Bibliometrics beyond rankings

(or: integrating heterogeneous data)

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What are bibliometric (alt-metic) scores?

- Performance metrics
  - Answering 'who are the best' (papers, journals, researchers, institutions, universities, countries)
  - Efforts to improve - finding 'the' correct indicators
- Incentive
  - With beneficial and negative effects (for who?)
  - Different, depending on position / career phase
- Ideology
  - Excellence discourse
  - Really used by established elites?

Demystifying citations

- Just an observational item
  - May be used (next to others) to measure aspects of performance
- But the underlying concepts are something else
  - Citations 'correlate' with underlying performance concepts
  - Ideally: multiple item scales are needed
  - Ranking on individual items is meaningless

- Observations help to find theoretical and practical answers

- However – where are smart questions about the functioning and impact of the science system

Incentives or ideology?

- Indicators and rankings have become important as incentives – as people react
  - E.g., citations, H-index, Impact factor or A-publications
  - Researchers, managers, policy makers, funders may adapt

- However, do decision makers really use citation based criteria?
  - Or do they only claim so?

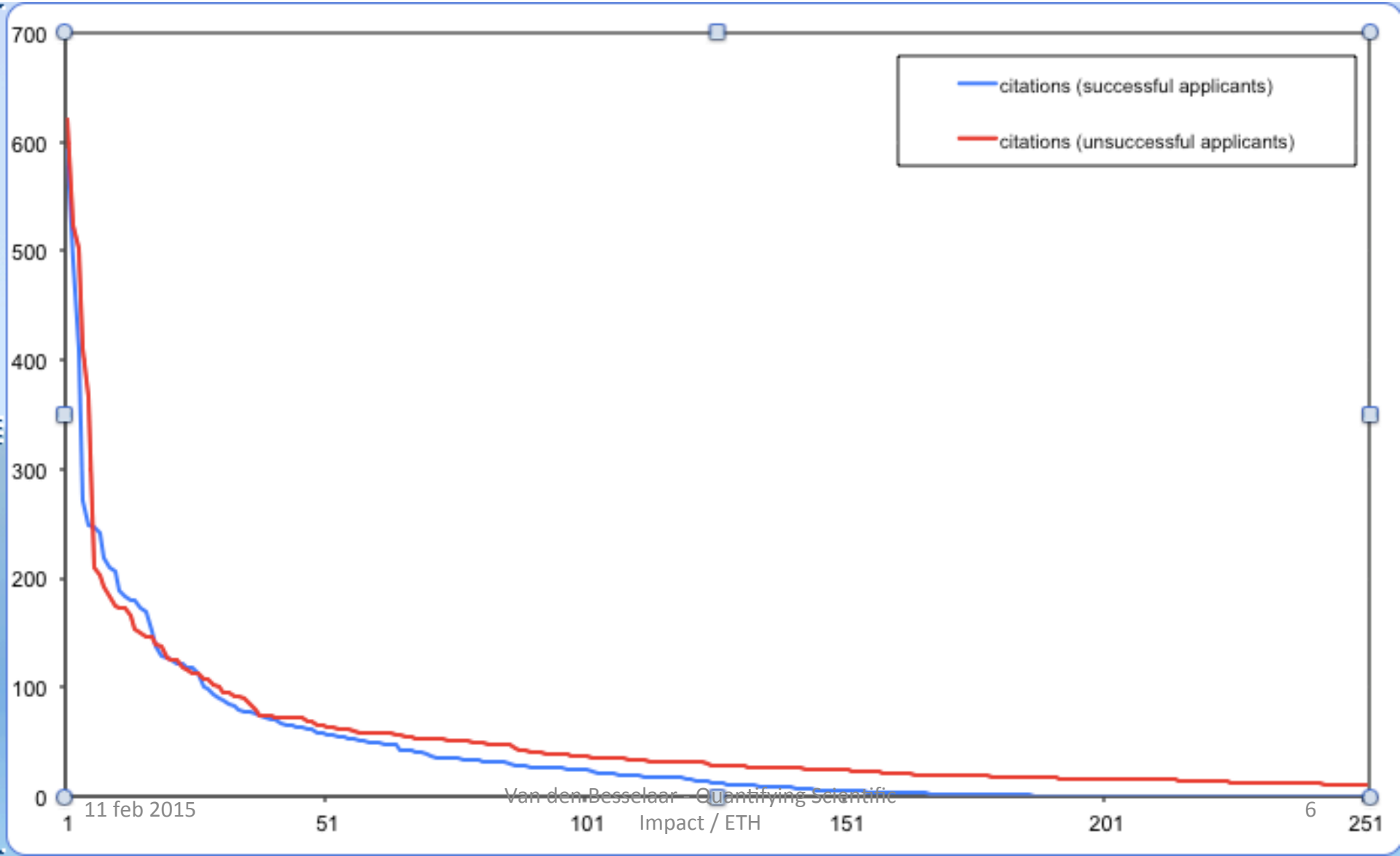
At least they do not always!

