Betydningen af Forskning, Innovation og Publikationer - Evidence-based R&D and innovation policy making

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CIM 2.0

- Central Innovation Manual on Excellent Econometric Evaluation of the Impact of Public R&D Investments:
  - Part of a broader agenda of evidence-based policy making
  - Minimum requirements and standards on methods and data collection that are necessary for excellent impact assessments of R&D policy
  - Measurement system: input, output, outcome, impact

Innovation Denmark database and Bibliometric Research Indicator (BFI) because data quality is important

1. Systematic registration of all projects in public support programmes (more than 16,000 enterprises, researchers and institutions with more 20,000 observations)
2. Systematic registration of all researchers and publications at Danish research institutions
3. ResearchFish i Novo Nordisk Fonden og andre?

5 channels for the economic impacts of R&D and innovation policy

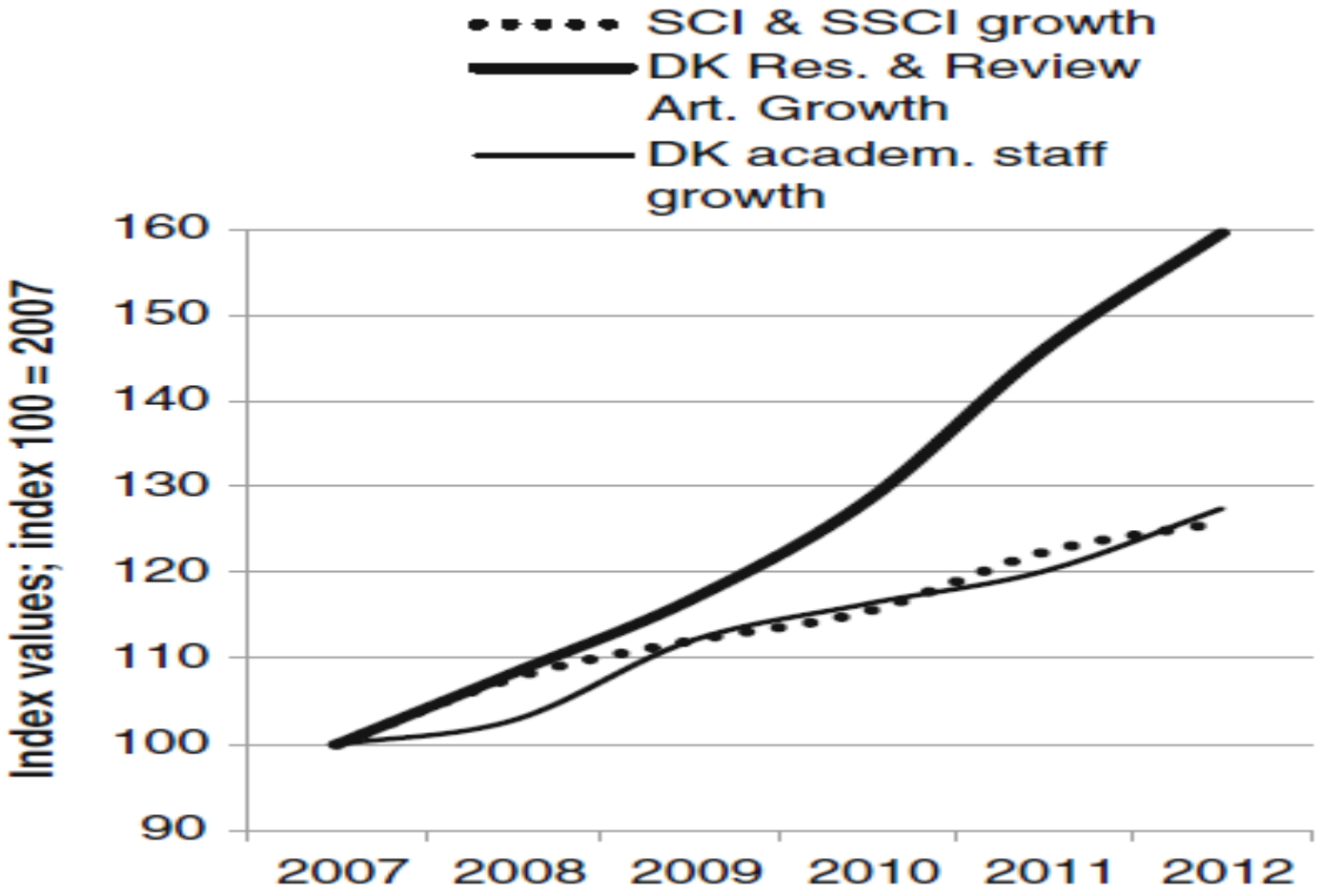
Microeconomic impacts – “triple-dividend” impact:

- Own investments in enterprises
- Public-private R&D Collaboration
- International R&D-collaboration with own R&D investments

