

Multidimensional evaluation and comparison of Finnish universities across fields of science

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Background

- Publication practices across fields of science differ
- Universities have different research profiles
- *How to take this into account in evaluating universities' publishing?*

- Wide reliance on Web of Science (WoS) and Scopus based bibliometric indicators in science policy making, and in most university rankings and assessments
- Coverage of WoS and Scopus is lacking in diversity of publishing
- *How to develop evaluations of universities' research performance and publication profiles?*

J. Pölönen & O. Auranen, [Research performance and scholarly communication profile of competitive research funding: the case of Academy of Finland](#), *Scientometrics*.

Aims of the study

- Develop indicators for multidimensional evaluation of the Finnish universities' publication output across the major fields of arts and sciences.
- Analyze research performance and scholarly communication profiles using field normalized indicators taking into account field variation in publication practices and universities' research profiles.
- Use comprehensive publication data consisting of 108,218 publications (years 2016-2018) registered in the national information service, which integrates CRIS (Current Research Information System) data of 13 Finnish universities.

108,218 publications (2016-18): 66 subfields

1 NATURAL SCIENCES	25993	3 MEDICINE AND HEALTH	21224	5 SOCIAL SCIENCES	28600
111 Mathematics	1725	3111 Biomedicine	2415	511 Economics	1007
112 Statistics and probability	289	3112 Neurosciences	1274	512 Business and management	5059
113 Computer and information sciences	6805	3121 General medicine, internal medicine and ot	3823	513 Law	3548
114 Physical sciences	5303	3122 Cancers	1141	5141 Sociology	2795
115 Astronomy and space science	1248	3123 Gynaecology and paediatrics	1548	5142 Social policy	1569
116 Chemical sciences	2011	3124 Neurology and psychiatry	1384	515 Psychology	1596
1171 Geosciences	976	3125 Otorhinolaryngology, ophthalmology	545	516 Educational sciences	5573
1172 Environmental sciences	1689	3126 Surgery, anesthesiology, intensive care, rad	2496	517 Political science	2835
1181 Ecology, evolutionary biology	2869	313 Dentistry	698	518 Media and communications	1607
1182 Biochemistry, cell and molecular biology	1395	3141 Health care science	1127	519 Social and economic geography	922
1183 Plant biology, microbiology, virology	980	3142 Public health care science, environmental a	1569	520 Other social sciences	2088
1184 Genetics, developmental biology, physiolog	516	315 Sport and fitness sciences	818		
119 Other natural sciences	186	316 Nursing	1105	6 HUMANITIES	18905
		317 Pharmacy	951	611 Filosofia	1522
2 ENGINEERING	11338	318 Medical biotechnology	148	612.1 Kielitieteet	3545
211 Architecture	491	319 Forensic science and other medical sciences	181	612.2 Kirjallisuuden tutkimus	2034
212 Civil and construction engineering	655			613.1 Teatteri. tanssi. musiikki. muut esittävät tai	1323
213 Electronic, automation and communications	3890	4 AGRICULTURE	2158	613.2 Kuvataide ja muotoilu	1356
214 Mechanical engineering	940	4111 Agronomy	275	614 Teologia	2127
215 Chemical engineering	1274	4112 Forestry	769	615 Historia ja arkeologia	4650
216 Materials engineering	1436	412 Animal science, dairy science	92	616 Muut humanistiset tieteet	2349
217 Medical engineering	409	413 Veterinary science	443		
218 Environmental engineering	870	414 Agricultural biotechnology	27		
219 Environmental biotechnology	43	415 Other agricultural sciences	554		
220 Industrial biotechnology	89				
221 Nanotechnology	424				
222 Other engineering and technologies	817				
				ALL FIELDS	108218

(Field-normalized) indicators for multidimensional evaluation

1. **Research performance:** share of peer-reviewed outputs published in journals, conferences and book publishers in JUFO levels 2 (“leading”) and 3 (“top”)
2. **Science communication:** share of not-peer-reviewed publications aimed at academic, professional and general audiences.
3. **Bibliodiversity:** share of peer-reviewed book publications (chapters, monographs and edited volumes) and conference articles.
4. **Multilingualism:** share of peer-reviewed publications in languages other than English (Finnish, Swedish and other languages).
5. **Domestic publishing:** share of peer-reviewed publications in journals and books published in Finland.
6. **Open access:** share of peer-reviewed open access publications, including gold, hybrid and green OA.
7. **Collaboration international:** share of peer-reviewed publications with co-authors affiliated with foreign institutions
8. **Collaboration inter-university:** share of peer-reviewed publications with co-authors from more than one Finnish university