- Council decisions do not correlate with bibliometrics / many false positives and false negatives, and with a very low predictive validity.

- Those around the council (insiders) apply more, and get more funding; but do not have better performance
  - Better bureaucratic competencies, learning to write proposals, information advantage.

- Panel members and reviewers consider impact factor of journals as more important than the performance of the applicants
  - "… has extensive experience in the field, achieving important research outcomes, with an impressive H-index and many citations. However, the publication venues are not very prestigious. The PI has already established a research team."

Citations: granted and non-granted



Impact: of agents or of the system?

- Impact rank order of individual agents: trivial
  - always a rank-order; there is always a top

- But the real impact question is at the systems level
  - What structural and behavioral characteristics pay off in terms of research systems' impact, performance?
    - Rankings may play a role (as part of an incentive structure)
    - How (if at all) do they work, and under what conditions?

- Understanding underlying mechanisms is important
  - Also for policy and management: what works and why?

What is the impact we are after?

- Scholarly impact
  - Does the system (to be defined) contribute to scientific break through and scientific progress
  - Does the system generate a next generation of very good researchers

- Societal impact
  - Does the system contribute to radical social and technological innovations?
  - Does the system generate a next generation of very creative highly educated workforce?
  - Are links between science and society well functioning

Proposal

- Let's use citation data for understanding the working of the system – let's first ask relevant questions
- For example:
  - Impact of organizational forms on performance?
  - Impact of funding ecology on performance?
  - Impact of evaluation institutions on performance?
  - How to link the system with society to improve the use of knowledge?
  - How to select talent selection – what is scholarly talent and how to identify?
  - Identification of new fields - specialties

Example 1: What incentives to introduce? (Quantity versus quality)

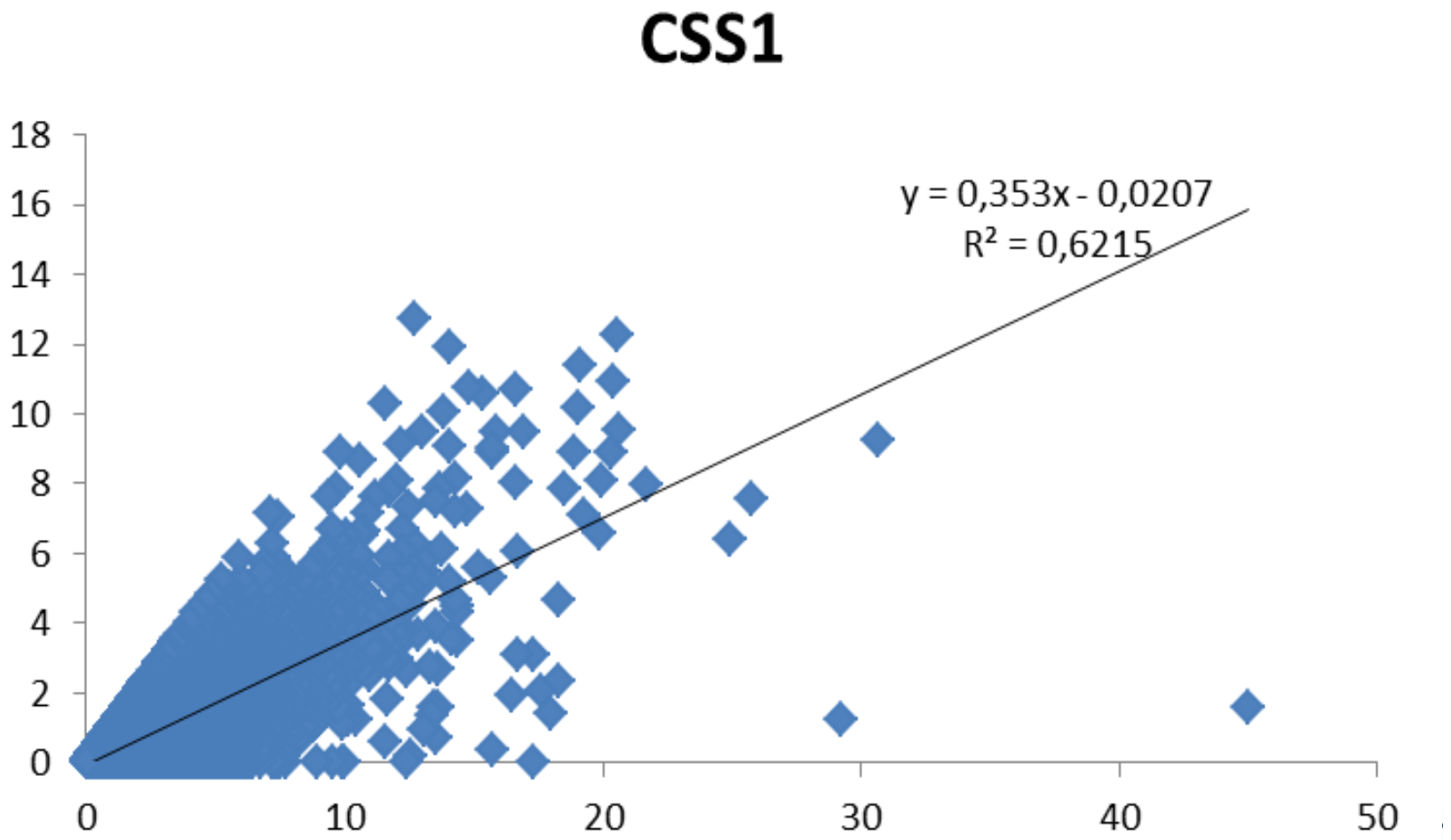
- Is focus on output good or bad for the system?
  - Focus on quantity is wrong incentive (L. Butler on Australia)
  - High impact is by chance – the more one tries (many publications) the more likely to get a hit (Simonton on scientific creativity)