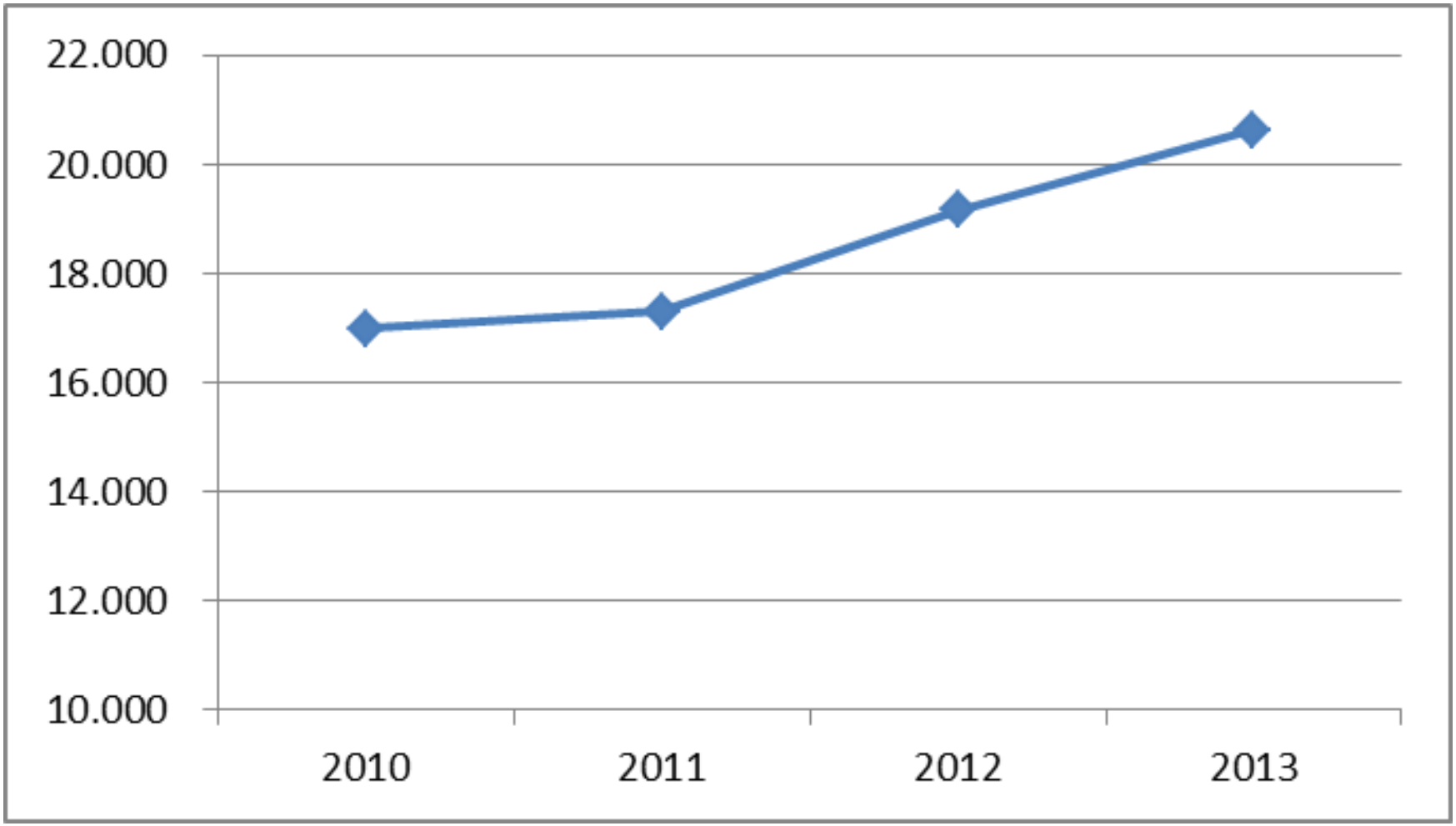
Macroeconomic impacts:

- Multiplicator impacts in the economy from knowledge dissemination and higher private and public R&D investments
- Mulitiplicator impact of public interventions

Publication, citation and academic staff growth since 2007 - Denmark



Number of publications since 2010



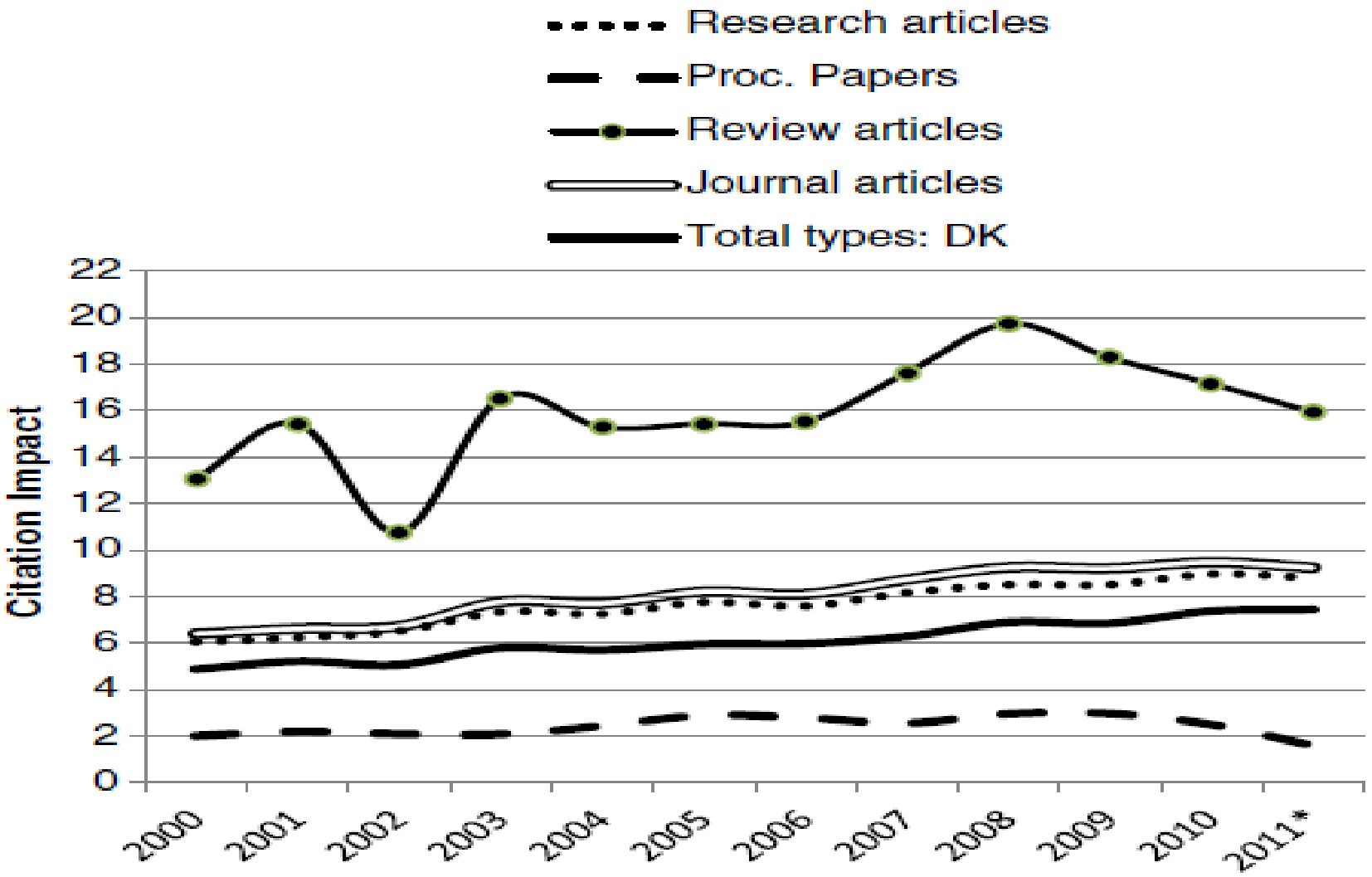
Costs per publication, all research fields (million DKK)

Hvd.	Publikationsår			
	2009	2010	2011	2012
Samfundsvid.	0,81	0,95	0,97	0,83
Naturv./Tek	0,92	1,00	0,82	0,82
Humaniora	0,60	0,64	0,52	0,54
Sundhedsvid.	0,89	0,92	1,07	1,09
I alt	0,86	0,93	0,88	0,86