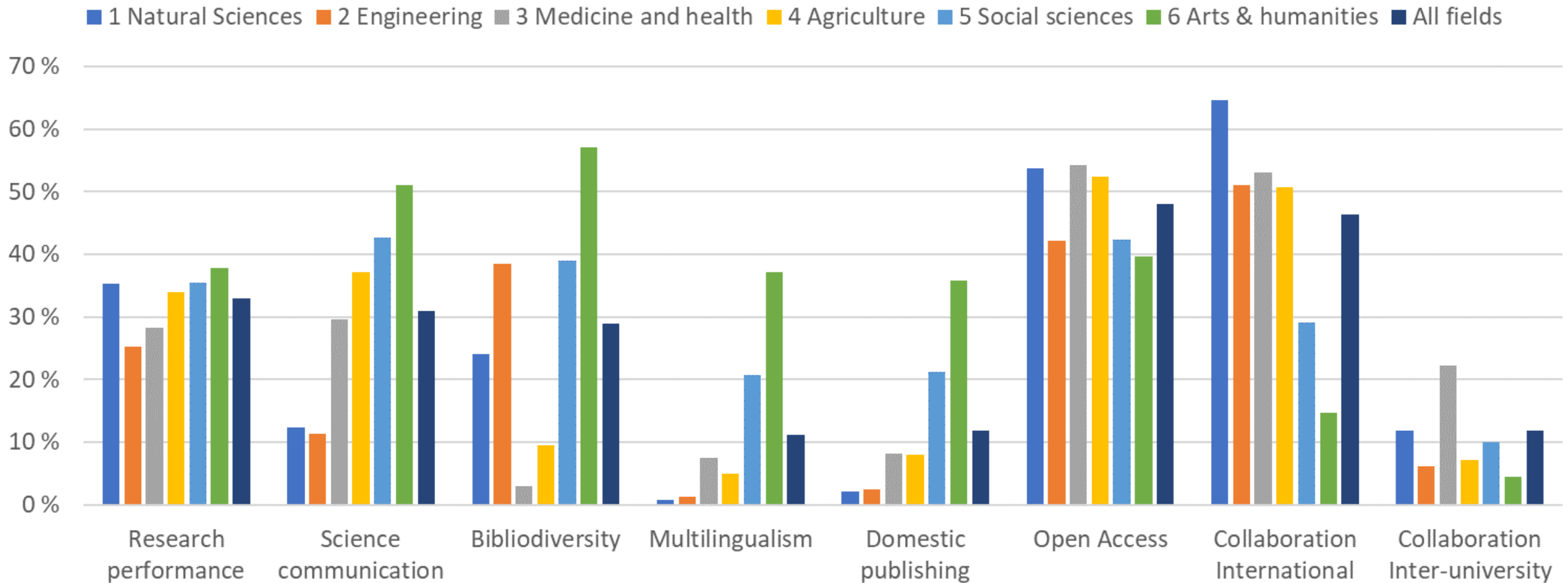
Calculation of field-normalized indicators

1. Compare in all 66 subfields the share (e.g. of non-peer-reviewed publications) for each university with the national average (university's share / national average)
2. Weigh university's publications in each 66 subfield (uni share / nat avg * number of publications)
3. Calculate the field-normalized indicators for universities (sum of weighted publications / number of publications)

	Main field	Publications	University's share	National average	Univ share / Nat avg	Weighted publications
Aalto	1 Natural Sciences	4047	6 %	12 %	0.47	1920
	2 Engineering	4287	10 %	11 %	0.87	3718
	3 Medicine and health	152	1 %	30 %	0.02	3
	4 Agriculture	1	0 %	37 %	0.00	0
	5 Social sciences	1522	23 %	43 %	0.54	825
	6 Arts & humanities	692	37 %	51 %	0.73	508
	All fields	10702				6975
Field-normalized indicator (6975/10702)						0.7

