València, April 2014
Eu-SPRI Young Researchers Conference, *Ingenio* PhD days

# Interdisciplinarity in STI policy studies:

# On problem-orientation, stakeholder engagement and modes of knowledge

**Presentation:** **From 9:15 to 9:45.**
**Debate:** **From 10:15 to 12:00**

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SPRU —Science and Technology Policy Research, University of Sussex

# Questions for waking (morning sermon)

1. **Are STI Studies interdisciplinary?**

2. **Why are STI Studies interdisciplinary?**

3. **What type of research do we do in STI studies?**

# What are STI studies?

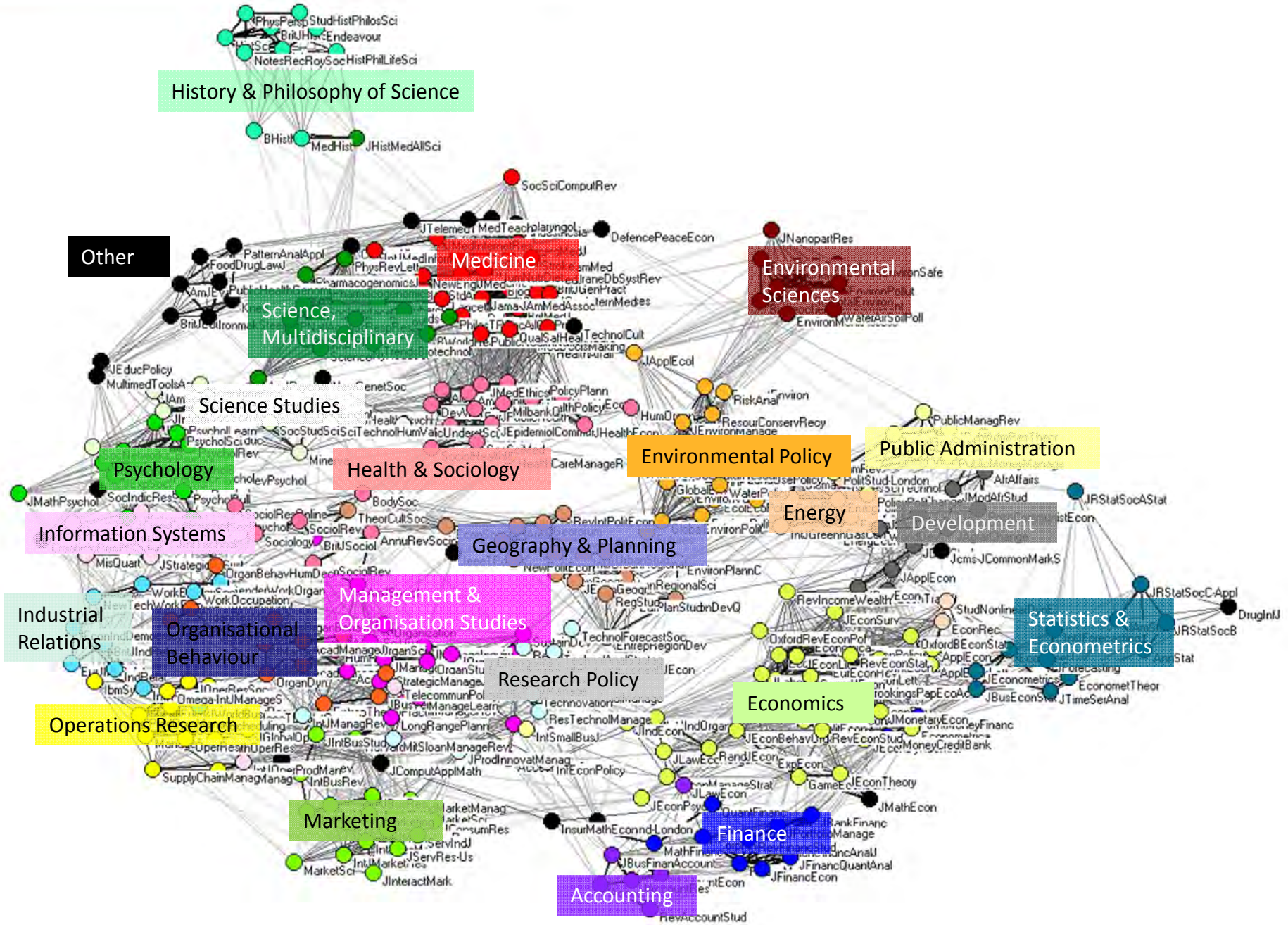
1. **What is your BSc degree?**
2. **What is your PhD?**
3. **What  is your field?**

A field of STI studies or many STI studies?

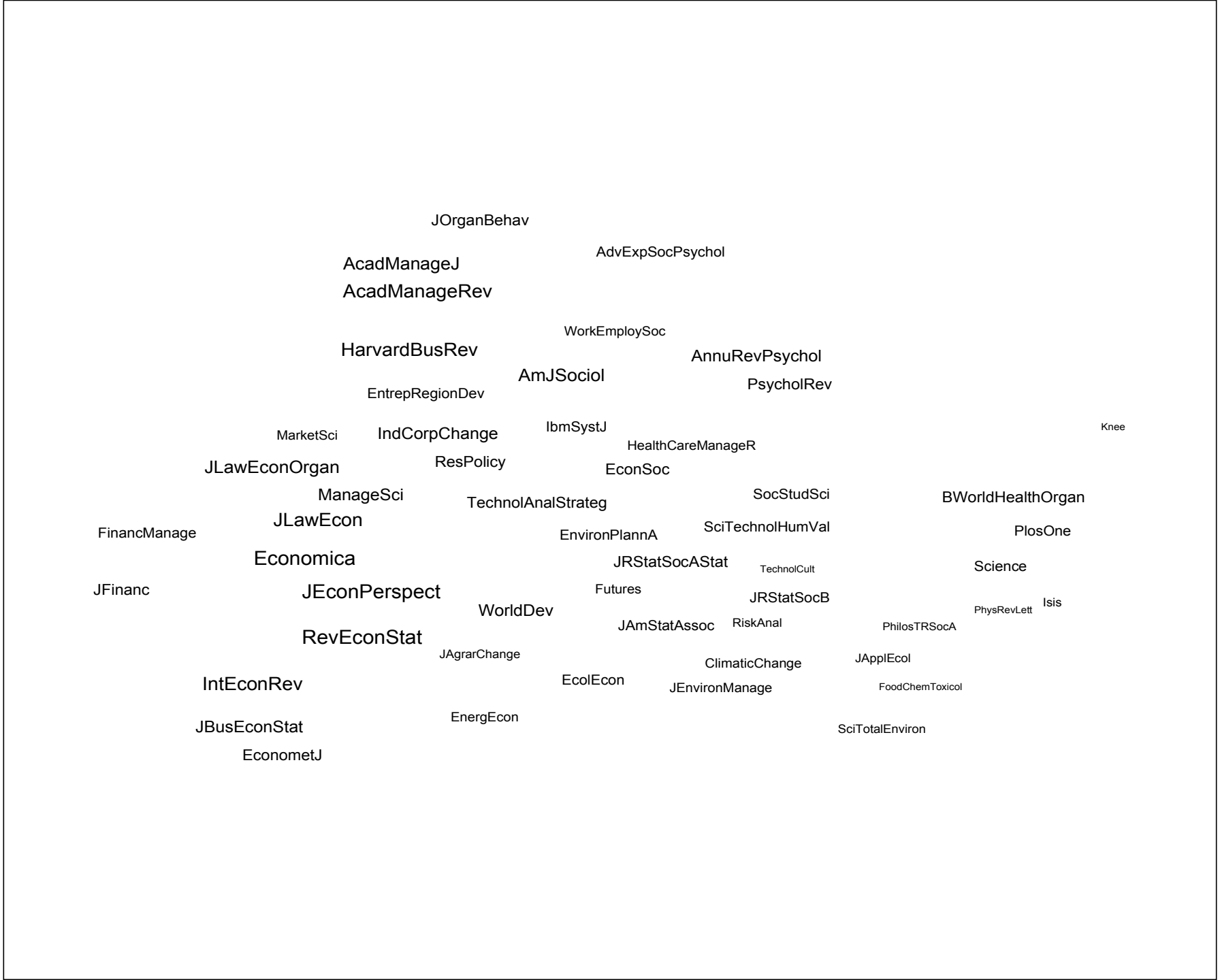
# A field of STI studies or many STI studies?

Dick Nelson (2013, p. 187):

- Innovation Studies (Fagerberg et al., 2012)
- Management of Innovation
- Economics of innovation
- Sociologies of Science and Tech
- History of Science and Technology




From Rafols et al. (2012), unpublished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RevEconStat
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EcolEcon
IntEconRev
JEnvironManage
FoodChemToxicol
EnergEcon
JBusEconStat
SciTotalEnviron
EconometJ

# A discipline or a hybrid space (a “mongrel”)?

Ed Steinmueller (SPRU):

“Do we want to become **a more academic discipline**,

**or** a field that continues to **respond to challenges by decision-makers** in goverment, industry and elsewhere,

even if that means **operating as an inter-disciplinary ‘mongrel’ of somewhat lower academic** status rather the a disciplinary pedigree??”

Cited by Fagerberg (2013, p. 11)

# 1. Are Science Technology and Innovation Studies

# *really* **Interdisciplinary? How?**

# Assessing interdisciplinarity:

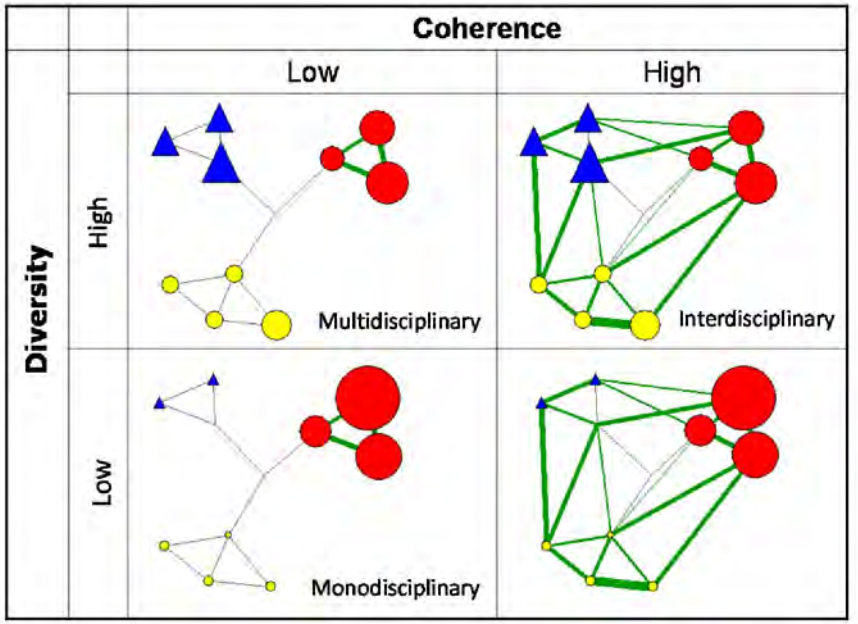
Conspicuous lack of consensus but most indicators aim to capture the following concepts

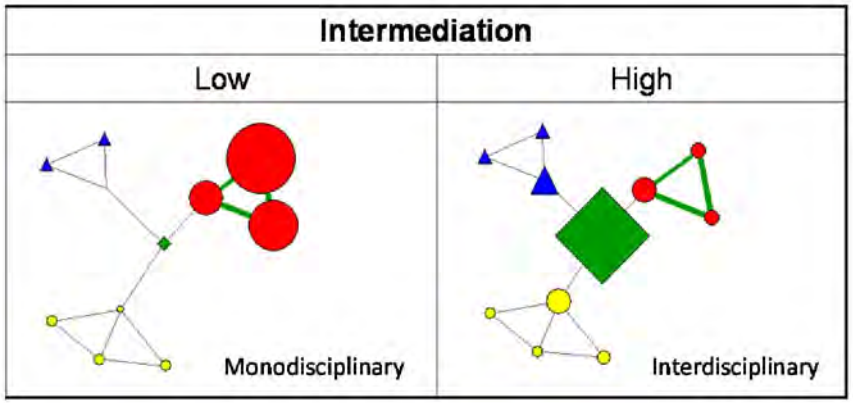
## Integration (diversity & coherence)

