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Background Report No 6 - Bibliometric Analysis of the Research Output of Norway in an International Context: Analysis of the research output of Norway and funding effects of the RCN

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Bibliometric Analysis of the Research Output of Norway in an International Context

Analysis of the research output of Norway and funding effects of the RCN

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This report provides a background document to the CWTS data deliveries. Its content briefly describes, in a non-technical fashion, the main features of the CWTS information system and methodology that was used to produce quantitative 'bibliometric' data for the Norwegian National Research Council on the Norwegian research performance within an international comparative perspective during the years 2001-2010.

1 CWTS information system

The publication output data and citation impact data were extracted from CWTS's proprietary version of the database *Web of Science* (WoS). This source of information is specifically designed for statistical 'bibliometric' analyses of the worldwide research literature.[1] The WoS database contains selected bibliographic information from all research papers published in about 12,000 'sources', including the paper's title and abstract, author names[2], author affiliations, full text, reference list, document type, and other bibliographic identifiers such as the journal's ISSN number. Some 11,000 of these sources are fully covered peer-reviewed international scientific and technical journals, the remainder being journals and conference proceedings that are often only partially covered.

The CWTS/WoS database is an upgraded and dedicated 'bibliometric' version of the widely available online/offline 'bibliographic' versions of the database provided by Thomson Reuters Scientific to its customers. The CWTS/WoS database covers the years 1981 up to and including the most recent publication year (currently 2010, with 2011 nearly added). The WoS is one of very few international multidisciplinary databases that offer a broad and high-quality coverage of the worldwide research literature, and has effectively been the common source for all large scale comparative bibliometric studies over the last two decades. The only other comparable database is *SCOPUS*, a relatively recent source produced by the science publisher *Elsevier* of thus far unknown added value compared to the WoS. Numerous other databases have a limited disciplinary scope, often focusing on specific scientific fields or research domains, such as *Inspec* (for physics and electrical engineering), *Medline* (medicine and health care), to name a few.

The CWTS bibliometric information system integrates the CWTS/WoS database and a series of software routines and research performance indicators based on publication output and citation impact statistics (section 6 provides more details about these indicators). Note that these indicator-based statistics may differ slightly from the results of similar citation analysis which are performed with other, on-line of off-line, 'bibliographic' (campus license) editions of the *Web of Science*, or CD-ROM versions of WoS predecessor databases such as the *Science Citation Index*, because of minor differences in coverage, definitions of admissible document types, time spans, or data upgrading by CWTS to improve the quality the WoS database (see section 2).

[1] Thomson Reuters (Philadelphia) is the producer and publisher of the Web of Science (WoS).CWTS owns a license agreement with the database producer, *Thomson Scientific* to supply WoS-based bibliometric information to clients worldwide on a commercial basis.

[2] Authors are institutional authors, i.e. a person and his or her institutional address at the time of the publication and listed in the heading or in a footnote of a research publication.

2 Data pre-processing for bibliometric analysis

CWTS invests considerable resources and efforts, on a continuous basis, to upgrade the *Thomson Reuters* bibliographic edition of the WoS into a CWTS bibliometric version thus improving the accuracy and comprehensiveness of the data. Part of this computerized procedure includes the cleaning and standardization of the names of organizations listed in the author affiliate address information.

Yet another step in the data processing is the 'unification' of the research output in the WoS for address information, both on country, city, and institutional level, and apparent errors need to be re-attributed before analysis.

3 Defining the fields of science

Each source journal within the CWTS/WoS database is attributed to one or more Thomson Scientific Reuters-defined *Journal Subject Categories (JSC's),* a collection of journals covering the same, or closely related, research topics or areas. *Thomson Reuters* has assigned these journals to these categories according to the opinions of subject experts and inter-journal citation patterns (more about citations in section 6.2). Each journal category is, basically, equivalent to a subfield of science. Wide-scope journals are often assigned to more than one subfield. The prestigious general journals with broad multidisciplinary scopes, such as *Nature* and *Science*, are assigned to a journal category of their own, denoted by *Thomson Reuters Scientific* as 'Multidisciplinary Sciences' and included in the CWTS system under the heading 'Multidisciplinary journals'.

The CWTS bibliometric information system offers customers the possibility to tailor research fields and design their own classification systems based on the groupings of the journal categories. In this study we have applied the disciplinary grouping of JSCs into about 40 main fields[3] of science resembling the classification scheme applied in the Dutch Observatory of Science & Technology (NOWT, see www.nowt.nl). An overview of the classification scheme applied in this study is attached to this report in Appendix 1.

4 Selecting benchmark countries

In this study, the choice was made to compare Norway's performance with the national output and impact of the following ten countries: Australia, Belgium, Canada, Denmark, Finland, Iceland, the Netherlands, New Zealand, Sweden, and Switzerland.

[3] We here use the definition of fields based on a classification of scientific journals. Although this classification is not perfect, it provides a clear and 'fixed', consistent field definition.

5 Database year and publication year

All calculations and statistics refer to database years – i.e. the year in which *Thomson Reuters Scientific* processed the publications for its WoS database. These measurements differ from those based on publication years, which refer to the publishing date of the journal issue. Some 5-10% of the publications that were issued in publication year *t* are processed by *Thomson Reuters* for the WoS database in the following two years *t+1* and *t+2*.

6 CWTS Bibliometric indicators

The package of quantitative indicators defined for this study comprises of a set of country level 'macro' indicators, comparing the research performance of Norway with other countries (see section 4). These indicators can be subdivided into two classes: publication output indicators and citation impact indicators. For a more detailed technical description we refer to Appendix 2.

6.1 Publication output indicators

Each journal publication that is indexed by the CWTS/WoS database is fully attributed to all countries listed in the author address list of the publication. The publication output is equal to the total number of papers published by a country during the entire period under investigation. These papers relate only to research-based publications that are published in peer-reviewed international scientific and technical journals (see section 1). Only publications reporting on original research findings are included – i.e. the document types 'normal article', 'letter', and 'review article'. 'Meeting abstracts', 'Corrections', 'Editorials' and other document types are not included. Apart from this selection, not all publications are treated equally in the computations, as letters are weighted with the value of 0.25 (for a further elaboration of this, see the section on impact indicators in the Appendices). In a very few cases publications are published in a journal that is not fully indexed within the CWTS/WoS database; such publications are not included in analyses (see section 1).

6.2 *Citation impact indicators*

Each research publication may or may not be read by other scientists and scholars, and its contents may or may not be used in their follow-up research – either by the author(s) or by others. In the event this follow-up research is published in a research article in an international journal, the corresponding researchers and scholars tend to acknowledge the value of the research publication by adding its bibliographic details to in their list of relevant literature (the 'reference list'). These 'citations' to the previous literature can be used as measure of the (international) intellectual influence and scientific impact of a piece of published research.

Hence, the international scientific impact of a country is calculated on the basis of the quantity of citations received by its research papers. A cited publication is assigned in full to all countries included in the address list of the publication. The citation frequency counts in this study refer only to citations that were recorded within the WoS-indexed set of international peer-reviewed journals.

A heavily cited research publication has made a significant impact on the (international) scientific community. Many publications are never cited. At aggregate levels, a significant positive correlation exists between citation impact frequency and scientific 'quality'. The number of observed citations obviously depends on the time span of measurement. The number of citations received also tends to be field-dependent.

The citation frequency distribution of research publications worldwide is also highly skewed: at high aggregate levels some 20% of the publications tend to receive about 80% of all citations. The top percentiles of most heavily cited publications reflect the best research worldwide. The share of a country within these top publications indicates its contribution to cutting edge research worldwide and provides a crude indicator of research excellence within a domestic science system. The publications in the top percentiles are determined separately for each subfield of science. Each publication is assigned in full to all countries included in its author address list.

The citation frequencies depend on the time-interval after the publication date during which the citations will accumulate and are counted. The accumulation of citations is counted within a pre-set time-interval – the 'citation window', which can be defined according to several operational criteria. These windows tend to vary from 1-2 years (short term impact, as measured in the Journal Impact Factor) to as much as 10 years of longer (long term impact). A period of 4-6 years is generally considered to be of appropriate length in most fields of science to assess medium-term impact levels with a sufficient degree of validity. In this study the window was aligned to the publication window – i.e. the set of publication years and citation years are identical, and set to nine years for the full period analysis, and to four years for the trend analysis.

These citation counts may or may not include author self-citations – i.e. a citation to a paper is a citation given in a publication of which at least one of the authors (either first author or a co-author) is also an author of the cited paper (again either first author or a co-author). These self citations were excluded in this study. When focusing on 'external' impact, the counts should always exclude the author self-citations.

Within the CWTS citation analysis, field normalization is applied. This means that every paper, and particularly its impact, is compared within its own environment first before it is compared with others. As citation practices differ among fields, it is necessary to create benchmark values for citation data, in order to do right to the specific character of a country's output profile. Within this field-normalized impact measurement, we take into consideration the type of document (as various types of documents have different citation characteristics), and the age of the publications (as stated above, older publications have had more time to collect citation impact) as well.

Another approach in citation impact analysis is a focus on the top of the worldwide literature, and the position in that top by a country. Contrary to an average based impact score', we determine the actual number of publications in the fields to which the journal belongs in which the papers were published, thereby focusing on the position among other top publications. To assess the number we found, we compare the observed number of highly cited publications with the top 10% value of the countries in this analysis (which we consider as an expected value). If the actual number exceeds the expected number of highly cited publications, the ratio of this comparison will be above the value 1, indicating a relative overrepresentation of the country among the top 10% most highly cited publications, whereas a score below

the value 1 indicates an under-representation of the country among the top 10% most highly cited publications. In this specific analysis we only focus on articles and reviews, as letters are considered as a too heterogeneous type of scientific communication, being often of a different nature than articles and reviews, and in some fields very rare, thus creating statistical unreliability. The analysis of highly cited publications is based on single publication years, in combination with a fixed four year citation window. This needs to be fixed, as this gives every single publication in every single year an equal chance to contribute to the top-down ranking per field, and makes annual analyses easier. Overall, all values are aggregated, leading to one score per country. For the years 2008-2009, citation windows of 3 and 2 year are simply too short to conduct valid citation analysis (for respectively 2008, 2009, and 2010 citation impact years), as in most fields a citation window of three to four years is needed to reach the so-called 'peak in numbers of citations received'.

As discussed above, this field-normalized impact indicator (MNCS) is a particularly powerful indicator of citation impact. This indicator relates the measured impact of a country to a worldwide, field-specific reference value. It is the internationally standardized impact indicator. This indicator enables us to observe immediately whether the performance of a country is significantly far below (indicator value < 0.5), below (indicator value 0.5 - 0.8), around (0.8 - 1.2), above (1.2 - 2.0), or far above (>2.0) the international (western world dominated) impact standard of the field.

7 Specific bibliometric analyses delivered to the Norwegian research council

7.1 *Scientific cooperation Analysis*

Indicators for scientific collaboration are based on an analysis of all addresses in papers published by a country. Each paper is classified in one of three categories. First, we identified all papers authored by scientists from one country only. These papers are classified as 'no collaboration' or 'single institute', as they involve no collaboration or only 'local' collaboration (two or more authors from one institute). The remaining papers are classified as 'national collaboration' when all addresses on a paper are from one country only. Finally, papers containing addresses from at least two different countries are assigned to the collaboration type 'international'. For example, if a paper is the result of collaboration with both another Norwegian institution and an institute outside Norway, it is marked as 'international'. Papers in each of the three categories are aggregated for each country, and for each of these aggregated sets, impact and output indicators are computed.

The purpose of this analysis is to show (1) how frequently a country has co-published papers with other countries, and (2) how the impact of papers resulting from national or international collaboration compares to the impact of papers authored by scientists from one country only.
For publications under each collaboration type, the impact is compared to the field citation average (FCSm), as described in Appendix 2. As an indication of the impact per type, if the ratio MNCS is lower than 0.8, the impact is said to be 'low', if the ratio is higher than 1.2, the impact is designated as 'high', while a ratio between 0.8 and 1.2 is called 'average'.

P	Number of articles (normal articles, letters, notes and reviews) published in journals processed for the Web of Science (WoS) version of Thomson Scientific's Citation Indexes (CI).
C+sc	Number of citations recorded in WOS journals to all articles involved. Self-citations are included.
CPP+sc	Average number of citations per publication, or citation per publication ratio. Self-citations are included.
CPP	Average number of citations per publication, or citation per publication ratio. Self-citations are excluded.
%Pnc	Percentage of articles not cited during the time period considered.
MNCS	The impact of a research unit's articles, compared to the world citation average in the subfields in which the research unit is active.
MNJS	The impact of the journals in which a research unit has published (the research unit's journal selection), compared to the world citation average in the subfields covered by these journals.
MNCS/MNJS	The impact of a research unit's articles, compared to the average citation rate of the research unit's journals.
% SELFCITS	Percentage of self-citations. A self-citation is defined as a citation in which the citing and the cited paper have at least one author in common (first author or co-author).
P 98-08	Number of articles (normal articles and reviews) published in journals processed for the WoS version of the Thomson Scientific Citation Indexes (CI) in the period 2001-2007.
P top	The absolute number of papers that are among the x% * most frequently cited of all similar papers in the period 2001-2007.
E (P top)	The expected number of papers amongst the top x % *, based on the number of papers published by the research group in the period 2001-2007.
A/E (P top)	Indicates the relative contribution of a group to the upper percentiles of the citation distribution in the period 2001-2007.

**** can here relate to the Top-20, Top-10, Top-5, Top-2 or even Top1-% most highly cited publications.***

Part I: Bibliometric analysis of Norway in an international comparative way.

8 Results

8.1 Overall bibliometric results

In Table 1, the standard bibliometric indicators are presented for the scientific production of Norway.

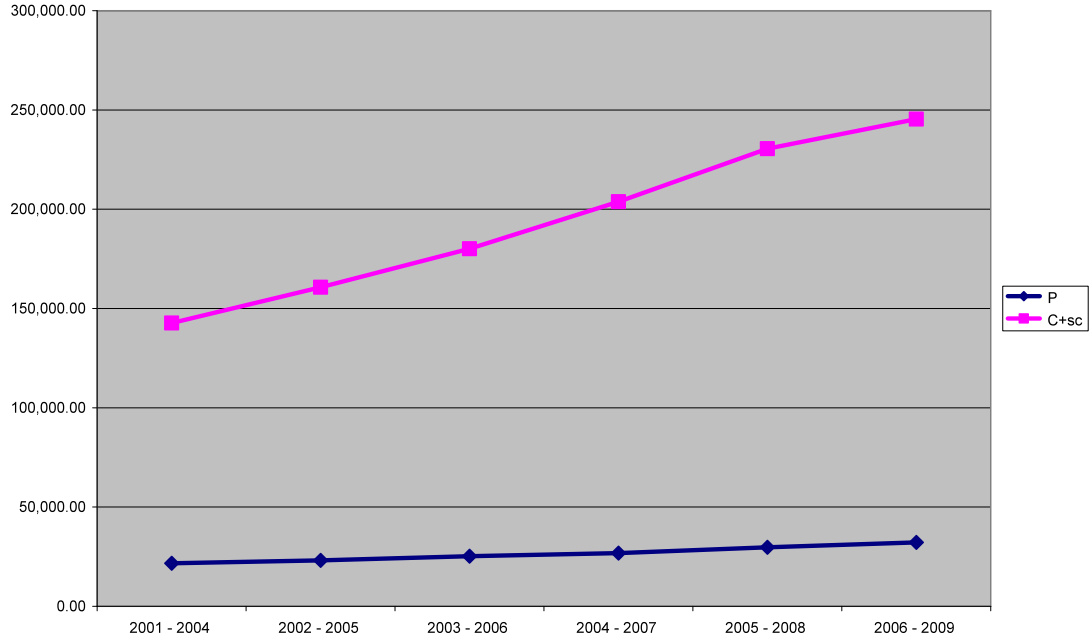
Table 1: Bibliometric statistics for Norway, 2001-2009/2010

Country	P	C+sc	CPP+sc	CPP	% Pnc	MNCS/ MNJS	MNCS	MNJS	% Self Cit
2001 - 2009	60,579.00	820,198.75	13.54	10.68	17%	1.09	1.22	1.12	21%
2001 - 2004	21,682.00	142,656.75	6.58	4.89	30%	1.09	1.20	1.10	26%
2002 - 2005	23,138.50	160,701.00	6.95	5.18	28%	1.11	1.22	1.11	25%
2003 - 2006	25,202.25	180,133.25	7.15	5.35	28%	1.11	1.22	1.10	25%
2004 - 2007	26,801.75	203,776.75	7.60	5.73	26%	1.10	1.21	1.10	25%
2005 - 2008	29,763.75	230,474.00	7.74	5.83	25%	1.09	1.21	1.12	25%
2006 - 2009	32,233.50	245,427.75	7.61	5.70	25%	1.07	1.21	1.13	25%

The total output of Norway during the period of analysis amounts a total of 60,579 publications and a total of 820,198.7 citations (including self-citations). The field normalized indicators show that Norway is performing above the international level. This is further underlined in the trend analysis, which presents a very stable pattern in these impact indicators for Norway.

Figure 1 shows that both the scientific production (P) and the impact in absolute terms (numbers of citations including self-citations, C+sc) are both increasing during the period of analysis. It is remarkable to observe the sustained increment of the impact, developing at a much faster pace than the number of publications, thus indicating a remarkable improvement in the international visibility of the scientific publication output of Norway over time.

Figure 1: Output and impact numbers for Norway, 2001-2009/1010.



In the same line as in Figure 1, Figure 2 shows how the percentages of papers without citations as well as the percentage of self-citations decrease over time. As both indicators cover specific aspects of visibility, through citation flows, either directly (percentage not cited) or indirectly (percentage self citations), these two indicators are important when we consider the research performance of scientists in the Norwegian R&D system. The percentage publications not cited (within a four year period) decreases from over 30% in the early years of the period of analysis, to 25% in the period 2006-2009/2010. This is a decrease of nearly 16%. The percentage self citation remains stable at roughly 25% of all incoming citations Thereby, this percentage ends at an international level or 'normal' level, as we often observe in our studies self citations shares to vary between 20-40% in a four year period. So concluding we can state that these two indicators suggest that the output of Norway becomes more internationally visible over the period 2001-2009/2010.

Figure 2: International visibility of Norway as indicated by percentages of publications not cited and self citations, 2001-2009/2010.

