Applying CRIS-data for Analysing Research Collaboration at the University of Bergen, Norway

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Summary

In this study, national and international collaboration at the University of Bergen is analysed. The study is based on CRIS data which enable us to obtain a complete overview of the collaboration profile as reflected in co-authorships of scientific and scholarly publications. The applied data set includes all types of scientific and scholarly publications, from books to articles. The focus is on the collaboration between institutions within Norway and other countries. While some faculties at the university have a pronounced international collaboration profile, other faculties collaborate most frequently with national research institutions and enterprises nearby. In addition to the interest of the empirical results themselves, the study can be seen as an example of the analytical possibilities of highly developed and advanced Cris's.

1 Introduction

Bibliographic data on the institutional affiliations of co-authors, is a commonly applied source for analysing network and collaboration structures in science (Glänzel & Schubert, 2004; Katz & Martin, 1997). When researchers from different institutions together author a publication, this indicates that the research has involved collaboration. Co-authorship data thereby provide a unique source for analyzing collaboration structures both at institutional, national and international levels. Such analyses are usually based on publication data provided by Thomson Reuters (e.g. ISI Web of Science) and, more recently, Elsevier (Scopus). Because large set of publication data can be analysed, empirically robust indicators of collaboration can be provided, reflecting both formal and informal types of co-operation. A main disadvantage of these data sources, however, is the limited coverage of the scholarly literature in the social sciences and the humanities (Aksnes, Frolich, & Slipersaeter, 2008; Hicks & Wang, 2011).

Publication data from Current research information systems (CRIS) is an alternative source for making collaboration analyses. Still, reliable results can only be provided if the database contains complete and verified bibliographic records where all co-authors and their institutional affiliations are registered. These requirements are often not fulfilled, but at the University of Bergen in Norway, CRIS publication data are available in a format and with a quality that allow such analyses. These data are collected through the Norwegian CRIS-system, CRIStin. This system is also used in a performance based funding model of the Norwegian Higher education institutions (Sivertsen, 2010)

The purpose of our study is to apply the CRIStin data at the University of Bergen to analyze the national and international collaboration profile of the university. Through the study we are able to

obtain a complete overview of the collaboration as this is reflected in co-authorships of scientific and scholarly publications. The focus is on the collaboration between other institutions within Norway and abroad at faculty level. In addition to the interest of the empirical results themselves, the study can be seen as an example of the analytical possibilities of highly developed and advanced Cris's.

2 Data and methods

The analysis is based on publication data from CRIStin (Current Research Information System in Norway) for the University of Bergen for the years 2009 and 2010. In the study, we have only included scientific and scholarly publications according to the criteria used in the Norwegian funding model. Here, an academic publication must: 1) present new insight, 2) be presented in a form that allows the research findings to be verified and/or used in new research activity, 3) be written in a language and have a distribution that make the publication accessible to most interested researchers, and 4) appear in a publication channel (e.g. journal, series, book publisher) that has routines for external peer review (Committee appointed by the Norwegian Association of Higher Education Institutions on assignment from the Ministry of Education and Research, 2004). A list of accredited publication channels is revised every year according to these criteria.

The restriction to academic publications, rend us a complete and highly qualified set, suitable for collaboration studies across all six faculties at the University of Bergen, The Faculty of Mathematics and Natural Sciences, The Faculty of Medicine and Dentistry, The Faculty of Psychology, The Faculty of Social Sciences, The Faculty of Humanities and the Faculty of Law.

However, publications authored by more than 30 individuals are excluded in this study, due to incomplete information on all involved authors and affiliations. In total, the study is based on more than 5,000 publications. The data were analysed at the level of faculties, institutions and countries.