- Research that **draws on diverse** bodies of knowledge
- Research that **links different** disciplines

## Intermediation

- Research that **lies between** or outside the dominant disciplines



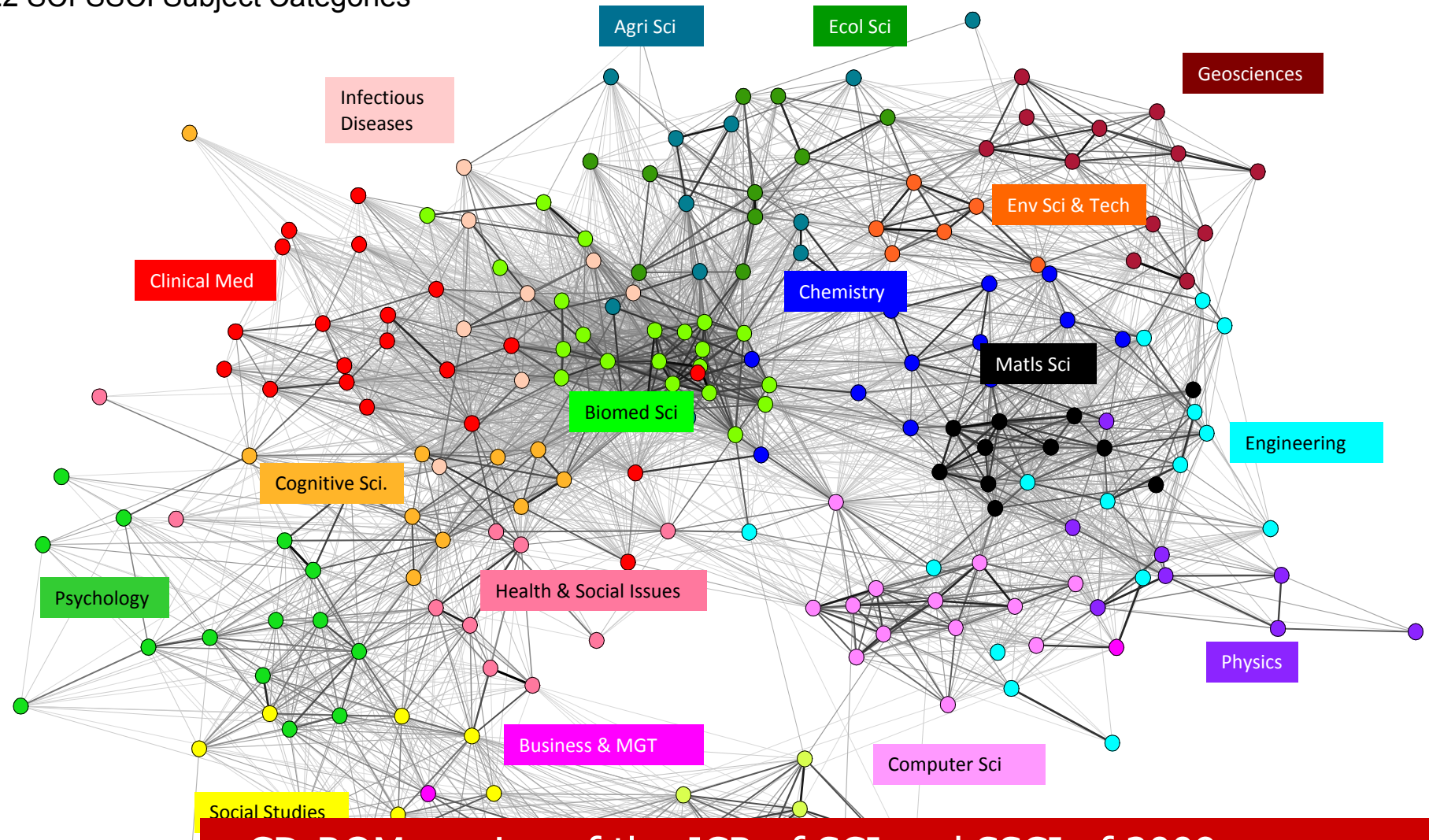



## Integration (1) -- Diversity:

Do Units contribute to or draw on different disciplines?

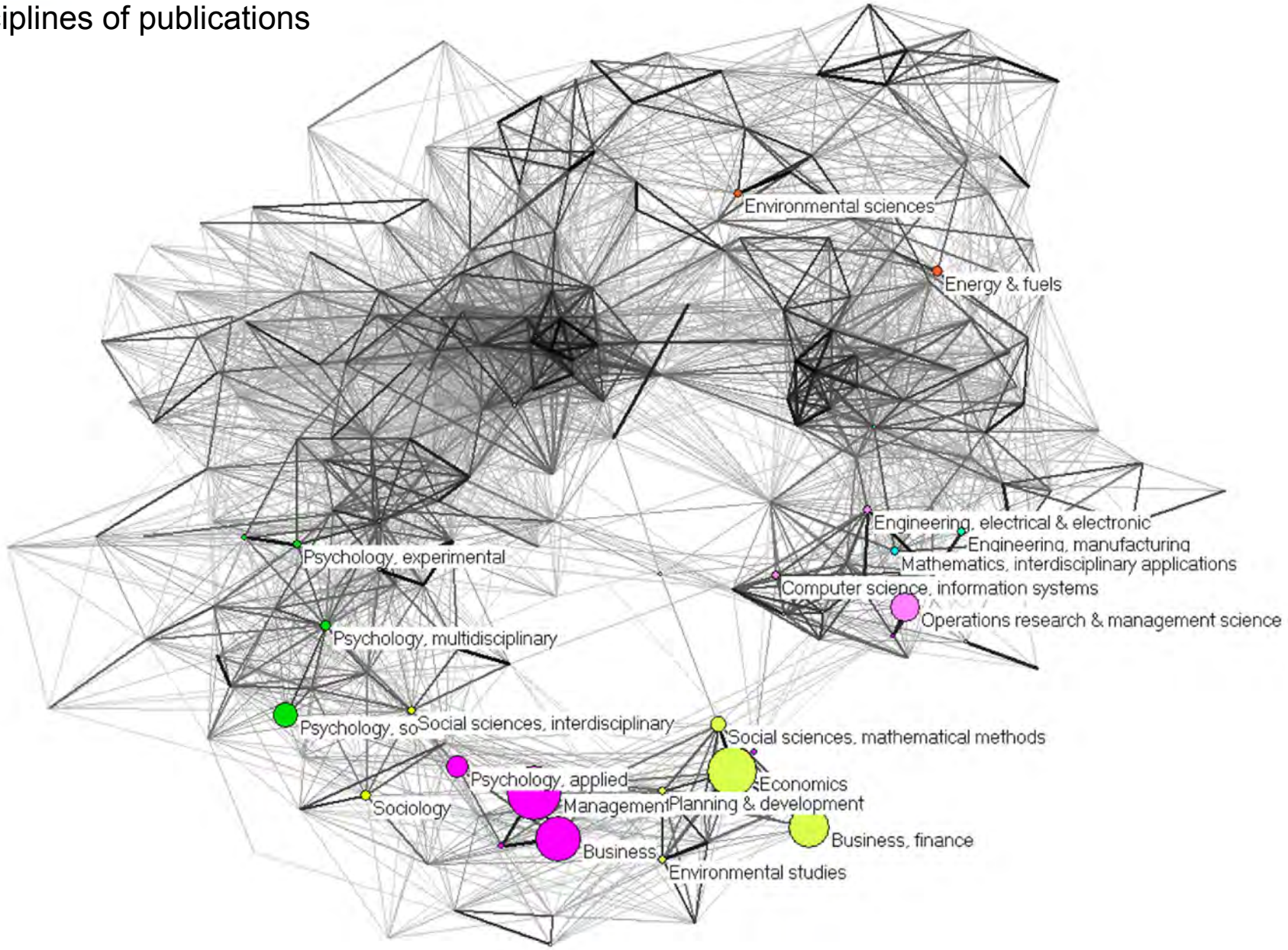
# A Global Map of Science

222 SCI-SSCI Subject Categories

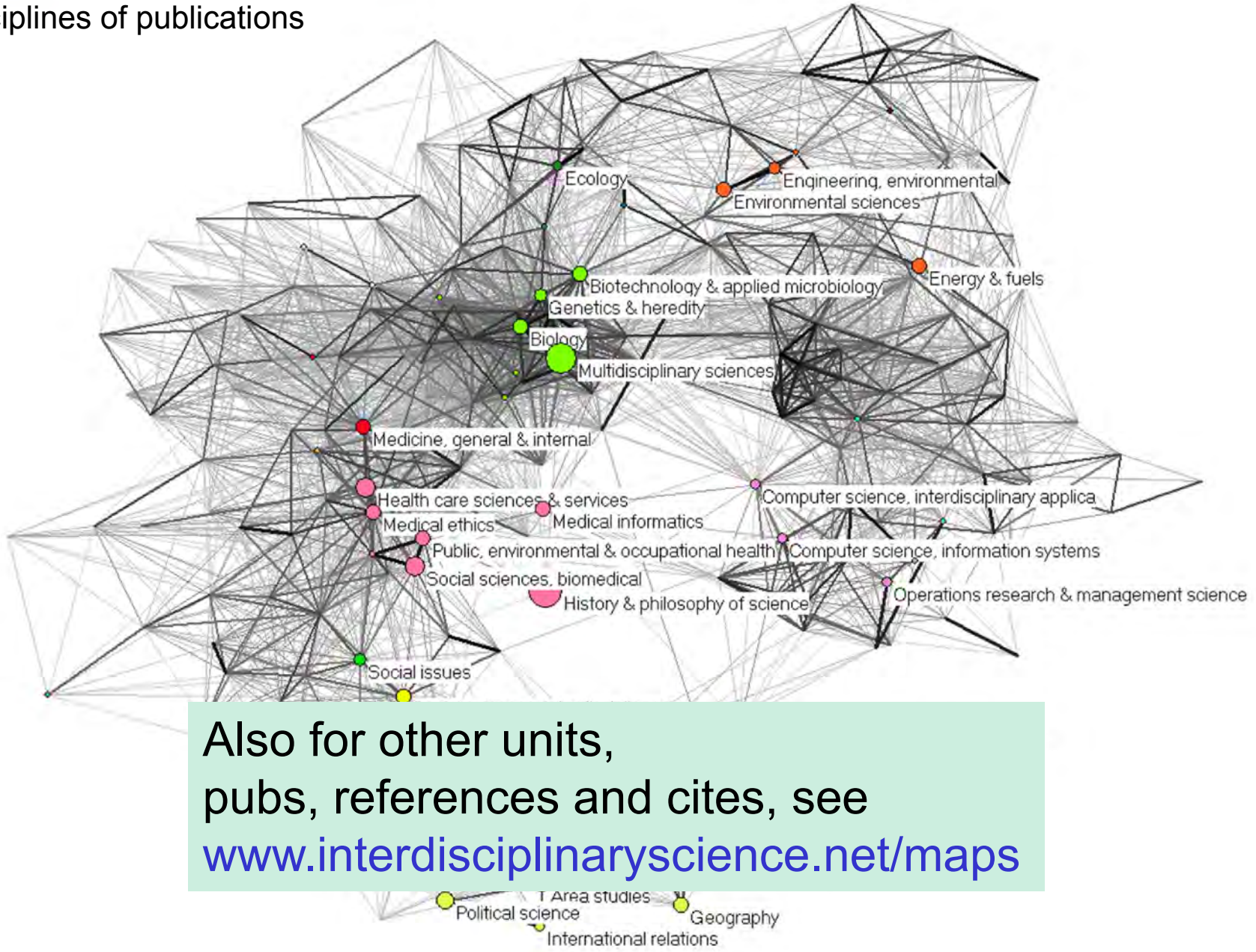



- CD-ROM version of the JCR of SCI and SSCI of 2009.
- Matrix of cross-citations between journals (9,000 x 9,000)
- Collapse to ISI Subject Category matrix (222 x 222)
- Create similarity matrix using Salton's cosine