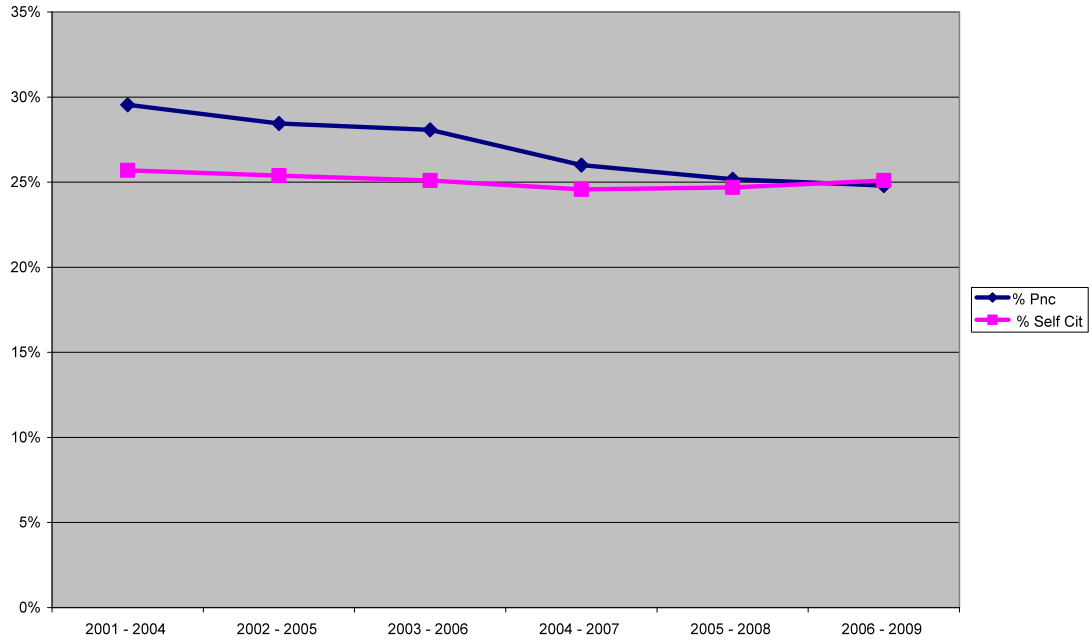
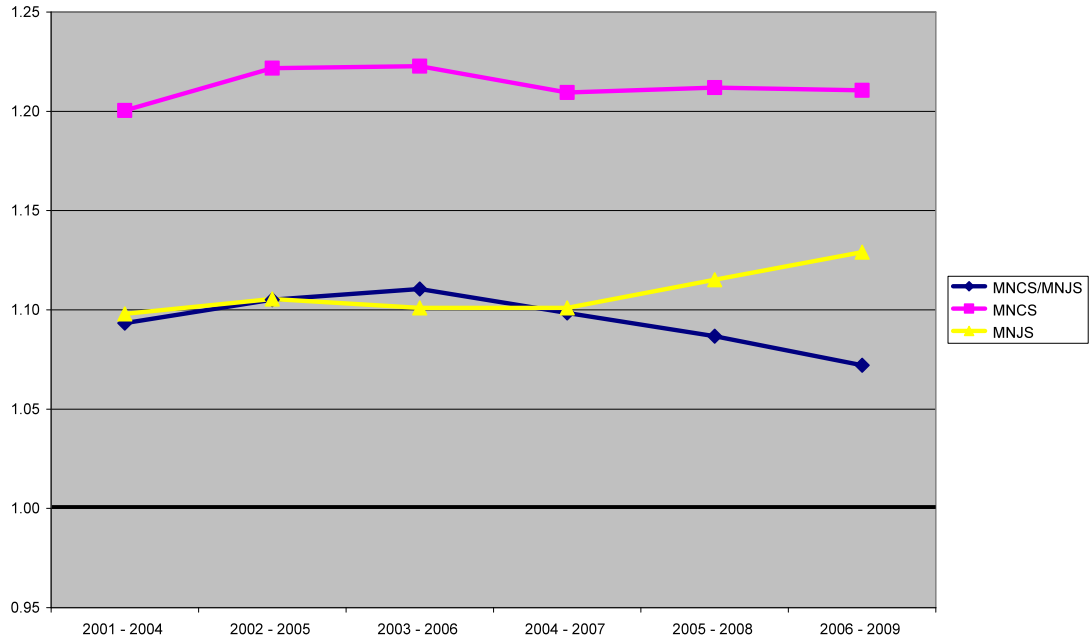


Figure 3 contains the trends for the three ratio indicators MNCS/MNJS, MNCS, MNJ. For all three, we find that the values are well above the value 1 (international field impact level) during the full period, with MNCS, the field normalized impact indicator at a level of 20% above worldwide average impact level. MNJS also tends to increase, which indicates that Norwegian scientists tend to publish in journals with a higher impact in their respective fields. .

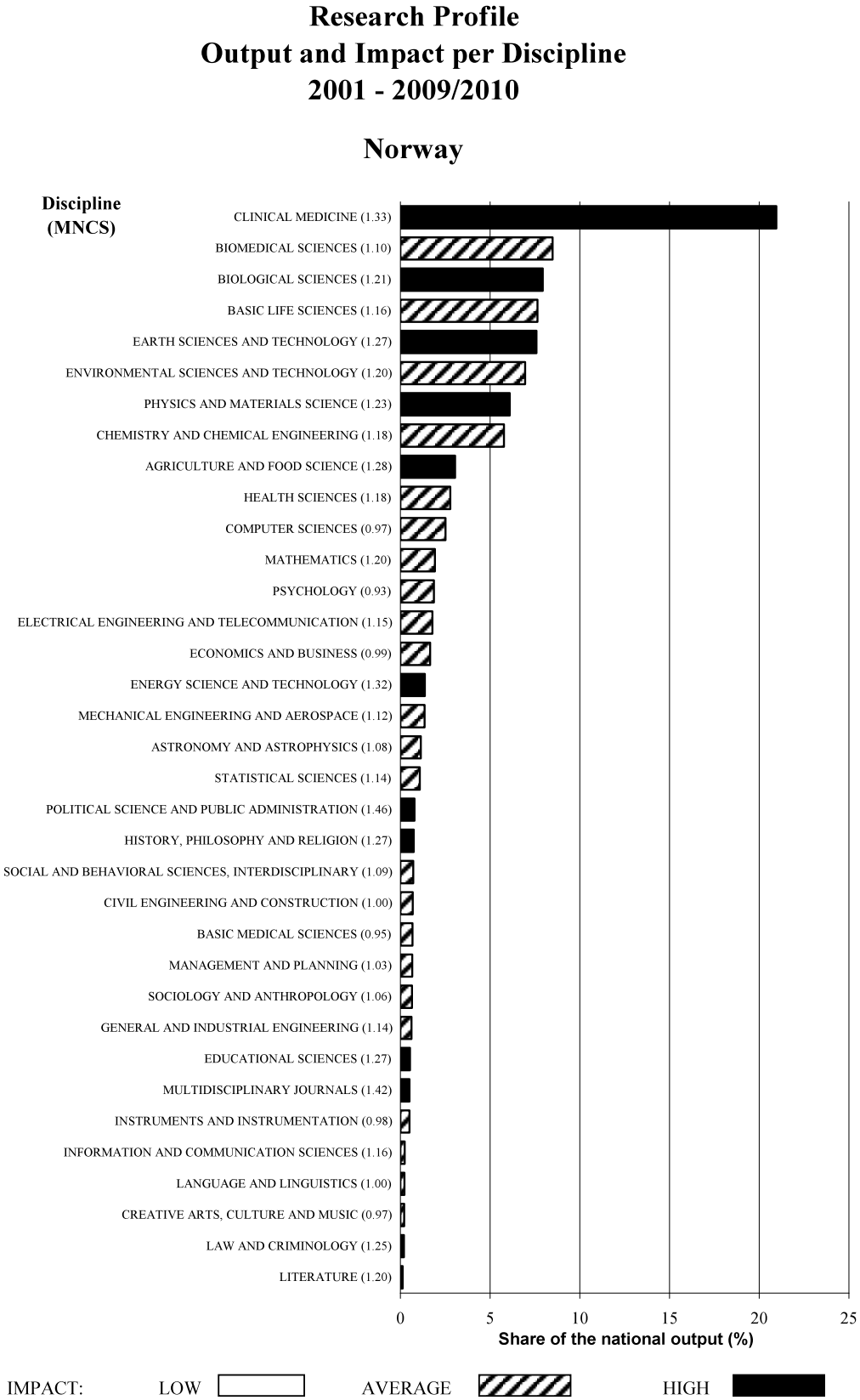
Figure 3: Normalized impact scores for Norway, 2001-2009/2010.



8.2 Research profile of Norway

In this section the research profile for Norway over the period 2001-2009/2010 is presented. Figure 4 shows this profile. The largest field is Clinical medicine, covering over 20% of the total Norwegian output in the period 2001-2009, followed by Biomedical sciences (with about 8% of the national output of Norway). In combination with Biological science and Basic life sciences, the Norwegian research profile strongly resembles the Anglo-Saxon research profile, in which life science and biomedical research fields tend to dominate the national research profile, contrary to a more traditional European continental research profile, in which physics and chemistry play a more dominant role (e.g., the research profiles of particularly Germany, France and Italy). Other disciplines covering more than 5% of the national output are Earth sciences and Technology, Environmental sciences and technology, Physics and materials science, and Chemistry and chemical engineering. In all of the abovementioned disciplines, we observe average to high impact levels, that is, representing values above the value of 1.00 on the indicator MNCS, the field normalized impact score.
In the profile we observe only disciplines in which the Norwegian research community has either an average or a high impact. No low impact disciplines are detected in the national research profile.

Figure 4: Research profile of Norway's research output, period 2001-2009/2010.



8.3 Scientific cooperation analysis on Norwegian papers

Figure 5 shows the importance of collaboration for Norwegian researchers as over two/thirds of the Norwegian output is somehow the result of scientific cooperation. Although over 30-20% of the Norwegian research output carries only one Norwegian address (SI, which stands for single institute), most publications carry either two national (NC, national cooperation) and/or international addresses (IC, international cooperation). An important observation relates to the impact generated by publications forthcoming from national or particularly international cooperation. Publications resulting from international cooperation have an impact level 40% higher as the publications resulting from either single institute activities or national cooperation.

Figure 5: The evolution of the three collaboration types, 2001-2009

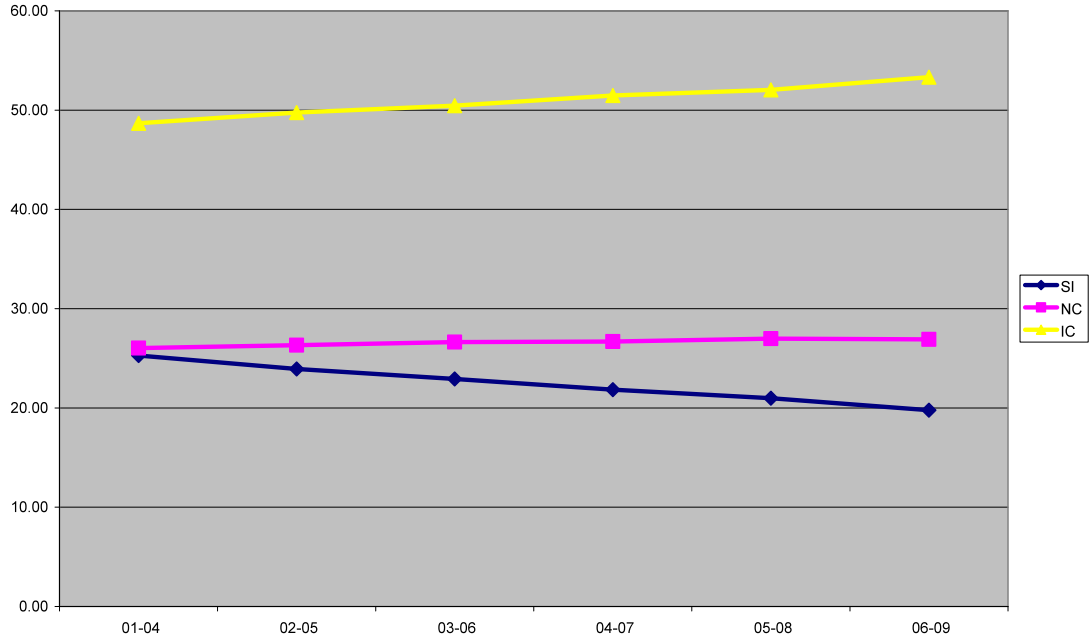
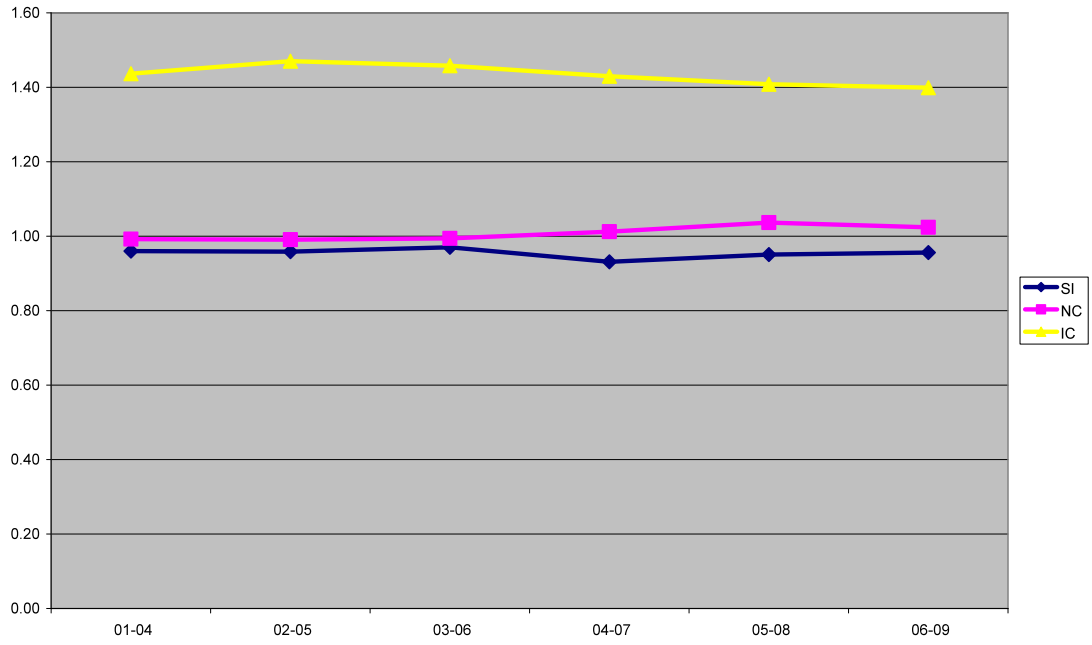


Figure 6 contains the development over time of the impact for the three types of scientific activity for Norway. In this graph, we observe stable trends in the impact for all three types. The highest impact is generated by the publications resulting from international cooperation (roughly some 40 % above worldwide field average impact level). This latter development is a common phenomenon which we observe more often for other countries (van Leeuwen, 2009). However, also the impact of the other two types of scientific activity is at worldwide average impact level, which indicates that the Norwegian system has a strong position, as the in-country output reaches this level of impact, a situation not observed for all western world countries.

Figure 6: Impact development of the three collaboration types, 2001-2009/2010



8.4 Benchmarking analysis of the Norwegian output in an international context

Finally, in Table 2 we present the results of the comparison of Norway with ten benchmark countries (Australia, Belgium, Canada, Denmark, Finland, Iceland, the Netherlands, New Zealand, Sweden, and Switzerland). The data in the Table cover the period 2001-2009/2010. The data in the table show that Norway's output is among the smaller outputs among this set of countries. The output volumes of Denmark and Finland are of a similar volume, while the output of Iceland is much smaller. Next, we also observe that the number of total received citations is small. With respect to the normalized impact scores, we find Norway at a well above worldwide average impact level, comparable with that of Canada and Belgium. Norway outperforms Australia, Finland, and New Zealand. In terms of the impact level of the journals in which Norwegian researchers published, this is some 12% above the average field impact level, which is not the best among the benchmark countries, but most certainly also not among the worst performing countries.

Table 2: Bibliometric statistics for Norway and the ten benchmark countries, 2001-2009/2010

Country	P	C+sc	CPP+sc	CPP	% Pnc	MNCS/ MNJS	MNCS	MNJS	% Self Cit
AUSTRALIA	257,229.50	3,263,481.50	12.69	10.14	20%	1.06	1.16	1.10	20%
BELGIUM	119,743.50	1,730,432.75	14.45	11.32	19%	1.08	1.22	1.13	22%
CANADA	392,658.50	5,372,228.75	13.68	11.12	20%	1.05	1.22	1.16	19%
DENMARK	83,492.75	1,411,302.75	16.90	13.43	14%	1.15	1.37	1.19	21%
FINLAND	77,467.50	1,109,120.00	14.32	11.25	17%	1.04	1.17	1.13	21%
ICELAND	4,366.25	73,931.25	16.93	13.73	19%	1.09	1.44	1.32	19%
NETHERLANDS	216,398.50	3,576,579.50	16.53	13.30	15%	1.12	1.37	1.23	20%
NEW ZEALAND	48,826.00	550,098.50	11.27	9.10	20%	1.02	1.09	1.07	19%
NORWAY	60,579.00	820,198.75	13.54	10.68	17%	1.09	1.22	1.12	21%
SWEDEN	155,166.00	2,423,580.75	15.62	12.52	15%	1.09	1.25	1.15	20%
SWITZERLAND	154,741.50	2,754,039.25	17.80	14.31	16%	1.19	1.44	1.21	20%

Figure 7 presents a graphical display of the output and impact of Norway and the benchmark countries over the period 2001-2009/2010. We use both the output volume (presented on the x-axis) and the impact score (as indicated by the MNCS, on the y-axis) for the analysis over the period 2001-2009/2010. Here we clearly observe the large difference in output between Canada and the other ten countries, with Australia and the Netherlands somewhere in between. On the other hand, we observe the differences in impact levels among the benchmark countries, as mentioned before.

In Figure 7, the highest impact levels (with MNCS around 40% above worldwide average impact level) are observed for Iceland, although based on a very small output, Switzerland, Denmark and the Netherlands. A next group of countries, with Sweden, Belgium, Norway, Finland, Australia and Canada, reach impact levels around roughly 20% above worldwide average impact level. Only New Zealand has an impact somewhat lower, as compared to the other ten countries in the study.

In Figure 8, the output is compared with the value of the indicator of the 'quality' of the journals in which the national output was published (MNJS). Here the differences are much smaller between the countries in the study, although the overall order is roughly the same. It is important to stress that all selected countries do choose journals with impact levels well above field impact level.