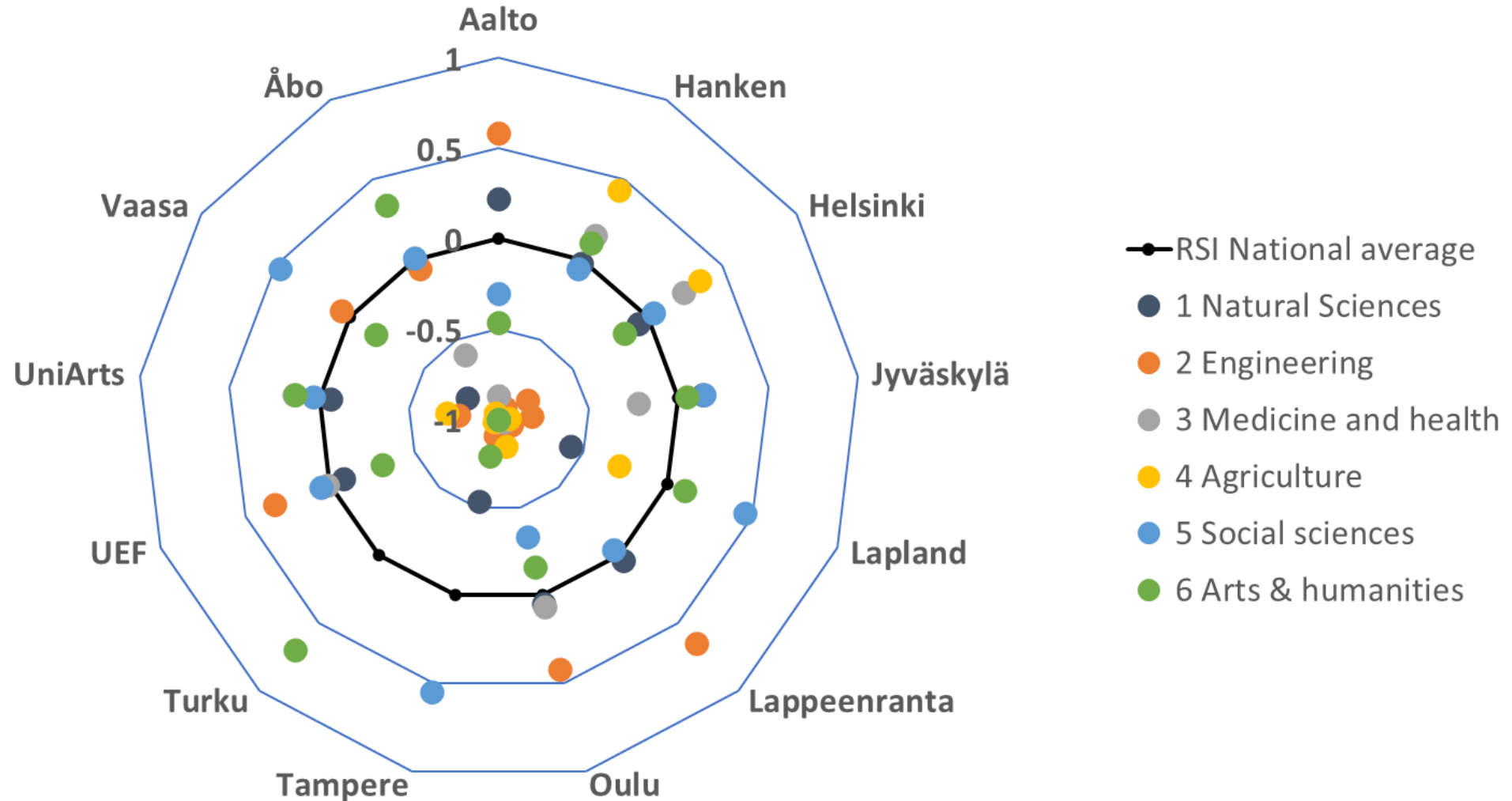
This example is based on 6 main fields but we calculated our indicators by comparing the universities' shares to the national averages across 66 subfields