London Business School
Disciplines of publications



ISSTI Edinburgh
Disciplines of publications

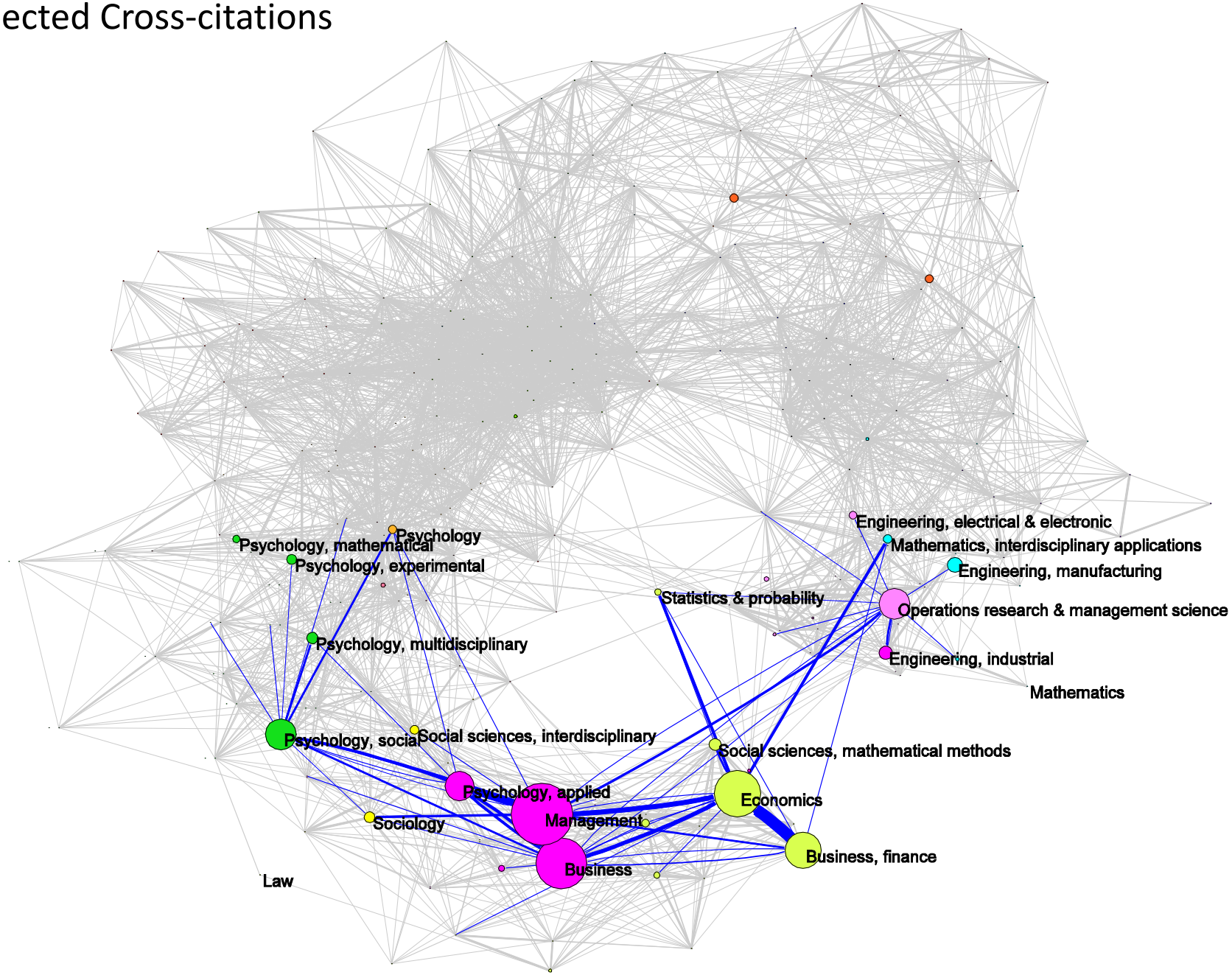



Also for other units,
pubs, references and cites, see
www.interdisciplinaryscience.net/maps

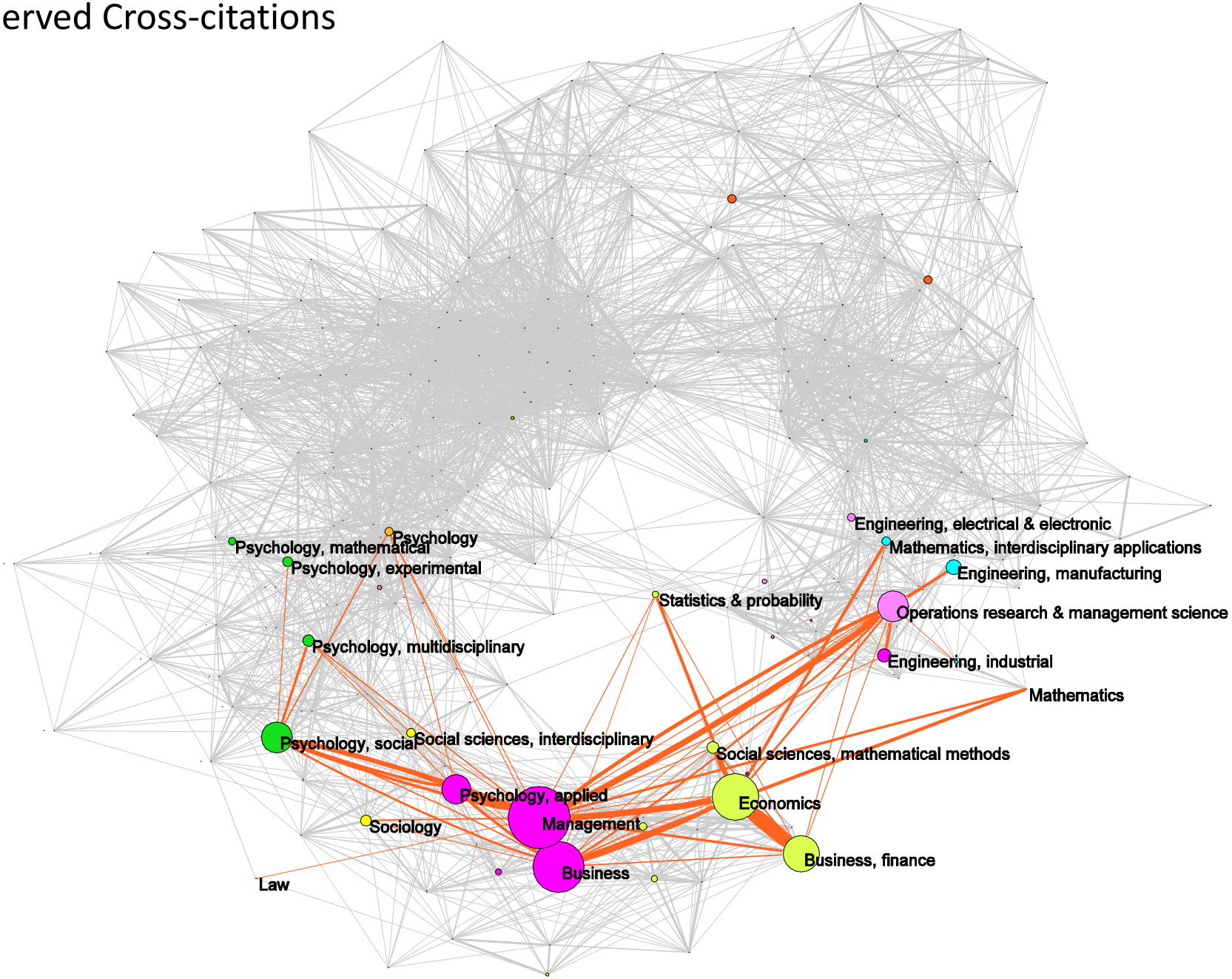
## Integration (2) -- Coherence:

Do Units link disparate disciplines?