Figure 7

IMPACT COMPARED TO WORLD FIELD AVERAGE
2001 - 2009/2010

Norway and benchmark countries

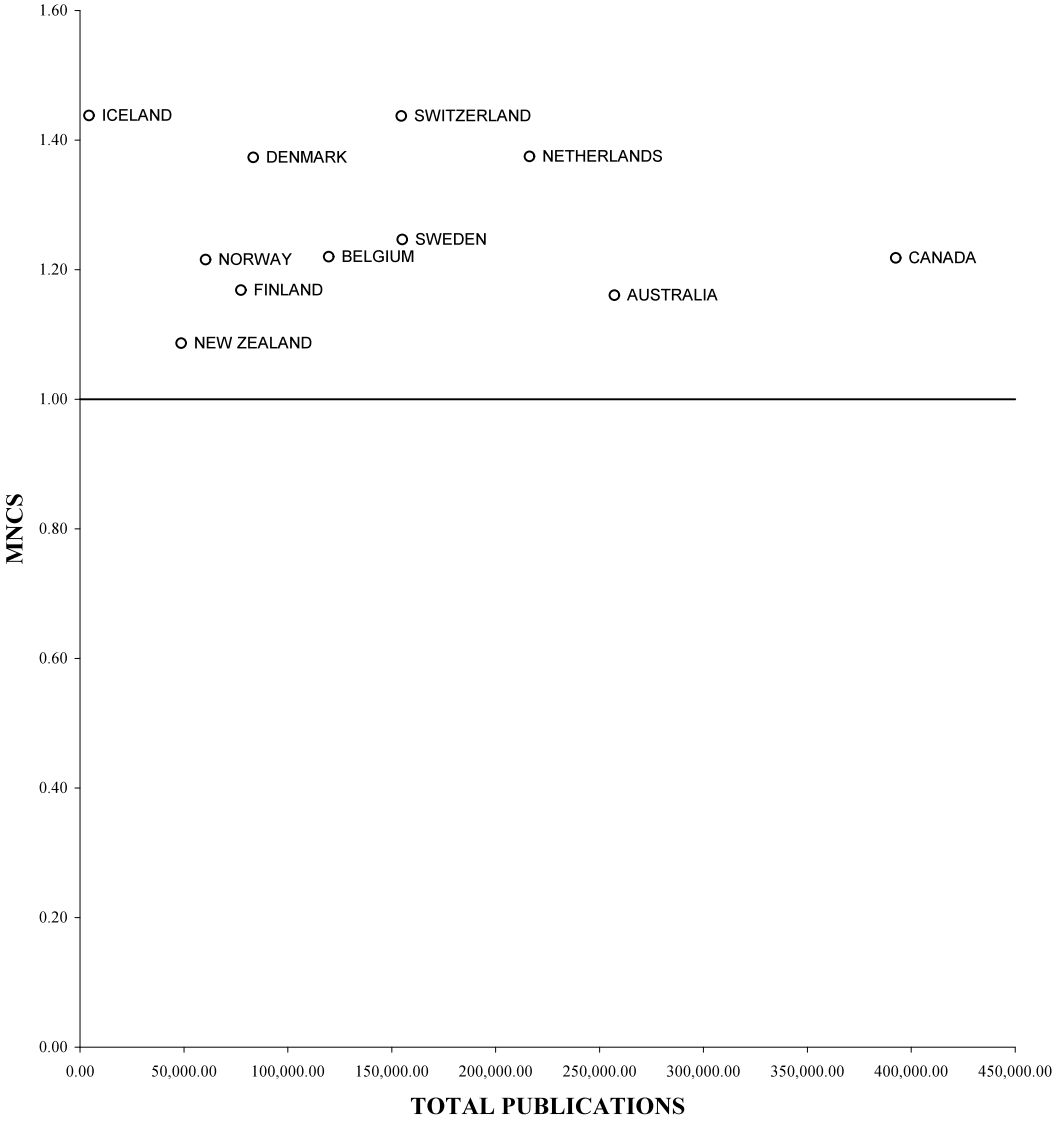


Figure 8

JOURNAL IMPACT COMPARED TO WORLD FIELD AVERAGE
2001 - 2009/2010

Norway and benchmark countries

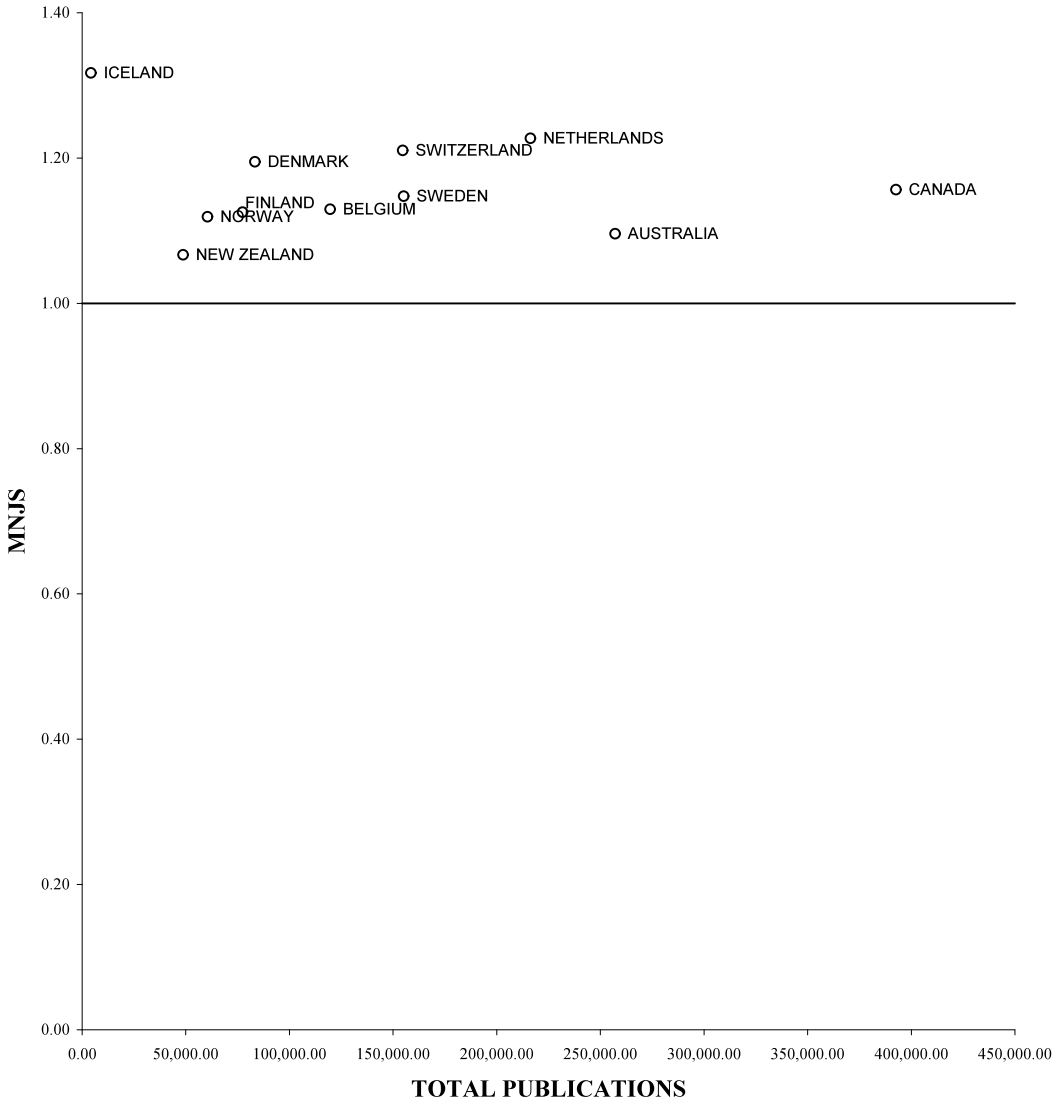
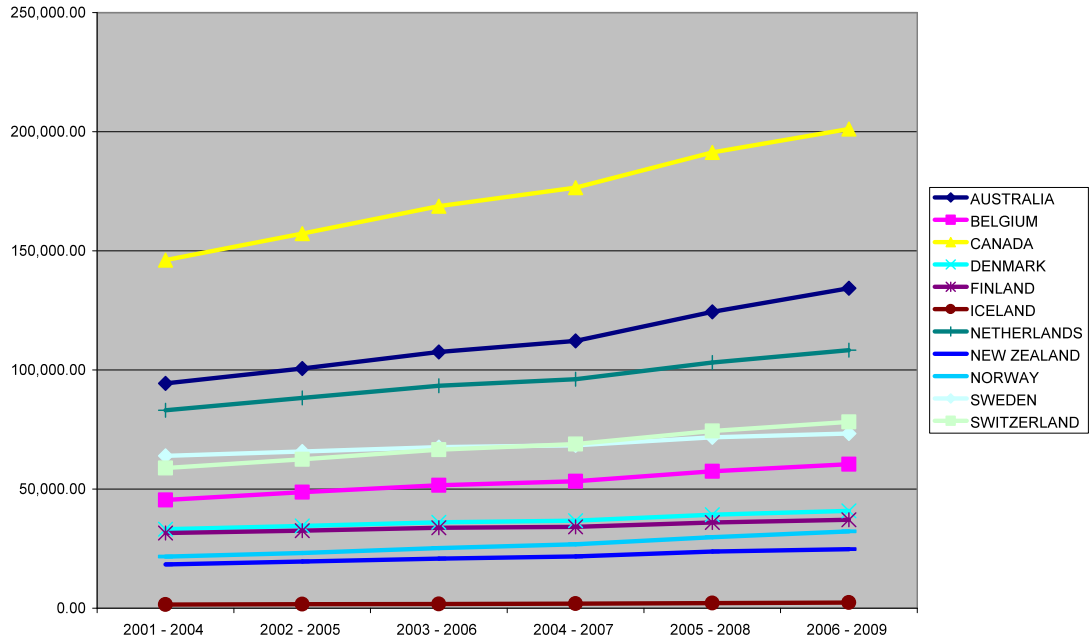


Figure 9 presents a graphical display of the output development of Norway and the ten benchmark countries. All countries show an increase in the output, which is not clearly visible due to the abovementioned difference in output volume between particularly Canada and the other ten countries. However, we could observe a relative fast increase of the output for Norway, as the country catches up with Finland in the later stages of the analysis.

Figure 9: Output development of Norway in comparison with the ten benchmark countries, 1993-2009



In **Figure 10** the development of the impact of the countries is shown in a trend analysis. It becomes clear from the graph that the group of benchmark countries is split up into two main sub-sets, with a first group with Switzerland, Iceland, Denmark and the Netherlands, and a second group with Norway and the other countries. Both groups present a general increasing trend in their field normalized impact over time.

Figure 10: Evolution of the field normalized impact score MNCS of Norway in comparison with the ten benchmark countries, 2001-2009/2010.

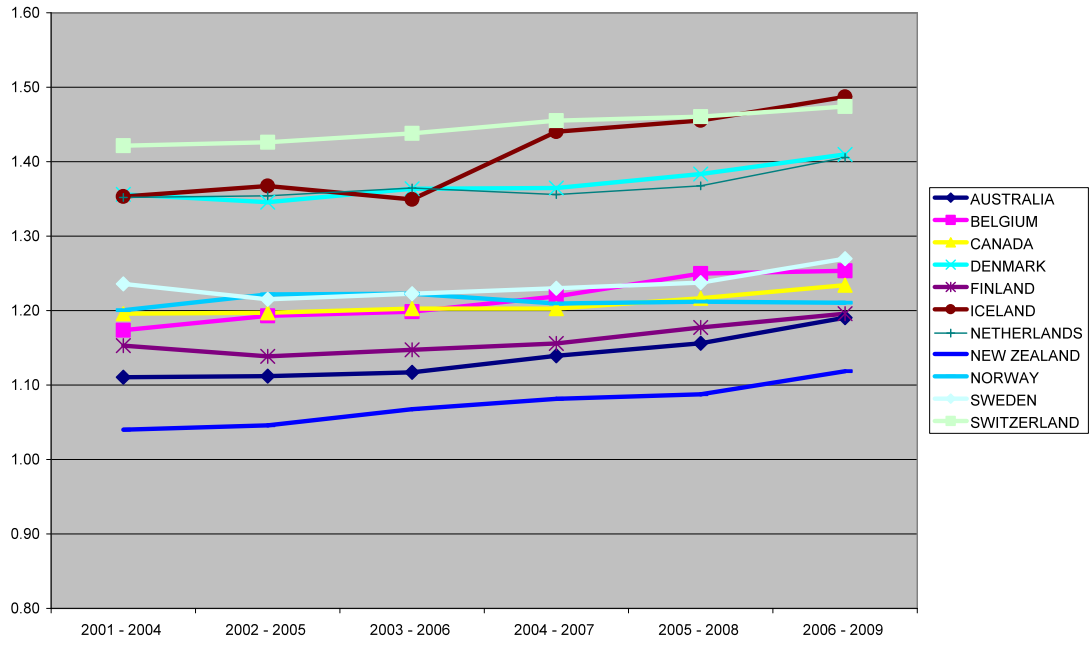
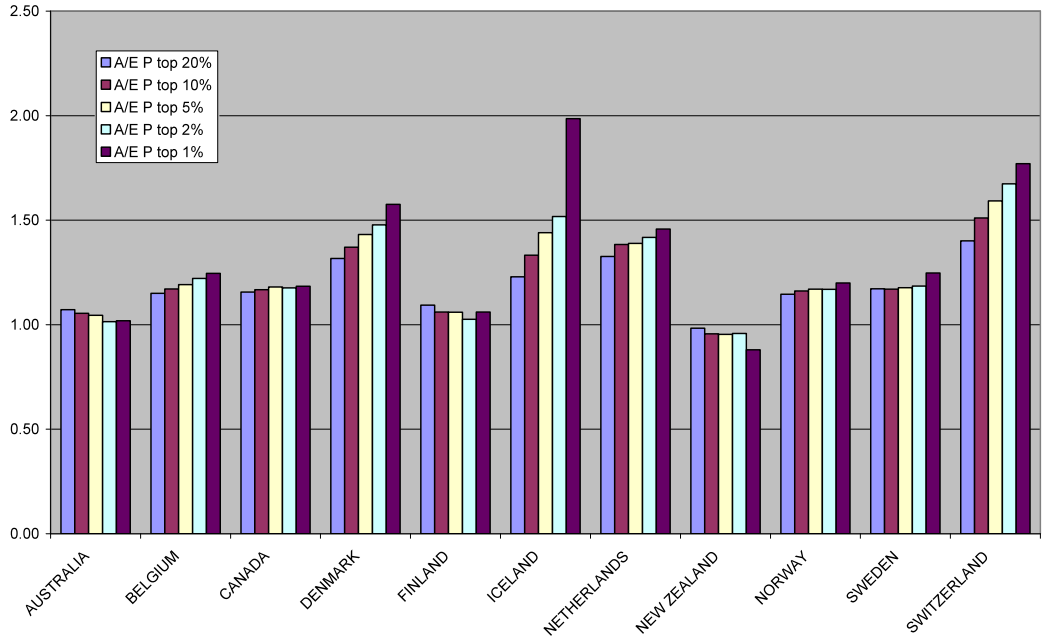


Figure 11 presents the results of the analysis of highly cited publications, that is, the degree of visibility among the most highly cited publications in the field(s) in which the researchers in the selected countries are active. We observe relative low degrees of visibility for Australia, Finland and New Zealand, while most other countries do show an increasing degree of visibility among the most highly cited publications in their respective fields. For Norway we observe a similar pattern as their neighboring country Sweden, an increase in visibility, even among the top 2% and top 1% most highly cited publications. The countries with the strongest increase in the more narrowly defined parts of the citation distributions are the Netherlands, Denmark and Switzerland. For Iceland we observe an even stronger increase, a situation we will discuss below (when we discuss the role of scientific cooperation in the output on the national level).

Figure 11: Visibility among the top highly cited publications, Norway and selected benchmark countries, 2001-2007/2010.



In **Table 3** we present the bibliometric scores while comparing Norway with other countries across the fields previously introduced. We calculated Activity Index scores. This Activity Index works as a relative/comparative indicator. For Norway we determined what share of the output was produced in which fields, and calculated average activity scores for the set of countries (indicated here as ***Diff P***). Please note that we did not base the benchmark Activity Index on the sum of absolute numbers of publications, but on the average of shares per country, thereby giving equal weight to every country's specialization. Furthermore, Table 3 also contains the comparison of the impact of Norway across fields with the benchmark countries. We express the difference in the impact across fields, in order to indicate whether Norway has a higher international influence across fields compared to the average of the set of benchmark countries (indicated here as ***Diff MNCS***). Particularly in combination with the comparison with activity across fields, this table can be seen as an important marker for the current situation of the science system of Norway.

In Table 3, the fields are arranged according to the decreasing output volume of Norway. It is important to note that among the most important fields for Norway, some have still an underrepresentation when it comes to the benchmark countries

(Biomedical sciences, Basic life sciences), next to two disciplines already previously mentioned as being of less importance for Norway (Physics & materials science and Chemistry & chemical engineering). In Biological sciences, Earth sciences & technology and Environmental sciences & technology, we find a strong activity of Norway compared to the benchmark countries.

Among the largest disciplines, we observe relatively lower impact scores for Norway in Mathematics and Psychology, although Norwegian impact scores are still on a worldwide average field impact level. Norway seems to be very influential in some of the social sciences and humanities disciplines, as impact scores are much higher compared to the benchmark countries (Political science and public administration, History, philosophy, & religion, and Educational sciences). This might be explained by a strong focus on the Anglo-Saxon world, in which English as a scientific language is relatively strong developed, which is shown by the overall profile, and spills over on the non natural science and life science disciplines.

Table 3: Bibliometric statistics for Norway and the ten benchmark countries, across fields, 2001-2009/2010.

	Benchmark countries			Norway				
Discipline	**P**	**% P**	**MNCS**	**P**	**% P**	**MNCS**	**Diff P**	**Diff MNCS**
CLINICAL MEDICINE	386,702	20.06	1.24	17,160.25	20.95	1.33	4.5	7.2
BIOMEDICAL SCIENCES	185,731	9.63	1.13	6,951.50	8.49	1.10	-11.9	-2.2
BIOLOGICAL SCIENCES	107,490	5.58	1.20	6,504.75	7.94	1.21	42.5	0.9
BASIC LIFE SCIENCES	176,512	9.16	1.20	6,256.50	7.64	1.16	-16.6	-3.8
EARTH SCIENCES AND TECHNOLOGY	73,302	3.80	1.21	6,208.75	7.58	1.27	99.4	4.7
ENVIRONMENTAL SCIENCES AND TECHNOLOGY	94,371	4.89	1.20	5,692.00	6.95	1.20	42.0	0.0
PHYSICS AND MATERIALS SCIENCE	172,358	8.94	1.31	4,990.00	6.09	1.23	-31.8	-6.2
CHEMISTRY AND CHEMICAL ENGINEERING	145,778	7.56	1.31	4,724.00	5.77	1.18	-23.7	-9.7
AGRICULTURE AND FOOD SCIENCE	57,161	2.96	1.21	2,497.50	3.05	1.28	2.9	5.6
HEALTH SCIENCES	49,693	2.58	1.09	2,282.00	2.79	1.18	8.1	8.2
COMPUTER SCIENCES	53,281	2.76	1.17	2,059.75	2.51	0.97	-9.0	-17.2
MATHEMATICS	37,074	1.92	1.11	1,573.25	1.92	1.20	-0.1	8.1
PSYCHOLOGY	43,186	2.24	1.08	1,532.75	1.87	0.93	-16.5	-13.9
ELECTRICAL ENGINEERING AND TELECOMMUNICATION	48,427	2.51	1.20	1,465.50	1.79	1.15	-28.8	-4.2
ECONOMICS AND BUSINESS	27,277	1.41	1.06	1,358.25	1.66	0.99	17.2	-5.9
ENERGY SCIENCE AND TECHNOLOGY	23,259	1.21	1.19	1,114.00	1.36	1.32	12.7	11.0
MECHANICAL ENGINEERING AND AEROSPACE	27,597	1.43	1.12	1,100.50	1.34	1.12	-6.1	-0.4
ASTRONOMY AND ASTROPHYSICS	26,199	1.36	1.20	934.25	1.14	1.08	-16.1	-9.8
STATISTICAL SCIENCES	20,748	1.08	1.10	887.75	1.08	1.14	0.7	3.9
POLITICAL SCIENCE AND PUBLIC ADMINISTRATION	8,243	0.43	1.04	639.50	0.78	1.46	82.6	40.5
HISTORY, PHILOSOPHY AND RELIGION	16,207	0.84	1.12	613.75	0.75	1.27	-10.9	13.0
SOCIAL AND BEHAVIORAL SCIENCES, INTERDISCIPLINARY	10,096	0.52	1.16	591.00	0.72	1.09	37.8	-5.9
CIVIL ENGINEERING AND CONSTRUCTION	12,231	0.63	1.04	564.75	0.69	1.00	8.7	-3.4
BASIC MEDICAL SCIENCES	21,477	1.11	1.04	550.50	0.67	0.95	-39.7	-8.3
MANAGEMENT AND PLANNING	12,687	0.66	1.07	540.75	0.66	1.03	0.3	-4.3
SOCIOLOGY AND ANTHROPOLOGY	12,398	0.64	1.06	530.25	0.65	1.06	0.7	0.6
GENERAL AND INDUSTRIAL ENGINEERING	14,168	0.73	1.12	504.25	0.62	1.14	-16.2	1.7
EDUCATIONAL SCIENCES	11,434	0.59	1.11	434.00	0.53	1.27	-10.7	13.7
MULTIDISCIPLINARY JOURNALS	10,516	0.55	1.50	415.75	0.51	1.42	-6.9	-5.4

INSTRUMENTS AND INSTRUMENTATION	13,402	0.70	1.04		410.25	0.50	0.98	-27.9	-5.5
INFORMATION AND COMMUNICATION SCIENCES	5,477	0.28	1.37		197.00	0.24	1.16	-15.3	-15.0
LANGUAGE AND LINGUISTICS	5,248	0.27	1.10		184.00	0.22	1.00	-17.5	-9.0
CREATIVE ARTS, CULTURE AND MUSIC	6,176	0.32	1.69		171.25	0.21	0.97	-34.7	-42.5
LAW AND CRIMINOLOGY	5,589	0.29	0.96		156.00	0.19	1.25	-34.3	29.5
LITERATURE	6,487	0.34	1.07		107.00	0.13	1.20	-61.2	12.4
	1,927,978				81,903				

In this section we will focus on the output and impact of the set of selected countries, in relation to the three types of scientific activity we introduced previously. In Figure 12 the output resulting from single address activity is compared to the field normalized impact of the output of that same output. Figure 13 presents the situation for the national cooperation output, while in Figure 14 we discuss the output resulting from international cooperation.

