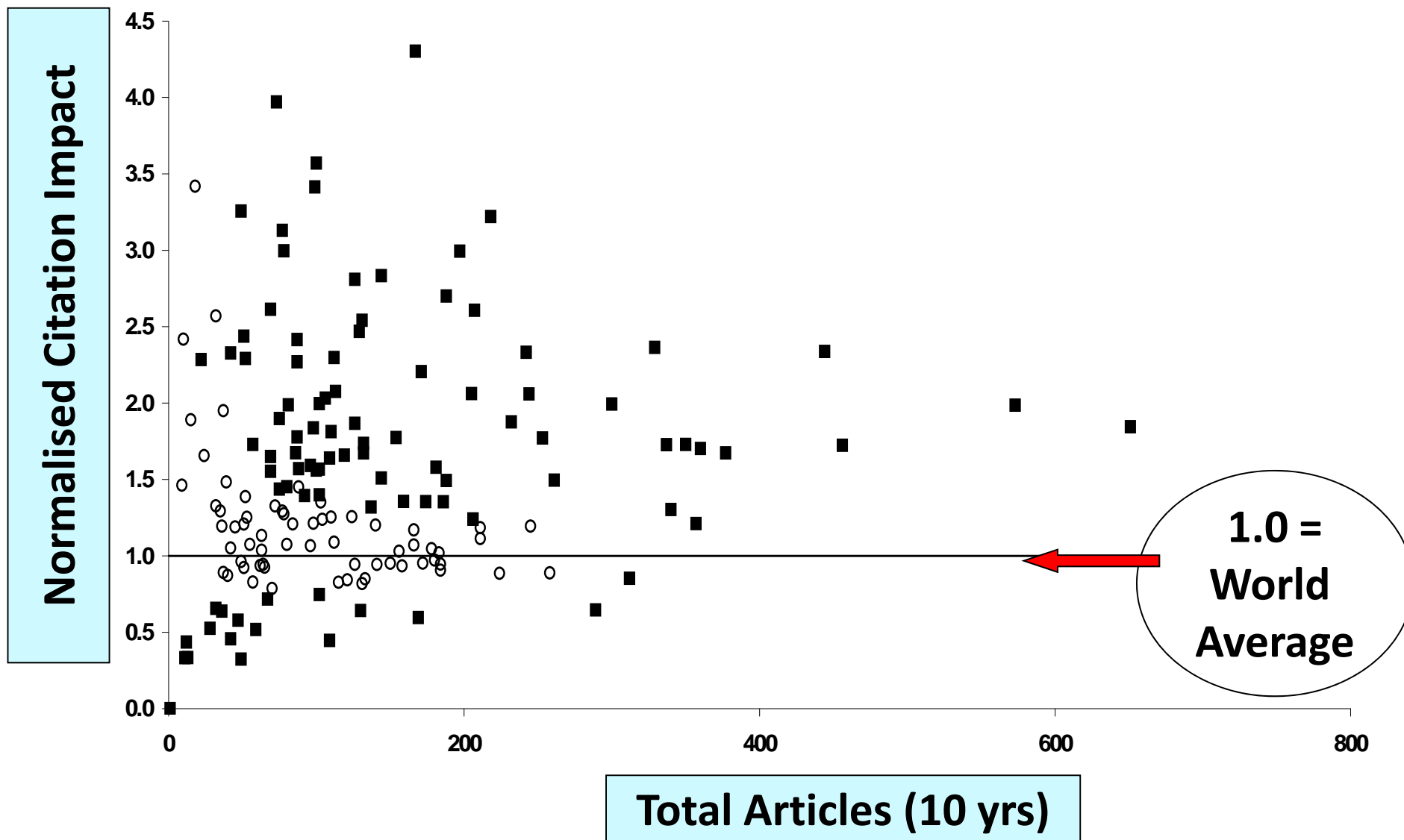
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**world citation average in the subfields in
which the unit is active**

Corrects for:

- a) differences in citation practices among fields;**
- b) publication years;**
- c) type of article.**

159 NL Academic Chemistry Groups



Indicators are becoming more 'informative'