3 Results

We have analysed the proportion of the publications having external national co-authors (i.e. co-authors from Norwegian institutions outside University of Bergen) and international co-authors (i.e. co-authors from foreign institutions). The results are illustrated in Figure 1. There are large differences between the faculties both in the proportion of national and international collaboration. The Faculty of Mathematics and Natural Sciences is by far the one with strongest international collaboration rate, with almost 60 % of the publications co-authored with foreign scientists. Then follow the Faculty of Medicine and Dentistry (44%), Faculty of Psychology (35%) and Faculty of Social Sciences (23%). The Faculty of Law and The Faculty of Humanities, on the other hand, have very few internationally co-authored publications. National collaboration is most pronounced at The Faculty of Medicine and Dentistry (72%), and the Faculty of Psychology (50%). Interestingly, international collaboration is much more common than national collaboration at The Faculty of Mathematics and Natural Sciences. Only 30% of the publications at this faculty had external Norwegian co-authors. At The Faculty of Law and The Faculty of Humani-

ties the proportion of nationally co-authored publication is very low (3 and 6 %). This is related to the fact that the large majority of the publications at these faculties have one author only.

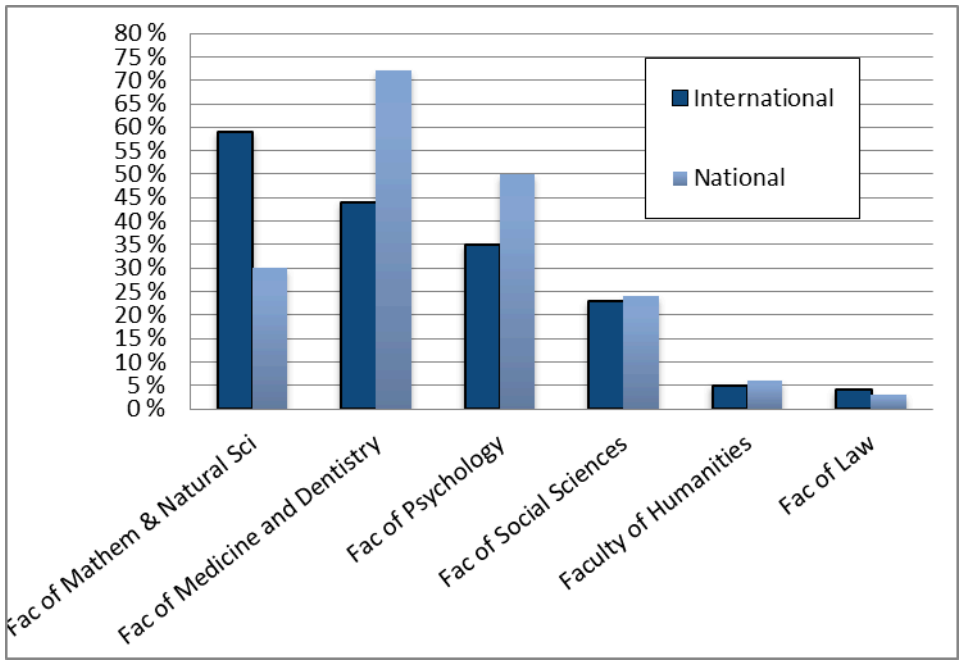

Figure 1: Co-authorship by faculty. Portion of national and international co-publications

The University of Bergen collaborated with over 1,400 foreign institutions in 98 countries, in 2009 and 2010 which proves the institution's international profile. Figure 2 illustrates the international co-publishing frequency, USA being the largest collaborator (9.3%), followed by Great Britain (8.2%) and Germany (5.9%). Numbers are not shown in the figure.