Figure 12

IMPACT COMPARED TO WORLD FIELD AVERAGE
2001 - 2009/2010

Output based on Single Institute type

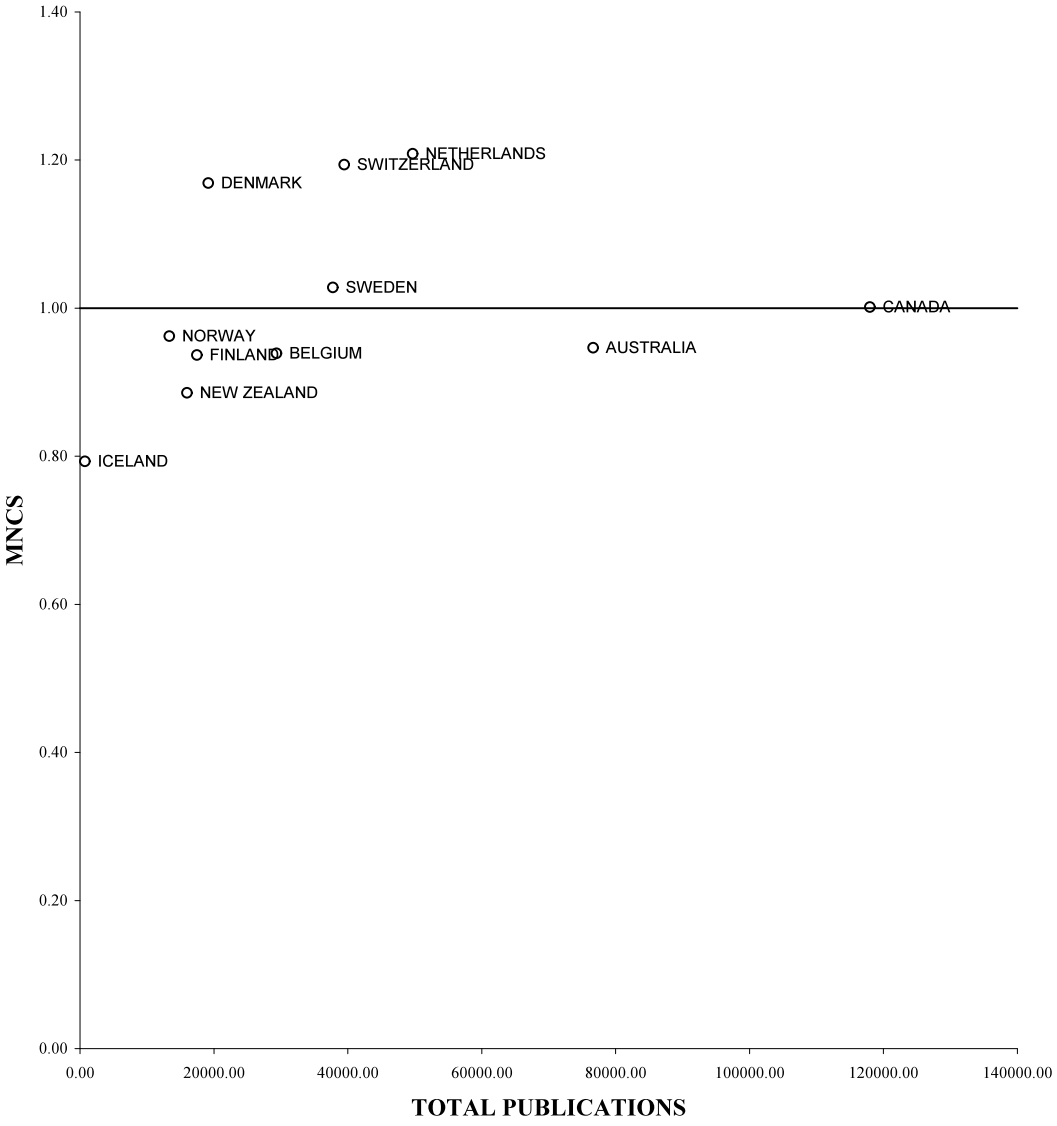


Figure 13

IMPACT COMPARED TO WORLD FIELD AVERAGE
2001 - 2009/2010

Output based on National Cooperation

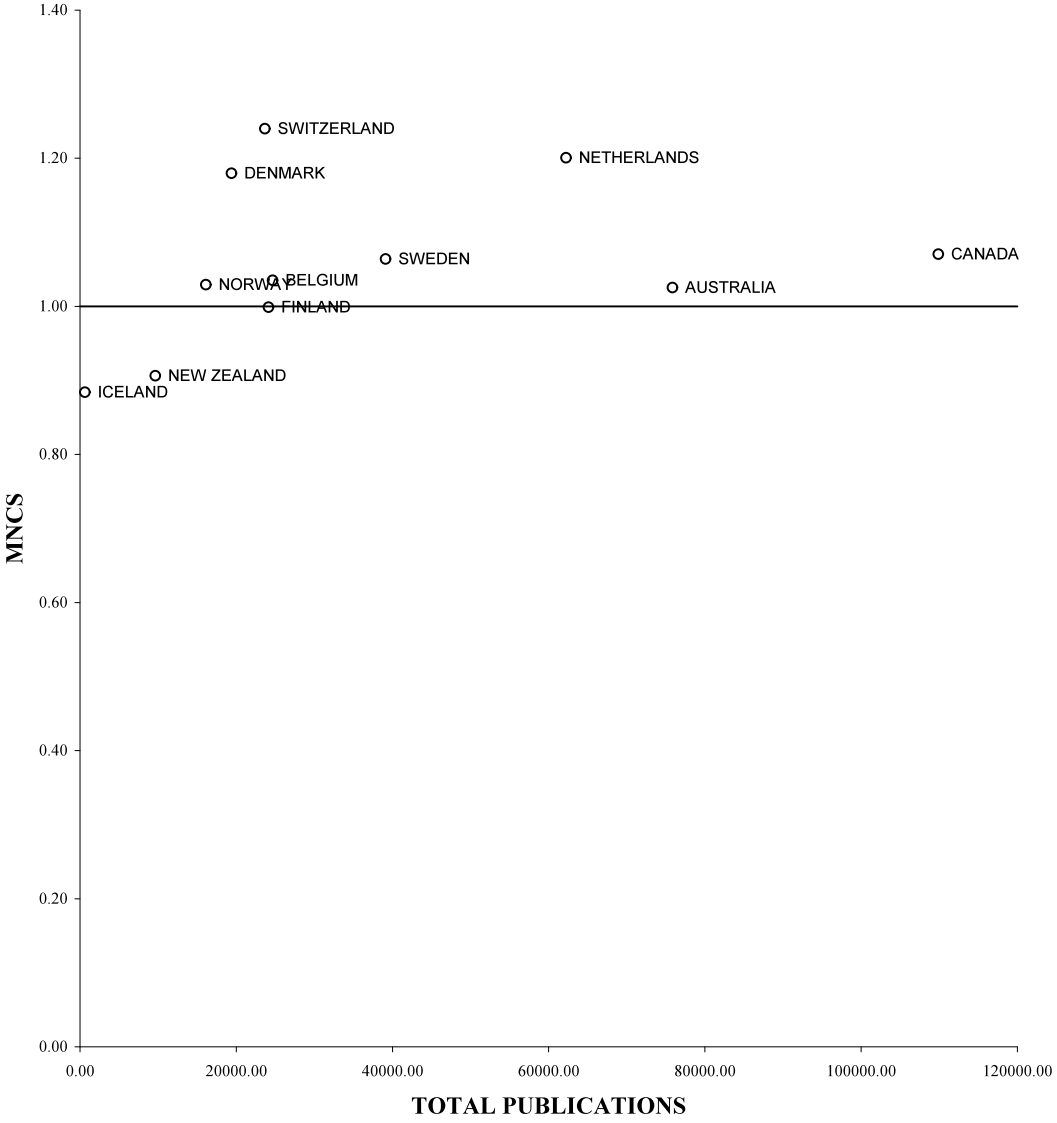
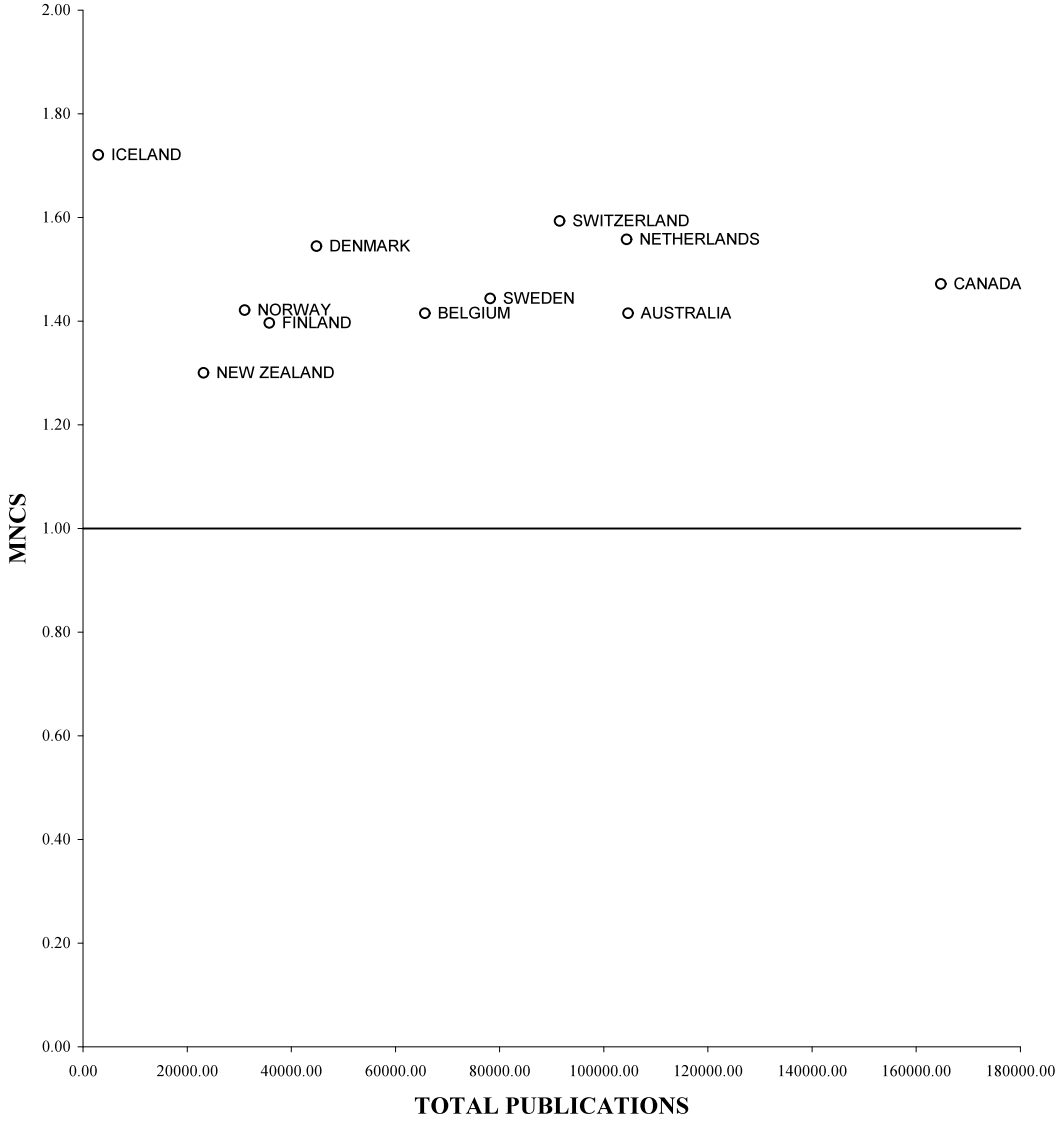


Figure 14

IMPACT COMPARED TO WORLD FIELD AVERAGE
2001 - 2009/2010

Output based on International Cooperation



In **Figure 12** the impact of the output resulting from single address publications over the period 2001-2009/2010 is compared to the worldwide average impact level, against the volume of publications produced. Canada has the largest output, and its' impact is at the worldwide average impact level. Sweden, Norway, Finland, Belgium, Australia, and New Zealand all have impact levels roughly around worldwide average impact level, while Iceland has a low impact connected to this part of their output. Countries for which we observe clearly high impact scores compared to the other countries are Denmark, Switzerland, and the Netherlands.

In **Figure 13** we present a similar analysis, this evolves around the output based on national cooperation. Eight countries now have impact scores around the worldwide average impact level: Canada, Australia, Sweden, Belgium, Norway, Finland, New Zealand, and Iceland. Countries with higher impact levels are Denmark, the Netherlands, and Switzerland.

Finally, in **Figure 14** we present the comparison of the output volume related to international cooperation and the connected impact levels. Now all countries have move up to at least >30% above worldwide average impact level. Iceland shows the largest increase in position, which clearly underlines the dependence of the Iceland R&D system on foreign partnerships. All other countries maintain the relative position towards one another which they took in the two previous figures (with Denmark, the Netherlands and Switzerland having impact scores some 5—60% above worldwide average impact level.

Part II: Bibliometric analysis of Norway and RCN funding procedures.

8.5 Bibliometric approach of RCN researchers and their applications.

Methodology

Given the large number of applicants, applying for research grants at the RCN, we had to come up with an alternative for collecting the publications data. Initially we had planned to collect per researcher his/her output, and check these individually. This is conform a study we conducted for the Dutch research council, and given the situation of producing high level of aggregation kind of statistics, the level of detail in the data collection phase is not harming any individual researcher in the study, and on the high level of data analysis, small errors in the underlying data cancel out. However, in the Norwegian case, we had to follow an alternative approach to collect valid data.

The alternative approach is the following: we collect all publications in the Web of Science that carry at least one Norwegian address. For these publications, we collect all author names attached to this body of publications. We then compare the list of names attached to the applications at the RCN with the collected publications from WoS, based on a 'full name' approach. After this step, we take the set of names of applicants that did not match with the WoS publication set, and take out the second (or other) initials, and compare that with the set of WoS publications that resulted after the first iteration. This results in an additional set of publications. This has to be checked carefully, in the light of homonyms and synonyms occurring in this set. We can conduct this check by focusing on the field of research attached to the applicant, and the field of research related to the selected publications.

There were three lists of applicant/applications supplied through the drop-box. A summary of the lists and the matching process can be checked in the box below. The first list (External FoU Projects) contains 58,339 observations, the second list (External FoU Other) contains 26,596 observations, while the third list (External Other) contains 4,897 observations. The "Round 1" matching of the first list with the WoS set of publications resulted in 31,608 combinations of applicant\application, the first round of the second list resulted in 15,401 combinations of applicant\application while the first round of the third list resulted in 2,184 combinations of applicant\application.
Before the second round of matching was started, we first looked whether the non-matched combinations contained a second or even three initials. All combinations in which the researcher carried only one initial were discarded, as these should have matched in the first round anyway. The second round of matching of the first list based on the above decision started with 4,838 combinations. This matching resulted in 1,734 matched combinations. This resulted in total in 33,402 combinations of applicant\application, which is 57% of all combinations. The second round of matching of the second list started with 2,667 combinations, of which 937 matched. Overall, the recall was 16,338 combinations, resulting in a lower percentage of 61% of all combinations of applicant\application. The second round of matching of the third list started with 738 combinations, of which 211 matched. Overall, the recall was 2.395 combinations, resulting in a percentage of around 49% of all combinations of applicant\application.

In all three lists we observed among the non matched combinations roughly 75% belonging to the humanities, social sciences, and engineering disciplines. As these fields are in general less well covered by the WoS, the impossibility to match these combinations to the WoS on the basis of the author name is highly likely a result from the fact that these authors do not publish in WoS journals anyway.

Overview of matching process

	Combination applicant/application	Round 1 (full match)		Decision for Round 2 (in case of 2 inits)		Round 2 (in case of 2 inits)		Number & percentage used
		Yes	No	Go	No Go	Yes	No	
List1 (Ext FoU Projects)	58339	31668	26731	4838	21893	1734	3104	33402
		54%				3%		57%
List 2 (Ext FoU Other)	26596	15401	11195	2667	8528	937	1730	16338
		58%				4%		61%
List 3 (Ext Other)	4897	2184	2713	738	1975	211	527	2395
		45%				4%		49%

Results

In this section we will first focus on the overall outcomes of the granting procedures of the RCN. **Table 4** contains results on the bibliometric statistics for the three different types of funding instruments (External FoU Projects, External FoU Other, and External, Other), as well as outcomes for the three different outcomes of the granting procedures as attached to the input received from RCN (3 – Bevilgnung (Granted/Ongoing), 4 - Avsluttet (Granted/Closed), and 6 - Avslag (Not granted)), and the combination of the type of funding and the decision reached in the evaluation process.

In reading these findings, it is extremely important to keep in mind that the research output is related to researchers in the Norwegian system. These researchers can ask for research grants at the RCN several times, and the outcomes can vary. This causes the output of such researchers to get related to various outcomes in the process. This leads to a multiplication of research output under various 'flags'. This is due to the fact that the RCN (like most research councils, by the way, they are no exception!) do not keep track of which publications do result from what funding. So no direct link between applying researcher, his or her publications, and the type or nature of the funding creating this output, exists.

Table 4: Bibliometric statistics for RCN granting procedures, 2001-2009/2010

Funding type	P	C+sc	CPP+sc	CPP	% Pnc	MNCS/ MNJS	MNCS	MNJS	% Self Cit
RCN-funded	48,266	677,544	14.04	11.01	16%	1.09	1.22	1.08	22%
List-1 (Ext FoU Projects)	40,429	589,190	14.57	11.42	15%	1.09	1.24	1.08	22%
List-2 (Ext FoU Other)	45,255	644,612	14.24	11.16	16%	1.10	1.24	1.09	22%
3 - Bevilgning	23,760	372,799	15.69	12.18	14%	1.11	1.33	1.10	22%
4 - Avsluttet	39,516	573,464	14.51	11.32	15%	1.10	1.25	1.08	22%
6 - Avslag	45,795	648,765	14.17	11.12	16%	1.09	1.23	1.08	22%

As most publications are related to the first type of funding (External FoU projects), followed by the second type (External FoU Other), we have decided to exclude the List-3 External Other from the study. Both remaining types reach an equally high average impact level, which is reflected in the field normalized impact indicator MNCS, which is exactly similar for both List-1 and List-2 related publication sets.

Next we observe the outcomes of the granting procedures. These are based on the aggregate of the List-1 and List-2 publications, disaggregated to decisions. The largest set is related to the not granted researchers. However, the two other sets are complementary, as part is already closed, and the other is still ongoing, but both related to granted research. Here we observe the highest impact scores for the research that is granted and still ongoing (MNCS=1.33). The closed grants and the not granted research staff do reach an equally high impact level (MNCS values of 1.25 and 1.23 respectively).

In Appendix 6 and 7 we present the outcomes of the combination of the granting decision per field, as well as the granting decisions per list /field combination.

Next, we will focus on the success rates related to the applications evaluated by the RCN. For this analysis, we have attributed an indication of the success rate to every researcher applying for research funding at RCN. This was calculated by dividing the number of successful applications on the number of applications. As this produced a wide variety of percentages, this was grouped into classes, each class covering a range of a percentile (until 10% success rates, from >10% until 20%, from >20% until 30%, etc.), with the exceptions made for the 0% class (no successful applications at all) and the 100% class (all successful applications). As we isolated the 100% class, the-before-last class ranges from 91% to 99.99% success rates (labeled 99%).

Table 5: Bibliometric statistics for RCN granting procedures and success rates, 2001-2009/2010

% Granted	P	C+sc	CPP+sc	CPP	% Pnc	MNCS/ MNJS	MNCS	MNJS	% Self Citations
0%	18,101	250,009	13.81	10.79	15%	1.07	1.19	1.07	22%
10%	1,302	17,805	13.68	10.30	13%	1.00	1.03	1.00	25%
20%	6,534	106,385	16.28	12.75	14%	1.15	1.32	1.15	22%
30%	9,294	150,038	16.14	12.52	13%	1.06	1.25	1.06	22%
40%	11,753	175,908	14.97	11.57	14%	1.11	1.30	1.10	23%
50%	12,344	196,370	15.91	12.39	14%	1.13	1.33	1.12	22%
60%	4,673	64,692	13.85	10.60	16%	1.06	1.24	1.04	23%
70%	4,465	76,630	17.16	12.96	12%	1.18	1.44	1.16	24%
80%	2,243	39,573	17.64	13.98	16%	1.16	1.47	1.21	21%
90%	806	12,671	15.73	12.22	16%	1.26	1.53	1.23	22%
99%	22	148	6.73	4.01	27%	0.60	0.86	0.72	39%
100%	8,407	125,459	14.92	11.46	15%	1.10	1.29	1.12	23%

The results in **Table 5** show that the group of rejected applicants and their publications is relatively large, while the impact is 19% above worldwide average impact level. The next group, much smaller in volume, has a lower impact score. The publications of applicants that get up 40-50% of their applications rewarded do represent a relatively large quantity of publications, with impact levels 30% above worldwide average impact level. The highest impact scores are observed for these applicants that have 70-80% of their applications rewarded.