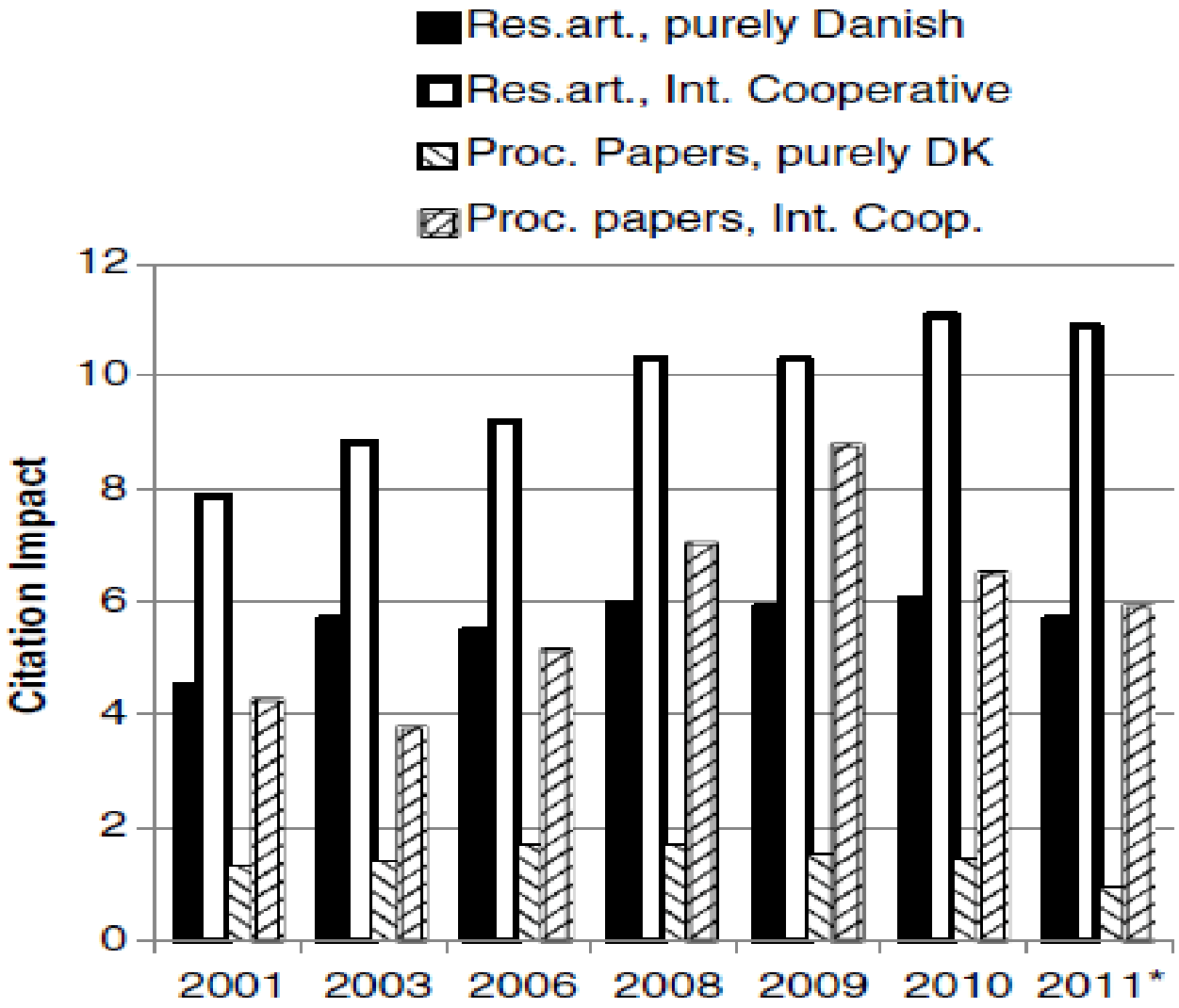
Costs per BFI-point (million DKK)

	Publikationsår			
	2009	2010	2011	2012
Samfundsv.	0,58	0,67	0,69	0,61
Naturv./Tek	0,82	0,85	0,72	0,72
Humaniora	0,40	0,43	0,38	0,40
Sundhedsv.	0,92	0,90	1,09	1,15
I alt	0,74	0,77	0,76	0,76

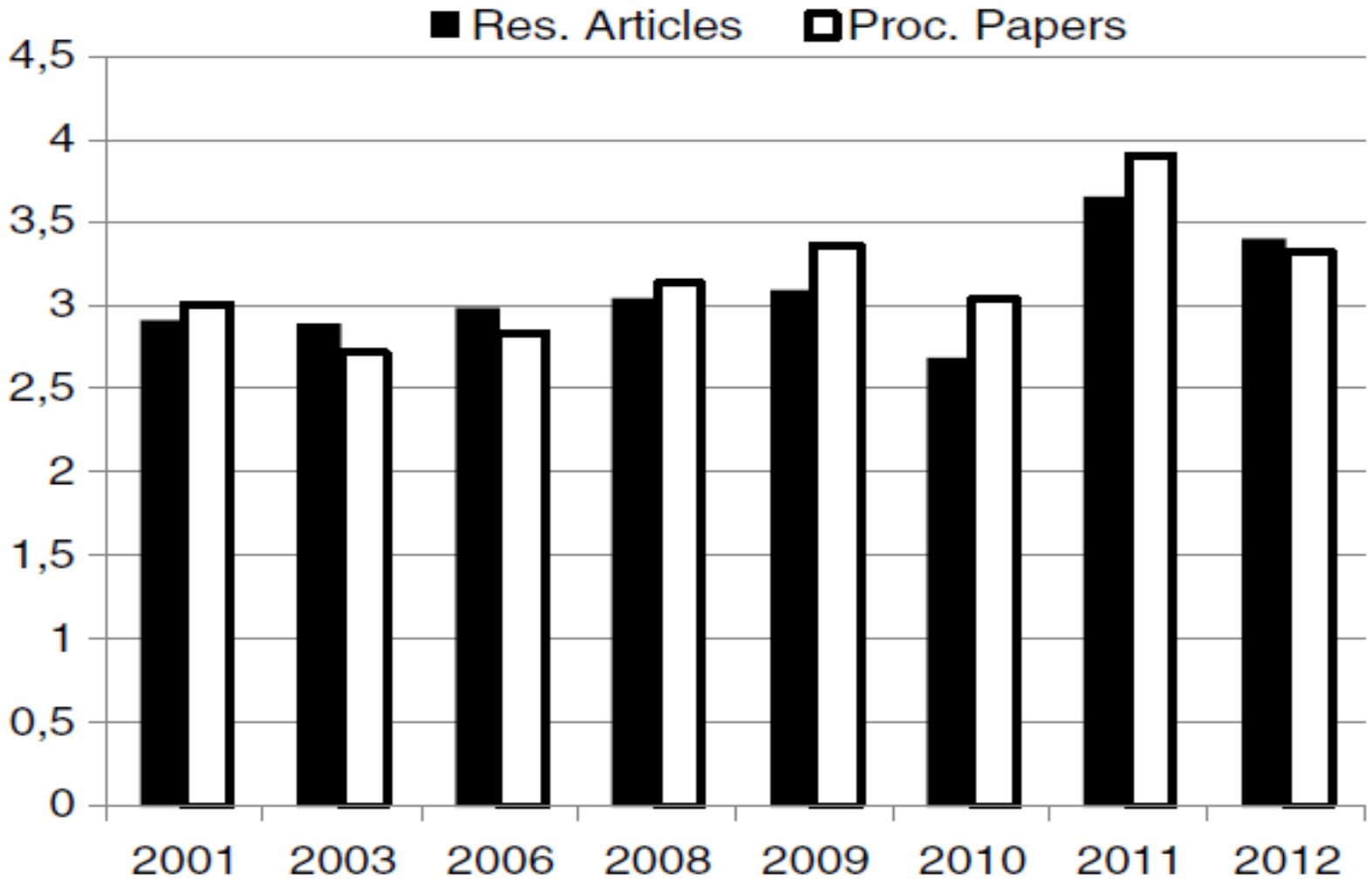
Annual development in Danish citation impacts