# London Business School
# Expected Cross-citations



# London Business School
# Observed Cross-citations



# London Business School
# Observed/Expected

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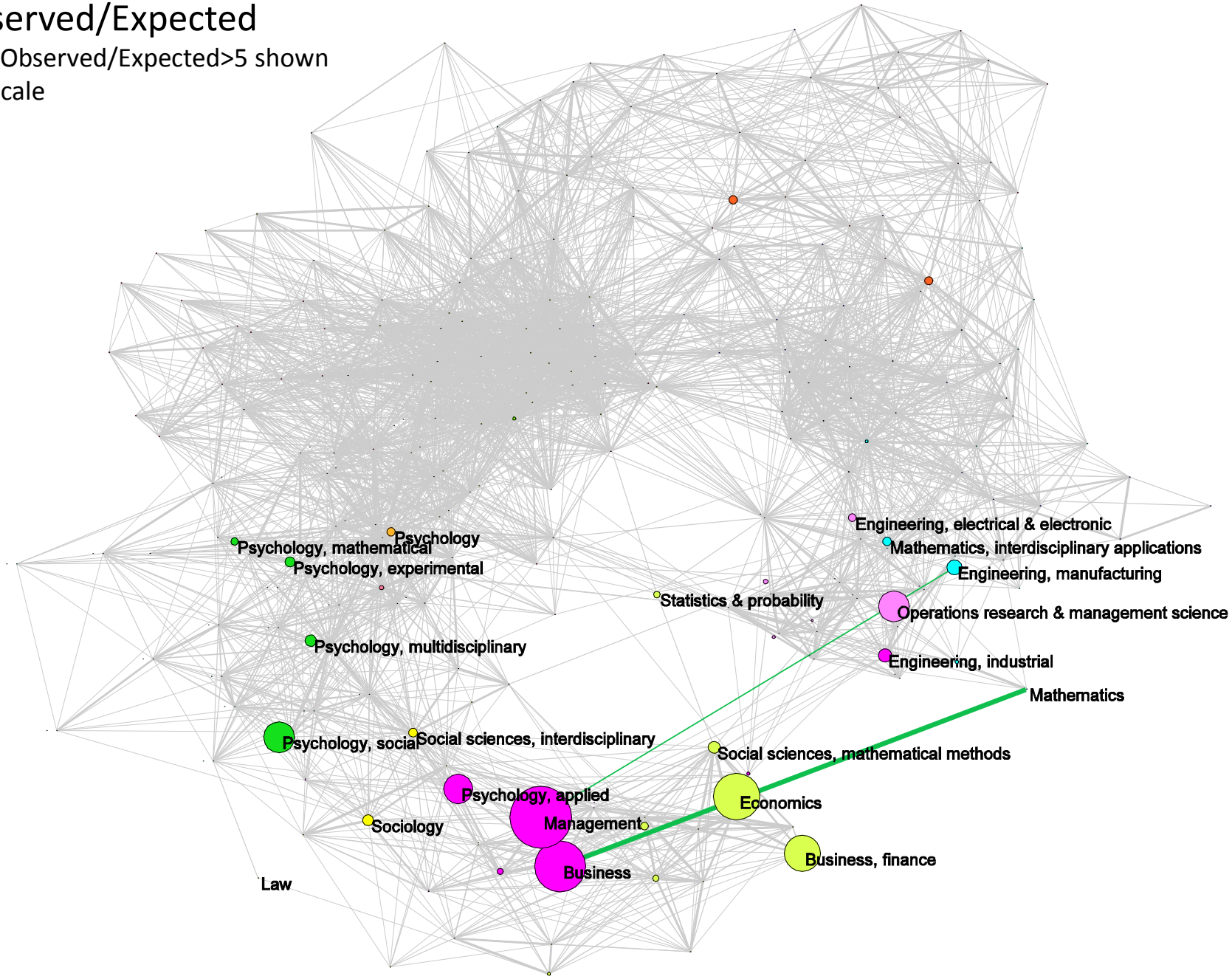
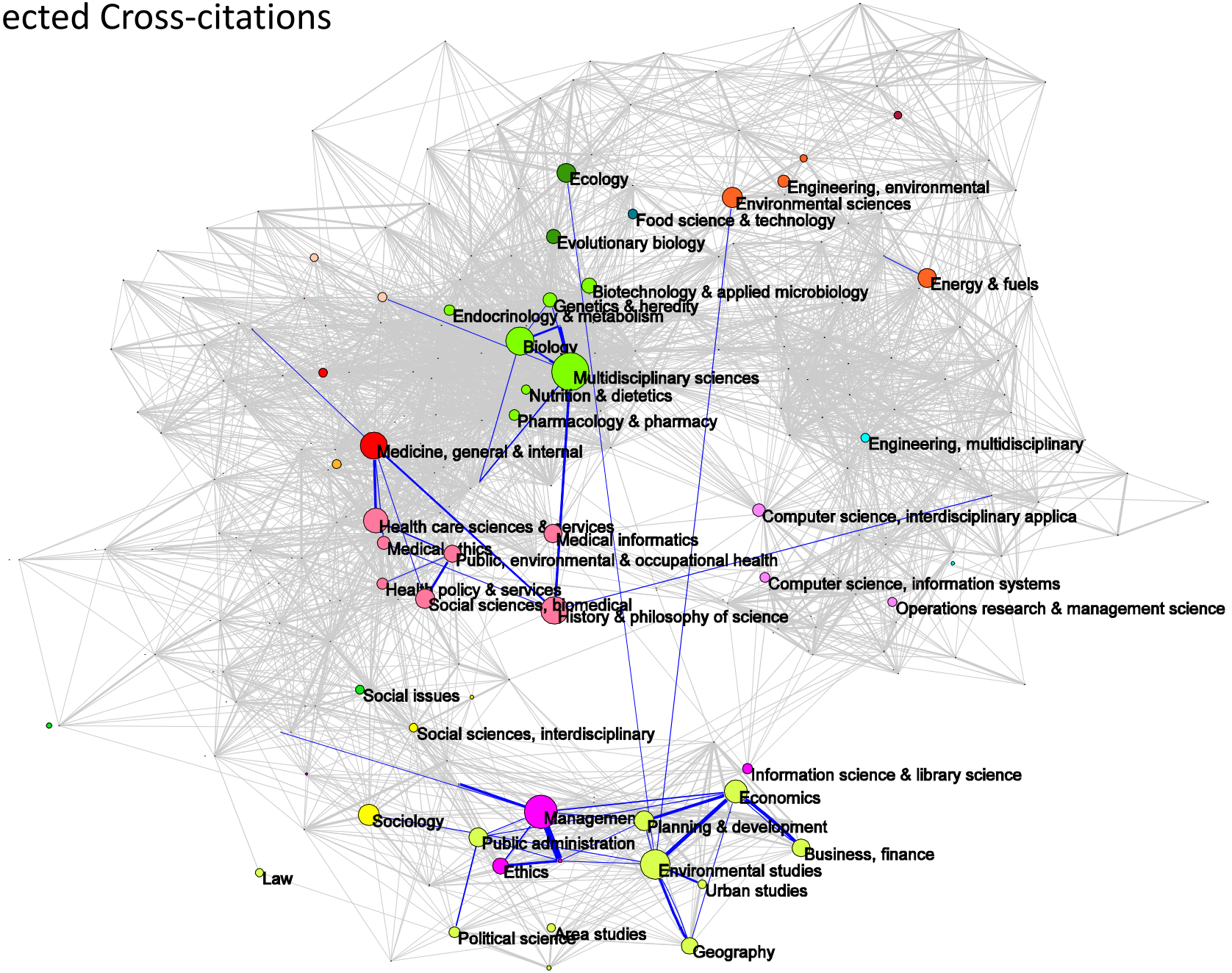
Log-scale



# ISSTI Edinburgh
# Expected Cross-citations



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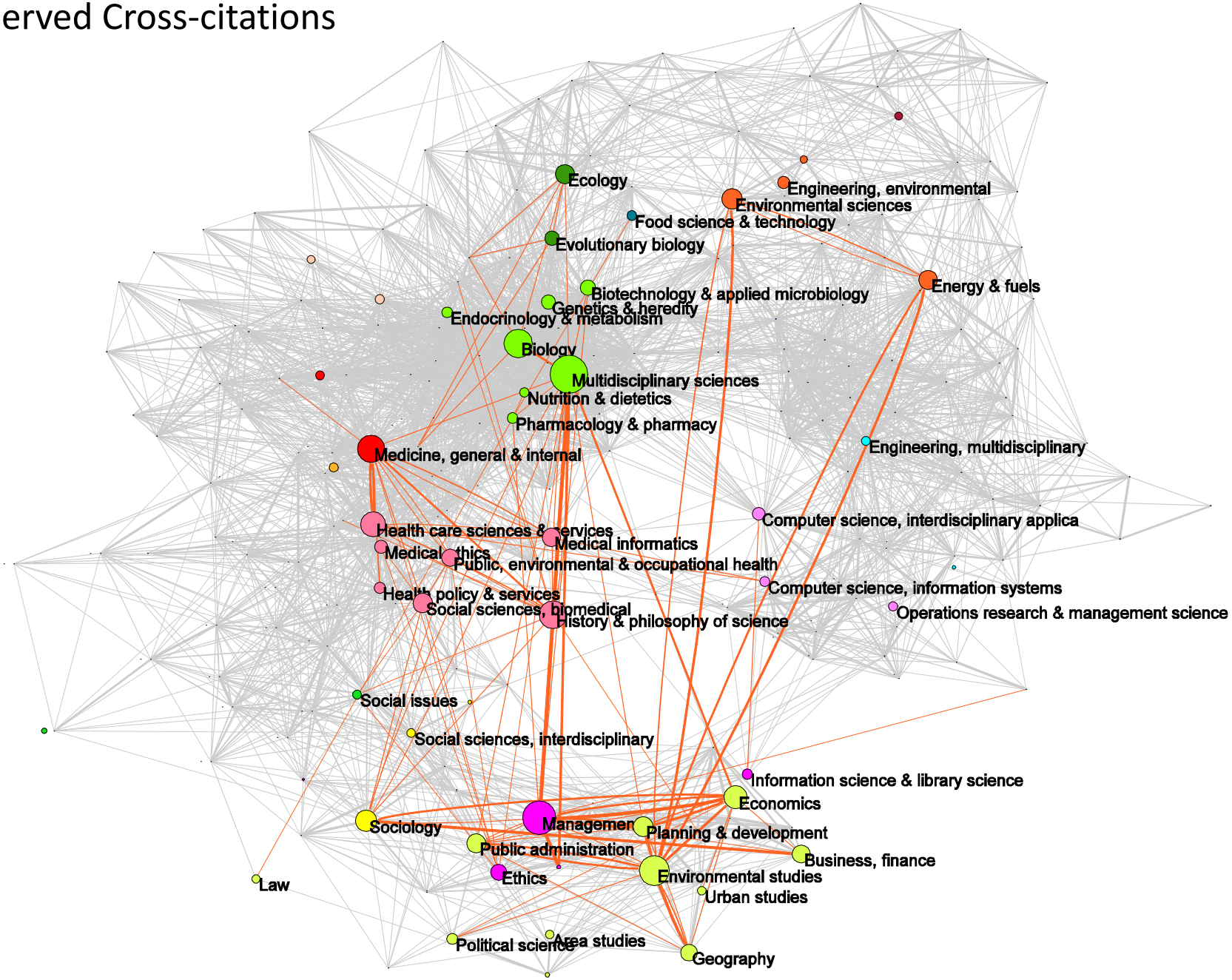

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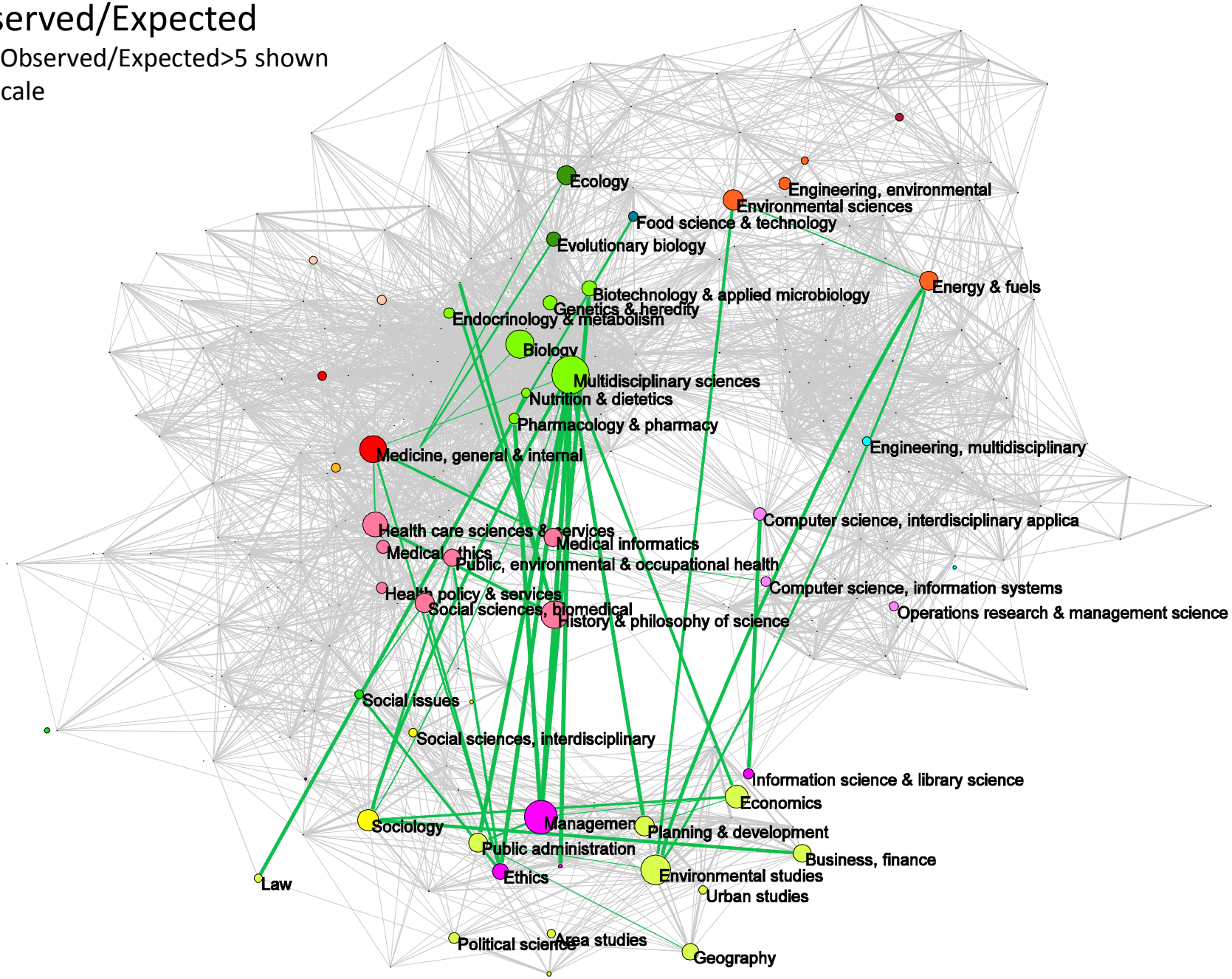
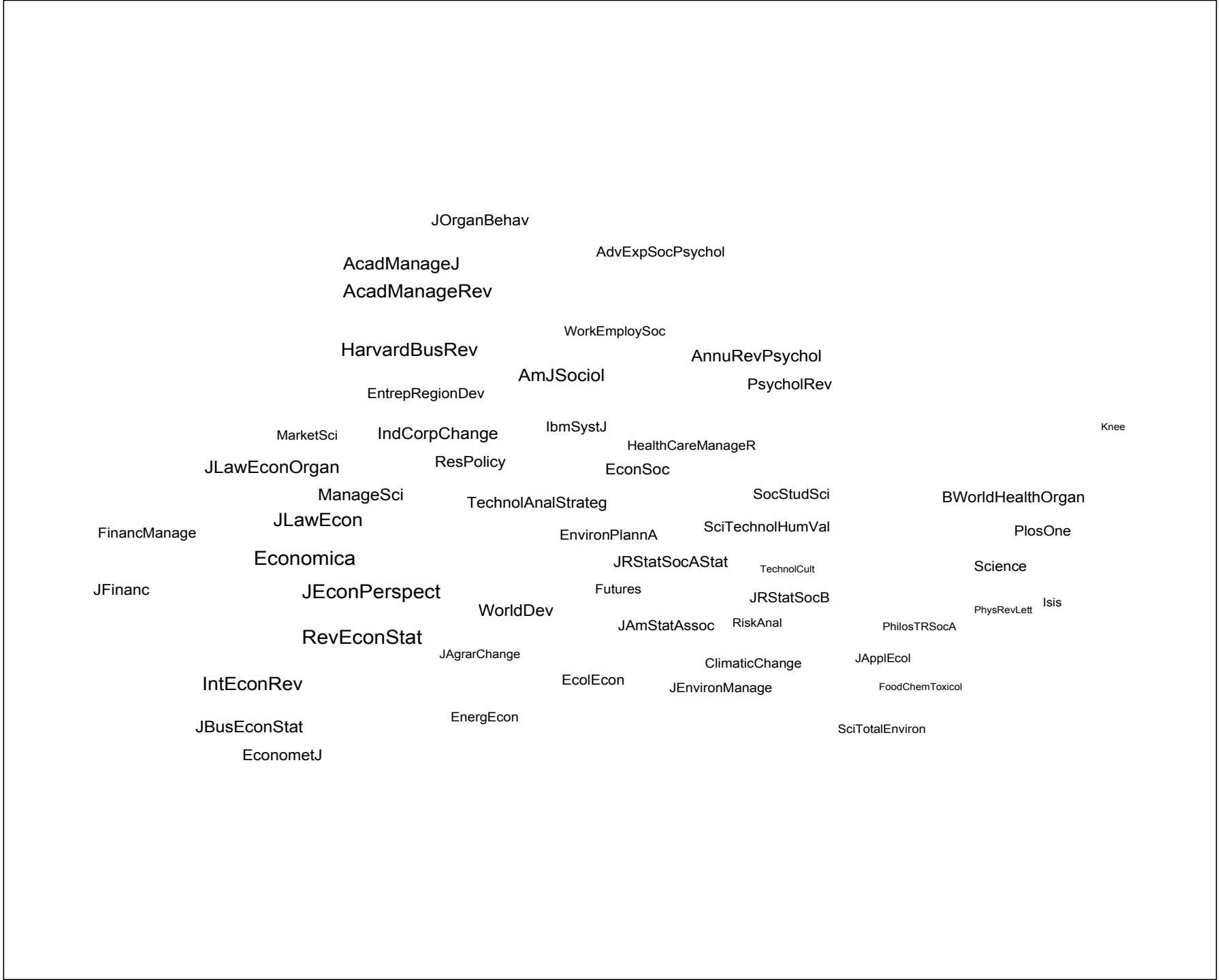