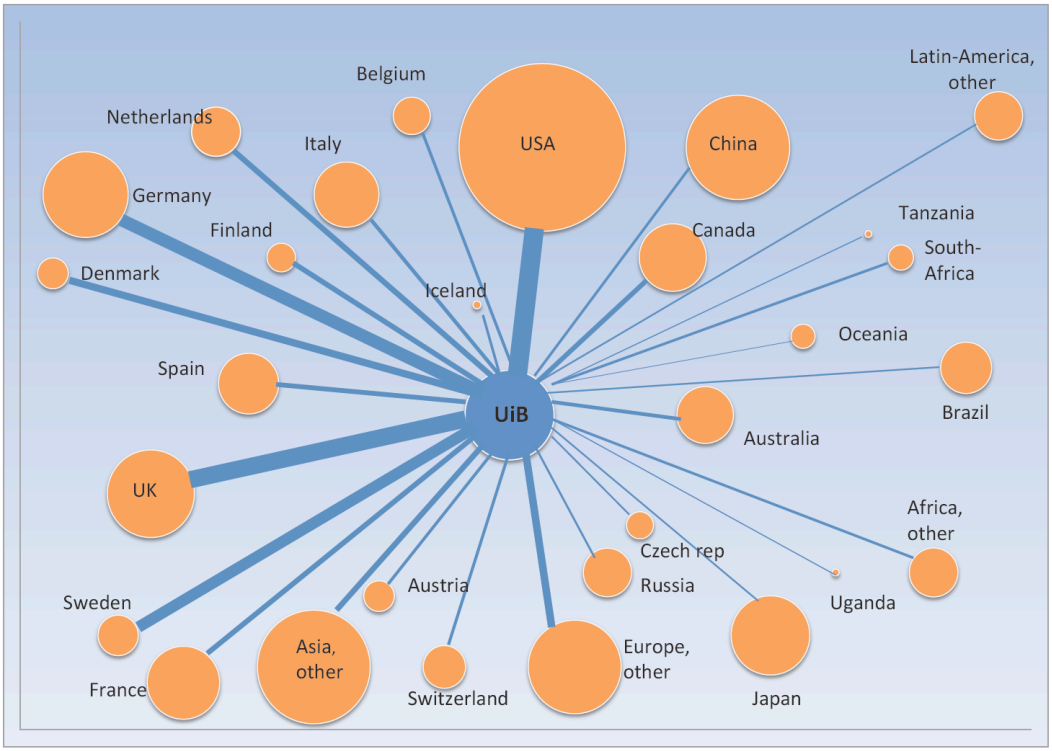

Figure 2: The University of Bergen's international collaboration profile based on co-publishing. The area of the circles is proportional to the countries' total amount of scientific publications (in Web of Science), while the width of the lines is proportional to the numbers of co-publications with The University of Bergen.

International co-publishing by faculty is shown in table 1. Independent of faculty, the University of Bergen collaborates most frequently with USA, Great Britain, Germany, Sweden and Denmark. In addition and in particular, The Faculty of Mathematics and Natural Sciences has a close relation to France (103 publications of 1463) and The Faculty of Psychology has a pronounced co-publishing activity with researchers from South Africa (31 publications of 319). In this presentation we have not shown results for foreign institutions, but such results have also been included in the study.

Country/faculty	FH	FL	FMD	FMNS	FP	FSS
USA	9		170	204	56	14
UK	3		151	164	36	33
Germany	2	1	81	165	30	13
Sweden	2	1	147	81	23	7
Denmark	3	1	92	48	11	7
France	6		45	103	4	5
Netherlands	1		65	43	18	3
Canada	3		34	60	13	
Spain	3		45	49	5	3
Australia			35	37	8	5
South Africa	5		8	12	31	1
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Total	49	7	1277	1463	319	143

Table 1: International collaboration profile by faculty, number of articles with co-authors from selected countries. Legends: FH: Faculty of Humanities, FL: Faculty of Law, FMD: Faculty of Medicine and Dentistry, FMNS: Faculty of Mathematics and Natural Sciences, FP: Faculty of Psychology, FSS: Faculty of Social Sciences

An overview of co-publishing at the national level is given in Table 2 (only selected results). The University of Oslo, the largest institution in the higher education sector in Norway, is one of the closest partners to The University of Bergen regarding all faculties, in particular The Faculty of Humanities. For The Faculty of Medicine and Dentistry and The Faculty of Psychology, the collaboration activity between national health institutions is predominant. Institute of Marin Research, located in Bergen, frequently co-publish together with The Faculty of Mathematics and Natural Sciences. Traditionally, the marine sciences have had strong position at the University of Bergen. Other examples of regional cooperation are Chr. Michelsen Institute and Norwegian School of Economics, both located in Bergen. These institutions have relatively high co-publishing activities with The Faculty of Social Sciences.