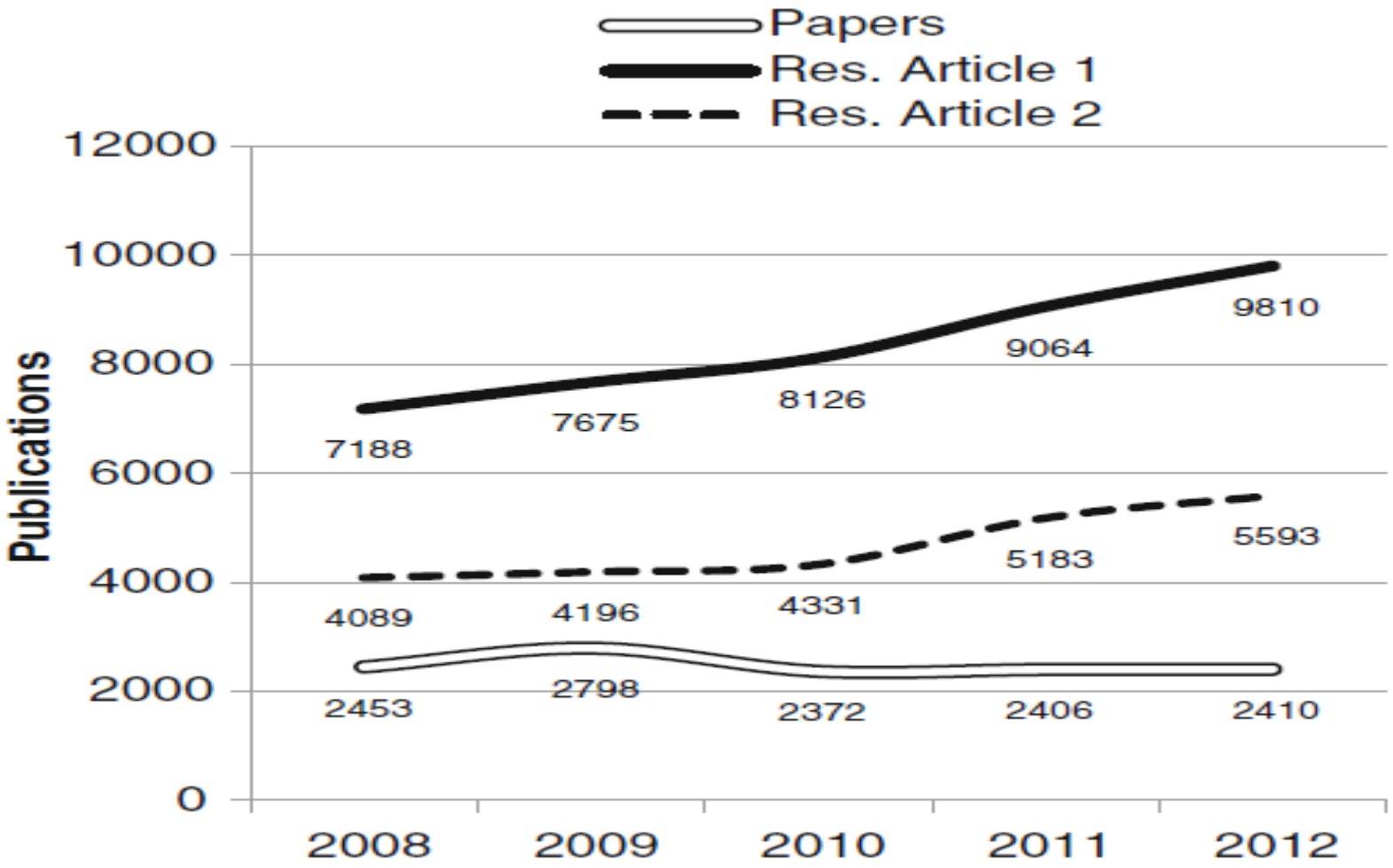
Citation impacts – pure Danish versus international research-collaboration



