Bibliometrics as a tool for research evaluation

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What is bibliometrics?

- statistical analysis of scientific communication patterns
- it uses published scientific literature: papers in scientific journals, proceeding's papers, reviews, research notes and other types of document

Areas of application of bibliometrics

- Library and information science
- Sociology and history of science
- Science policy
- Research evaluation

Uses of bibliometrics in research evaluation

- bibliometrics as an *objective* way to evaluate science (as compared to peer-review)
- positioning and benchmarking of countries, universities, research laboratories (assessment of publications output and scientific impact)
- mapping and assessing trends of development in fields and subfields of science
- collaboration mapping (inter-sectorial, inter-institutional, international relations)
- measuring the impact of granting programs and institutions (government, funds)

Sources of bibliometric data

- International citation indexes: Web of Science, Scopus
- National citation indexes (Russian Index of Scientific Citation, Chinese Social Sciences Citation Index, etc.)
- Specialized bibliographic databases (PubMed, EconLit, etc.)
- Google Scholar, etc.

Citation indexes

(Web of Science & Scopus)

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- author(s)'s affiliation
- address
- abstract
- keywords
- list of references

Bibliometric indicators (1)

- **Publications** (number of publications, index of specialization, co-athorship, etc.)
- **Citations** (number of citations, average citations by field, highly cited papers, co-citation, etc.)
- **Citations and publications** (Hirsch-index, number of citations per paper, etc.)

Bibliometric indicators (2)

- **Impact-factor** of a scientific journal is an average number of citations received by articles in a journal two years after their publication
  - For example, the impact factor 2010 for a journal would be calculated as follows:
  - A = the number of times articles published in 2008-2009 were cited in indexed journals during 2010
  - B = the number of articles, reviews, proceedings or notes published in 2008-2009
  - impact factor 2010 = A/B

Great variations of average impact factors in different fields and subfields

- journal “Nature”: 34,48
- Biochemical research: 2,59
- Nuclear Physics: 2,15
- Mathematics: 0,39

Impact-factors of journals are published in:

- Journal Citation Report (JCR), by Thomson Reuters
- Scopus Journal Impact Factor, by Elsevier
  - SNIP (Source Normalized Impact per Paper)
  - SJR (Scimago Journal Rank)

Limits of Web of Science and Scopus

- Access is expensive !
- User interface is adapted only to bibliographic research
- Language bias (non English language research is underrepresented)
- Natural sciences bias (social sciences and humanities are underrepresented)

Bibliometric databases do not index all of the scientific literature !

E.g.: Less than 10% of all Russian papers are covered by international citation indexes

Russian Academy of Sciences

Total staff in 2009: 55402

	Number of researchers	Number of Papers in Scopus*	Researchers / papers ratio
Physics and Astronomy	13013	5986	**2,17**
Mathematics	4480	1396	**3,21**
Social Sciences	1032	177	**5,83**
Economics	2244	13	**172,62**

Effects of a growing international competition: papers race instead of arms race

* Source: Scopus

Average citation rates

USA: 15,02
England: 13,78
Germany: 12,28
France: 11,5

Brazil: 5,95
China: 5,24
India: 5,08
Russia: 4,39

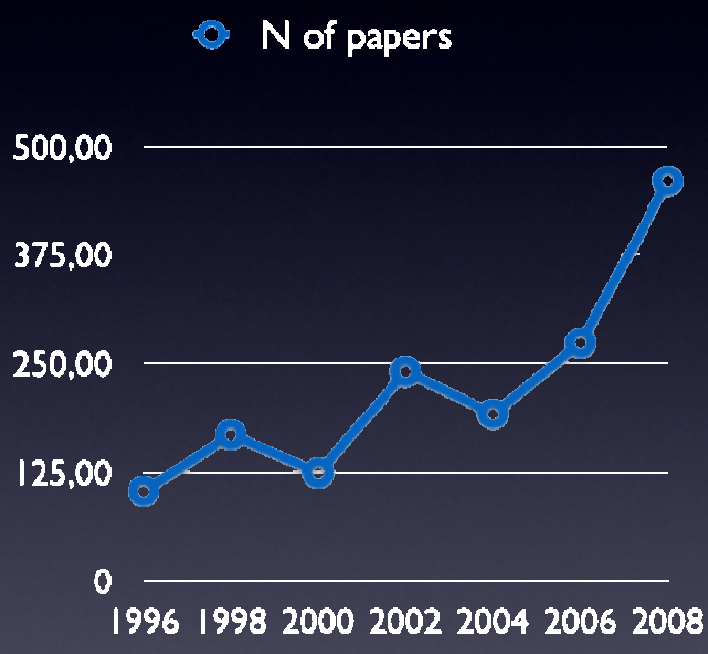
Distribution of world publications and citations (2008)