Large field-variation in most indicators



Different disciplinary profiles of universities

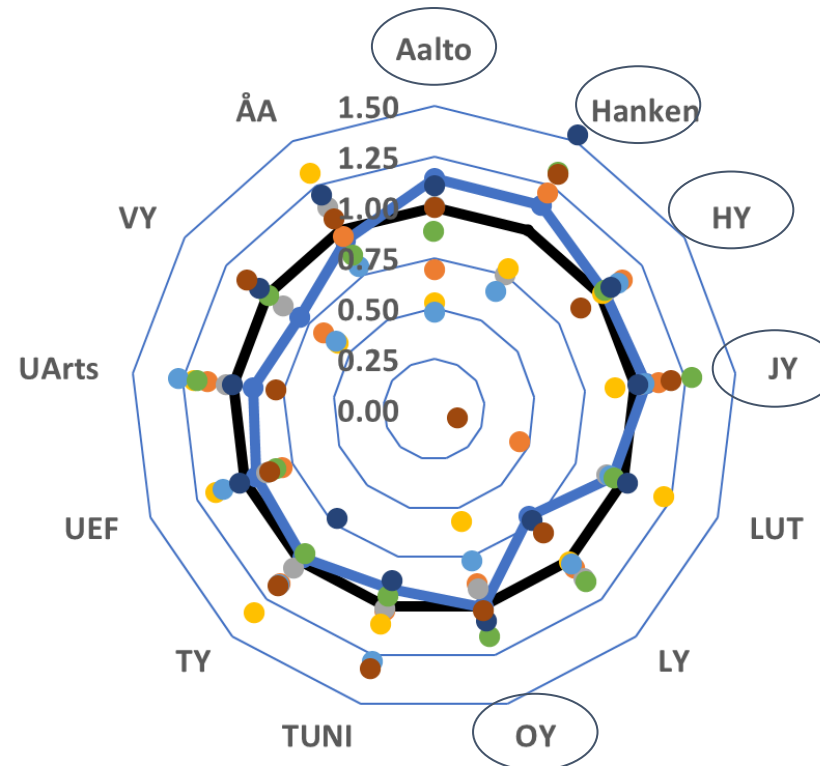
Relative Specialization Index (RSI)



Results: 2016-2018 publication profiles

- National average
- Bibliodiversity
- Open Access
- Research performance
- Multilingualism
- Collaboration International
- Science communication
- Domestic publishing
- Collaboration Inter-university