**Intermediation:**

Are units active in between disciplinary ‘cores’?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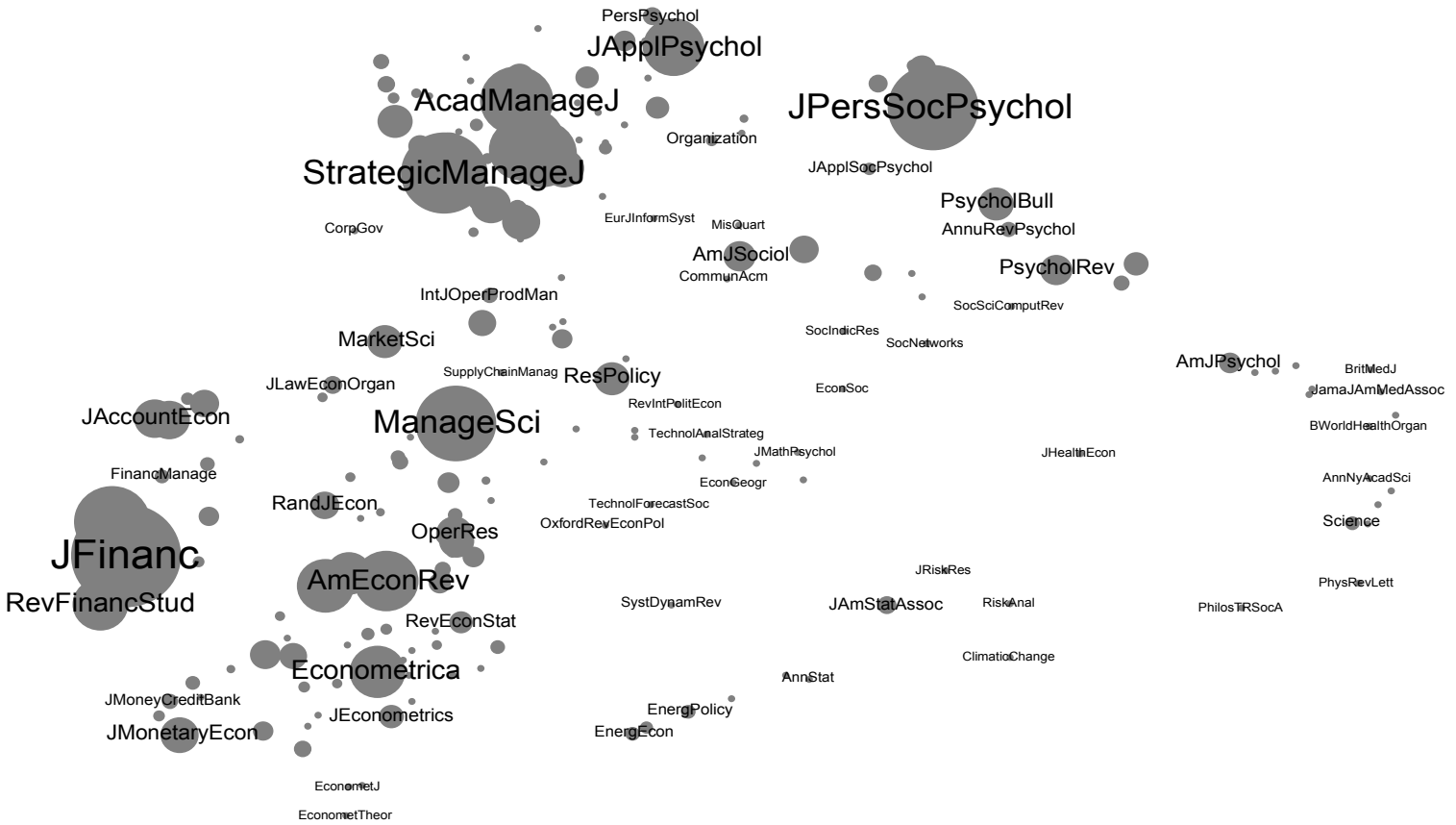
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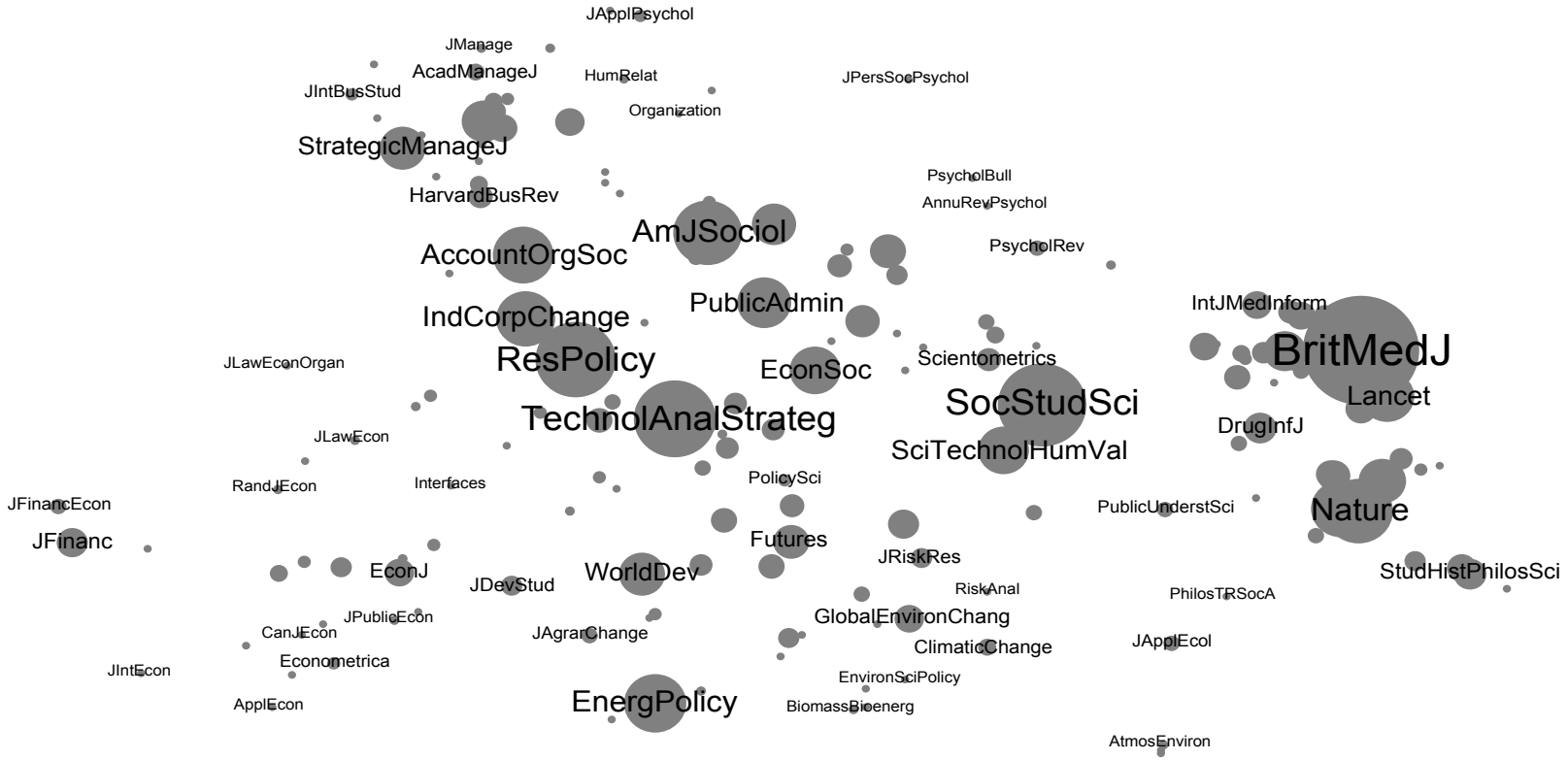
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ResPolicy
Scientometrics
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DrugInfJ
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PolicySci
RandJEcon
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PublicUnderstSci
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Nature
Futures
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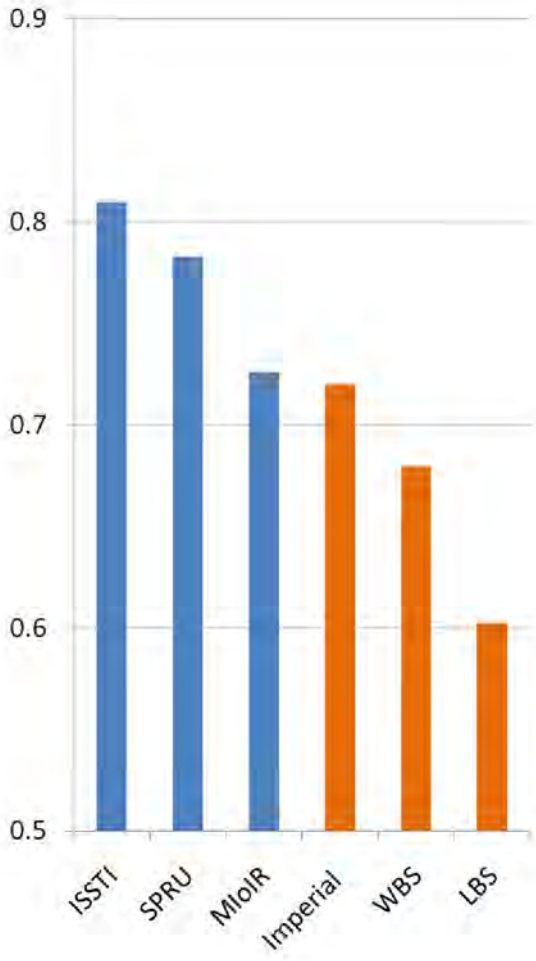
JAgrarChange
ClimaticChange
JApplEcol
Econometrica
JIntEcon
EnvironSciPolicy
EnergPolicy
ApplEcon
BiomassBioenerg
AtmosEnviron