Yet another approach to the success rates of the RCN is a rough characterization of the success rates, in three types of description: when the percentage granted was between 0 and 30% the descriptive labels states “Never/sometimes”. When the percentages granted was between 31% and 70%, the descriptive labels was “Often”, while the final group of percentage granted was between 71% and 100%, the descriptive label was “Highly frequent/always”.

Table 6: Bibliometric statistics for RCN granting procedures and success rates, 2001-2009/2010

Overall status	P	C+sc	CPP+sc	CPP	% Pnc	MNCS/ MNJS	MNCS	MNJS	% Self Citation
Never/sometimes	28,958	413,676	14.29	11.19	15%	1.07	1.20	1.07	22%
Often	27,454	409,411	14.91	11.59	14%	1.11	1.29	1.10	22%
Highly frequent/always	10,971	166,908	15.21	11.77	16%	1.11	1.32	1.13	23%

In **Table 6** the classes presented in table 5 are grouped according to the descriptions introduced above. The table clearly shows that the more often you are funded by the RCN, the higher impact scores are observed. Both the mean impact levels for the three sets, as well as the normalized scores comparing impact with fields averages as well as the journals to the fields in which the publications appeared.

The next section presents the comparison of the RCN funded part of the output of Norway with the remaining non funded part of the national output of the country. This comparison is made for the aggregate of the two components, the composition in terms of the disciplines involved, and the major research performing institutions involved in the Norwegian system. Two additional analyses focus on the visibility of the funded and non funded work in the top segments of the impact distribution, as well as on the distinction within these two sets on the various types of scientific output (national and international collaborative publications).

Table 7: Bibliometric statistics for output sets by RCN granted and non granted, 2001-2009/2010

Funded/not funded	P	C+sc	CPP+sc	CPP	% Pnc c	MNCS/ MNJS	MNCS	MNJS	% Self Citations
RCN-funded	48,266	677,544	14.04	11.01	16%	1.09	1.22	1.08	22%
Norway (not RCN-funded)	12,313	142,693	11.59	9.39	23%	1.07	1.18	1.10	19%

In **Table 7** the aggregated publication sets for both RCN granted and non granted applicants are presented. The largest number of publications is related to RCN funded applicants. The average impact is higher for the funded part of the Norwegian output as compared to the non funded part. Papers funded by RCN are on average more often cited. However, the field normalized impact score MNCS is more or less of an equal level.

Table 8: Bibliometric statistics for output sets by RCN granted and non granted, per discipline, 2001-2009/2010

	RCN Funded		non RCN funded	
	P 01-09	MNCS 01-09/10	P 01-09	MNCS 01-09/10
AGRICULTURE AND FOOD SCIENCE	2,498	1.28	298	1.47
ASTRONOMY AND ASTROPHYSICS	934	1.08	238	0.77
BASIC LIFE SCIENCES	6,257	1.16	922	1.11
BASIC MEDICAL SCIENCES	551	0.95	136	0.98
BIOLOGICAL SCIENCES	6,505	1.21	834	1.19
BIOMEDICAL SCIENCES	6,952	1.10	1,169	1.17
CHEMISTRY AND CHEMICAL ENGINEERING	4,724	1.18	816	1.12
CIVIL ENGINEERING AND CONSTRUCTION	565	1.00	134	1.09
CLINICAL MEDICINE	17,160	1.33	3,610	1.38
COMPUTER SCIENCES	2,060	0.97	647	1.08
CREATIVE ARTS, CULTURE AND MUSIC	171	0.97	65	0.91
EARTH SCIENCES AND TECHNOLOGY	6,209	1.27	1,475	1.14
ECONOMICS AND BUSINESS	1,358	0.99	290	0.93
EDUCATIONAL SCIENCES	434	1.27	126	1.60
ELECTRICAL ENGINEERING AND TELECOMMUNICATION	1,466	1.15	378	1.17
ENERGY SCIENCE AND TECHNOLOGY	1,114	1.32	324	1.28
ENVIRONMENTAL SCIENCES AND TECHNOLOGY	5,692	1.20	902	1.20
GENERAL AND INDUSTRIAL ENGINEERING	504	1.14	109	1.08
HEALTH SCIENCES	2,282	1.18	543	1.12
HISTORY, PHILOSOPHY AND RELIGION	614	1.27	214	1.48
INFORMATION AND COMMUNICATION SCIENCES	197	1.16	66	0.90
INSTRUMENTS AND INSTRUMENTATION	410	0.98	82	0.99
LANGUAGE AND LINGUISTICS	184	1.00	56	0.85
LAW AND CRIMINOLOGY	156	1.25	52	1.13
LITERATURE	107	1.20	50	1.38
MANAGEMENT AND PLANNING	541	1.03	145	1.01
MATHEMATICS	1,573	1.20	459	0.91
MECHANICAL ENGINEERING AND AEROSPACE	1,101	1.12	266	0.78
MULTIDISCIPLINARY JOURNALS	416	1.42	101	0.83
PHYSICS AND MATERIALS SCIENCE	4,990	1.23	941	1.05
POLITICAL SCIENCE AND PUBLIC ADMINISTRATION	640	1.46	150	1.24
PSYCHOLOGY	1,533	0.93	323	0.83
SOCIAL AND BEHAVIORAL SCIENCES, INTERDISCIPLINARY	591	1.09	118	0.99
SOCIOLOGY AND ANTHROPOLOGY	530	1.06	139	1.10
STATISTICAL SCIENCES	888	1.14	228	1.13

Table 8 presents the output and impact scores of RCN funded and non funded output per disciplines. As might be expected from the above analyses, the largest part of the output per discipline is related to RCN funding. However, in a number of disciplines we observe differences in impact levels among the two sets of publications. We observe five discipline sin which the RCN funded output is showing higher impact levels: Earth sciences & technology, Multidisciplinary journals, Physics & materials science, Political science & public administration, and Social and behavioral sciences, interdisciplinary. Discipline s which the non funded research output does present higher impact levels are: Agriculture & food science, Computer sciences, Educational sciences, History,

philosophy& religion, and Literature, remarkably enough three out of five from the Social Sciences and humanities realm.

Table 9: Bibliometric statistics for output sets by RCN granted and non granted, per discipline, 2001-2009/2010

Institute	All Pubs		RCN Funded Pubs	
	P	MNCS	P	MNCS
UNIV OSLO	19,186	1.24	15,982	1.22
UNIV BERGEN	10,793	1.26	9,019	1.28
NORWEGIAN UNIV SCI & TECHNOL TRONDHEIM	9,476	1.21	7,821	1.23
UNIV TROMSO	5,473	1.18	4,617	1.21
NORWEGIAN UNIV LIFE SCI	1,461	1.16	1,316	1.17
NORWEGIAN RADIUM HOSP	1,417	1.36	1,154	1.45
NORWEGIAN INST PUBL HLTH	1,278	1.42	1,186	1.43
NORWEGIAN SCH VET SCI OSLO	1,246	1.29	1,174	1.30
AGR UNIV NORWAY	1,167	1.25	1,044	1.25
INST MARINE RES	1,082	1.23	984	1.23
SINTEF	928	1.33	830	1.33
HOSP NATL OSLO	817	1.30	666	1.31
UNIV STAVANGER	754	0.94	626	0.90
NORWEGIAN INST NAT RES	728	1.25	687	1.23
NATL VET INST	724	1.50	662	1.47
GEOLOG SURVEY NORW	584	1.34	418	1.37
NORWEGIAN POLAR RES INST	452	1.29	415	1.30
NORWEGIAN INST AIR RES	426	1.66	392	1.63
INST ENERGY TECHN	407	1.25	362	1.27
NORGES HANDELSHØYSKOLE	392	0.97	305	0.98

In **Table 9** we present the output of the major (top-20) research performing organizations in Norway. For every institution we present the full output in the period 2001-2009/2010, and the RCN funded part of the institutional output. Again, given the strong influence and presence of the RCN, the output and impact figures do resemble each other quiet strongly. Only for the Norwegian Radium Hospital we observe some difference in impact when comparing the overall and the RCN funded output sets.

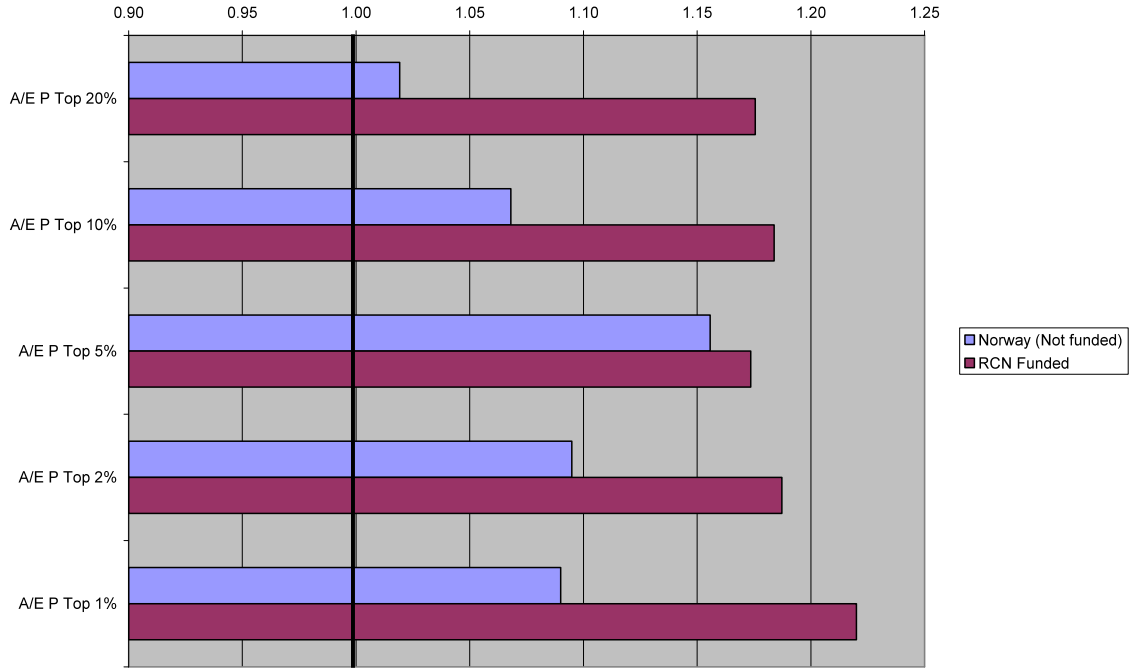
In **Table 10** we present the output of RCN funded and non funded applicants, according to a breakdown into three types of scientific activity. The smallest part in the funded output is the single institute output. This is observed more often, as most research output is the result of team work, often extramural and international. The national cooperation output related part is second largest, while the output related to international cooperation is the largest part of the RCN funded research output. In terms of impact, the single institute output funded by RCNM is at worldwide average impact level. This is quite a strong performance, as this indicates that Norwegian researchers can perform art that level without any kind of interference from outside. The national collaborative output has a slightly higher impact level (MNCS=1.05), while the output resulting form international cooperation has the highest impact (MNCS=1.44).
The output not funded by RCN shows somewhat differing pattern. In the first place, the national cooperation related output is the smallest, while the single institute share of the output is more than twice as many publications. The largest output is related to international cooperation. Here we also observe the highest impact (MNCS=1.37). For this type of scientific activity, the difference between the funded and non funded output is not so large, while for the other tow types, the differences in MNCS values between RCN funded and non funded is larger (MNCS values of 0.83 and 0.95, for single institute an d national cooperation output respectively).

Table 10: Bibliometric statistics for output sets by RCN granted and non granted, for scientific cooperation types, 2001-2009/2010

Funded/not funded Cooperation type	P	C+sc	CPP+sc	CPP	% Pnc	MNCS/ MNJS	MNCS	MNJS	% Self Citations
RCN-funded									
SINGLE INSTITUTE	10,954	109,107	9.96	8.15	16%	1.02	1.00	0.99	18%
NATIONAL	14,280	155,042	10.86	8.74	10%	1.02	1.05	0.99	19%
INTERNATIONAL	23,032	413,396	17.95	13.79	8%	1.17	1.44	1.16	23%
Norway (not RCN-funded)									
SINGLE INSTITUTE	3,269	19,337	5.92	5.06	27%	0.91	0.83	0.90	14%
NATIONAL	1,308	10,087	7.71	6.82	16%	1.05	0.95	1.02	12%
INTERNATIONAL	7,737	113,269	14.64	11.65	12%	1.14	1.37	1.18	20%

In Figure 15 we present the comparison of the visibility of the RCN funded and the non funded output among the top segments of the worldwide output. This analysis is based on an expected number of the publications to appear among for example the top 10% most highly cited publications in the field these publications belong to. So for example, if an institution published 1000 publications, we expect 100 to be among the top 10%. An actual number of 150 publications among the top 10% creates a ratio of 1.5, namely 50% more publications among the top 10% as expected. We conduct this analysis for the top 20%, top 10%, top 5%, top 2%, and finally, the top 1%. For the RCN funded research output we observe this ratio to vary between 1.5 and 2.0, with a highest score in the top 1%. For the non funded research, the visibility among the top segments increases form top 20 to top 5%, and decreases among the top 2% and top 1%.

Figure 15: Visibility among the top in the field, for RCN funded and non funded research output, 2001-2007.



9 Conclusions

In this study the research output of Norway is bibliometrically analyzed by comparing the country's output and impact with that of a number of benchmark countries, among which the neighboring Nordic countries. Next to that international comparison, this bibliometric analysis focused on the effects and success rates of the funding procedures and granting of researchers at the RCN.

The output of Norway displays a slow but steady growth. The impact related to this output is showing an increase at an even much higher pace. This causes the average impact of a Norwegian publication in the Web of Science covered journal literature to increase rapidly. However, this holds equally well for the 'environment', as the field normalized impact of Norway remains at a stable percentage of roughly 20% above worldwide average field impact level. Over the last couple of years, Norwegian researchers show a trend of publishing their findings in journals with a somewhat higher impact in the field(s) to which these journals belong.

The research profile of Norway has a strong focus on biomedicine and the life sciences, in relation to earth and environmental sciences. All in all, this covers nearly 60% of the total Norwegian output. Furthermore, the impact related to these activities in these fields is either at an average or high level, with some disciplines displaying impact levels over 20% above worldwide average level, and clinical medicine on top with over 30% above worldwide average level. The natural and engineering sciences take a much more modest position in the Norwegian research profile, although the impact is of an equally high level as the top ranking disciplines. This makes the Norwegian research profile resemble the Anglo-Saxon research profile, rather than a European continental research profile.

Scientific cooperation is of importance for Norway, as over 50% of all output relates to international cooperation, while another 25-30% relates to national cooperation. As observed more often, international collaborative work relates to the highest impact levels, (some 40% above worldwide4 average file impact level), but it is important to stress that the Norwegian output that results from single institute research fluctuates around that worldwide average impact level, which is indicative of the strength of the research system.

The international comparison shows that Norway is situated among the countries with the somewhat smaller research output, but with respect to the impact is positioned at roughly the same levels as Sweden and Belgium, as well as Canada. When we look at the selection of journals in which Norwegian researchers publish, we notice that they publish in journals with above average impact levels, but not in the top journals in the fields in which the Norwegian researchers are active (roughly selecting journals with impact levels comparable with the choice of colleagues in Finland, Belgium, Sweden, as well as Australia and Canada).

When we look at trends in the output and impact in a comparative way, we notice that the Norwegian output seems to be increasing somewhat faster as compared to the output of the benchmark countries. As stated before, the impact related to that growing output remains relatively stable, and Norway is in a group together with Australia and

Finland (with somewhat lower impact scores in 20006-2009/2010), and Canada, Belgium, and Sweden (with somewhat higher impact scores in that same period).

When we compare the activity of Norway across fields with the benchmark countries, and the impact related to that activity, we notice a few remarkable aspects of the research output of Norway. Norway is much more active in following disciplines: Biological sciences, Earth sciences & technology, Environmental sciences & technology, Political science & public administration, and Social & behavioral science, interdisciplinary. In Earth sciences & technology and Political science & public administration we also notice a high impact, particularly in the latter field. Another discipline worth mentioning here, for which we observe a higher impact for Norway as compared to the benchmark countries is Energy Science & technology. Disciplines for which we observe a Norwegian under activity are Physics & materials science, Electrical engineering & telecommunication, and Basic medical sciences, although the impact levels in these three disciplines are comparable to the impact of the benchmark countries. For some of the very small disciplines we observe also a lagging impact compared to the benchmark countries.

Internationally, Norway compares very well with the benchmark countries when we look at the types of scientific cooperation. Norway performs at worldwide average impact level for both single institute and national cooperation based publication output, as do most of their comparator countries, and Norway profits equally well from international scientific cooperation.

The analysis on the funding of RCN is based on the input data supplied by RCN. We distinguish three different types of funding types (List-1/Ext FoU – projects, List-2/Ext FoU Other, and List-3/Ext other). List-3 was not analyzed any further in this study. Next we distinguish three types of statuses, namely Not granted, Granted – closed, and Granted – ongoing. In the study we analyzed these separately, and in combination. Additional to this more general approach, we also focused on the rate of success in applying for research funding at RCN. For every applicant we determined the percentage of successful applications in relation to the total number of applications. These success rates were then grouped together into groups.

The overall impact of applicants, whether they are granted or not, in the three types of funding instruments is varying between 25%-35% above worldwide average impact level. While the first two types (List-1 and List-2) contain the largest number of publications, the impact is roughly 25% above worldwide average field impact level. When we focus on the status of the applications, we notice that the set of publications related to ongoing applications/funding is having the highest impact of the three types. This makes clear that the processes used to select researchers applying for research funding at RCN manages to pick out these researchers that do realize the higher impact scores, particularly in List-1 and List-2. More in particular, the impact of the researchers that have been granted and whose funding is not yet finished, do have the highest impact scores.

The results clearly show that the researchers that have their applications granted by RCN, and more frequently so, do have higher impact levels as compared to those researchers that have a lower frequency of being rewarded by RCN on their applications.

When we compare the output sets by researchers who have their applications rewarded with the sets of the non funded output, we clearly notice that the RCN funded output has a slightly higher impact level. If we make this comparison when taking into account the scientific cooperation types, we notice the funded and non funded output sets to of a nearly equal impact level when looking at international cooperation. The larger differences are observed for single institute and national cooperation output sets for funded and non funded research. When observing the differences between funded and non funded output across fields, the funded research part is of course the dominant output form. When observing the impact related to the two types of output, we observe in five fields a clearly higher impact for the RCN funded research, while we also observe higher impact scores for five fields for the non funded research.