Citation impact as test:

- Are the more productive authors also author of the highly cited papers?
  - Test (50.000 Swedish authors); Using percentile groups
  - Top 1% highly cited authors: good for 8% of the fract. publications
  - The high volume producers have much larger share in top impact papers.

- Simonton, not Butler!

CSS1 (top 20% cited papers) by productivity



Example 2: Does higher competition and autonomy improve performance?

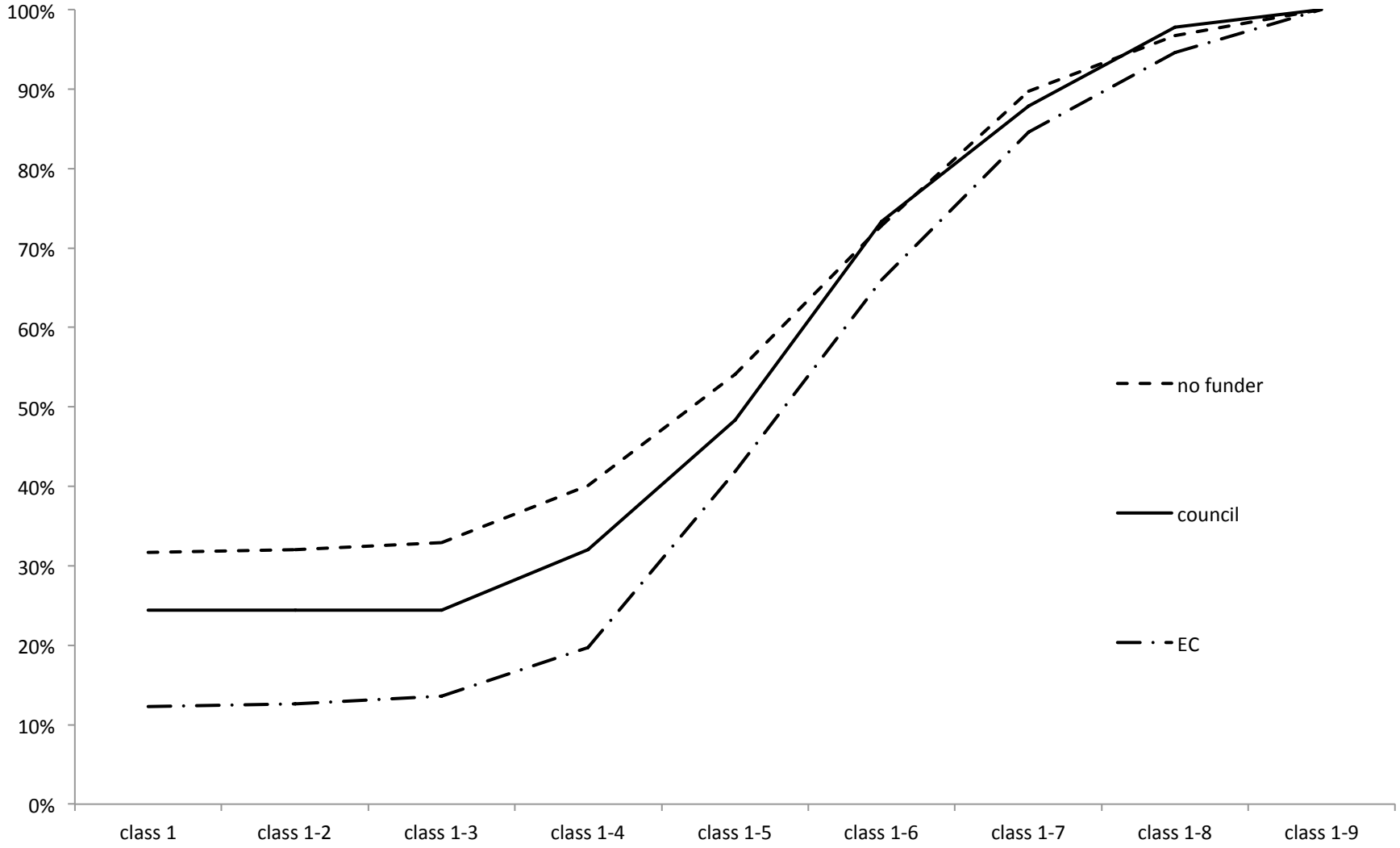
- Competition: % project funding
  - Van Steen (2010) OECD project-funding study
- Autonomy of universities
  - Aghion et al (2007) survey among universities
- Academic freedom
  - Teichler et al (2013) study on academic profession
- Performance:
  - Share of country in (field normalized) top 10% cited papers (woS)