Institution	FH	FL	FMD	FMNS	FP	FSS
University of Oslo	23		336	84	70	26
Oslo University Hospital	1		140	9	21	1
Norwegian Institute of Public Health			133	1	31	
Stavanger University Hospital			148		5	
Uni Research	3		47	40	30	10
Institute of Marin Research			13	113		
Norwegian University of Science and Technology	1		75	15	21	6
University of Tromsø	2		70	22	3	3
Bergen University College	2		49	16	12	4
St Olav's Hospital			63	2	6	
University Hospital North Norway			42		1	
Akvaplan Niva				35		
University of Stavanger	1		22	3	7	
National Institute of Nutrition and Seafood Research			10	19	2	
Nansen Environmental and Remote Sensing Center				28		
Statoil			2	24	1	1
Norwegian School of Economics	3		1	1	4	10
Chr. Michelsen Institute			3	2		11
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Table 2: National collaboration profile by faculty, number of articles with co-authors from selected institutions. Legends: FH: Faculty of Humanities, FL: Faculty of Law, FMD: Faculty of Medicine and Dentistry, FMNS: Faculty of Mathematics and Natural Sciences, FP: Faculty of Psychology, FSS: Faculty of Social Sciences

4 Discussion

Numerous previous studies have analysed international collaboration using data on co-authorship. These studies have one the one hand shown that there exists pronounced differences in degree of international orientation among disciplines, and, on the other, that there seems to be a universal hierarchy among the disciplines (Aksnes, et al., 2008).

Discipline/Year	82-84	85-87	88-90	91-93	94-96	97-99	00-02	03-05	N
Physics	42	40	45	55	59	65	65	72	5680
Earth/space sciences	36	38	42	37	50	63	63	68	7069
Mathematics	42	46	37	41	44	47	54	58	1559
Chemistry	25	31	32	41	43	48	50	55	7408
Biomedicine	20	22	28	34	42	49	51	55	18345
Biology	19	20	26	27	34	39	46	53	16647
Engineering	20	21	23	30	31	37	43	49	7362
Clinical medicine	15	17	20	23	30	36	41	48	24383
Agricultural sciences	13	20	17	21	25	33	45	44	3288
Economics	18	13	22	24	27	28	31	38	1318
Psychology	20	14	15	18	26	31	32	37	2977
Social sciences – other	9	12	15	21	15	23	23	27	3042
Humanities	3	8	5	3	5	2	4	9	1393

Table 3: Co-authorship by discipline, 1982-2005, Norway. Share of articles involving international co-authorship, in per cent. Source: Aksnes et al. (2008).

Typically, natural science disciplines like physics and earth sciences have the highest proportion of international-authorship followed by other natural science disciplines, medicine and technology. International collaboration reflected trough co-authorship is much less common in the social sciences and rare in the humanities. We have included a table (Table 2) from another Norwegian study to illustrate this point. This table also reveals that there has been a tremendous increase in international collaboration in all disciplines in recent years – with one notable exception, the humanities.

The result of our study corresponds well with the ranking pattern of the disciplines described above – despite the fact that our study is based on a complete coverage of the publication output at a university while previously studies mostly (including the one in Table 2) have been based on Thomson Reuter (ISI) data.

Our study is an example of how advanced metadata may be used for monitoring cooperation links of an institution. Data from the CRIStin based CERIF model allows us to document the extent of cooperation between institutions including inter-departmental cooperation, measured through co-authorship. Such analyses presuppose that the complete bibliographic details of the publications in terms of internal and external authors and addresses are recorded. In Norway, this has been done in a systematic way at the University of Bergen. Thus, our analysis illustrates the benefit of including such data in CRIS systems.

The results of our study have been reported to the university management and other interested partners and have already triggered further studies on co-publishing at the university. We plan to extend the study to the department level, not only to faculties. Moreover, it is possible to monitor the collaboration pattern by making time series. Thus, the study will be updated when publication data from additional years are available. Even more detailed analysis on co-publishing may be made by including academic position and other personal data such as age and sex as variables. As the unique article identifier by Thomson Reuters is indexed in the Norwegian database CRIStin, it is possible to retrieve citation counts of the journal articles, and this means that a variety of citation analyses may be carried out.

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