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Appendix 1: Field composition

Field	Journal Subject Category
AGRICULTURE AND FOOD SCIENCE	AGRICULTURAL ENGINEERING
	AGRICULTURAL EXPERIMENT STATION REPORTS
	AGRICULTURE, DAIRY & ANIMAL SCIENCE
	AGRICULTURE, MULTIDISCIPLINARY
	AGRONOMY
	FOOD SCIENCE & TECHNOLOGY
	NUTRITION & DIETETICS
	SOIL SCIENCE
ASTRONOMY AND ASTROPHYSICS	ASTRONOMY & ASTROPHYSICS
BASIC LIFE SCIENCES	BIOCHEMICAL RESEARCH METHODS
	BIOCHEMISTRY & MOLECULAR BIOLOGY
	BIOPHYSICS
	BIOTECHNOLOGY & APPLIED MICROBIOLOGY
	CELL & TISSUE ENGINEERING
	CELL BIOLOGY
	DEVELOPMENTAL BIOLOGY
	GENETICS & HEREDITY
	MICROBIOLOGY
	REPRODUCTIVE BIOLOGY
BASIC MEDICAL SCIENCES	CHEMISTRY, MEDICINAL
	ENGINEERING, BIOMEDICAL
	MATERIALS SCIENCE, BIOMATERIALS
	MEDICAL INFORMATICS
BIOLOGICAL SCIENCES	BEHAVIORAL SCIENCES
	BIOLOGY
	ENTOMOLOGY
	EVOLUTIONARY BIOLOGY
	FISHERIES
	HORTICULTURE
	MARINE & FRESHWATER BIOLOGY
	MATHEMATICAL & COMPUTATIONAL BIOLOGY
	MYCOLOGY
	ORNITHOLOGY
	PLANT SCIENCES
	ZOOLOGY
BIOMEDICAL SCIENCES	ANATOMY & MORPHOLOGY
	IMMUNOLOGY
	INTEGRATIVE & COMPLEMENTARY MEDICINE
	MEDICAL LABORATORY TECHNOLOGY
	MEDICINE, RESEARCH & EXPERIMENTAL
	NEUROIMAGING
	NEUROSCIENCES
	PHARMACOLOGY & PHARMACY
	PHYSIOLOGY
	RADIOLOGY, NUCLEAR MEDICINE & MEDICAL IMAGING
	TOXICOLOGY
	VIROLOGY
CHEMISTRY AND CHEMICAL ENGINEERING	CHEMISTRY, ANALYTICAL
	CHEMISTRY, APPLIED
	CHEMISTRY, INORGANIC & NUCLEAR

Field	Journal Subject Category
CHEMISTRY AND CHEMICAL ENGINEERING (continued)	CHEMISTRY, MULTIDISCIPLINARY
	CHEMISTRY, ORGANIC
	CHEMISTRY, PHYSICAL
	ELECTROCHEMISTRY
	ENGINEERING, CHEMICAL
	MATERIALS SCIENCE, PAPER & WOOD
	MATERIALS SCIENCE, TEXTILES
	POLYMER SCIENCE
	SPECTROSCOPY
CIVIL ENGINEERING AND CONSTRUCTION	CONSTRUCTION & BUILDING TECHNOLOGY
	ENGINEERING, CIVIL
CLINICAL MEDICINE	ALLERGY
	ANDROLOGY
	ANESTHESIOLOGY
	CARDIAC & CARDIOVASCULAR SYSTEMS
	CLINICAL NEUROLOGY
	CRITICAL CARE MEDICINE
	DENTISTRY, ORAL SURGERY & MEDICINE
	DERMATOLOGY
	EMERGENCY MEDICINE
	ENDOCRINOLOGY & METABOLISM
	GASTROENTEROLOGY & HEPATOLOGY
	HEMATOLOGY
	INFECTIOUS DISEASES
	MEDICINE, GENERAL & INTERNAL
	OBSTETRICS & GYNECOLOGY
	ONCOLOGY
	OPHTHALMOLOGY
	ORTHOPEDICS
	OTORHINOLARYNGOLOGY
	PARASITOLOGY
	PATHOLOGY
	PEDIATRICS
	PERIPHERAL VASCULAR DISEASE
	PSYCHIATRY
	PUBLIC, ENVIRONMENTAL & OCCUPATIONAL HEALTH
	RESPIRATORY SYSTEM
	RHEUMATOLOGY
	SURGERY
	TRANSPLANTATION
	TROPICAL MEDICINE
	UROLOGY & NEPHROLOGY
	VETERINARY SCIENCES
COMPUTER SCIENCES	COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE
	COMPUTER SCIENCE, CYBERNETICS
	COMPUTER SCIENCE, HARDWARE & ARCHITECTURE
	COMPUTER SCIENCE, INFORMATION SYSTEMS
	COMPUTER SCIENCE, INTERDISCIPLINARY APPLICATIONS
	COMPUTER SCIENCE, SOFTWARE ENGINEERING
	COMPUTER SCIENCE, THEORY & METHODS

Field	Journal Subject Category
CREATIVE ARTS, CULTURE AND MUSIC	ARCHITECTURE
	ART
	ASIAN STUDIES
	CLASSICS
	DANCE
	FILM, RADIO, TELEVISION
	FOLKLORE
	HUMANITIES, MULTIDISCIPLINARY
	MUSIC
	THEATER
EARTH SCIENCES AND TECHNOLOGY	ENGINEERING, GEOLOGICAL
	ENGINEERING, MARINE
	ENGINEERING, OCEAN
	GEOCHEMISTRY & GEOPHYSICS
	GEOGRAPHY, PHYSICAL
	GEOLOGY
	GEOSCIENCES, MULTIDISCIPLINARY
	IMAGING SCIENCE & PHOTOGRAPHIC TECHNOLOGY
	METEOROLOGY & ATMOSPHERIC SCIENCES
	MINERALOGY
	OCEANOGRAPHY
	PALEONTOLOGY
	REMOTE SENSING
ECONOMICS AND BUSINESS	AGRICULTURAL ECONOMICS & POLICY
	BUSINESS
	BUSINESS, FINANCE
	ECONOMICS
	INDUSTRIAL RELATIONS & LABOR
EDUCATIONAL SCIENCES	EDUCATION & EDUCATIONAL RESEARCH
	EDUCATION, SCIENTIFIC DISCIPLINES
	EDUCATION, SPECIAL
	PSYCHOLOGY, EDUCATIONAL
ELECTRICAL ENGINEERING AND TELECOMMUNICATION	AUTOMATION & CONTROL SYSTEMS
	ENGINEERING, ELECTRICAL & ELECTRONIC
	ROBOTICS
	TELECOMMUNICATIONS
	TRANSPORTATION
	TRANSPORTATION SCIENCE & TECHNOLOGY
ENERGY SCIENCE AND TECHNOLOGY	ENERGY & FUELS
	ENGINEERING, PETROLEUM
	MINING & MINERAL PROCESSING
	NUCLEAR SCIENCE & TECHNOLOGY
ENVIRONMENTAL SCIENCES AND TECHNOLOGY	BIODIVERSITY CONSERVATION
	ECOLOGY
	ENGINEERING, ENVIRONMENTAL
	ENVIRONMENTAL SCIENCES
	ENVIRONMENTAL STUDIES
	FORESTRY
	GEOGRAPHY
	LIMNOLOGY

Field	Journal Subject Category
ENVIRONMENTAL SCIENCES AND TECHNOLOGY (continued)	URBAN STUDIES
	WATER RESOURCES
GENERAL AND INDUSTRIAL ENGINEERING	ENGINEERING, INDUSTRIAL
	ENGINEERING, MANUFACTURING
	ENGINEERING, MULTIDISCIPLINARY
	ERGONOMICS
HEALTH SCIENCES	GERIATRICS & GERONTOLOGY
	GERONTOLOGY
	HEALTH CARE SCIENCES & SERVICES
	HEALTH POLICY & SERVICES
	NURSING
	REHABILITATION
	SOCIAL WORK
	SPORT SCIENCES
	SUBSTANCE ABUSE
HISTORY, PHILOSOPHY AND RELIGION	ARCHAEOLOGY
	ETHICS
	HISTORY
	HISTORY & PHILOSOPHY OF SCIENCE
	HISTORY OF SOCIAL SCIENCES
	MEDICAL ETHICS
	MEDIEVAL & RENAISSANCE STUDIES
	PHILOSOPHY
	RELIGION
INFORMATION AND COMMUNICATION SCIENCES	COMMUNICATION
	INFORMATION SCIENCE & LIBRARY SCIENCE
INSTRUMENTS AND INSTRUMENTATION	INSTRUMENTS & INSTRUMENTATION
	MICROSCOPY
LANGUAGE AND LINGUISTICS	LANGUAGE & LINGUISTICS
	LINGUISTICS
LAW AND CRIMINOLOGY	CRIMINOLOGY & PENOLOGY
	LAW
	MEDICINE, LEGAL
LITERATURE	LITERARY REVIEWS
	LITERARY THEORY & CRITICISM
	LITERATURE
	LITERATURE, AFRICAN, AUSTRALIAN, CANADIAN
	LITERATURE, AMERICAN
	LITERATURE, BRITISH ISLES
	LITERATURE, GERMAN, DUTCH, SCANDINAVIAN
	LITERATURE, ROMANCE
	LITERATURE, SLAVIC
	POETRY
MANAGEMENT AND PLANNING	MANAGEMENT
	OPERATIONS RESEARCH & MANAGEMENT SCIENCE
	PLANNING & DEVELOPMENT
MATHEMATICS & STATISTICAL SCIENCES	MATHEMATICS
	MATHEMATICS, APPLIED
	MATHEMATICS, INTERDISCIPLINARY APPLICATIONS
	STATISTICS & PROBABILITY

Field	Journal Subject Category
MECHANICAL ENGINEERING AND AEROSPACE	ACOUSTICS
	ENGINEERING, AEROSPACE
	MECHANICS
MULTIDISCIPLINARY JOURNALS	MULTIDISCIPLINARY SCIENCES
PHYSICS AND MATERIALS SCIENCE	CRYSTALLOGRAPHY
	ENGINEERING, MECHANICAL
	MATERIALS SCIENCE, CERAMICS
	MATERIALS SCIENCE, CHARACTERIZATION & TESTING
	MATERIALS SCIENCE, COATINGS & FILMS
	MATERIALS SCIENCE, COMPOSITES
	MATERIALS SCIENCE, MULTIDISCIPLINARY
	METALLURGY & METALLURGICAL ENGINEERING
	NANOSCIENCE & NANOTECHNOLOGY
	OPTICS
	PHYSICS, APPLIED
	PHYSICS, ATOMIC, MOLECULAR & CHEMICAL
	PHYSICS, CONDENSED MATTER
	PHYSICS, FLUIDS & PLASMAS
	PHYSICS, MATHEMATICAL
	PHYSICS, MULTIDISCIPLINARY
	PHYSICS, NUCLEAR
	PHYSICS, PARTICLES & FIELDS
	THERMODYNAMICS
POLITICAL SCIENCE AND PUBLIC ADMINISTRATION	INTERNATIONAL RELATIONS
	POLITICAL SCIENCE
	PUBLIC ADMINISTRATION
PSYCHOLOGY	PSYCHOLOGY, APPLIED
	PSYCHOLOGY, BIOLOGICAL
	PSYCHOLOGY, CLINICAL
	PSYCHOLOGY, DEVELOPMENTAL
	PSYCHOLOGY, EXPERIMENTAL
	PSYCHOLOGY, MATHEMATICAL
	PSYCHOLOGY, MULTIDISCIPLINARY
	PSYCHOLOGY, PSYCHOANALYSIS
	PSYCHOLOGY, SOCIAL
SOCIAL AND BEHAVIORAL SCIENCES, INTERDISCIPLINARY	DEMOGRAPHY
	SOCIAL ISSUES
	SOCIAL SCIENCES, BIOMEDICAL
	SOCIAL SCIENCES, INTERDISCIPLINARY
	SOCIAL SCIENCES, MATHEMATICAL METHODS
SOCIOLOGY AND ANTHROPOLOGY	ANTHROPOLOGY
	AREA STUDIES
	ETHNIC STUDIES
	FAMILY STUDIES
	HOSPITALITY, LEISURE, SPORT & TOURISM
	SOCIOLOGY
	WOMEN'S STUDIES

Appendix 2: Basic Bibliometric Indicators

We calculated the following indicators. The numbering of the indicators corresponds to the position these indicators have in the data tables.

A *first* statistic gives the total number of papers published by the research unit during the entire period ***(P)***. We considered only papers classified as *normal articles*, *letters*, *notes*, and *reviews*. Meeting abstracts, corrections, and editorials are *not* included. In a few cases, a paper is published in a journal for which no citation data are available, or that is not assigned to a CI journal category. These papers are not considered in the calculation of the indicators presented in the tables below.

The next two indicators give the total number of citations received, without (***C***) and with self-citations (***C+sc***). A self-citation (sc) to a paper is a citation given in a publication of which at least one author (either first author or co-author) is also an author of the cited paper (either first author or co-author). As an indication of the self-citation rate we present the percentage of self-citations ***(% Selfcits***), relative to the total number of citations received (sc/(C+sc)).

The *fourth* indicator is the average number of citations per publication calculated while self-citations are not included (***CPP***). In ***CPP+sc***, self-citations have been included.

A *fifth* indicator is the percentage of articles not cited during the time period considered (***%Pnc***), excluding self-citations.

International reference values: JCS and FCS

Next, two international reference values are computed. A first value represents the expected citation rate of the journals in which the research unit has published (***JCS,*** the **J**ournal **C**itation **S**core). The ***JCS*** takes into account both the type of paper (e.g., normal article, review, and so on), as well as the specific years in which the research unit's papers were published. For example, the number of citations received during the period 2005 - 2010 by a *letter* published by a research unit in 2005 in journal X is compared to the average number of citations received during the same period (2005 - 2010) by all *letters* published in the same journal (X) in the same year (2005). Self-citations are excluded from the computation of ***JCS***.

The second reference value presents the expected citation rate of the subfields (journal categories) in which the research unit is active (***FCS,*** the **F**ield **C**itation **S**core). Our definition of subfields is based on a classification of scientific journals into *categories* developed by Thomson Reuters (see Section 3.3). Although this classification is certainly not perfect, it is at present the only classification available to us. In calculating ***FCS***, we used the same procedure as the one we applied in the calculation of ***JCS,*** with journals replaced by subfields. In most cases, a research

unit is active in more than one subfield (i.e., journal category). In those cases, we apply various field impact scores, as related to the individual publications, the selection of the fields being determined by the journals the research unit has used to publish its' research findings.

When a journal is classified in multiple subfields, as happens frequently in the WoS, citation scores are computed as follows. Basically, a paper in a journal classified in N subfields is counted as 1/N paper in each subfield, and so are its FCSm scores, so this creates per individual publication an expected mean field citation score.

Main indicators

The most important indicators compare the number of citations per individual publication within the oeuvre of a research unit (***C***) to the two international reference values, namely the corresponding journal and field expected citation scores of individual publications (***JCS*** and ***FCSm***, respectively), by calculating the ratio for every single publication against both expected citation scores. Self-citations are excluded in the calculation of the ratios ***C/FCSm*** and ***C/JCS***, to prevent that citation scores are affected by divergent self-citation behavior. Over all ratios of individual publications, we calculate a mean impact score, for both the fields as well as the journals in which the institute has published.

The overall field normalized impact indicator for an institute output is ***MNCS***, the Mean Normalized Citation Score. As this indicator focuses on the broader environment of the group's output, this indicator seems the most suitable indicator of the international position of a research unit. If the ***MNCS*** is above (below) 1.0, this means that the output of the research unit is cited more (less) frequently than an 'average' publication in the subfield(s) in which the research unit is active. The ***FCSm*** values of the individual publications constitute a *world subfield average* in a specific (combination of) subfield(s). In this way, one may obtain an indication of the international position of a research unit, in terms of its impact compared to a 'world' average. This 'world' average is calculated for the total population of articles published in WoS journals assigned to a particular subfield or journal category. As a rule, about 80 percent of these papers are authored by scientists from the United States, Canada, Western Europe, Australia and Japan. Therefore, this 'world' average is dominated by the Western world.

A second important indicator, ***MNJS***, is above (below) 1.0 if the citation score of the journal set in which the research unit has published exceeds the citation score of all papers published in the subfield(s) to which the journals belong. In this case, one can conclude that the research unit publishes in journals with a relatively high (low) impact.

The ***MNCS/MNJS*** indicator matches the impact of papers closely to the publication pattern of research units. If the ratio ***MNCS/MNJS*** is above 1.0, the impact of a research unit's papers exceeds the impact of all articles published in the journals in which the particular research unit has published its papers (the research unit's journal set). A limitation of this indicator is that low impact publications published in low impact journals may get a similar score as high impact publications published in high impact journals.
It should be noted that the ***MNCS***, ***MNJS*** and the ***MNCS/MNJS*** indicators are not independent. The value of each one of these follows directly from the values of the other two indicators.
For a more detailed discussion on the differences between the former set of CWTS indicators and the current one we refer to the Appendix 3.

The Activity Index, as we calculated in this study for the international comparison of Norway across fields, focuses on the output of a country in the different fields defined, and compared with the overall average distribution of output across fields of the countries in the benchmarking exercise. By this, one can create insight in the relative over- or underrepresentation of the central country in the study, here Norway, in comparison with the whole set of benchmarking countries. A score of zero on this indicator indicates an exact similar activity in a field, as compared to the benchmarking countries. So a score on this index that is far above zero indicates over-representation or a strong focus of a country on this field, while a score far below zero indicates an under representation of a field by the central country (or a lesser focus).

Appendix 3 Changes in the bibliometric indicators of CWTS

Introduction

This report provides a short summary of the changes in the bibliometric indicators of CWTS. These changes are the result of internal discussions within CWTS and also of recent insights in the bibliometric literature. The emphasis in this report is on the CPP/FCSm indicator and the MNCS indicator. For a long time, CWTS has been using the CPP/FCSm indicator, but this indicator is going to be replaced by the MNCS indicator. Both indicators will be discussed and the advantages and disadvantages of the MNCS indicator compared with the CPP/FCSm indicator will be summarized. Some other changes in the bibliometric indicators of CWTS will be mentioned briefly.

CWTS is well aware of the importance of continuity in the use of bibliometric indicators. For this reason, the new indicators will sometimes be used together with the old ones in studies of CWTS. When necessary, the new indicators will also be calculated retroactively.

Definitions of the CPP/FCSm indicator and the MNCS indicator

The CPP/FCSm (citations per publication / mean field citation score) indicator is defined as

$$\text{CPP/FCSm} = \frac{(c_1 + c_2 + \ldots + c_n)/n}{(e_1 + e_2 + \ldots + e_n)/n},$$

where n denotes the number of publications, c_i denotes the actual number of citations of publication i, and e_i denotes the expected number of citations of publication i. The expected number of citations of a publication is given by the average number of citations of all publications that appeared in the same field and the same year and that have the same document type (*article*, *letter*, or *review*).

The MNCS (mean normalized citation score) indicator is defined as

$$\text{MNCS} = \frac{1}{n}\left(\frac{c_1}{e_1} + \frac{c_2}{e_2} + \ldots + \frac{c_n}{e_n}\right).$$

As can be seen from the above formulas, the essential difference between the CPP/FCSm indicator and the MNCS indicator is that the former indicator is defined as a ratio of averages while the latter indicator is defined as an average of ratios.

The following example illustrates the calculation of both indicators. Suppose there are three publications, and suppose these publications have the following characteristics:

Publication	Field	Publication year	Actual citations	Expected citations
1	Psychiatry	2005	25	10
2	Surgery	2005	20	20
3	Surgery	2008	15	5

This yields the following indicators:

$$\text{CPP/FCSm} = \frac{(25 + 20 + 15)/3}{(10 + 20 + 5)/3} = 1.71,$$

$$\text{MNCS} = \frac{1}{3}\left(\frac{25}{10} + \frac{20}{20} + \frac{15}{5}\right) = 2.17.$$

Advantages and disadvantages of the MNCS indicator

The MNCS indicator has two important advantages compared with the CPP/FCSm indicator:

- All publications have equal weight in the MNCS indicator, while in the CPP/FCSm indicator older publications and publications from fields with a lot of citation traffic have more weight.
- The MNCS indicator is consistent, while the CPP/FCSm indicator is not. Consistency means that the way in which researchers, departments, or universities are being ranked satisfies certain logical conditions.

The MNCS indicator has two disadvantages compared with the CPP/FCSm indicator:

- The MNCS indicator can be very sensitive to citations to recent publications.
- Publications of the document type *letter* need to be treated in a special way in the MNCS indicator.

These advantages and disadvantages are discussed in more detail below.

Equal weighing of publications in the MNCS indicator

Older publications and publications from fields with a lot of citation traffic on average have a relatively large number of citations. These publications also have a large expected number of citations. In the numerator of the CPP/FCSm indicator, citations to publications from different fields and different publication years are added together. In the denominator, the same is done with expected citations. This causes older publications and publications from fields with a lot of citation traffic to have a relatively high weight in the CPP/FCSm indicator. In the MNCS indicator, the number of citations of a publication is compared directly with the expected number of citations of the publication, without first aggregating over publications. In this way, all publications have equal weight in the indicator. CWTS regards equal weighing of publications from different fields and different publication years as the most natural way to determine the citation score of a set of publications.