Preliminary findings

- Some preliminary tests
  - Competition: works negative on performance
    r = - 0.24 (14 countries)
  - Autonomy: too large autonomy works negative
    r = - 0.29 (9 countries)
  - Academic freedom is important for performance
    r = 0.58 (8 countries)

- Further work needed

Example 3: funding modes



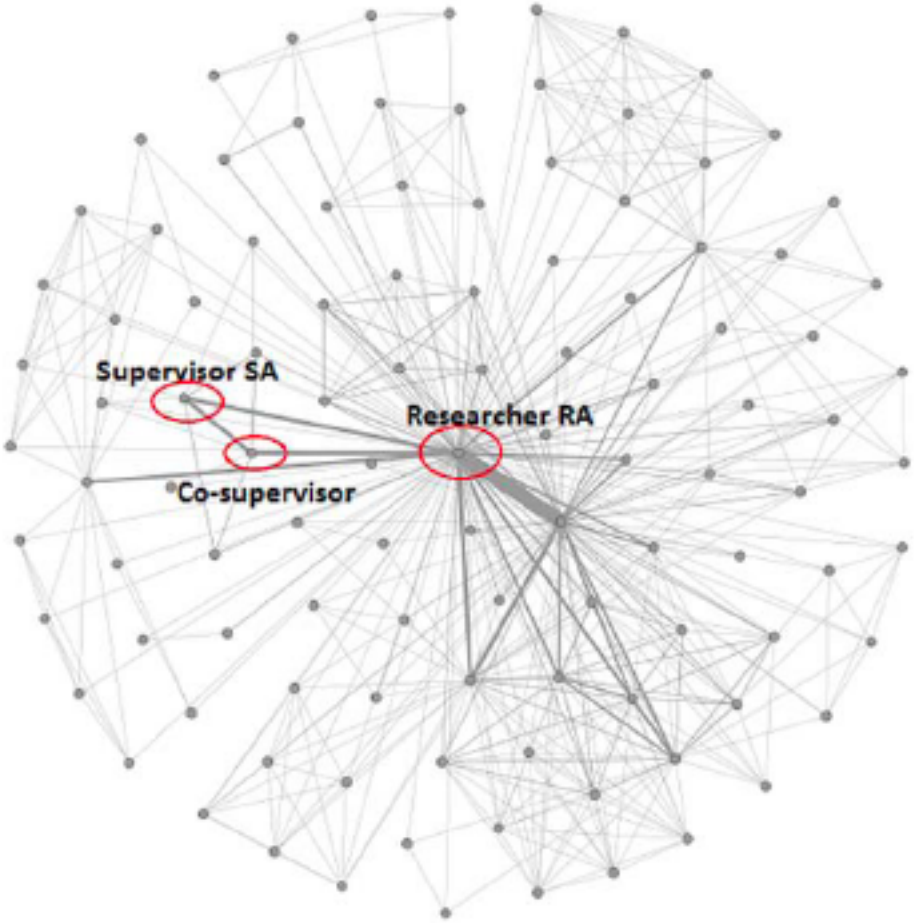
Example 4: What factors influence selection of talent?

- What is talent?
  - Many dimensions (Van Arensbergen, et al, *Res Eval* 2014)
  - Which dominate?
  - Independence often mentioned for early career researchers