- Top 10 countries publish 68% of all papers indexed by Scopus (top 20 countries publish 85 % of papers)
- Top 10 countries receive 75% of world attention as measured by citations (top 20 countries receive 90% of all citations)

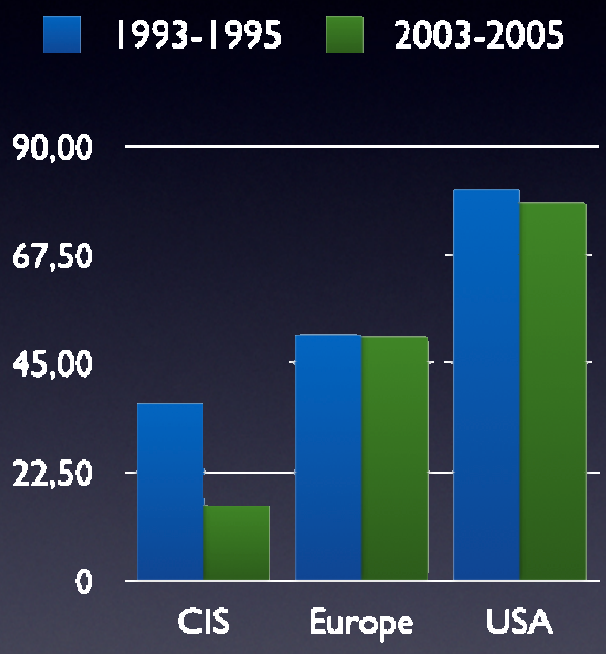
- A «Matthew effect» in science, or accumulated advantage

Papers by authors from peripheral countries and institutions have less chances to be cited by colleagues