The numerical example given in the previous section illustrates the difference between the CPP/FCSm indicator and the MNCS indicator. In this example, publications 1 and 3 have many more citations than expected. Publication 2 has exactly the expected number of citations. Publication 2 originates from a field in which there is much more citation traffic than in the field of publication 1. Furthermore, publication 2 is much older than publication 3. For these reasons, publication 2 has a larger expected number of citations than publications 1 and 3, and consequently publication 2 has more weight in the CPP/FCSm indicator. Since publication 2 has a lower citation impact than publications 1 and 3 (after correcting for field and publication year), giving more weight to this publication leads to a lower citation score. This explains why the MNCS indicator, which gives equal weight to all publications, yields a higher citation score than the CPP/FCSm indicator.

Consistency of the MNCS indicator

Suppose there are two universities (or departments or researchers), A and B, which have the same number of publications. Suppose the citation score of A exceeds the citation score of B. Suppose next that A and B jointly produce a new publication. Since it is a joint publication and, consequently, A and B make the same improvement, it is natural to expect that with the new publication included the citation score of A still exceeds the one of B. An indicator that guarantees this is called consistent. The CPP/FCSm indicator is not consistent. In certain cases, the way in which this indicator ranks two units relative to each other changes in a counter-intuitive manner. The MNCS indicator is consistent and therefore does not have this problem.

Sensitivity of the MNCS indicator to citations to recent publications

Recent publications have a small expected number of citations. In some cases, a relatively small number of citations to a recent publication can therefore be sufficient to get a high value for the ratio of the actual and the expected number of citations of the publication. For this reason, the MNCS indicator can be very sensitive to citations to recent publications. In some cases, this sensitivity may cause the MNCS indicator to provide a distorted picture of the citation score of a set of publications.

CWTS has two ways of dealing with this disadvantage of the MNCS indicator. First, CWTS calculates the MNCS indicator only for publications that have had at least one year to earn citations. In this way, the expected number of citations of a publication will never be very small, and the sensitivity of the MNCS indicator to citations to recent publications will therefore be limited. Second, confidence intervals can be added to the MNCS indicator. When the MNCS indicator is heavily influenced by citations to recent publications, this will translate into wide confidence intervals.

Special treatment of publications of the document type *letter* in the MNCS indicator

The general idea of the MNCS indicator is that all publications should have equal weight. However, in the case of publications of the document type *letter*, this principle is difficult to justify. In general, it does not seem fair to give the same weight to a *letter* as to an *article* or *review*. Moreover, since *letters* often have a small expected number of citations, this would cause the MNCS indicator to be highly sensitive to citations to *letters*. For these reasons, *letters* need to be treated in a special way in the MNCS indicator. CWTS chooses to give *letters* a weight of 0.25 in the MNCS indicator. To illustrate this, let's consider the numerical example given earlier. If publication 3 in this example is of the document type *letter*, the MNCS indicator is calculated as

$$\mathrm{MNCS} = \frac{1}{2.25}\left(\frac{25}{10} + \frac{20}{20} + 0.25 \times \frac{15}{5}\right) = 1.89\,.$$

Practical differences between the CPP/FCSm indicator and the MNCS indicator

CWTS has extensively investigated how the CPP/FCSm indicator and the MNCS indicator differ from each other in practice. At the level of universities or large parts of universities (e.g., large faculties), the differences are typically small. Differences of more than five percent are highly exceptional at this level. At the level of departments or research groups, the differences are somewhat larger. Although also at this level there is a strong correlation between the CPP/FCSm indicator and the MNCS indicator, differences up to twenty percent are not exceptional. The main cause of differences seems to be that the MNCS indicator gives more weight to recent publications than the CPP/FCSm indicator.

Other changes in the bibliometric indicators of CWTS

In addition to the change from the CPP/FCSm indicator to the MNCS indicator, several other changes are going to take place in the bibliometric indicators of CWTS. Important changes are:

- The JCSm/FCSm (mean journal citation score / mean field citation score) indicator, which indicates the average citation score of the journals in which one has published, will be replaced by the MNJS (mean normalized journal score) indicator.
- The CPP/JCSm (citations per publication / mean journal citation score) indicator, which indicates the journal-normalized citation score of a set of publications, will be replaced by an indicator that is based on similar principles as the MNCS and MNJS indicators.
- Indicators based on counting highly cited publications are going to play a more prominent role.
- The stability of indicators is going to get more attention, for instance through the use of confidence intervals.

More information

More information on the changes in the bibliometric indicators of CWTS is available in the publications listed below. In these publications, the decision to move from the CPP/FCSm indicator to the MNCS indicator is discussed in more detail. References to other relevant literature are provided as well.

Waltman, L., van Eck, N.J., van Leeuwen, T.N., Visser, M.S., & van Raan, A.F.J. (2011). Towards a new crown indicator: Some theoretical considerations. *Journal of Informetrics*, *5*(1), 37–47. Available on http://dx.doi.org/10.1016/j.joi.2010.08.001.

Waltman, L., van Eck, N.J., van Leeuwen, T.N., Visser, M.S., & van Raan, A.F.J. (2011). Towards a new crown indicator: An empirical analysis. *Scientometrics* 87 (3), 467-481 . Available on http://arxiv.org/abs/1004.1632.

Appendix 4: Bibliometric statistics for Norway and its benchmark countries, 2001-2009/2010.

Country Period	P	C+sc	CPP+sc	CPP	% Pnc	JCSm	FCSm	MNCS/ MNJS	MNCS	MNJS	% Self Citations
AUSTRALIA											
2001 - 2009	257,229.50	3,263,481.50	12.69	10.14	20%	9.60	8.97	1.06	1.16	1.10	20%
2001 - 2004	94,342.25	582,277.50	6.17	4.66	33%	4.41	4.24	1.05	1.11	1.06	25%
2002 - 2005	100,582.25	628,966.25	6.25	4.72	32%	4.52	4.33	1.05	1.11	1.06	25%
2003 - 2006	107,551.00	691,626.25	6.43	4.87	31%	4.67	4.41	1.05	1.12	1.06	24%
2004 - 2007	112,176.50	779,504.25	6.95	5.30	28%	5.06	4.71	1.05	1.14	1.08	24%
2005 - 2008	124,396.50	898,443.25	7.22	5.52	27%	5.24	4.83	1.05	1.16	1.10	24%
2006 - 2009	134,312.25	999,395.25	7.44	5.68	26%	5.33	4.82	1.06	1.19	1.12	24%
BELGIUM											
2001 - 2009	119,743.50	1,730,432.75	14.45	11.32	19%	10.29	9.24	1.08	1.22	1.13	22%
2001 - 2004	45,424.00	316,657.50	6.97	5.11	32%	4.70	4.36	1.07	1.17	1.09	27%
2002 - 2005	48,726.75	352,402.00	7.23	5.34	31%	4.89	4.47	1.08	1.19	1.11	26%
2003 - 2006	51,602.50	389,193.25	7.54	5.60	30%	5.10	4.59	1.08	1.20	1.11	26%
2004 - 2007	53,276.50	431,130.00	8.09	6.05	27%	5.50	4.87	1.08	1.22	1.13	25%
2005 - 2008	57,504.00	493,716.00	8.59	6.44	26%	5.76	5.02	1.10	1.25	1.14	25%
2006 - 2009	60,441.00	520,877.00	8.62	6.45	26%	5.80	4.99	1.08	1.25	1.16	25%

Country Period	P	C+sc	CPP+sc	CPP	% Pnc	JCSm	FCSm	MNCS/ MNJS	MNCS	MNJS	% Self Citations
CANADA											
2001 - 2009	392,658.50	5,372,228.75	13.68	11.12	20%	10.61	9.14	1.05	1.22	1.16	19%
2001 - 2004	146,137.25	986,542.25	6.75	5.21	32%	4.98	4.29	1.05	1.20	1.14	23%
2002 - 2005	157,208.50	1,073,865.25	6.83	5.30	32%	5.05	4.36	1.05	1.20	1.14	22%
2003 - 2006	168,712.75	1,179,447.75	6.99	5.43	31%	5.15	4.45	1.06	1.20	1.14	22%
2004 - 2007	176,543.75	1,308,346.50	7.41	5.77	29%	5.46	4.72	1.05	1.20	1.15	22%
2005 - 2008	191,286.50	1,483,029.50	7.75	6.05	27%	5.72	4.92	1.05	1.22	1.16	22%
2006 - 2009	201,139.00	1,587,830.75	7.89	6.17	26%	5.79	4.94	1.05	1.23	1.17	22%
DENMARK											
2001 - 2009	83,492.75	1,411,302.75	16.90	13.43	14%	11.66	10.04	1.15	1.37	1.19	21%
2001 - 2004	33,117.50	270,644.75	8.17	6.11	25%	5.35	4.69	1.16	1.36	1.17	25%
2002 - 2005	34,549.00	286,546.25	8.29	6.21	25%	5.49	4.79	1.16	1.35	1.16	25%
2003 - 2006	36,055.25	317,143.75	8.80	6.64	24%	5.72	4.95	1.18	1.36	1.16	24%
2004 - 2007	36,769.75	341,154.25	9.28	7.08	22%	6.07	5.23	1.17	1.36	1.17	24%
2005 - 2008	39,220.50	378,109.75	9.64	7.37	20%	6.30	5.42	1.16	1.38	1.20	24%
2006 - 2009	40,864.25	402,930.25	9.86	7.53	20%	6.43	5.39	1.15	1.41	1.23	24%

Country Period	P	C+sc	CPP+sc	CPP	% Pnc	JCSm	FCSm	MNCS/ MNJS	MNCS	MNJS	% Self Citations
FINLAND											
2001 - 2009	77,467.50	1,109,120.00	14.32	11.25	17%	10.60	9.49	1.04	1.17	1.13	21%
2001 - 2004	31,584.75	223,345.25	7.07	5.23	29%	4.84	4.39	1.05	1.15	1.10	26%
2002 - 2005	32,532.75	232,755.75	7.15	5.31	29%	4.99	4.46	1.04	1.14	1.10	26%
2003 - 2006	33,798.50	240,845.50	7.13	5.28	29%	5.06	4.54	1.04	1.15	1.10	26%
2004 - 2007	34,150.75	257,878.25	7.55	5.63	27%	5.32	4.83	1.04	1.16	1.11	26%
2005 - 2008	35,950.00	286,099.25	7.96	5.96	25%	5.55	4.98	1.04	1.18	1.14	25%
2006 - 2009	37,155.75	300,846.00	8.10	6.05	25%	5.62	4.96	1.03	1.20	1.16	25%
ICELAND											
2001 - 2009	4,366.25	73,931.25	16.93	13.73	19%	10.92	8.90	1.09	1.44	1.32	19%
2001 - 2004	1,549.75	11,958.75	7.72	6.00	29%	4.82	4.24	1.11	1.35	1.22	22%
2002 - 2005	1,642.75	14,063.00	8.56	6.80	28%	5.11	4.40	1.09	1.37	1.25	21%
2003 - 2006	1,781.75	15,621.50	8.77	6.92	28%	5.42	4.59	1.09	1.35	1.24	21%
2004 - 2007	1,877.25	17,967.00	9.57	7.59	27%	5.88	4.78	1.09	1.44	1.32	21%
2005 - 2008	2,113.50	21,422.00	10.14	8.07	27%	6.23	4.82	1.07	1.46	1.36	20%
2006 - 2009	2,368.75	25,279.00	10.67	8.36	28%	6.31	4.73	1.09	1.49	1.36	22%

Country Period	P	C+sc	CPP+sc	CPP	% Pnc	JCSm	FCSm	MNCS/ MNJS	MNCS	MNJS	% Self Citations
NETHERLANDS											
2001 - 2009	216,398.50	3,576,579.50	16.53	13.30	15%	12.04	9.93	1.12	1.37	1.23	20%
2001 - 2004	83,091.75	668,067.50	8.04	6.13	26%	5.52	4.66	1.14	1.35	1.19	24%
2002 - 2005	88,298.25	731,439.50	8.28	6.34	25%	5.72	4.79	1.14	1.35	1.19	23%
2003 - 2006	93,366.00	798,866.75	8.56	6.56	25%	5.90	4.91	1.14	1.36	1.19	23%
2004 - 2007	96,118.00	874,823.50	9.10	7.00	22%	6.35	5.23	1.13	1.36	1.20	23%
2005 - 2008	103,102.75	973,711.25	9.44	7.28	21%	6.65	5.42	1.11	1.37	1.23	23%
2006 - 2009	108,320.75	1,034,571.50	9.55	7.36	21%	6.70	5.35	1.11	1.41	1.26	23%
NEW ZEALAND											
2001 - 2009	48,826.00	550,098.50	11.27	9.10	20%	8.89	8.78	1.02	1.09	1.07	19%
2001 - 2004	18,362.00	92,825.00	5.06	3.83	35%	3.82	4.03	1.03	1.04	1.01	24%
2002 - 2005	19,606.75	103,850.75	5.30	4.02	34%	3.95	4.03	1.02	1.05	1.03	24%
2003 - 2006	20,839.00	117,578.50	5.64	4.32	33%	4.19	4.13	1.02	1.07	1.04	23%
2004 - 2007	21,699.25	132,372.00	6.10	4.69	30%	4.56	4.41	1.01	1.08	1.07	23%
2005 - 2008	23,773.50	153,678.25	6.46	4.99	29%	4.82	4.56	1.01	1.09	1.08	23%
2006 - 2009	24,779.25	165,104.00	6.66	5.12	28%	4.93	4.58	1.02	1.12	1.10	23%

Country Period	P	C+sc	CPP+sc	CPP	% Pnc	JCSm	FCSm	MNCS/ MNJS	MNCS	MNJS	% Self Citations
NORWAY											
2001 - 2009	60,579.00	820,198.75	13.54	10.68	17%	9.64	8.84	1.09	1.22	1.12	21%
2001 - 2004	21,682.00	142,656.75	6.58	4.89	30%	4.44	4.20	1.09	1.20	1.10	26%
2002 - 2005	23,138.50	160,701.00	6.95	5.18	28%	4.60	4.28	1.11	1.22	1.11	25%
2003 - 2006	25,202.25	180,133.25	7.15	5.35	28%	4.72	4.35	1.11	1.22	1.10	25%
2004 - 2007	26,801.75	203,776.75	7.60	5.73	26%	5.08	4.64	1.10	1.21	1.10	25%
2005 - 2008	29,763.75	230,474.00	7.74	5.83	25%	5.23	4.78	1.09	1.21	1.12	25%
2006 - 2009	32,233.50	245,427.75	7.61	5.70	25%	5.26	4.76	1.07	1.21	1.13	25%
SWEDEN											
2001 - 2009	155,166.00	2,423,580.75	15.62	12.52	15%	11.33	10.19	1.09	1.25	1.15	20%
2001 - 2004	63,919.00	481,217.25	7.53	5.70	26%	5.15	4.77	1.12	1.24	1.10	24%
2002 - 2005	65,796.50	502,817.50	7.64	5.81	26%	5.26	4.84	1.10	1.22	1.10	24%
2003 - 2006	67,606.50	534,239.25	7.90	6.02	26%	5.43	4.96	1.09	1.22	1.12	24%
2004 - 2007	68,397.00	569,873.25	8.33	6.39	24%	5.77	5.20	1.09	1.23	1.13	23%
2005 - 2008	71,723.75	624,534.50	8.71	6.70	23%	6.08	5.37	1.07	1.24	1.16	23%
2006 - 2009	73,333.00	650,792.75	8.87	6.79	22%	6.17	5.31	1.07	1.27	1.18	23%

Country Period	P	C+sc	CPP+sc	CPP	% Pnc	JCSm	FCSm	MNCS/ MNJS	MNCS	MNJS	% Self Citations
SWITZERLAND											
2001 - 2009	154,741.50	2,754,039.25	17.80	14.31	16%	12.39	10.15	1.19	1.44	1.21	20%
2001 - 2004	58,878.75	534,397.50	9.08	6.97	26%	6.00	4.95	1.20	1.42	1.19	23%
2002 - 2005	62,531.75	575,414.50	9.20	7.08	26%	6.11	5.01	1.20	1.43	1.19	23%
2003 - 2006	66,554.00	621,841.00	9.34	7.19	25%	6.21	5.07	1.20	1.44	1.19	23%
2004 - 2007	68,911.00	690,828.75	10.02	7.74	23%	6.63	5.34	1.20	1.46	1.21	23%
2005 - 2008	74,357.50	768,914.25	10.34	7.97	22%	6.86	5.48	1.19	1.46	1.23	23%
2006 - 2009	78,238.00	817,974.25	10.45	8.02	22%	6.90	5.47	1.18	1.47	1.25	23%

Appendix 5: Bibliometric statistics for Norway and its benchmark countries across disciplines, Australia, 2001-2009/2010.

Discipline	P	C+sc	CPP+sc	CPP	% Pnc	JCSm	FCSm	MNCS/ MNJS	MNCS	MNJS	% Self Citations
AGRICULTURE AND FOOD SCIENCE	12,039.50	111,257.75	9.24	7.26	19%	6.98	7.07	1.06	1.13	1.06	21%
ASTRONOMY AND ASTROPHYSICS	5,000.75	95,464.25	19.09	13.61	13%	12.74	11.67	1.05	1.15	1.10	29%
BASIC LIFE SCIENCES	27,039.75	528,070.50	19.53	15.74	9%	15.25	14.97	1.04	1.15	1.10	19%
BASIC MEDICAL SCIENCES	3,023.00	31,094.50	10.29	8.03	16%	8.44	8.95	0.99	0.96	0.97	22%
BIOLOGICAL SCIENCES	25,313.00	300,570.00	11.87	9.17	15%	8.86	8.55	1.05	1.15	1.09	23%
BIOMEDICAL SCIENCES	28,179.75	458,403.75	16.27	13.12	10%	13.25	13.06	1.02	1.07	1.05	19%
CHEMISTRY AND CHEMICAL ENGINEERING	21,024.25	263,854.00	12.55	9.36	15%	9.47	8.16	1.03	1.24	1.21	25%
CIVIL ENGINEERING AND CONSTRUCTION	2,368.25	13,762.00	5.81	4.33	29%	4.10	4.11	1.09	1.07	0.99	26%
CLINICAL MEDICINE	67,763.00	1,051,568.00	15.52	13.04	14%	11.66	10.92	1.09	1.21	1.12	16%
COMPUTER SCIENCES	9,184.50	37,979.25	4.14	3.24	44%	3.34	3.40	1.02	1.01	0.99	22%
CREATIVE ARTS, CULTURE AND MUSIC	1,328.75	994.50	0.75	0.59	73%	0.55	0.62	1.05	1.61	1.54	22%
EARTH SCIENCES AND TECHNOLOGY	15,822.25	186,114.75	11.76	8.83	15%	8.08	7.22	1.10	1.28	1.17	25%
ECONOMICS AND BUSINESS	5,506.75	27,880.50	5.06	4.32	32%	4.58	5.12	1.00	0.88	0.88	15%
EDUCATIONAL SCIENCES	3,355.50	17,559.25	5.23	4.41	32%	4.21	4.17	1.05	1.11	1.05	16%
ELECTRICAL ENGINEERING AND TELECOMMUNICATION	7,007.50	40,707.75	5.81	4.52	33%	4.43	3.88	1.07	1.24	1.16	22%
ENERGY SCIENCE AND TECHNOLOGY	3,377.00	25,582.00	7.58	5.64	23%	5.52	5.22	1.07	1.21	1.12	26%
ENVIRONMENTAL SCIENCES AND TECHNOLOGY	18,246.50	214,516.50	11.76	9.37	14%	8.93	8.28	1.06	1.19	1.12	20%
GENERAL AND INDUSTRIAL ENGINEERING	2,631.75	14,428.75	5.48	4.17	26%	4.54	4.28	0.99	1.06	1.07	24%
HEALTH SCIENCES	12,551.00	110,603.00	8.81	7.37	20%	6.72	6.90	1.08	1.08	0.99	16%
HISTORY, PHILOSOPHY AND RELIGION	3,368.00	7,417.50	2.20	1.82	49%	1.86	1.87	0.99	1.36	1.37	17%
INFORMATION AND COMMUNICATION SCIENCES	1,138.75	5,365.50	4.71	4.04	37%	4.22	3.64	0.95	1.20	1.26	14%
INSTRUMENTS AND INSTRUMENTATION	1,743.75	13,021.00	7.47	4.88	26%	4.41	5.23	1.20	1.09	0.91	35%
LANGUAGE AND LINGUISTICS	860.50	3,847.50	4.47	3.41	36%	3.76	3.82	0.94	1.08	1.15	24%
LAW AND CRIMINOLOGY	1,323.00	6,189.00	4.68	3.69	31%	3.66	4.90	1.04	0.88	0.84	21%
LITERATURE	1,074.75	474.00	0.44	0.38	81%	0.33	0.39	1.01	1.23	1.21	14%
MANAGEMENT AND PLANNING	2,719.25	15,526.25	5.71	5.04	27%	5.40	5.82	0.95	0.94	0.99	12%
MATHEMATICS	5,907.00	26,771.00	4.53	3.02	40%	2.89	3.07	1.07	1.04	0.97	33%
MECHANICAL ENGINEERING AND AEROSPACE	4,656.75	29,505.25	6.34	4.44	28%	4.58	4.27	1.02	1.09	1.07	30%
MULTIDISCIPLINARY JOURNALS	1,905.25	120,825.25	63.42	53.80	13%	52.20	41.88	1.13	1.36	1.20	15%
PHYSICS AND MATERIALS SCIENCE	25,109.75	253,641.25	10.10	7.16	24%	7.19	6.17	1.06	1.24	1.16	29%
POLITICAL SCIENCE AND PUBLIC ADMINISTRATION	1,724.25	5,574.25	3.23	2.76	36%	2.67	3.57	1.03	0.92	0.89	14%
PSYCHOLOGY	8,556.00	88,259.00	10.32	8.41	17%	8.43	8.78	1.02	1.01	0.98	18%
SOCIAL & BEHAVIORAL SCIENCES, INTERDISCIPLINARY	2,169.25	14,428.00	6.65	5.77	25%	5.81	5.73	1.04	1.12	1.07	13%
SOCIOLOGY AND ANTHROPOLOGY	3,228.75	15,693.75	4.86	4.03	31%	3.78	4.30	1.08	1.09	1.00	17%
STATISTICAL SCIENCES	3,217.50	21,522.00	6.69	5.37	33%	4.71	4.80	1.05	1.09	1.03	20%