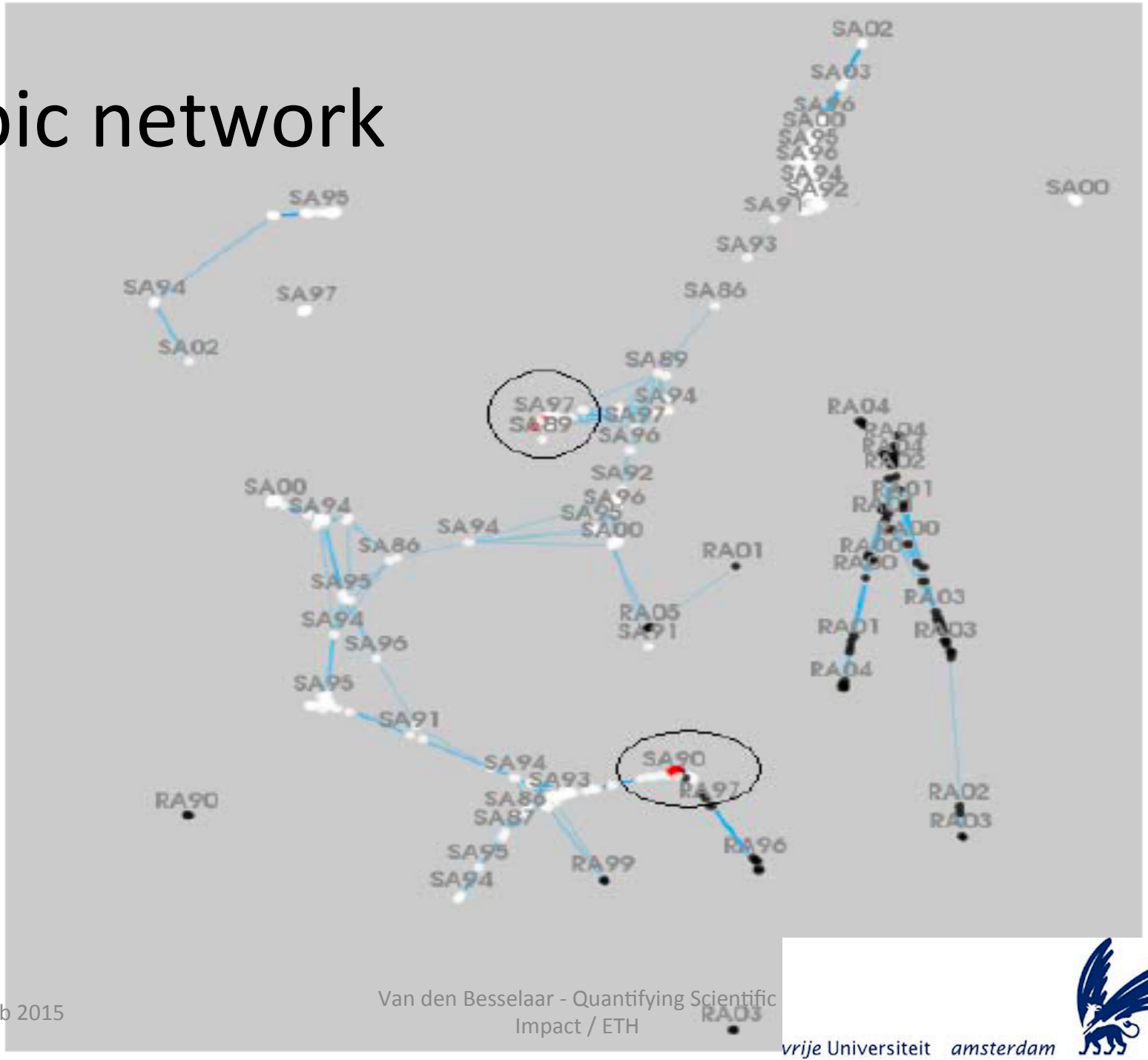
- Independence or impact or productivity?

- How to measure independence using bibliometrics?
  - An independent young researcher has
    - An *own* network – different from former supervisor's network
    - An *own* research agenda – different from former supervisor's agenda