Average number of countries collaboration with Danish research

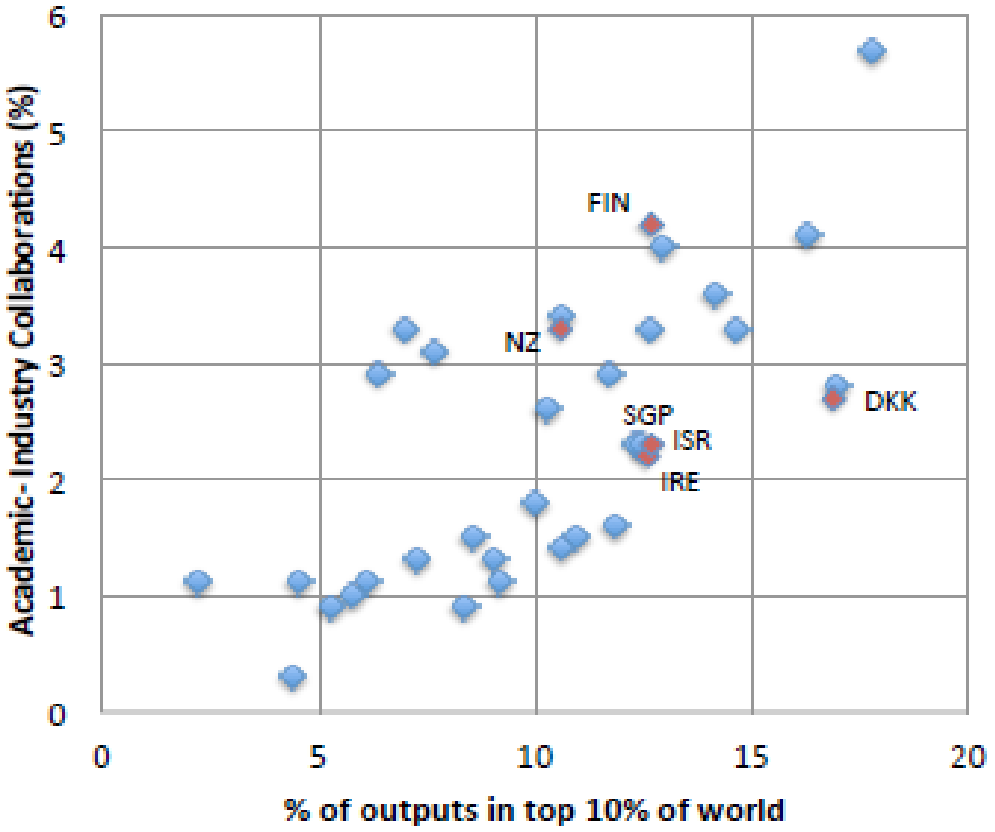


Publications in the BFI indicator divided into quality levels



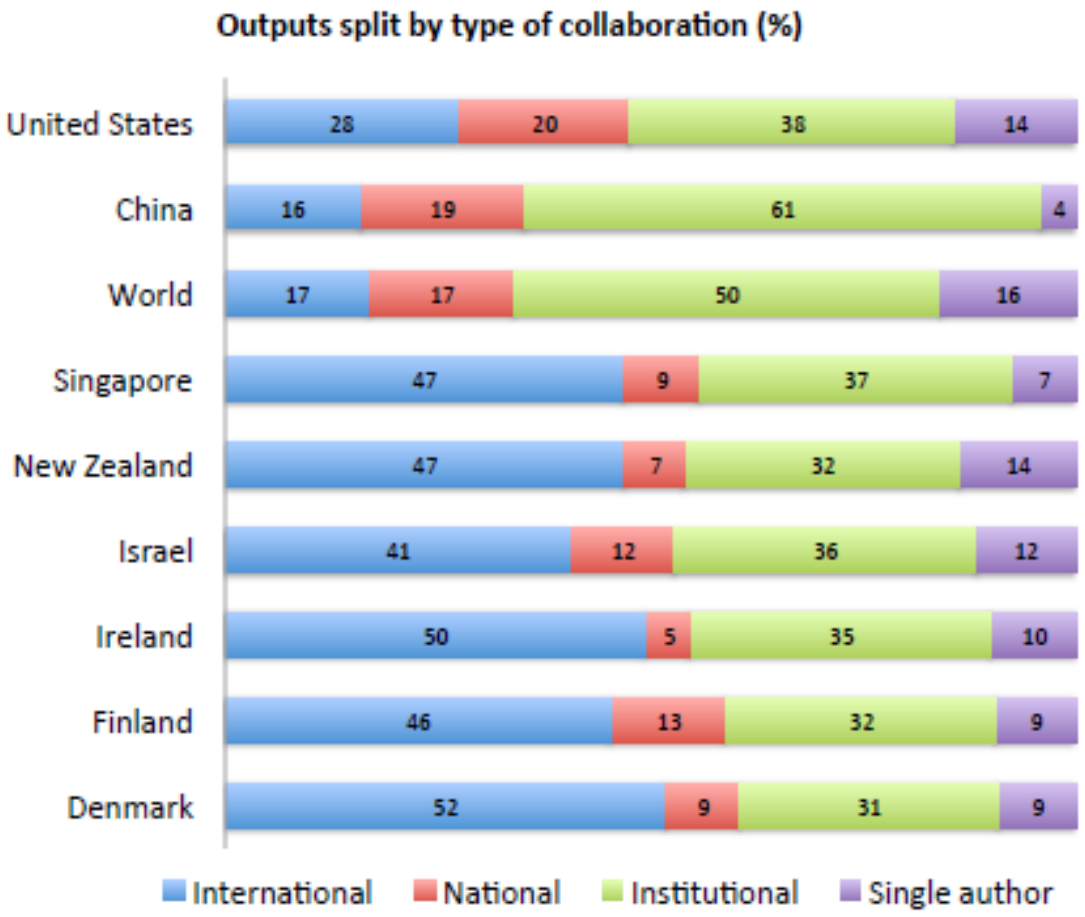
Correlation between top cited outputs and industry collaboration

Outputs in top percentiles vs academic-corporate collaboration (2000-2012)



Data: Articles only, self-citations excluded from "Top10" metric

Collaboration (2008-12)