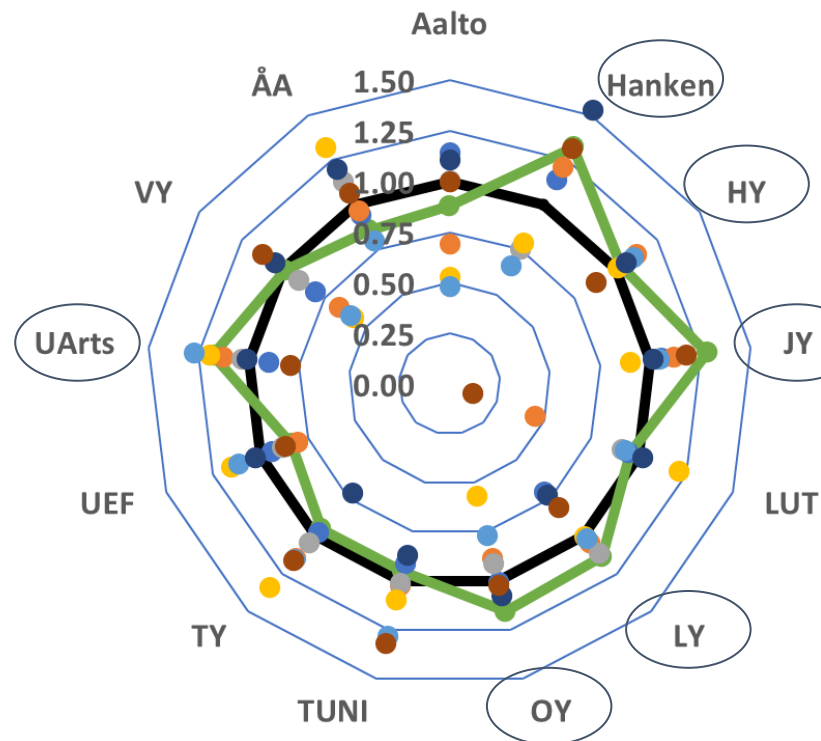
Research performance



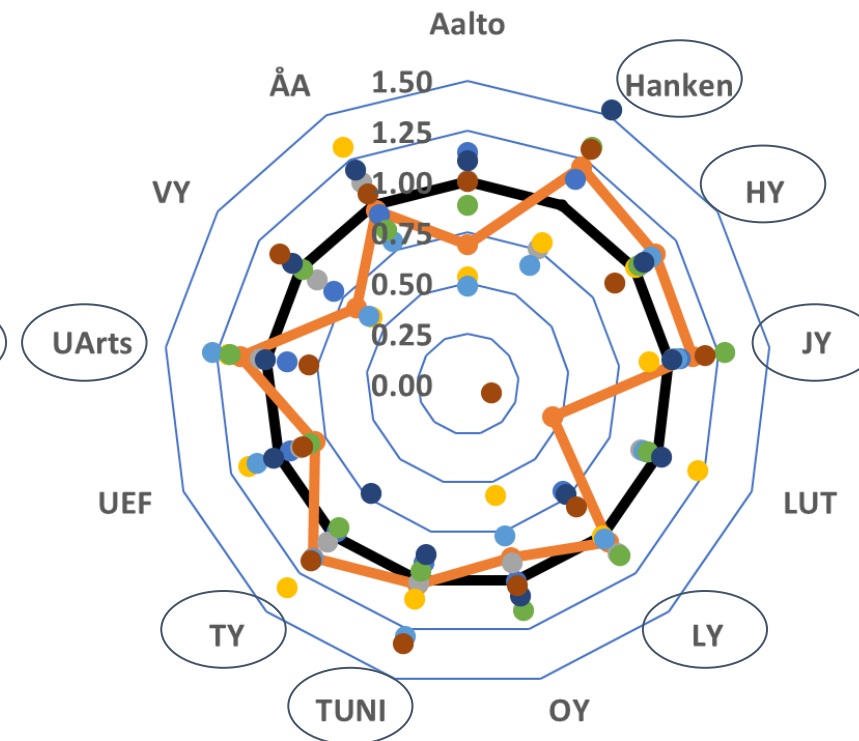
Results: 2016-2018 publication profiles

- National average
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Open Access