Coauthor ego network



Topic network

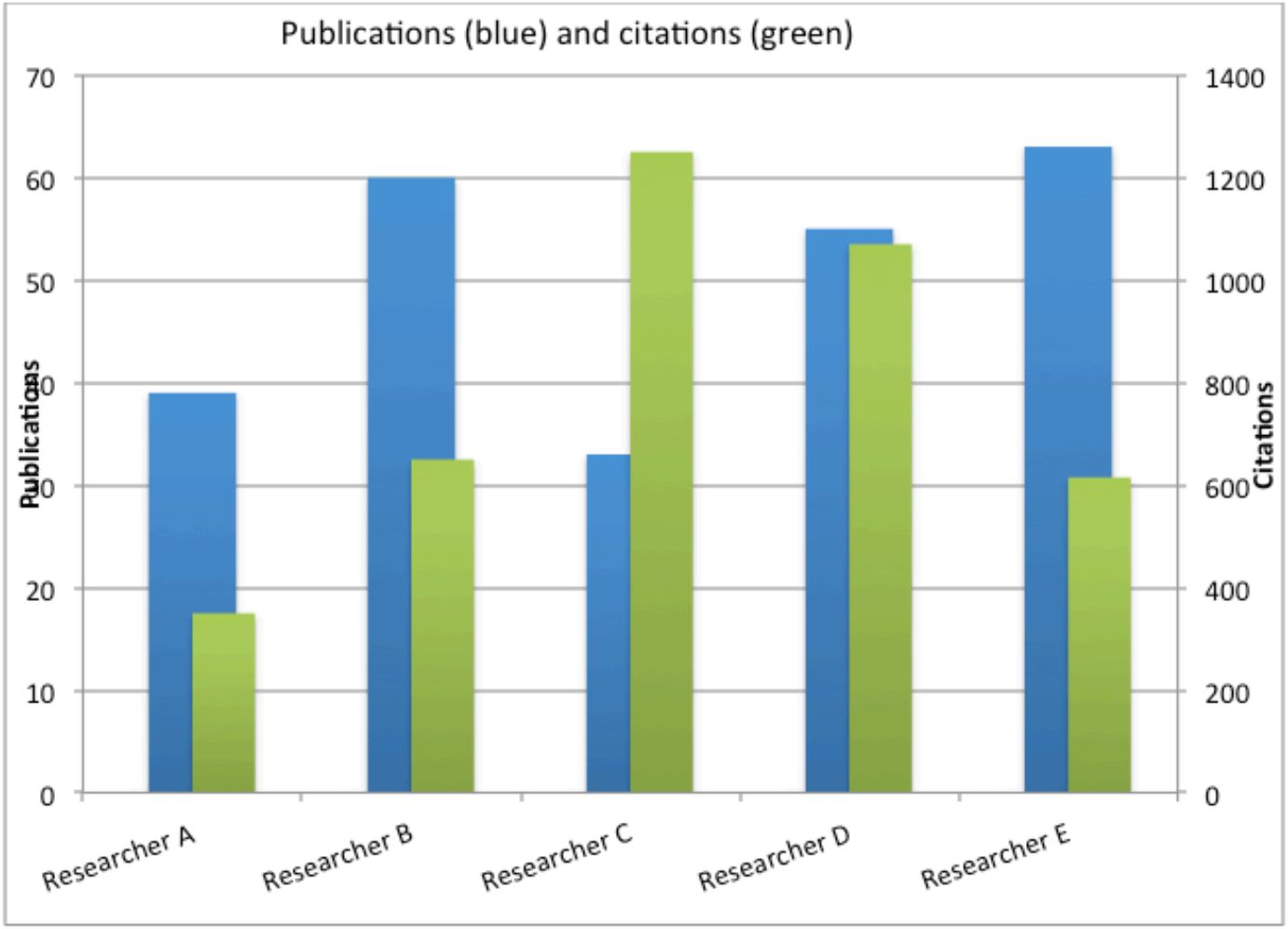


Initial test

- Five researcher-supervisor relations
- All in chemistry and life sciences
- Researchers about the same age (-> 40)
- All with good publication and citation performance