# Summary: IS units are more interdisciplinary than BMS

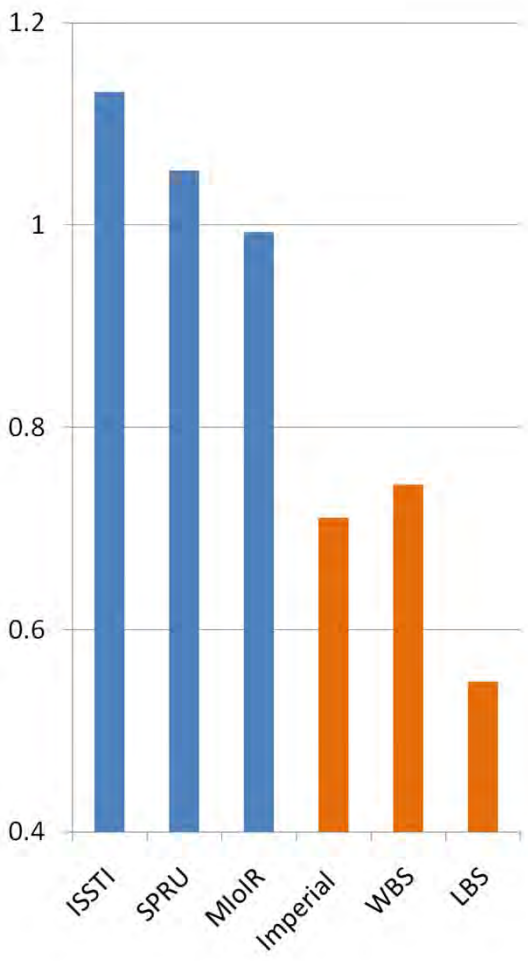
## More Diverse

**Rao-Stirling Diversity**



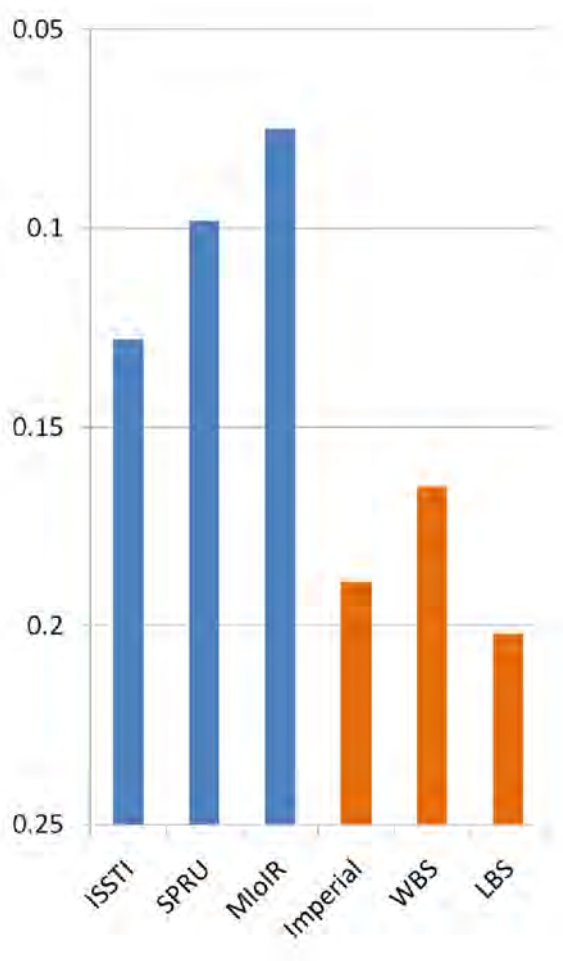

## More Coherent

**Observed/Expected Cross-Citation Distance**




## More Intermediate

**Clustering Coefficient**



# However, practice of IDR faces many barriers

Research funded in IDR programmes is not so successful as desired:

- …too risk averse
- …lacking (disciplinary) notions of quality
- …not meeting policy expectations

Barriers

- Difficulty in managing coordination and integration of distributed knowledge (Llerena and Mayer-Krahmer, 2004)

- Poor career prospects for IDR researchers
- Lower esteem from colleagues
- Discrimination by reviewers in proposals
- High rejection in prestigious journals

# Persistent scepticism on bias in elites and policy on value of IDR

Given the subjectivities involved, the claims that IDR faces barriers are often seen (and discarded) in policy as being deserved or unsubstantiated

*"perhaps interdisciplinarity has even been overly populated with researchers who have difficulties in surviving within the tight rigor requirements of mono-disciplinary science, turning into a safe-haven for the lesser talented…."*

Anonymous referee in *Research Policy* to Rafols et al. (2012)

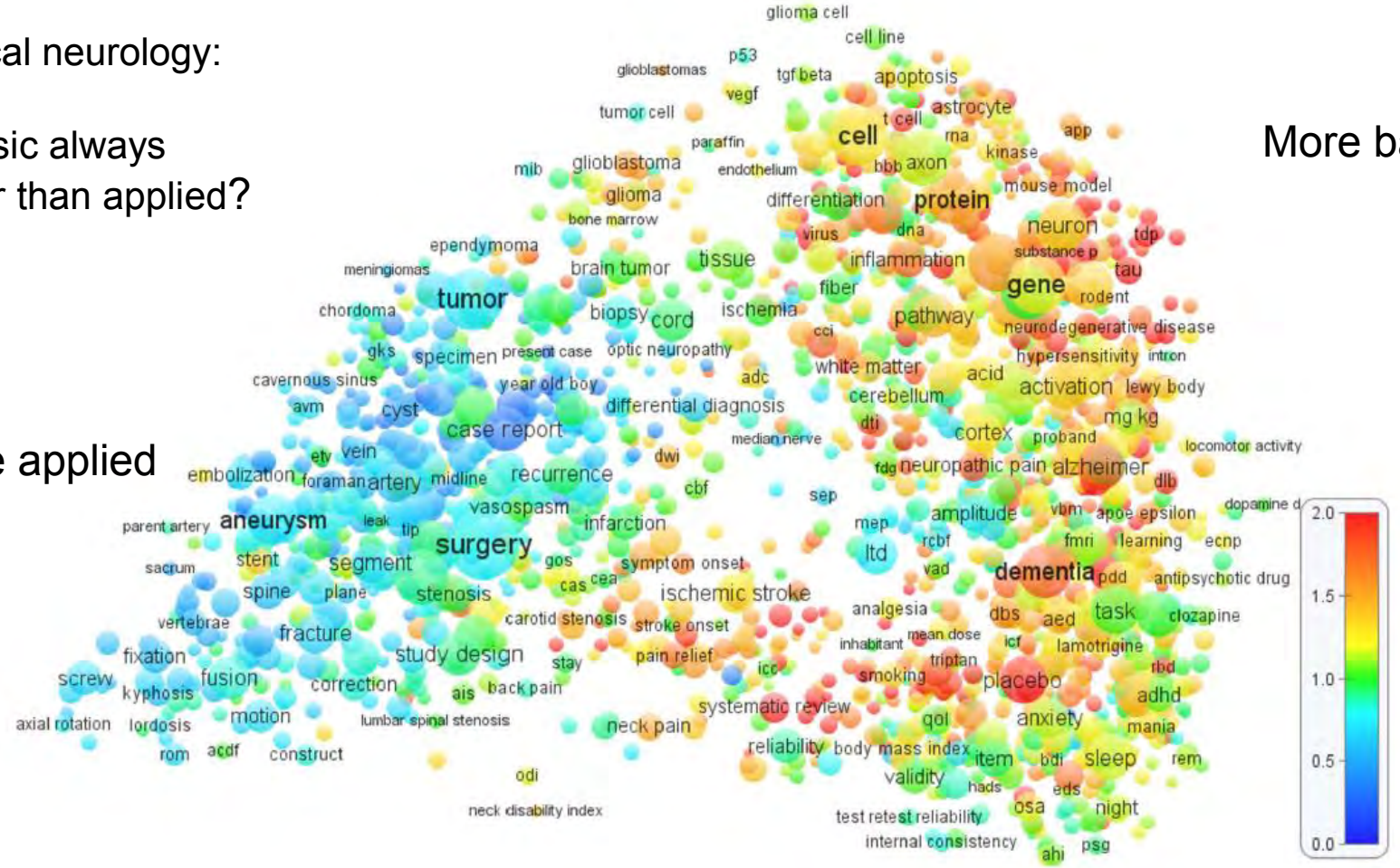
# Are measures of “excellence” consistent and robust?

Citations: not stable to changes in classification and granularity
(Zitt et al., 2005; Adams et al., 2008)

Clinical neurology:

Is basic always
better than applied?