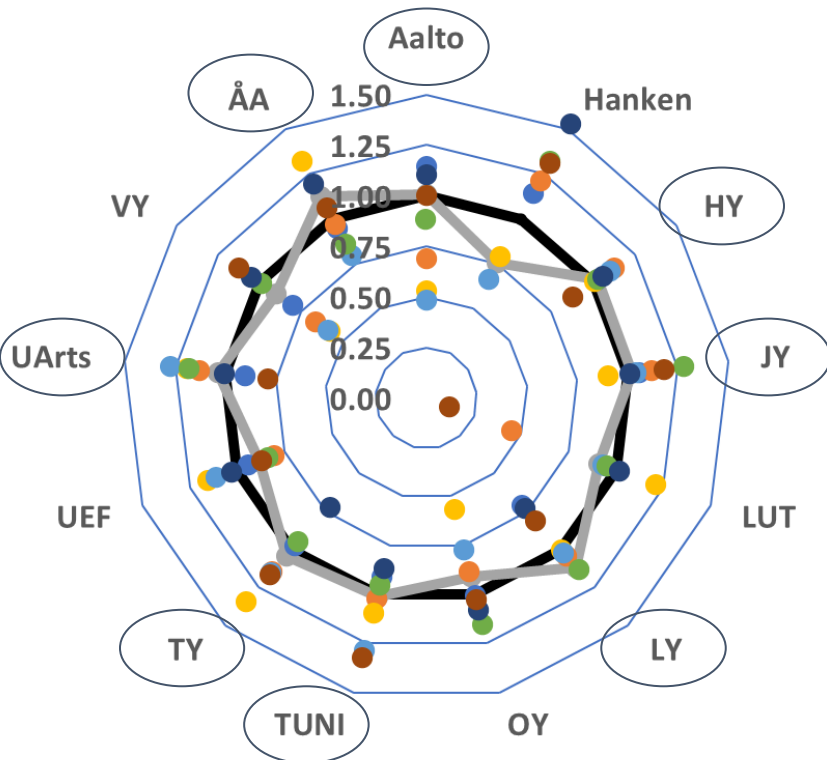
Science communication



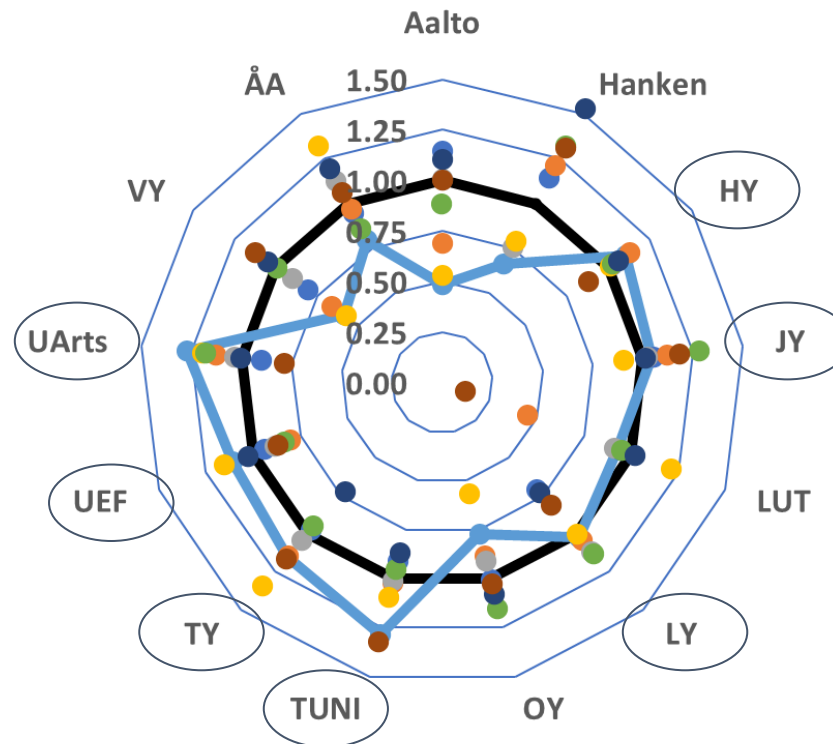
Results: 2016-2018 publication profiles

- National average
- Bibliodiversity
- Open Access
- Research performance
- Multilingualism
- Domestic publishing
- Collaboration International
- Science communication
- Domestic publishing
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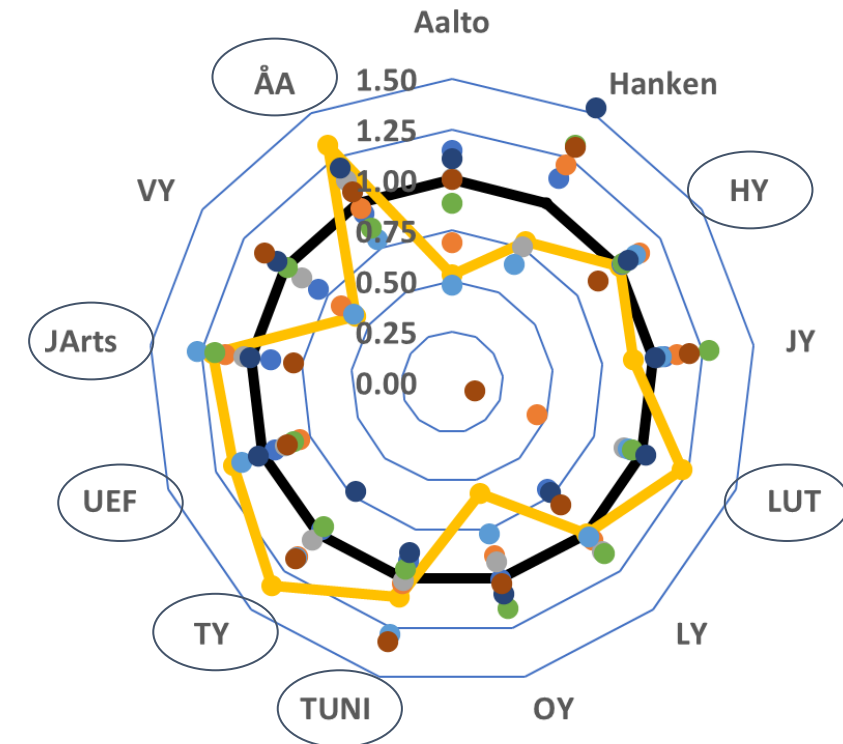
Bibliodiversity