Feature	Example
Put numbers in context	Field-normalized citation measures
"who" is citing	Citations weighted with "prestige" of citing source
"Distance" between citing and cited authors	Impact outside the own niche; multi-disciplinarity; bridging paradigms
"Why" is it cited	Classification of citation context in full text analysis
How often papers are downloaded by whom?	Usage indicators based on full text downloads from publication archives

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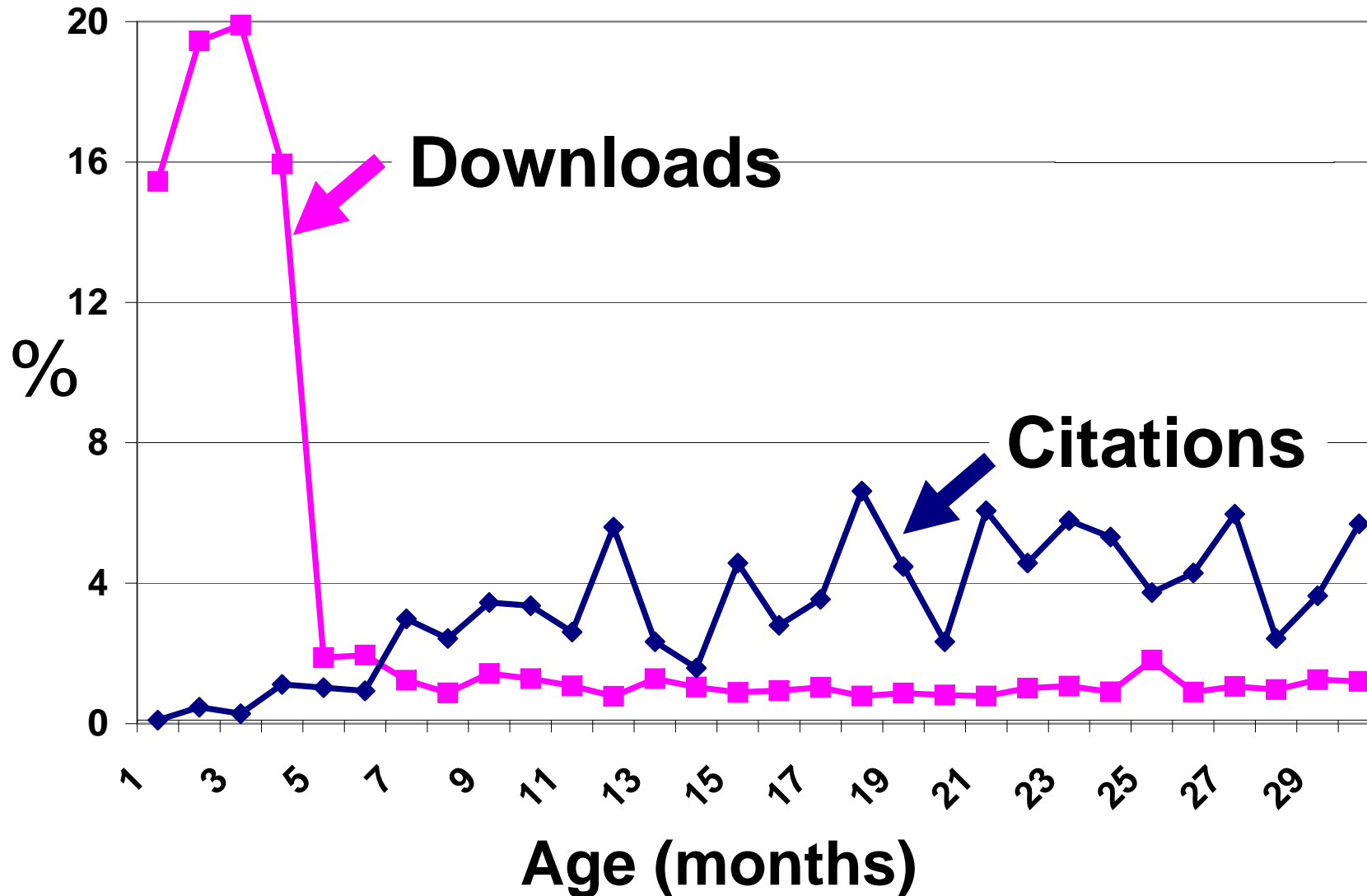
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Analogy Model