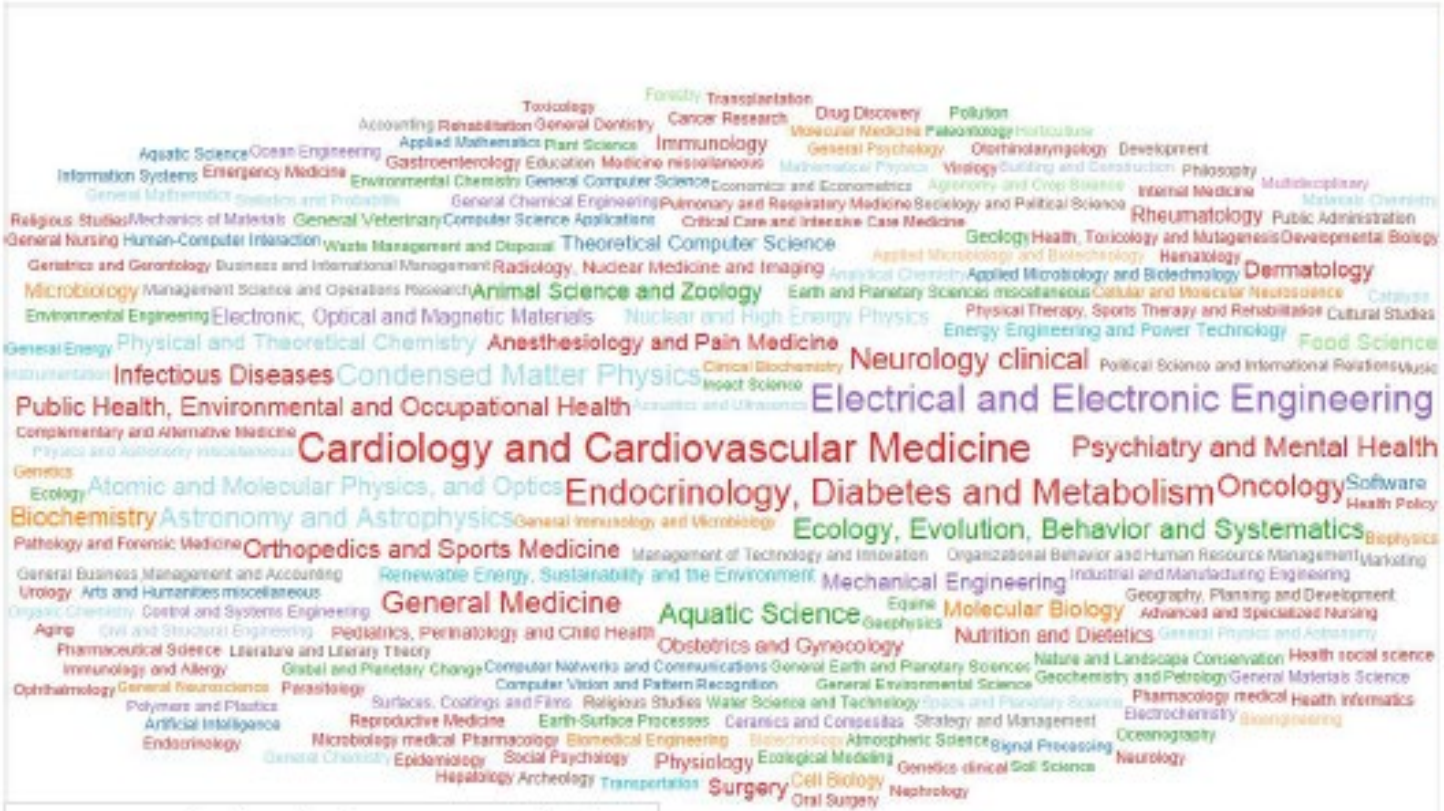


- Science is an international endeavour
- In small countries, the majority of papers produced involve international collaboration (40-50%)
- The degree of collaboration has only been increasing over time.

Institutional Competencies (2012)

The word cloud below shows sub-disciplines associated with institutional-level competencies for Danish universities.

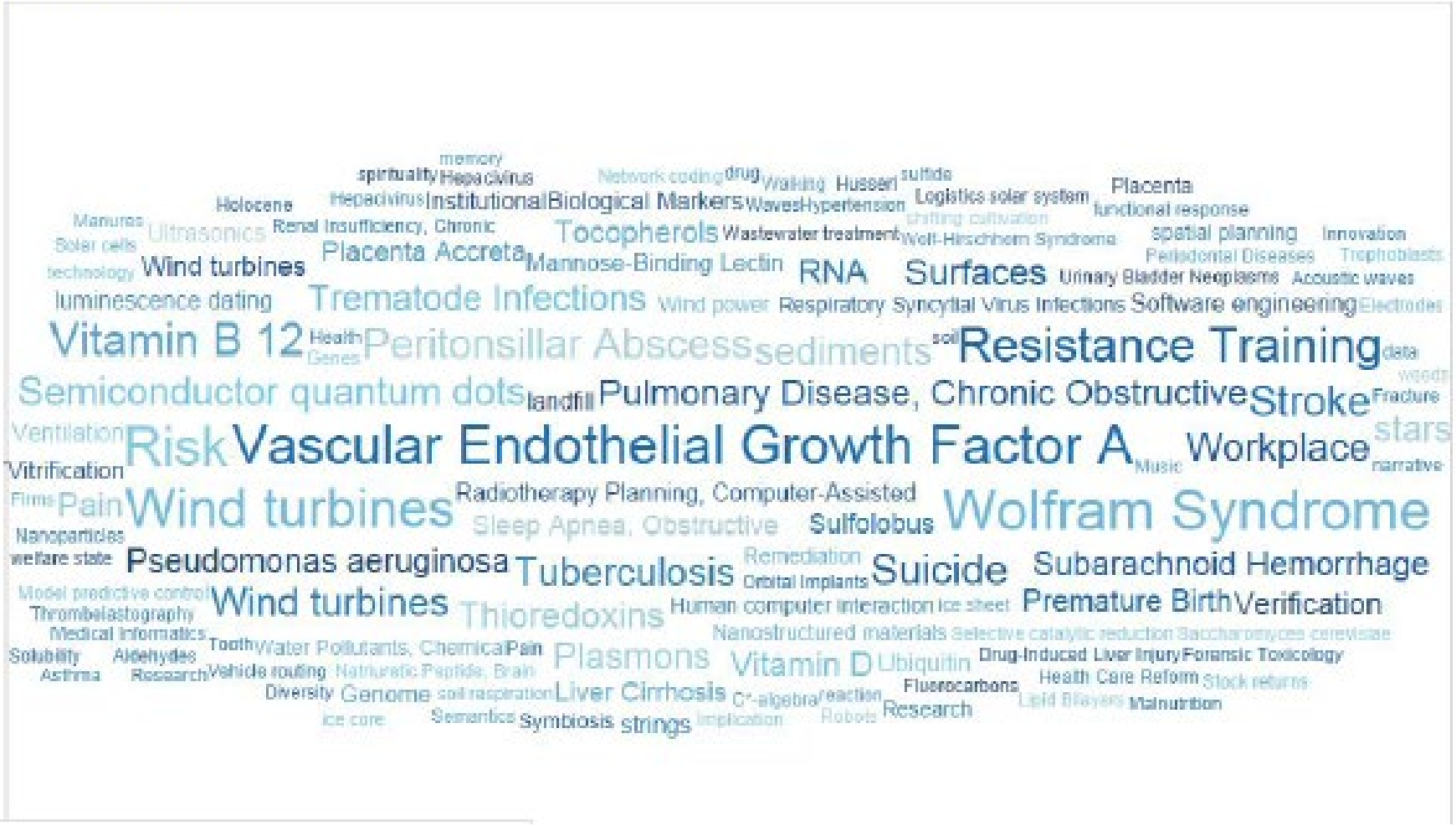
The size of the word is related to how many fractional papers from competencies are approximately associated with the discipline. The colours represent the high-level discipline area.