Domestic publishing



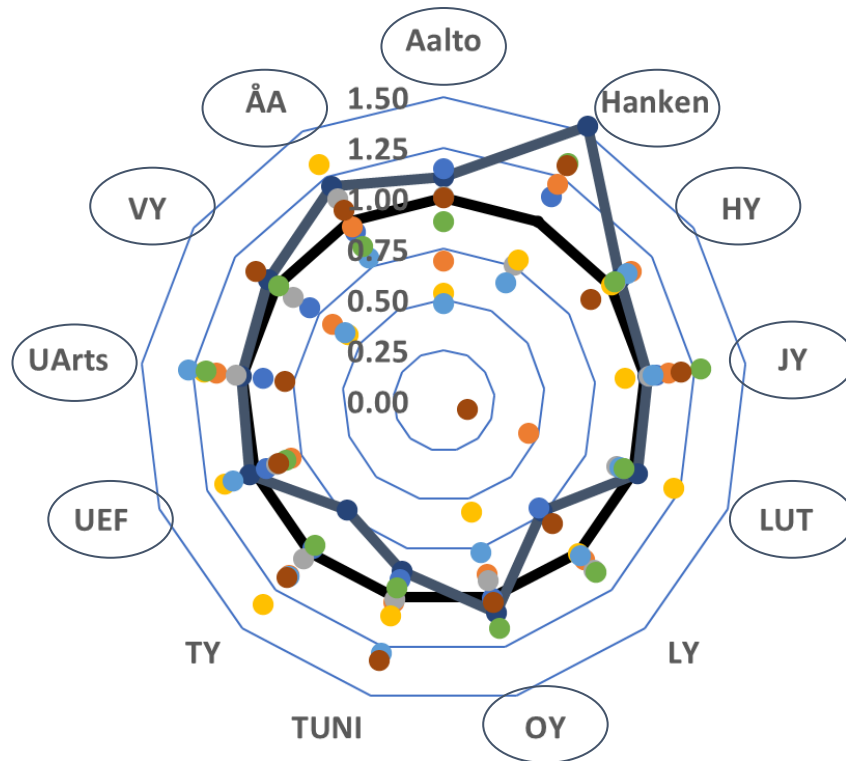
Multilingualism



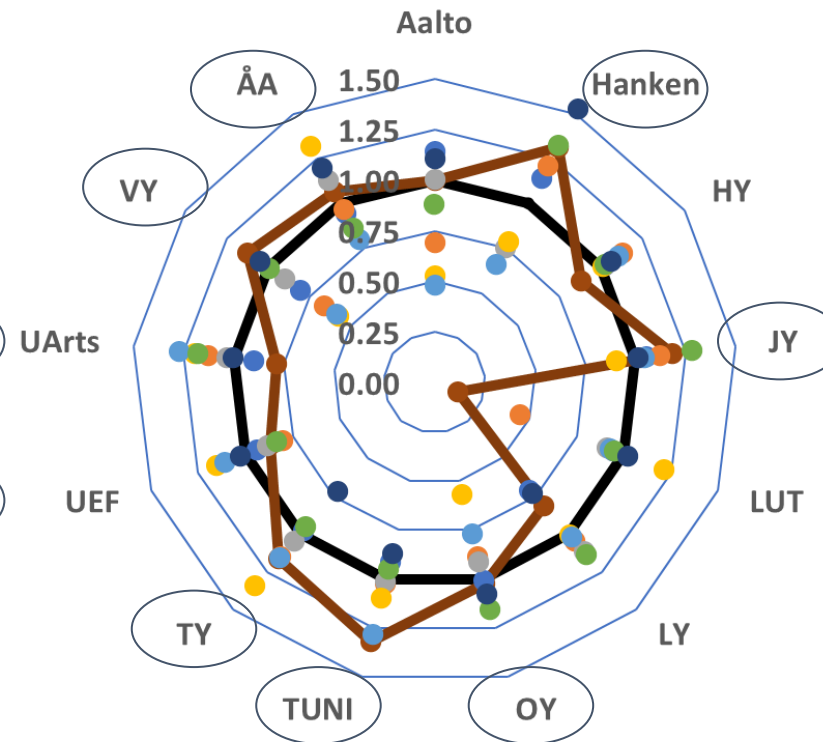
Results: 2016-2018 publication profiles

- National average
- Bibliodiversity
- Open Access
- Research performance
- Multilingualism
- Collaboration International
- Science communication
- Domestic publishing
- Collaboration Inter-university

International collaboration



Inter-university collaboration



Results: summary of publication profiles

	Research performance	Science communication	Bibliodiversity	Multilingualism	Domestic publishing	Open Access	Collaboration International	Collaboration Inter-university	Above national average
Aalto	1.14	0.69	1.00	0.53	0.48	0.88	1.11	1.00	3
Hanken	1.14	1.21	0.75	0.79	0.66	1.32	1.53	1.31	5
HY	1.02	1.13	1.03	1.01	1.10	1.03	1.06	0.88	7
JY	1.06	1.12	1.02	0.90	1.04	1.28	1.01	1.18	7
LUT	0.95	0.45	0.91	1.21	0.93	0.95	1.02	0.12	2
LY	0.71	1.05	1.12	1.00	1.02	1.14	0.73	0.81	5
OY	1.01	0.88	0.91	0.57	0.77	1.16	1.08	1.02	4
TUNI	0.91	1.02	1.01	1.09	1.28	0.95	0.87	1.32	5
TY	0.98	1.15	1.05	1.34	1.16	0.95	0.72	1.16	5
UEF	0.94	0.80	0.88	1.15	1.11	0.83	1.03	0.87	3
UArts	0.90	1.13	1.04	1.19	1.27	1.18	1.01	0.79	6
VY	0.81	0.66	0.90	0.58	0.59	0.99	1.05	1.13	2
ÅA	0.94	0.97	1.13	1.32	0.80	0.86	1.20	1.06	4

Results: correlations of indicators across fields and universities