Performance of researchers in the test

publications between 40 and 60; citations between 350 and 1200



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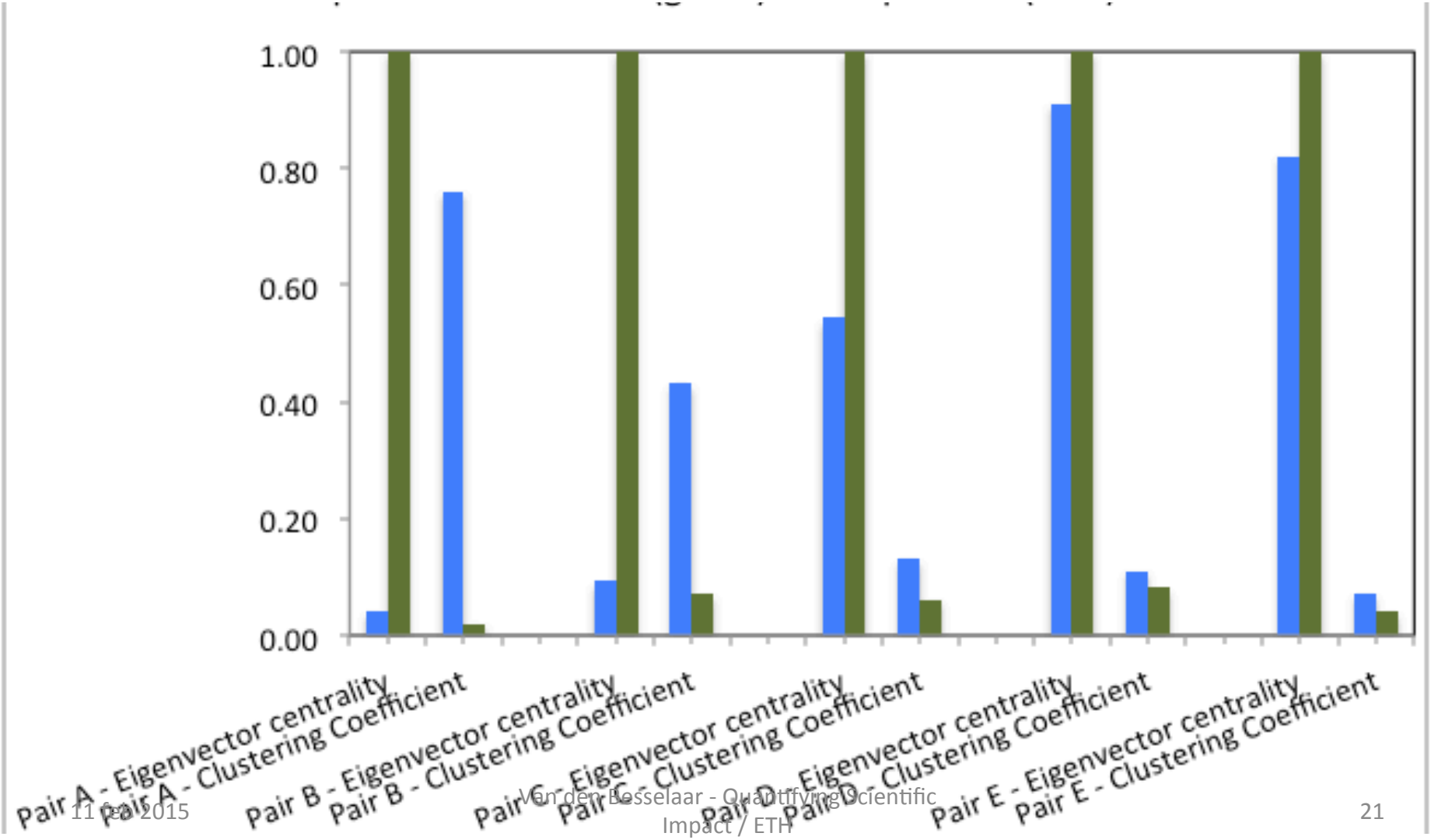
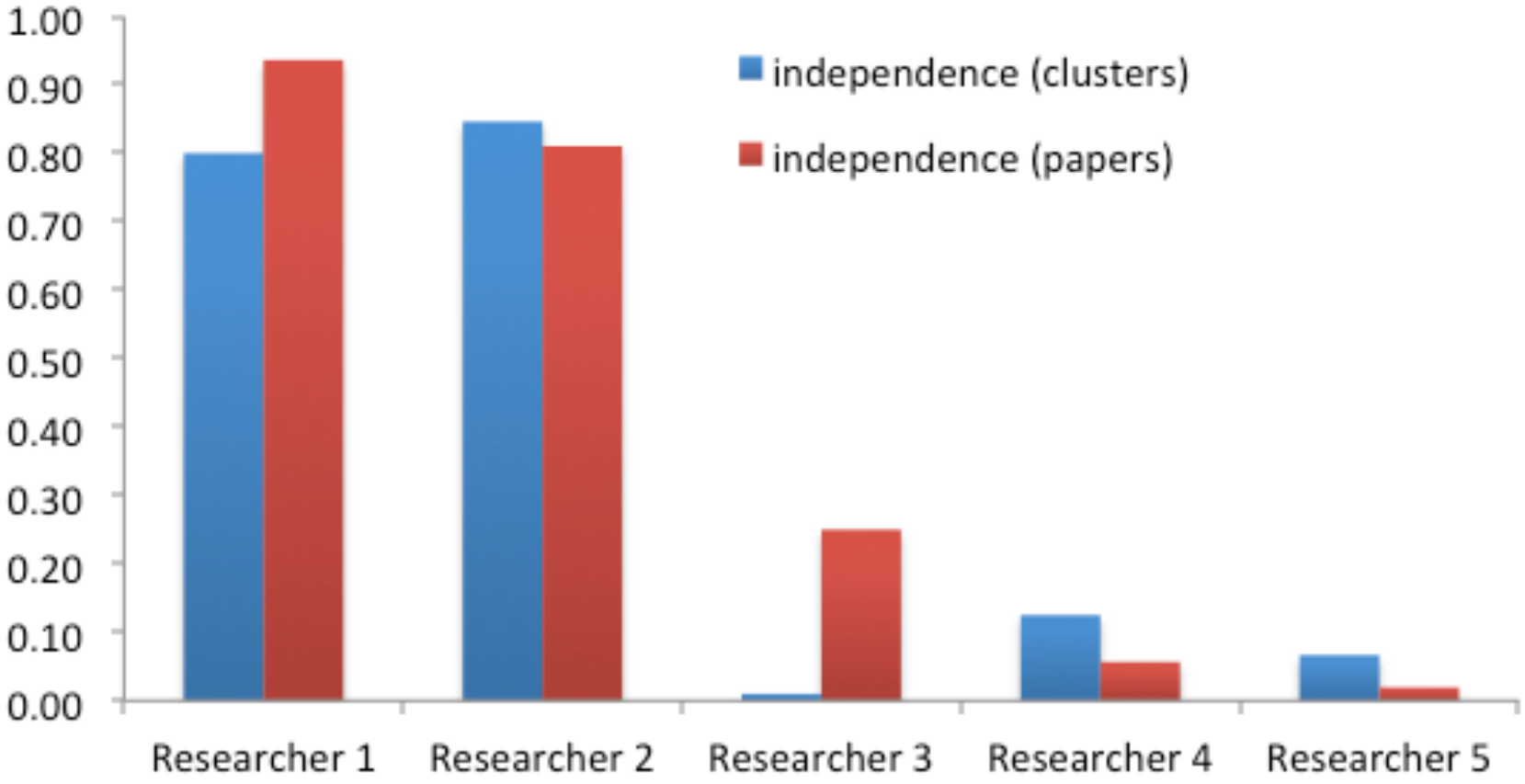
Coauthor network independence

(Blue = supervisor; green = researcher)



Cognitive independence
(share of topical clusters without papers of supervisor)



Preliminary findings (3)

- 'Quantity indicators (publications, citations)' do not distinguish successful (A, B) from the others (C, D, E).