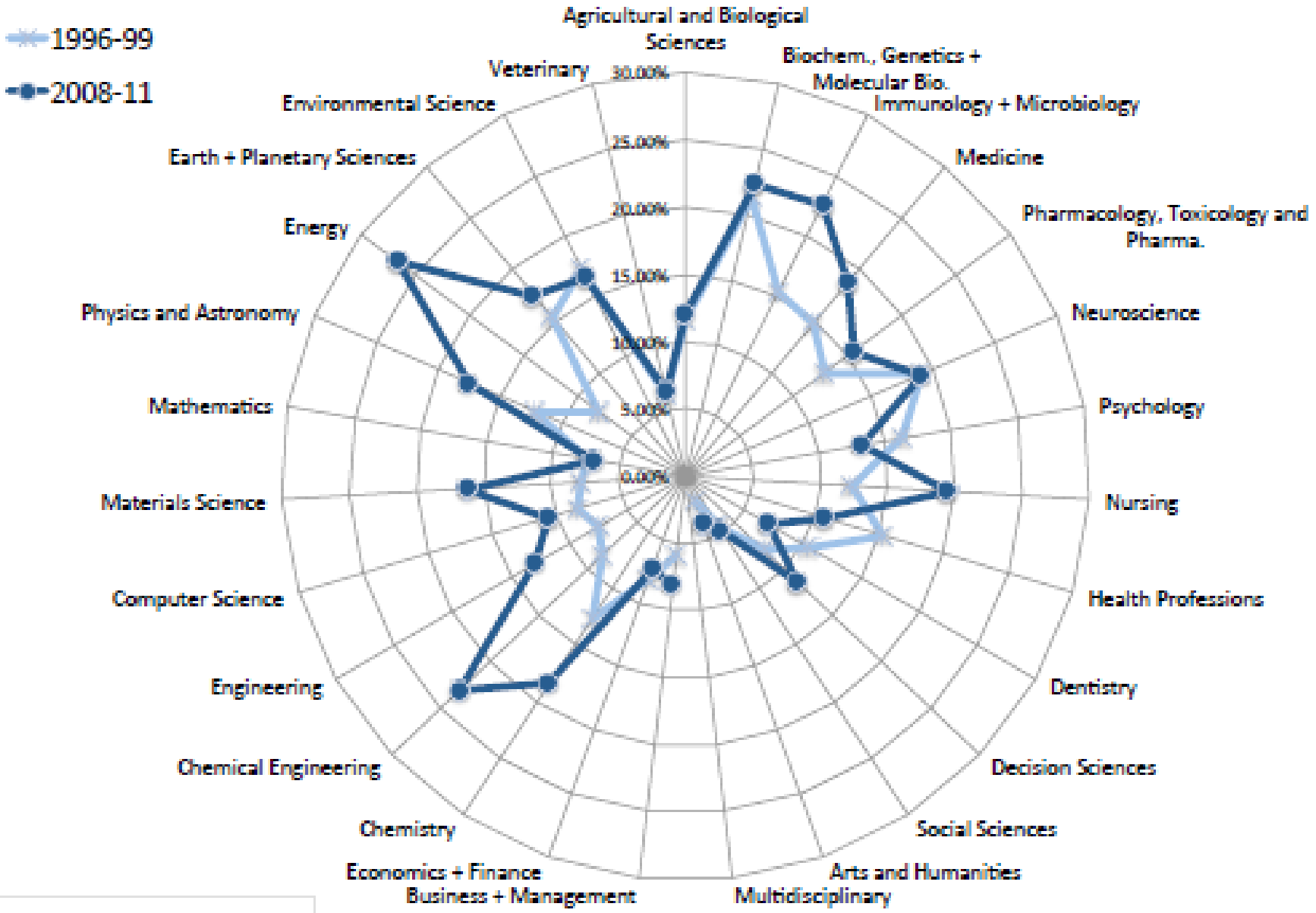
Data source: Elsevier, SciVal competency analysis
Graph produced by: SAEI Secretariat

Institutional competencies (2012)

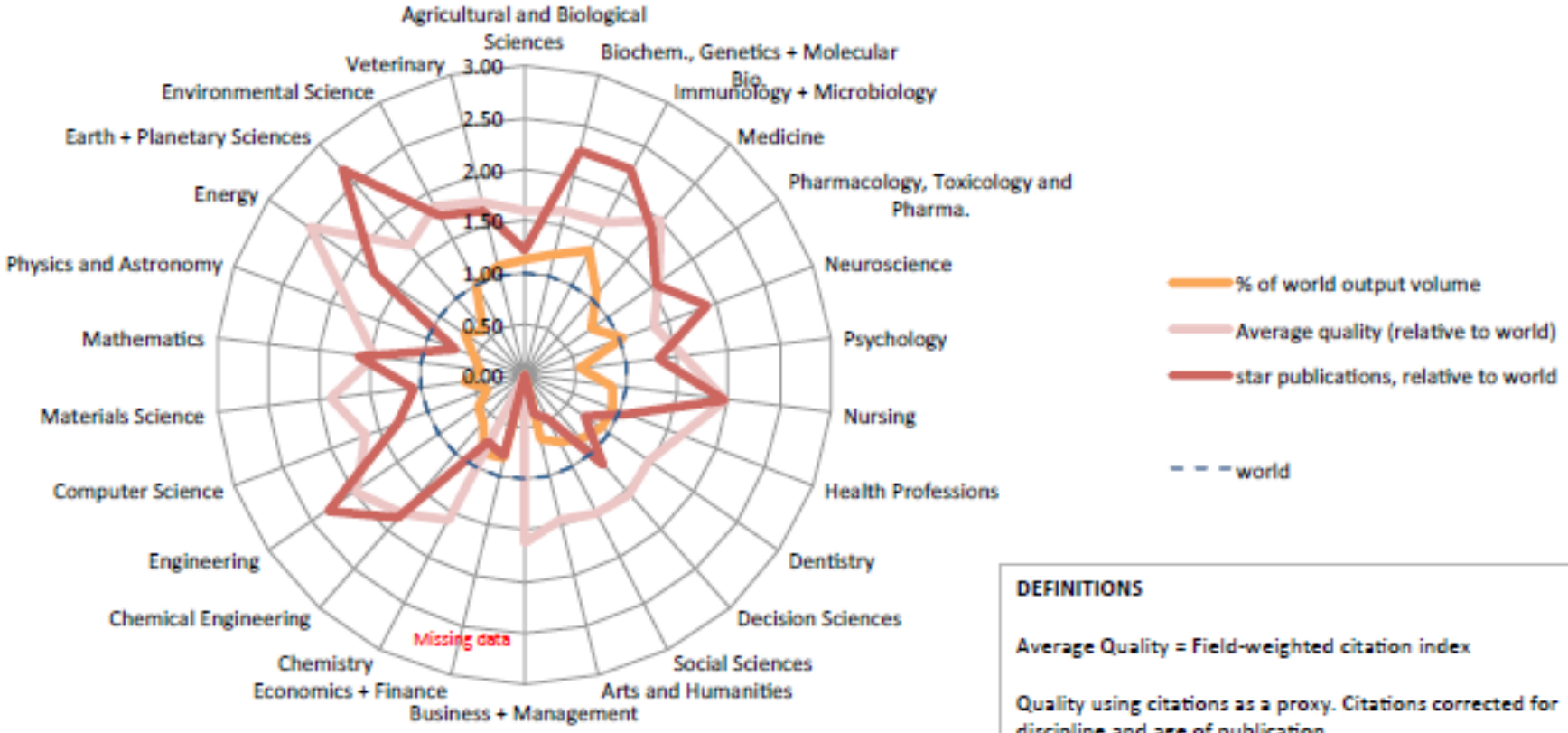
The word cloud below highlights some of the key words from competencies of Danish institutions. The size of the font is linked to the number of papers from the institutions for the associated competency.