<u>Formal use</u>	<u>Informal use</u>
(Collections of) publishing authors	(Collections of) users
Citing a document	Retrieving the full text of a document
Article	User session
Author's institutional affiliation	User's account name
Number of times cited	Number of times retrieved as full text

Age distribution downloads vs. citations

[Tetrahedron Lett, ScienceDirect; Moed, JASIST, 2005]



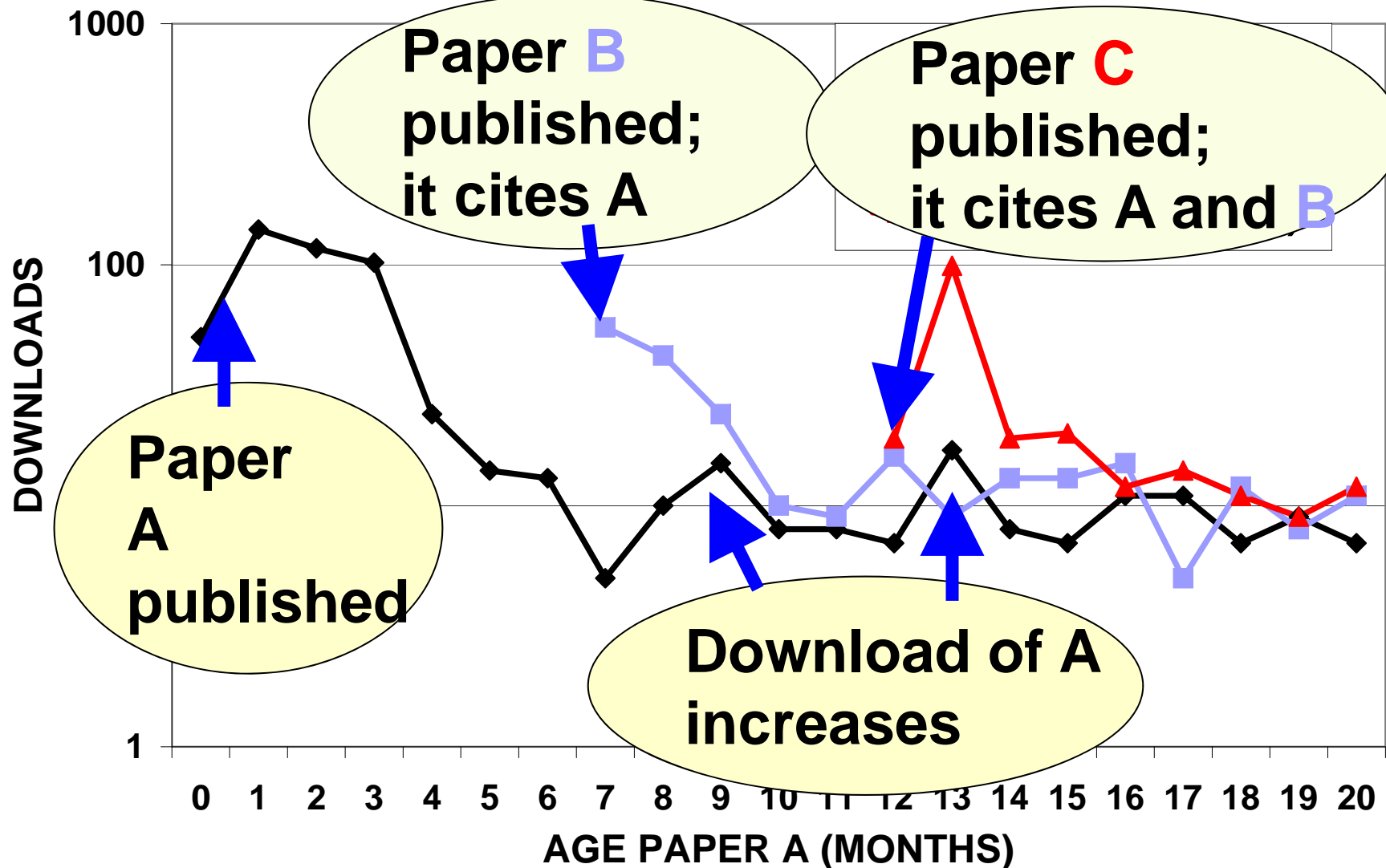
More downloads → more citations

or

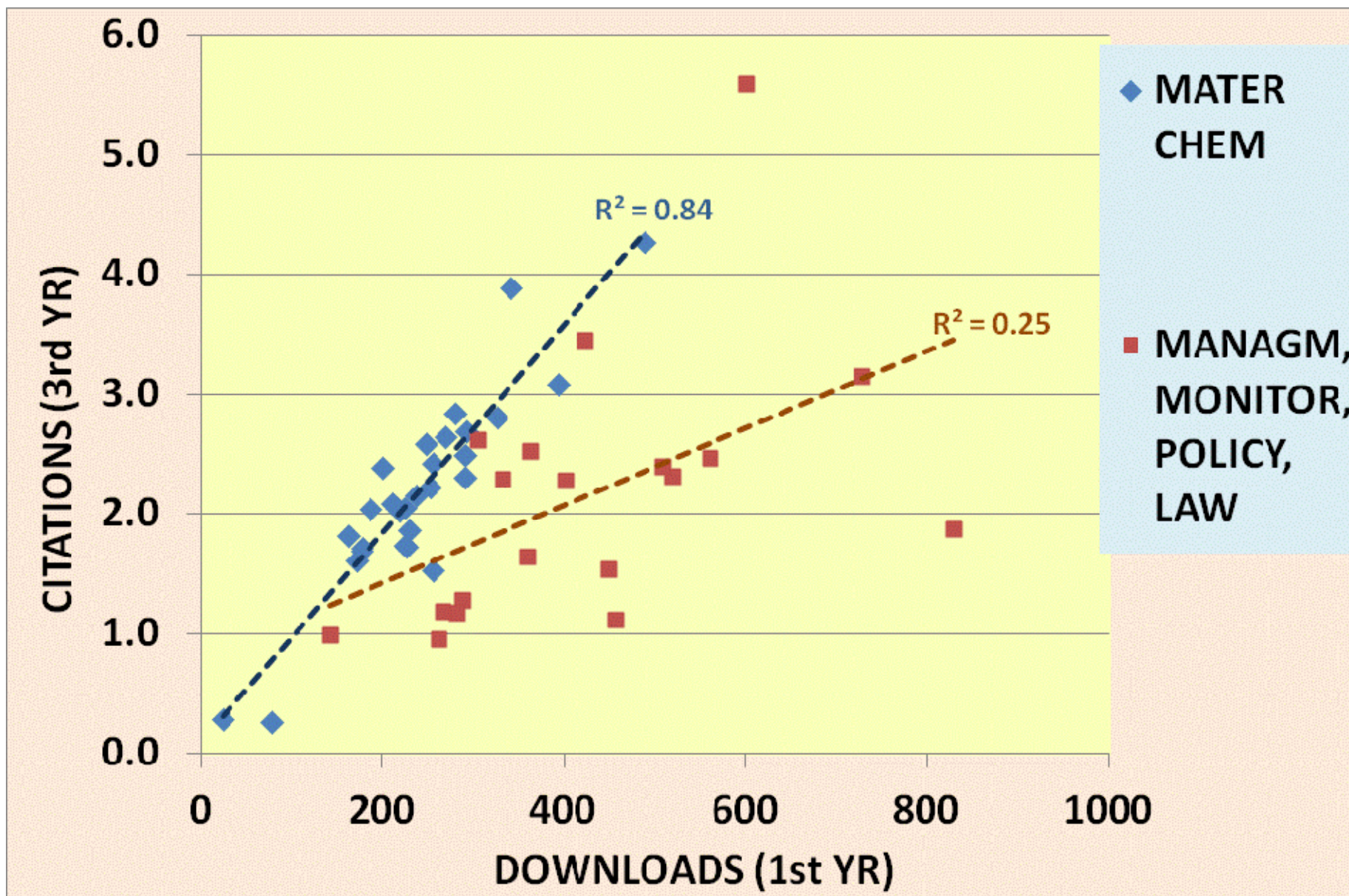
More citations → more downloads?