- The proposed indicators are plausible indicators for measuring independence.

- Independence seem to predict academic career success

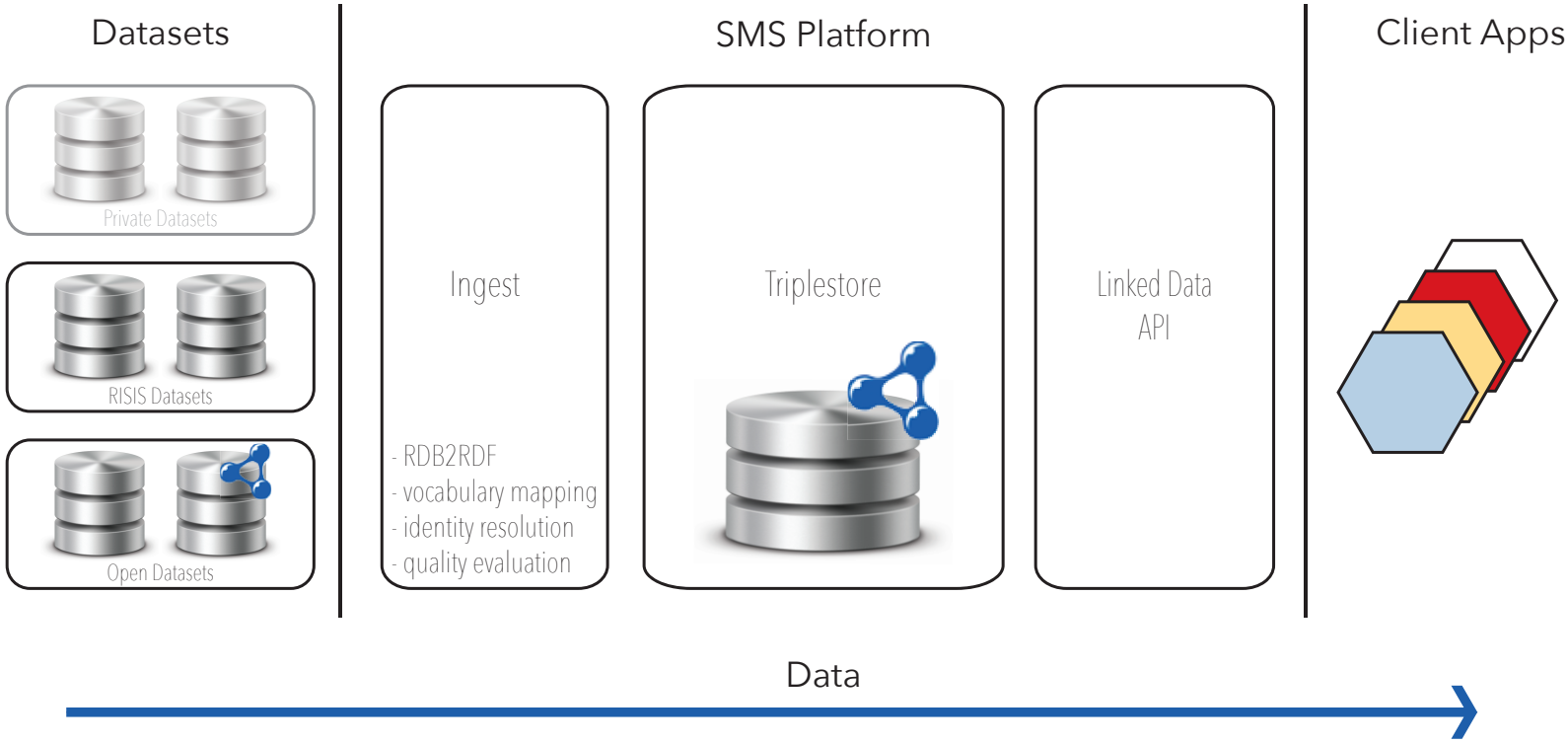
Conclusions

- Bibliometric indicators should be used better as variables in sociologically informed studies of how science systems work and can be improved
  - Rankings and related phenomena are part of the system – not of its understanding

- Alt-metrics: an additional data source for those research
  - if we know what it means!

- Bibliometric data remain of utmost importance – but in combination with other data -> data infrastructure

Annex: RISIS SMS: Data integration with maximal flexibility, quality control, access



- Based on semantic Web Technologies for maximum flexibility and interoperability
- Client access via a set of entity-centric APIs

Thanks for your attention

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