DENMARK Star publications over time (% of outputs in top 10% of world by citations)



Quantity and quality for Denmark – 2008 to 2012



Data source: Elsevier, Scopus
Graph produced by: SAEI Secretariat

DEFINITIONS

Average Quality = Field-weighted citation index

Quality using citations as a proxy. Citations corrected for discipline and age of publication.

Quality – star performers:

Using top-cited publications as a proxy. Based on % in top 10% of world outputs, normalised to 1.

The marginal rate of return of private R&D investments

	Rate of return of the last invested EUR in private R&D
The median enterprise in Denmark	34.2 %
The median enterprise in Finland	22.7 %
The median enterprise in Norway	22.7 %
The median enterprise in Sweden	16.4 %

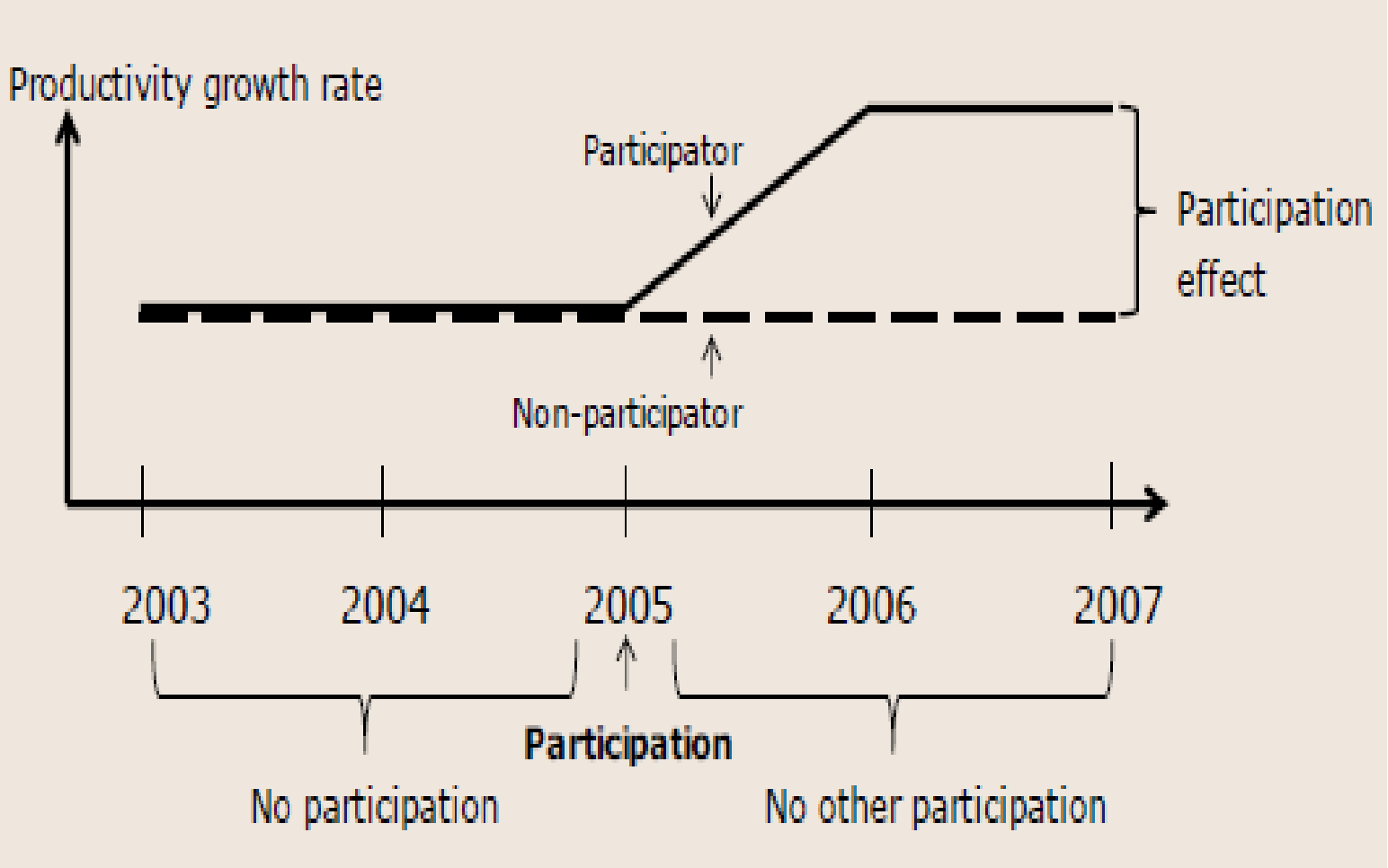
The marginal rate of return of business R&D investments by enterprise size

	0-49 employees	50-99 employees	100-249 employees	More than 250 employees
Denmark	12.4	15.0	37.4	63.7
Norway	9.4	22.8	31.3	125.3
Finland	10.2	17.9	23.1	51.5
Sweden	4.9	-4.4	-7.6	24.6

The marginal rate of return of business R&D investments by industry

	High tech industry	Other Industry	ICT	Business service	Other service
Denmark	11.0	19.6	9.6	56.6	65.4
Norway	9.5	15.3	5.8	34.6	109.1
Finland	18.8	26.3	1.8	13.3	6.0
Sweden	3.5	-1.2	24.9	10.2	3.1

Comparison of growth rates for participants and non participants (propensity score matching, ranking or lottery)



Economic impacts of participation in the Danish R&D support system

- All programmes:
  - 2½ per cent higher total factor productivity
- Collaboration programmes:
  - 3,6 per cent higher total factor productivity

    (but variations between research-industry innovation consortia, innovation vouchers, PhD-collaboration)
- Network facilitation (Innovation Network Denmark)
  - 3½ per cent higher productivity
- Counceling
  - No significance
- Single Innovation projects (Innovation Assistant)
  - 2,9 per cent higher total factor productivity