More basic




More applied

High

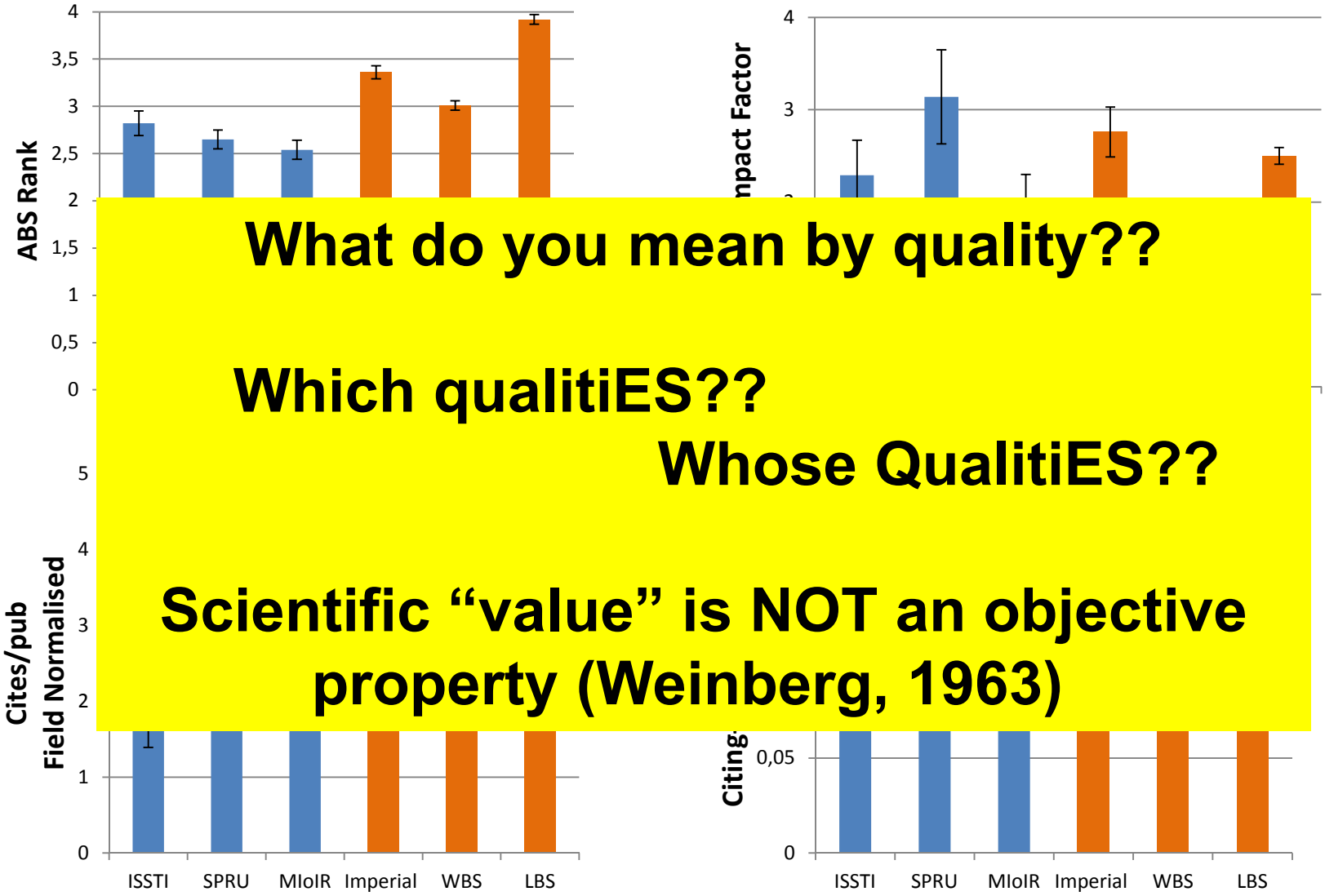
Average

Low

Citations

Van Eck, Waltman et al. (2013)

# Ambiguity regarding “excellence” of research




**What do you mean by quality??**

**Which qualitiES??**

**Whose QualitiES??**

**Scientific “value” is NOT an objective property (Weinberg, 1963)**

2. **Why** are Science Tech and Innovation Studies

**Interdisciplinary?**

# IDR is viewed as an important element in Science

*Perception* that IDR:

- …contributes to scientific breakthrough (Hollingsworth, 2000)
- … fosters innovation (Gibbons et al., 1994)
- … addresses societal problems (Lowe, 2006)

because IDR is :

- …better at problem solving (Page, 2007)
- … it is a source of creativity (Hemlin et al., 2004)
- ...generates new questions and research avenues (Barry et al. 2007)
- …rejuvenates the science system (Jacobs and Frickel, 2009)

As a result, IDR highly valued in Science Policy and Management

# Why are STI studies interdisciplinary?

***Because STI studies are problem-oriented***

*All science is problem-oriented*

*but in science problem-oriented research refers to "life-world problems, which, so the argument goes, are different from genuinely scientific problems and call for a specific type of knowledge production."*

Ziehofer and Burger (2007, p. 55)

There is a (statistically) strong relation between IDR and problem orientation:

- IDR collaboration associated with work industry or government (Carayol and Thi, 2005, p. 77, Rijnsover and Hessels, 2011)
- IDR researchers have more pro-social behaviour (D'Este et al. 2013) and are more likely to exploit their inventions (D'Este et al. 2012).

# Why are STI studies interdisciplinary?

***Because STI studies are problem-oriented***

"The dominant external demand for innovation studies comes from policy-makers who need grounds [justification?] for doing what they do in order stimulate economic growth [no other social goal?] and from business leaders who want to know how to organize activities in order to make a profit form innovation.

(…) Interdisciplinarity is crucial (…) and without a continuing degree of openness to a rage of disciplines, the field may not survive."

Lundvall (2013, pp. 60-61)

# 3. Gordian knots in problem-oriented research

(tentative...)

# What type of problem in STI policy research?

- STI for solving social problems (traditional):
  - Nuclear plants for energy generation
  - Drugs for neglected diseases
  - But why can we go to the moon, but not solve the ghetto?

- Problems created by STI (Beck's "Risk society", 1992)
  - Research on anthropogenic global warming (climate change)
  - Fukushima's nuclear plant clean up
  - But most often problems created by STI are not technical?

- Technologies as political machines (Barry, 2001)??
  - Techniques such as statistics are a crucial 'part of the technology of power in a modern state' (Hacking, 1991; p. 181)
  - US National Security Agency (NSA) surveillance

# 1. What type of problem?

Dick Nelson (*The moon and the ghetto,* 1977)

"…what is a problem, and what is a solution, are not questions that rational analysis alone can decide. The question of what values, and whose values, ultimately are to count inherently must be answered through political process, not rational analysis alone."

"…analysis of a problem generally involves some rather strong preconceptions about the nature of problems and solutions, preconceptions that may turn out to be fruitful or unfruitful."

In summary: the choice of problem is a NORMATIVE one.

- Lots of R&D expenditure goes to not-so relevant research…

# 2. What type stakeholders?

What are the stakeholders to engage ifor STI policy research?

- Often framed in technocratic terms. (Steakholders)
  - Policy-makers, low level participants in policy making
    - Godin: Innovation Systems constructed between OECD and academia.
  - Firms??
- How about other actors?
  - STI Non-expert politicians
  - NGOs
- What are the ethical challenges in each case?

# 3. What type knowledge?

**Can research be bad for policy (Nightingale, 2013)?**

- "If it was once thought rational to accept the judgement of scientific experts without question, a reliance on experts is said by many to be an inadequate basis for good government." (Barry, 2001, pp. 3-4)
- "…civil society or the public sphere can, in principle, provide a *more rational* solution to political controversy than that offered by the application of technical methods."

  (Barry, 2001, p. 8)

Example:

- A colleague of mine once showed that the optimum level of collaboration in nanotech was about 7 co-authors.
- Should the advice be followed ? It hides many other relevant circumstances. (Field differences, dynamics…) It gives a false sense of knowledge.

# Appraisal in policy

**Appraisal:**

**‘the ensemble of processes through which knowledges are gathered and produced in order to inform decision-making and wider institutional commitments’ Leach et al. (2008)**

**Breadth:** extent to which appraisal covers diverse dimensions of knowledge

**Openness:** degree to which outputs provide an array of options for policies.

# Appraisal in policy

**Appraisal:**

**'the ensemble of processes through which knowledges are gathered and produced in order to inform decision-making and wider institutional commitments' Leach et al. (2010)**

Example:

Allocation of resources based on research "excellence"

**Breadth:** extent to which appraisal covers diverse dimensions of knowledge

Narrow: citations/paper

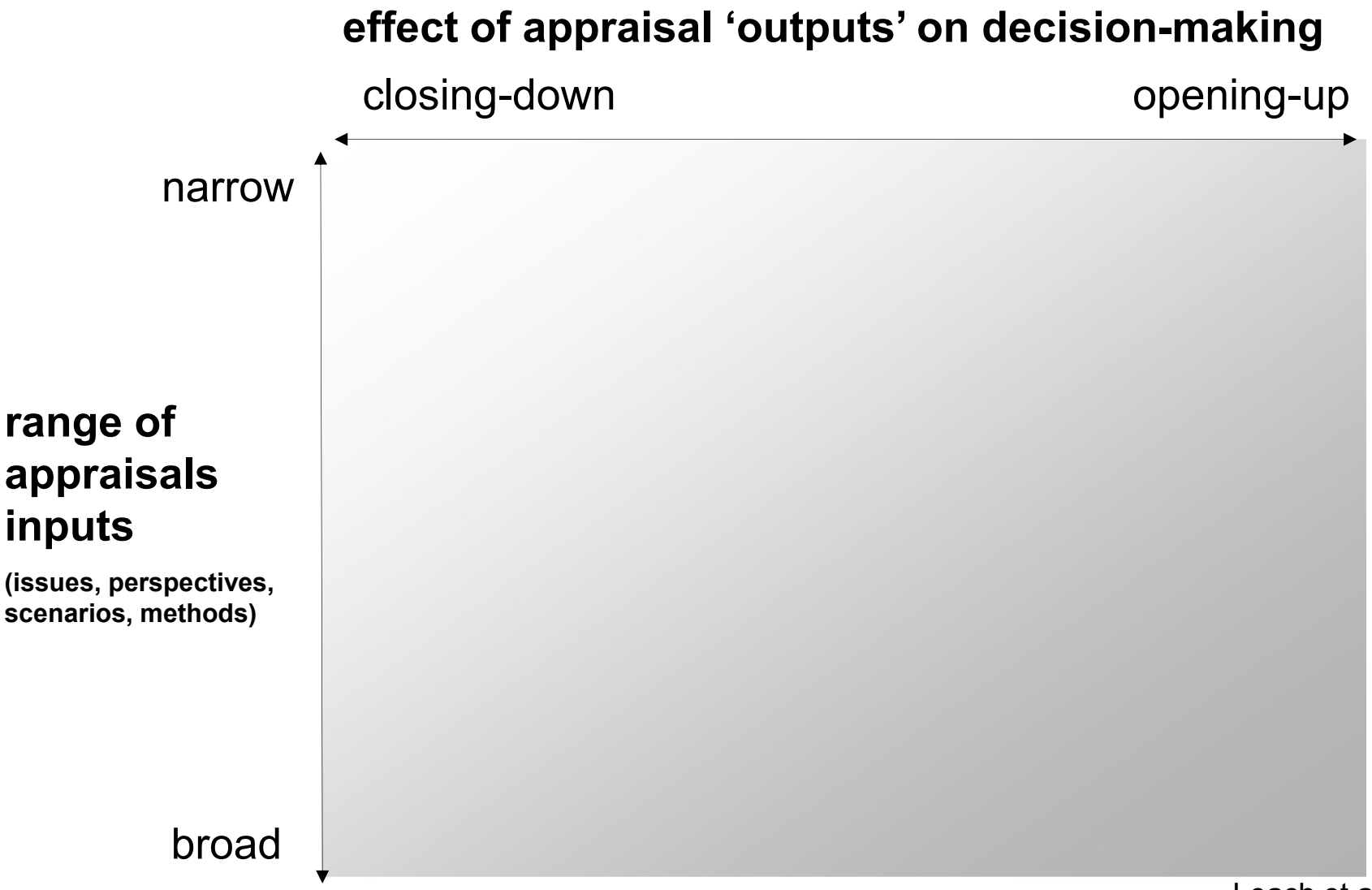
Broad: citations, peer interview, stakeholder view, media coverage, altmetrics