	Research performance	Science communication	Bibliodiversity	Multilingualism	Domestic publishing	Open Access	Collaboration International	Collaboration Inter-university
Research performance	1.0	0.1	-0.4	-0.3	-0.3	0.2	0.6	0.2
Science communication	0.1	1.0	0.2	0.2	0.4	0.5	0.0	0.6
Bibliodiversity	-0.4	0.2	1.0	0.4	0.4	-0.3	-0.6	0.0
Multilingualism	-0.3	0.2	0.4	1.0	0.7	-0.3	-0.4	-0.3
Domestic publishing	-0.3	0.4	0.4	0.7	1.0	0.0	-0.6	-0.1
Open Access	0.2	0.5	-0.3	-0.3	0.0	1.0	0.3	0.2
Collaboration International	0.6	0.0	-0.6	-0.4	-0.6	0.3	1.0	0.2
Collaboration Inter-university	0.2	0.6	0.0	-0.3	-0.1	0.2	0.2	1.0

Discussion

- Universities that are strong in Multilingualism, Domestic publishing and Bibliodiversity tend to show weaker profile in Research performance, Open Access and Collaboration.
- Yet strong Research performance does not exclude strong profile in Multilingualism, Science communication or Open Access (some universities excel in almost all indicators).
- In general, strong Research performance correlates with strong (International) collaboration - not surprising in light of previous research.
- Comprehensive national publication data provides good information base for analysing and recognizing strengths and differences in the universities' publication profiles.
- In future, we plan to apply these indicators to the most recent data and observe trends and changes in the Finnish universities' profiles.