Citations lead to downloads

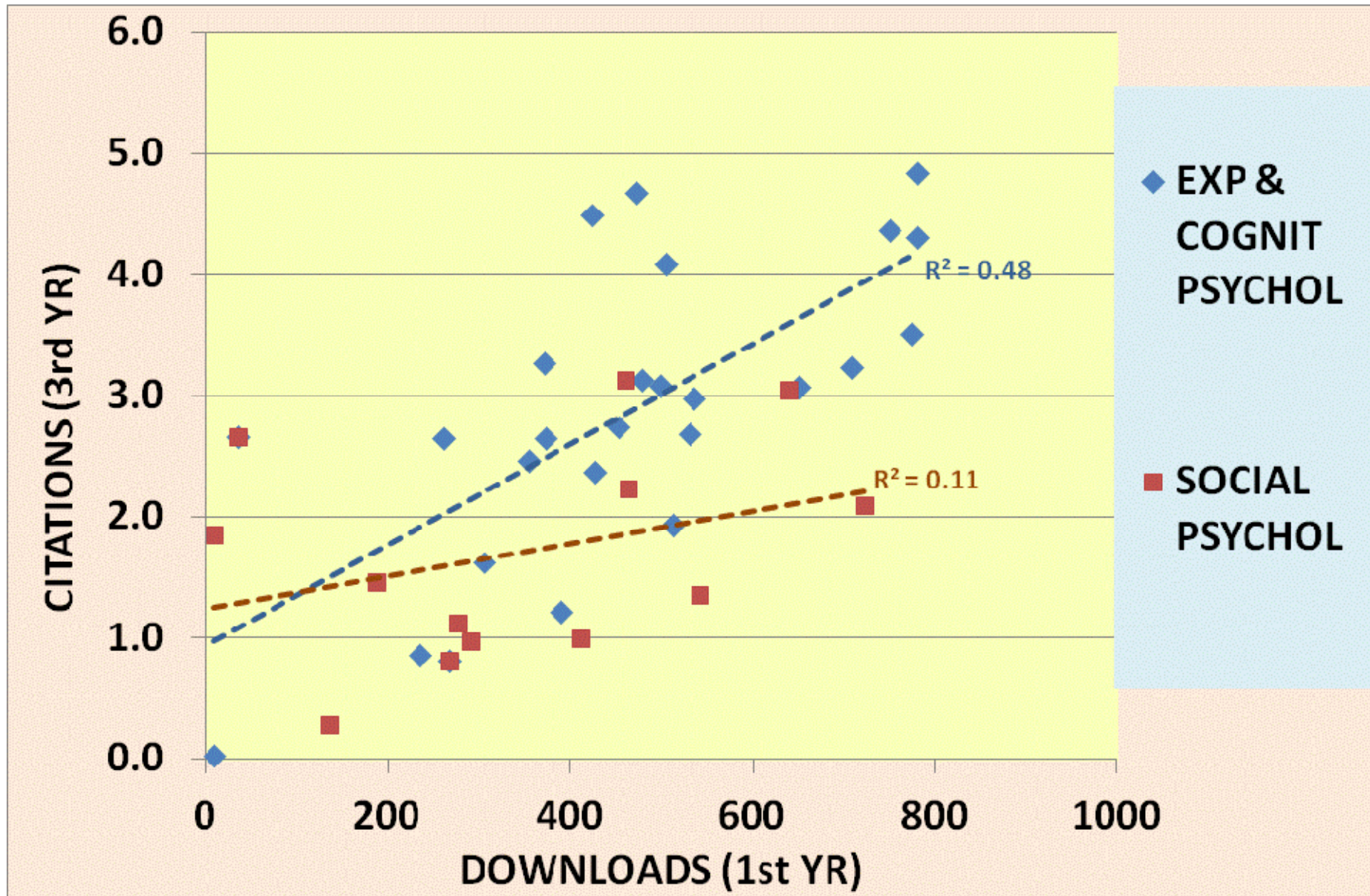
[Moed, J. Am Soc Inf Sci Techn, 2005]



Do downloads predict citations to journals? - 1



Do downloads predict citations to journals? - 2



**Downloads and citations
relate to **distinct** phases in
scientific information processing**

**.... but (many) more cases must
be studied**

**Thank you for your
attention!**