**Openness:** degree to which outputs provide an array of options for policies.

Closed: fixed composite measure of variables → unitary and prescriptive

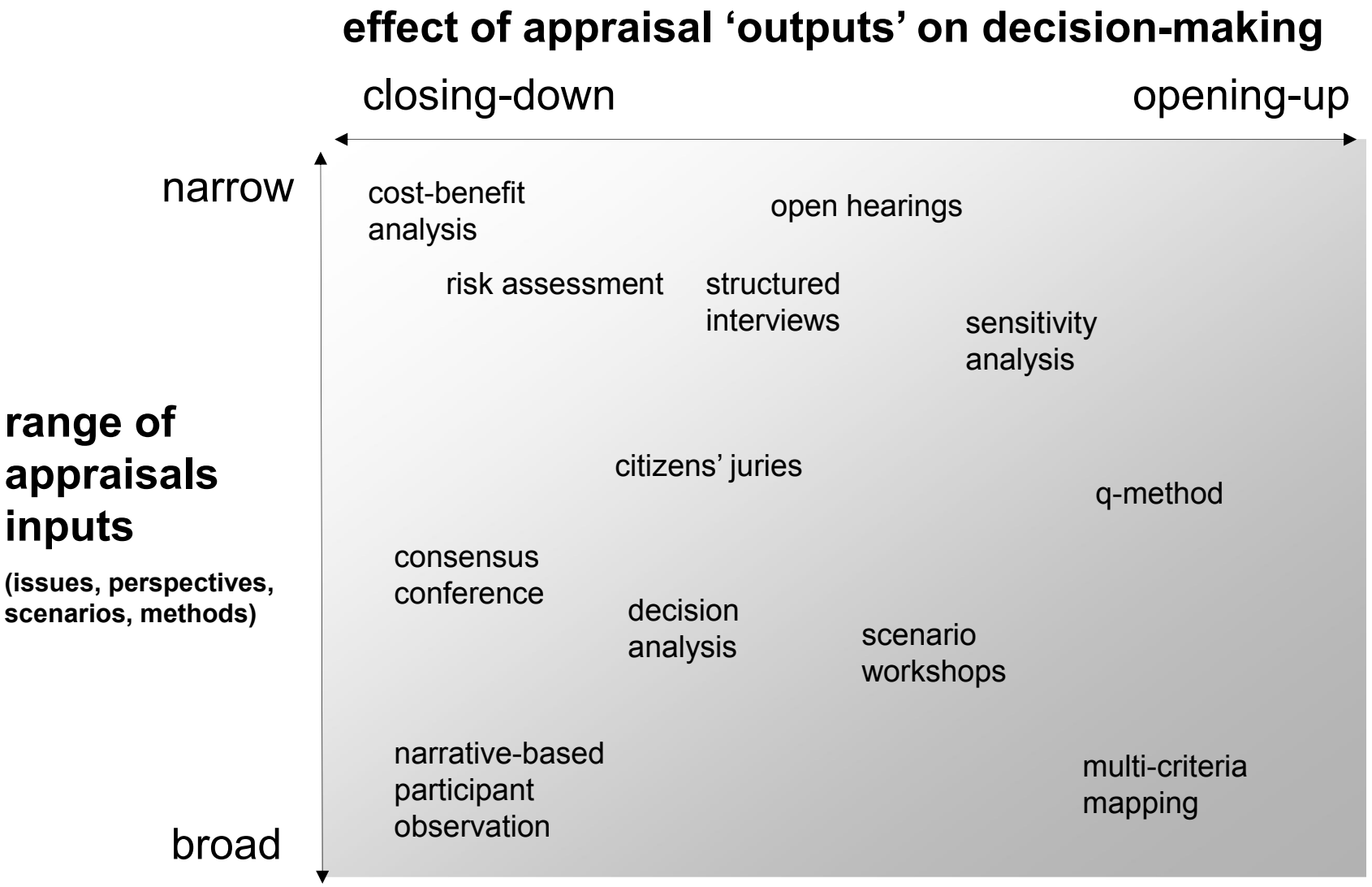
Open: consideration of various dimensions → plural and conditional

# Appraisal methods: broad vs. narrow & closing vs. opening



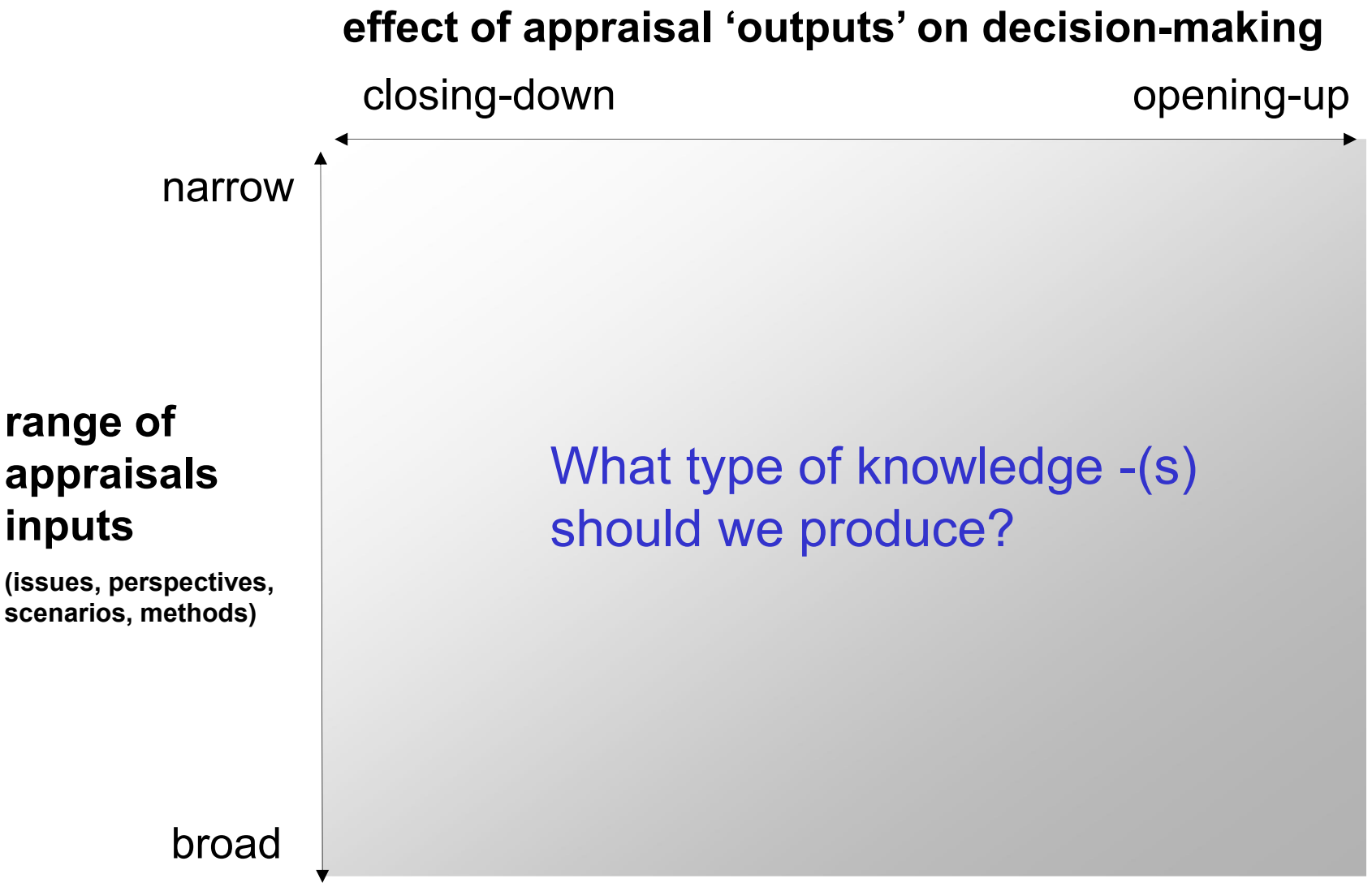

Leach et al. 2010

# Appraisal methods: broad vs. narrow & close vs. open

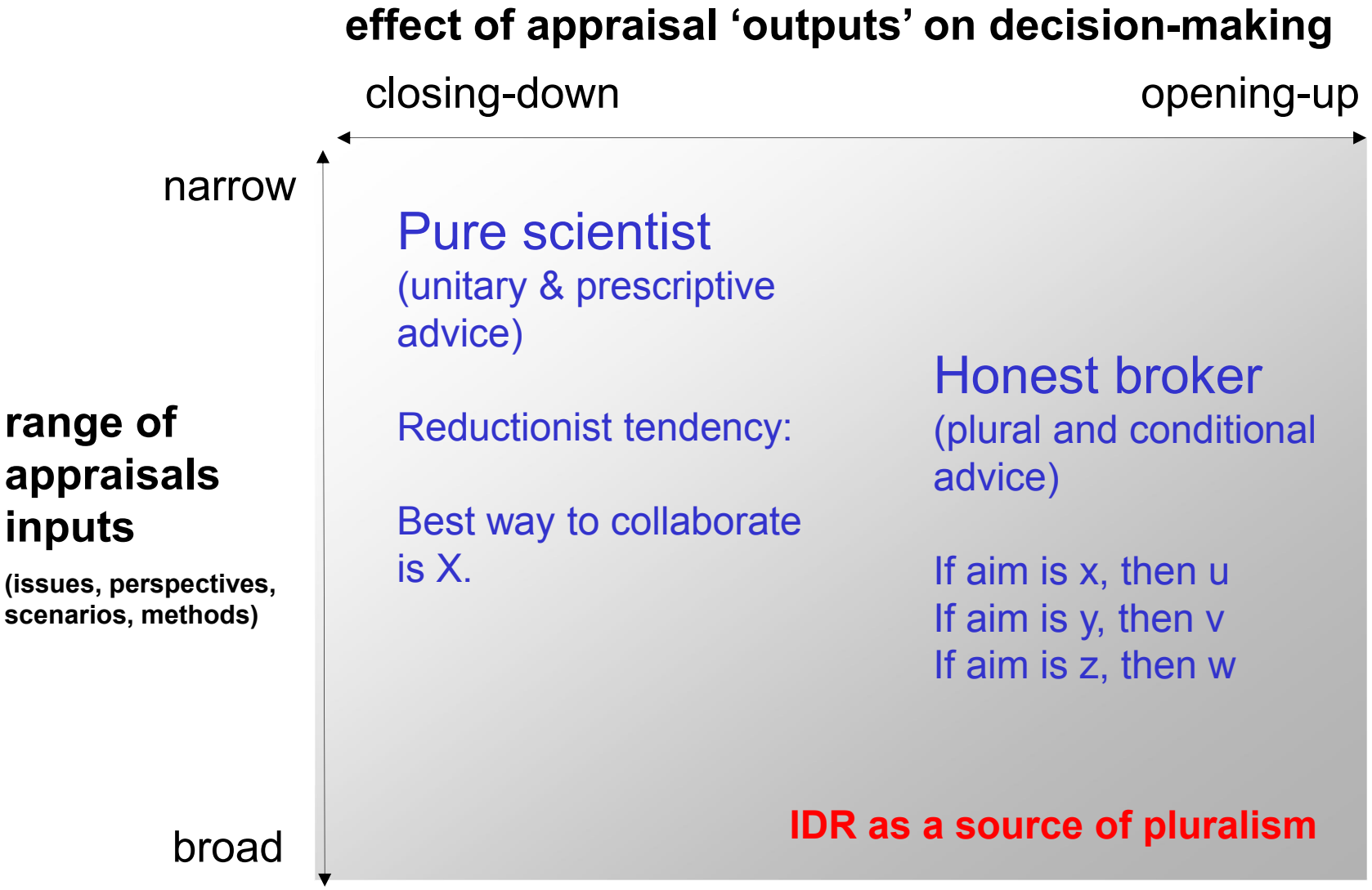



Stirling et al. (2007)

# Appraisal methods: broad vs. narrow & closing vs. opening



# Pure scientist vs. Honest broker (Pielke, 2007)



# Summary

1. **Are STI Studies interdisciplinary?**
   - **Yes – this means they don't look good in "BM School performance"**

2. **Why are STI Studies interdisciplinary?**
   - **Yes, because they are problem-oriented**

   **(Also because it is a source of pluralism)**

3. **What type of research do we do in STI studies?**

   **Open to normative (ethical) choices**
   - **What types of problems?**
   - **What types of stakeholders?**
   - **What types of knowledge?**

# Roundtable: STI policy studies vs “real” policy

The roundtable aims to explore how STI Studies interact with actual policy and management.

- What type of studies are relevant for policy, consultancy and management? Which research agendas / methods are academic pastimes and which are important for policy?
- How does knowledge exchange takes place?
- Is there a synergy or a trade-off between academic visibility and societal relevance in our field?
- What are the normative or ethical implications of problem-choice?