Publication and citation trends in Russian social sciences

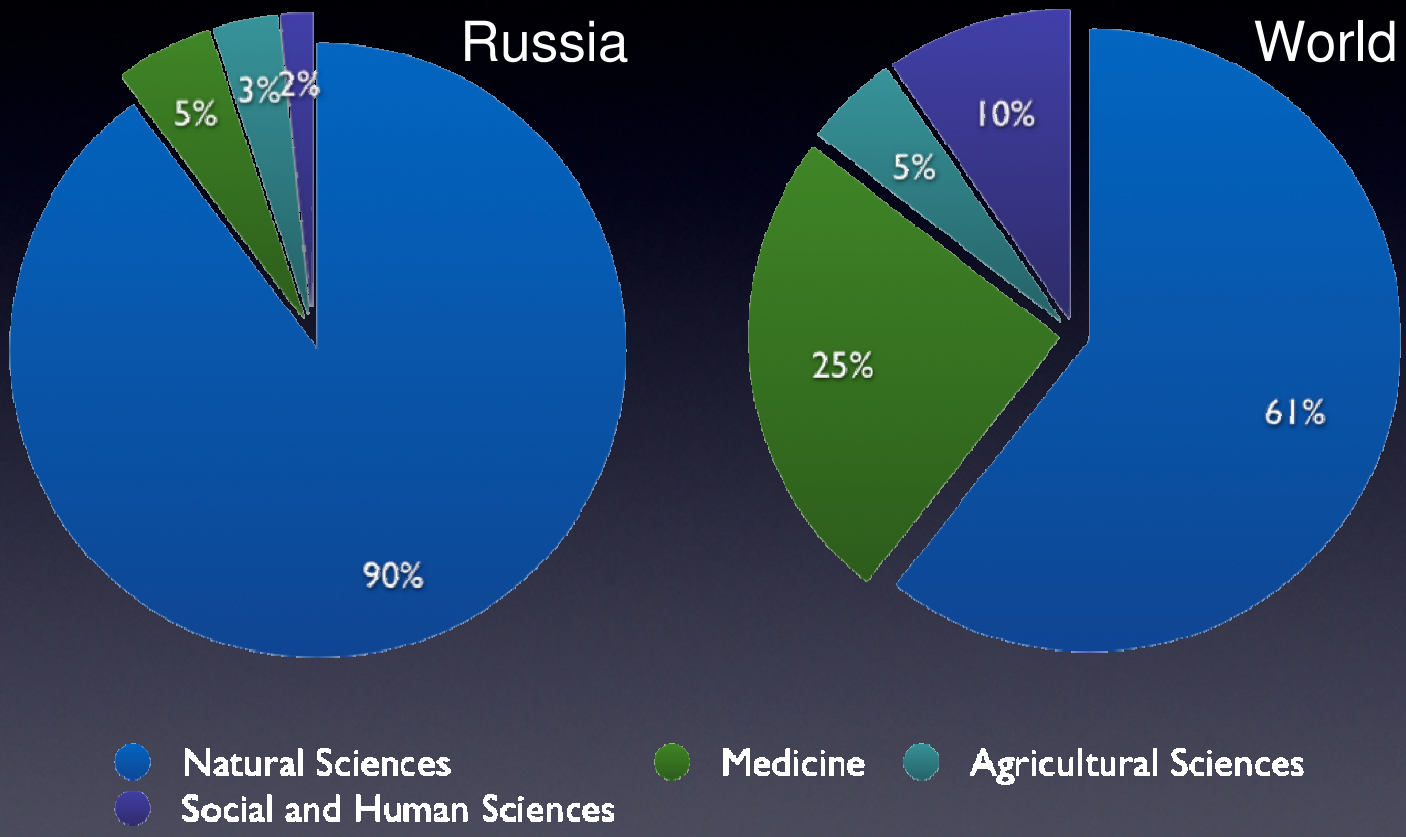


Source: Scopus

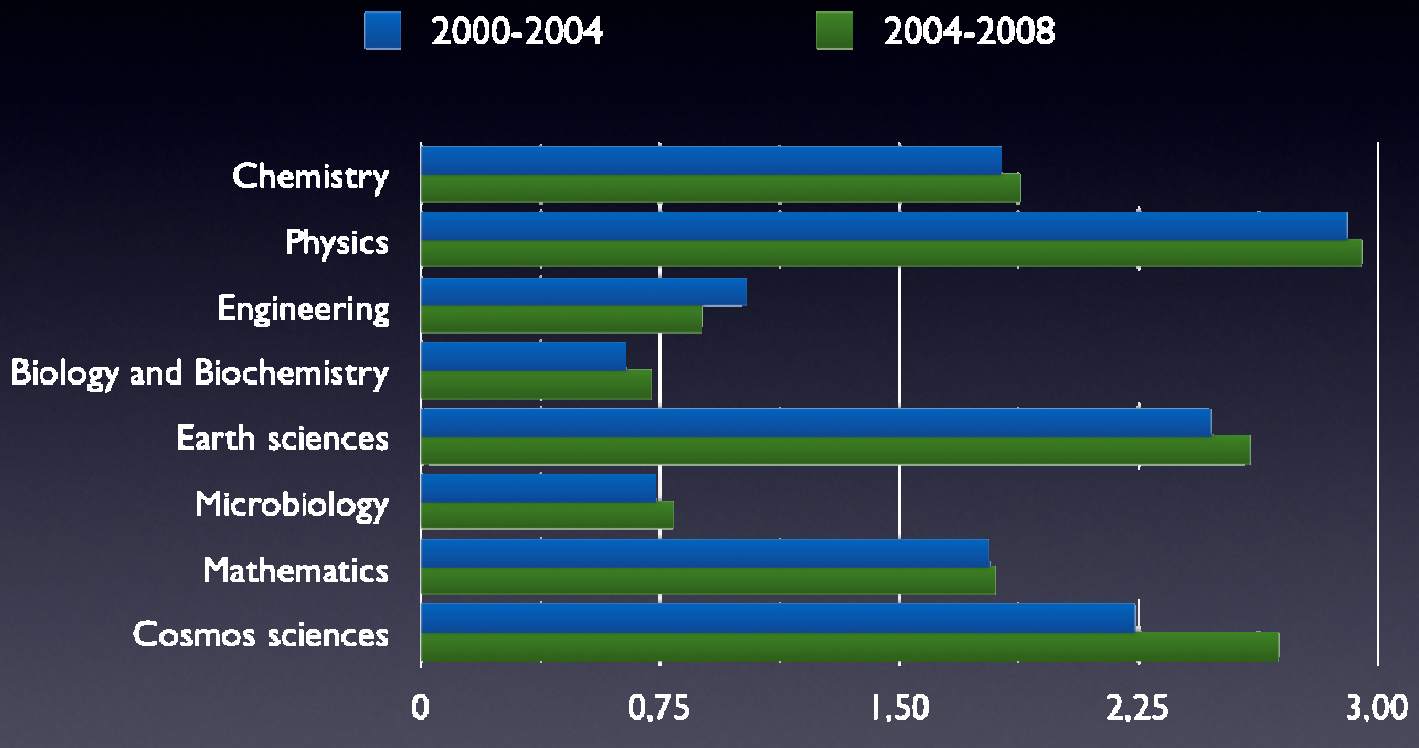


Source: Gingras, Mosbah-Natanson

Distribution of papers by group of subjects (2009)



Index of scientific specialization for Russia (>1)



Conclusion

- Bibliometrics is a useful tool for mapping micro-structures and trends in science
- Bibliometric indicators of performance should be interpreted with caution, especially in peripheral countries
- Bibliometrics should *not* be used for evaluation of individual researchers
- Bibliometrics should *not* be used as a unique tool of evaluation

Спасибо
Thank you