Bibliometric statistics for Norway and its benchmark countries across disciplines, Belgium, 2001-2009/2010

Discipline	P	C+sc	CPP+sc	CPP	% Pnc	JCSm	FCSm	MNCS/ MNJS	MNCS	MNJS	% Self Citations
AGRICULTURE AND FOOD SCIENCE	4,586.75	50,698.25	11.05	8.36	16%	7.93	6.86	1.07	1.28	1.20	24%
ASTRONOMY AND ASTROPHYSICS	2,273.00	33,868.50	14.90	9.61	16%	9.84	10.68	1.02	0.95	0.94	36%
BASIC LIFE SCIENCES	15,817.25	332,822.75	21.04	16.79	8%	15.65	14.48	1.08	1.24	1.15	20%
BASIC MEDICAL SCIENCES	2,198.25	27,937.25	12.71	9.65	13%	9.61	9.70	1.03	1.03	0.99	24%
BIOLOGICAL SCIENCES	7,501.50	94,774.25	12.63	9.47	17%	9.23	8.61	1.02	1.11	1.09	25%
BIOMEDICAL SCIENCES	16,105.00	273,863.75	17.00	13.62	11%	12.75	12.27	1.10	1.20	1.09	20%
CHEMISTRY AND CHEMICAL ENGINEERING	14,287.00	186,642.25	13.06	9.73	14%	10.33	8.65	1.00	1.19	1.19	26%
CIVIL ENGINEERING AND CONSTRUCTION	653.25	4,768.00	7.30	5.47	26%	5.16	4.35	1.09	1.18	1.08	25%
CLINICAL MEDICINE	32,656.00	626,743.75	19.19	15.92	14%	12.80	11.41	1.16	1.41	1.21	17%
COMPUTER SCIENCES	4,745.25	25,984.25	5.48	4.08	37%	3.62	3.36	1.24	1.29	1.04	26%
CREATIVE ARTS, CULTURE AND MUSIC	447.25	289.00	0.65	0.46	81%	0.51	0.73	0.62	1.02	1.65	29%
EARTH SCIENCES AND TECHNOLOGY	3,992.00	48,447.00	12.14	8.24	17%	7.90	6.99	1.05	1.23	1.17	32%
ECONOMICS AND BUSINESS	2,080.75	13,254.50	6.37	5.27	26%	5.25	5.31	1.03	1.01	0.99	17%
EDUCATIONAL SCIENCES	515.00	2,968.25	5.76	4.36	35%	4.29	4.09	1.06	1.05	0.99	24%
ELECTRICAL ENGINEERING & TELECOMMUNICATION	5,000.25	30,199.00	6.04	4.39	33%	4.35	4.43	1.03	1.05	1.02	27%
ENERGY SCIENCE AND TECHNOLOGY	1,992.25	12,034.50	6.04	3.81	30%	3.91	4.74	1.11	1.04	0.93	37%
ENVIRONMENTAL SCIENCES AND TECHNOLOGY	5,676.25	76,185.00	13.42	10.08	14%	9.05	8.06	1.09	1.26	1.16	25%
GENERAL AND INDUSTRIAL ENGINEERING	944.25	6,893.00	7.30	5.58	26%	4.76	4.23	1.17	1.38	1.18	24%
HEALTH SCIENCES	2,273.25	21,958.50	9.66	7.75	18%	7.45	7.66	1.05	1.09	1.04	20%
HISTORY, PHILOSOPHY AND RELIGION	1,662.75	2,393.75	1.44	1.08	69%	1.02	1.97	0.89	0.68	0.76	25%
INFORMATION AND COMMUNICATION SCIENCES	413.25	3,188.25	7.72	6.12	27%	4.50	3.44	1.27	1.81	1.43	21%
INSTRUMENTS AND INSTRUMENTATION	1,466.00	11,085.50	7.56	4.85	27%	4.31	5.21	1.15	1.03	0.90	36%
LANGUAGE AND LINGUISTICS	577.25	1,984.00	3.44	2.66	57%	2.83	3.01	0.86	0.77	0.90	23%
LAW AND CRIMINOLOGY	413.25	2,306.00	5.58	4.77	34%	3.72	5.06	1.18	0.90	0.77	15%
LITERATURE	488.25	178.00	0.36	0.28	84%	0.27	0.48	0.88	0.89	1.01	22%
MANAGEMENT AND PLANNING	607.25	4,676.00	7.70	6.37	25%	6.07	5.52	1.10	1.21	1.10	17%
MATHEMATICS	3,895.00	20,872.00	5.36	3.61	40%	3.27	3.41	1.05	1.09	1.03	33%
MECHANICAL ENGINEERING AND AEROSPACE	2,043.00	15,060.50	7.37	5.05	28%	4.50	4.20	1.11	1.21	1.09	32%
MULTIDISCIPLINARY JOURNALS	626.00	48,164.00	76.94	64.07	7%	54.61	39.41	1.21	1.59	1.32	17%
PHYSICS AND MATERIALS SCIENCE	18,965.50	198,101.25	10.45	7.30	23%	7.54	6.73	1.03	1.13	1.10	30%
POLITICAL SCIENCE AND PUBLIC ADMINISTRATION	583.50	2,149.75	3.68	3.09	38%	3.16	3.62	0.95	1.02	1.08	16%
PSYCHOLOGY	2,899.00	32,595.00	11.24	8.55	19%	8.59	8.48	1.07	1.12	1.04	24%
SOCIAL & BEHAVIORAL SCIENCES, INTERDISCIPLINARY	493.00	3,079.50	6.25	5.12	28%	5.26	5.15	0.91	1.05	1.16	18%
SOCIOLOGY AND ANTHROPOLOGY	519.25	2,286.25	4.40	3.33	32%	3.72	4.22	0.93	1.06	1.14	24%
STATISTICAL SCIENCES	2,107.75	14,868.00	7.05	5.28	25%	5.08	4.68	1.12	1.22	1.09	25%

Bibliometric statistics for Norway and its benchmark countries across disciplines, Canada, 2001-2009/2010

Discipline	P	C+sc	CPP+sc	CPP	% Pnc	JCSm	FCSm	MNCS/ MNJS	MNCS	MNJS	% Self Citations
AGRICULTURE AND FOOD SCIENCE	14,266.25	139,518.25	9.78	7.78	20%	7.54	7.47	1.05	1.14	1.09	20%
ASTRONOMY AND ASTROPHYSICS	7,082.50	157,657.00	22.26	16.91	11%	13.13	10.95	1.20	1.48	1.24	24%
BASIC LIFE SCIENCES	45,985.25	934,895.00	20.33	16.60	8%	16.69	15.19	1.02	1.16	1.14	18%
BASIC MEDICAL SCIENCES	5,628.00	61,479.50	10.92	8.49	16%	8.85	9.18	1.00	0.97	0.97	22%
BIOLOGICAL SCIENCES	29,186.00	361,736.50	12.39	9.69	15%	9.30	8.70	1.07	1.16	1.09	22%
BIOMEDICAL SCIENCES	50,830.50	878,888.25	17.29	14.11	10%	13.95	12.96	1.03	1.14	1.11	18%
CHEMISTRY AND CHEMICAL ENGINEERING	37,688.50	493,239.75	13.09	10.16	16%	10.48	8.34	1.03	1.27	1.24	22%
CIVIL ENGINEERING AND CONSTRUCTION	4,758.25	22,806.50	4.79	3.60	34%	3.59	4.15	1.04	0.86	0.83	25%
CLINICAL MEDICINE	93,765.00	1,708,753.00	18.22	15.54	12%	13.88	11.40	1.10	1.37	1.24	15%
COMPUTER SCIENCES	15,731.50	76,461.25	4.86	3.84	39%	3.72	3.45	1.09	1.17	1.07	21%
CREATIVE ARTS, CULTURE AND MUSIC	2,221.75	2,117.75	0.95	0.80	67%	0.73	0.64	1.08	1.94	1.80	16%
EARTH SCIENCES AND TECHNOLOGY	21,293.00	234,178.50	11.00	8.17	17%	8.01	7.31	1.03	1.17	1.13	26%
ECONOMICS AND BUSINESS	7,243.25	50,994.00	7.04	6.25	26%	6.49	5.72	0.97	1.13	1.16	11%
EDUCATIONAL SCIENCES	3,397.50	22,101.50	6.51	5.57	26%	5.41	4.94	1.04	1.18	1.14	14%
ELECTRICAL ENGINEERING & TELECOMMUNICATION	16,706.00	91,379.00	5.47	4.21	35%	4.23	3.68	1.03	1.20	1.16	23%
ENERGY SCIENCE AND TECHNOLOGY	6,193.25	47,288.75	7.64	5.86	31%	4.99	4.92	1.14	1.18	1.04	23%
ENVIRONMENTAL SCIENCES AND TECHNOLOGY	27,161.25	320,697.25	11.81	9.35	16%	8.86	8.28	1.05	1.16	1.11	21%
GENERAL AND INDUSTRIAL ENGINEERING	4,017.00	21,084.25	5.25	4.10	29%	4.13	4.12	1.00	1.05	1.05	22%
HEALTH SCIENCES	14,945.00	145,431.75	9.73	8.11	18%	7.43	7.69	1.08	1.12	1.03	17%
HISTORY, PHILOSOPHY AND RELIGION	5,617.50	11,201.50	1.99	1.67	55%	1.65	1.88	0.98	1.14	1.17	16%
INFORMATION AND COMMUNICATION SCIENCES	1,470.75	9,642.00	6.56	5.72	29%	5.65	4.53	0.99	1.25	1.26	13%
INSTRUMENTS AND INSTRUMENTATION	2,736.25	18,925.75	6.92	4.69	32%	4.68	4.89	1.03	0.96	0.93	32%
LANGUAGE AND LINGUISTICS	1,601.50	7,670.75	4.79	3.90	37%	4.00	4.18	0.99	1.19	1.20	19%
LAW AND CRIMINOLOGY	1,698.25	10,584.75	6.23	5.28	27%	4.57	5.44	1.08	1.07	1.00	15%
LITERATURE	3,375.25	1,437.00	0.43	0.38	80%	0.36	0.42	0.98	1.09	1.11	12%
MANAGEMENT AND PLANNING	3,519.50	28,233.50	8.02	7.17	24%	7.23	6.32	1.04	1.19	1.15	11%
MATHEMATICS	12,625.00	54,827.75	4.34	3.00	40%	2.85	2.92	1.08	1.09	1.02	31%
MECHANICAL ENGINEERING AND AEROSPACE	8,343.25	47,095.25	5.64	4.11	31%	4.05	3.97	1.01	1.05	1.04	27%
MULTIDISCIPLINARY JOURNALS	2,747.75	200,376.50	72.92	63.09	8%	60.97	42.07	1.06	1.58	1.49	13%
PHYSICS AND MATERIALS SCIENCE	40,093.50	441,505.50	11.01	8.16	24%	7.92	6.47	1.04	1.26	1.21	26%
POLITICAL SCIENCE AND PUBLIC ADMINISTRATION	2,379.50	7,756.75	3.26	2.79	39%	2.74	3.70	1.08	0.85	0.79	15%
PSYCHOLOGY	14,601.75	175,964.25	12.05	9.96	16%	9.79	9.12	1.01	1.15	1.13	17%
SOCIAL & BEHAVIORAL SCIENCES, INTERDISCIPLINARY	2,961.00	22,460.00	7.59	6.45	23%	6.37	5.84	1.04	1.24	1.19	15%
SOCIOLOGY AND ANTHROPOLOGY	4,338.00	23,483.75	5.41	4.57	26%	4.72	5.17	0.98	1.04	1.07	16%
STATISTICAL SCIENCES	6,576.00	38,214.75	5.81	4.53	30%	4.71	4.67	1.08	1.07	0.99	22%

Bibliometric statistics for Norway and its benchmark countries across disciplines, Denmark, 2001-2009/2010

Discipline	P	C+sc	CPP+sc	CPP	% Pnc	JCSm	FCSm	MNCS/ MNJS	MNCS	MNJS	% Self Citations
AGRICULTURE AND FOOD SCIENCE	4,865.50	60,313.75	12.40	9.76	14%	9.08	7.52	1.08	1.32	1.23	21%
ASTRONOMY AND ASTROPHYSICS	1,557.00	32,574.00	20.92	14.55	11%	12.18	11.88	1.24	1.29	1.04	30%
BASIC LIFE SCIENCES	12,883.50	290,217.75	22.53	18.23	7%	15.63	14.52	1.16	1.36	1.17	19%
BASIC MEDICAL SCIENCES	1,257.25	14,125.50	11.24	8.57	14%	9.45	9.43	0.92	0.96	1.04	24%
BIOLOGICAL SCIENCES	6,423.50	86,146.25	13.41	10.22	12%	9.46	8.73	1.13	1.28	1.13	24%
BIOMEDICAL SCIENCES	11,987.00	206,673.25	17.24	13.42	9%	12.24	12.57	1.12	1.15	1.03	22%
CHEMISTRY AND CHEMICAL ENGINEERING	7,428.50	117,773.75	15.85	12.36	12%	11.38	8.95	1.11	1.45	1.31	22%
CIVIL ENGINEERING AND CONSTRUCTION	659.75	5,858.25	8.88	7.15	18%	6.01	5.00	1.19	1.54	1.29	20%
CLINICAL MEDICINE	25,379.00	509,082.25	20.06	16.44	10%	13.57	11.60	1.17	1.46	1.26	18%
COMPUTER SCIENCES	2,466.50	15,199.00	6.16	4.91	36%	4.10	3.60	1.21	1.30	1.08	20%
CREATIVE ARTS, CULTURE AND MUSIC	209.50	182.25	0.87	0.56	74%	0.53	0.56	0.81	1.36	1.68	35%
EARTH SCIENCES AND TECHNOLOGY	4,225.25	58,101.25	13.75	9.98	12%	8.99	7.70	1.12	1.38	1.23	27%
ECONOMICS AND BUSINESS	1,405.00	9,629.50	6.85	6.02	25%	5.63	5.52	1.09	1.13	1.04	12%
EDUCATIONAL SCIENCES	177.50	826.00	4.65	3.42	32%	3.55	3.74	1.03	0.94	0.92	27%
ELECTRICAL ENGINEERING & TELECOMMUNICATION	1,717.00	13,384.00	7.79	6.22	26%	5.04	4.17	1.23	1.47	1.20	20%
ENERGY SCIENCE AND TECHNOLOGY	1,223.00	13,236.50	10.82	8.16	15%	5.95	5.47	1.45	1.81	1.25	25%
ENVIRONMENTAL SCIENCES AND TECHNOLOGY	5,422.00	76,681.00	14.14	10.85	12%	9.53	8.55	1.14	1.34	1.18	23%
GENERAL AND INDUSTRIAL ENGINEERING	746.50	5,390.50	7.22	5.75	21%	4.93	4.58	1.24	1.33	1.07	20%
HEALTH SCIENCES	2,014.75	24,668.50	12.24	9.76	16%	7.90	8.16	1.19	1.21	1.01	20%
HISTORY, PHILOSOPHY AND RELIGION	564.75	1,232.25	2.18	1.70	51%	1.87	2.11	1.06	1.07	1.02	22%
INFORMATION AND COMMUNICATION SCIENCES	257.50	1,598.25	6.21	5.36	23%	4.40	3.67	1.26	1.52	1.21	14%
INSTRUMENTS AND INSTRUMENTATION	731.75	8,057.75	11.01	8.00	18%	5.99	5.76	1.39	1.59	1.14	27%
LANGUAGE AND LINGUISTICS	194.00	417.00	2.15	1.72	51%	1.89	2.31	1.07	0.96	0.89	20%
LAW AND CRIMINOLOGY	187.50	1,406.50	7.50	5.60	26%	4.84	5.43	1.08	1.14	1.06	25%
LITERATURE	168.25	71.00	0.42	0.33	82%	0.30	0.52	1.07	0.87	0.81	23%
MANAGEMENT AND PLANNING	663.25	4,899.50	7.39	6.60	23%	5.48	5.62	1.15	1.26	1.09	11%
MATHEMATICS	1,596.25	9,507.75	5.96	4.39	35%	3.95	3.41	1.13	1.26	1.11	26%
MECHANICAL ENGINEERING AND AEROSPACE	1,565.25	11,806.25	7.54	5.47	22%	4.77	4.64	1.21	1.22	1.01	27%
MULTIDISCIPLINARY JOURNALS	735.25	60,798.25	82.69	68.91	6%	62.50	40.65	1.10	1.84	1.66	17%
PHYSICS AND MATERIALS SCIENCE	9,617.75	134,196.00	13.95	10.37	19%	9.27	7.13	1.19	1.51	1.27	26%
POLITICAL SCIENCE AND PUBLIC ADMINISTRATION	463.50	1,980.50	4.27	3.68	28%	3.46	3.37	1.08	1.30	1.20	14%
PSYCHOLOGY	827.00	7,911.75	9.57	7.32	22%	7.73	8.33	1.00	0.96	0.95	24%
SOCIAL & BEHAVIORAL SCIENCES, INTERDISCIPLINARY	388.50	2,615.25	6.73	5.76	21%	5.73	5.36	1.17	1.23	1.05	14%
SOCIOLOGY AND ANTHROPOLOGY	410.25	1,800.00	4.39	3.51	31%	3.92	4.04	0.92	1.01	1.10	20%
STATISTICAL SCIENCES	1,090.25	8,870.00	8.14	6.73	24%	6.12	5.14	1.24	1.40	1.13	17%

Bibliometric statistics for Norway and its benchmark countries across disciplines, Finland, 2001-2009/2010

Discipline	P	C+sc	CPP+sc	CPP	% Pnc	JCSm	FCSm	MNCS/ MNJS	MNCS	MNJS	% Self Citations
AGRICULTURE AND FOOD SCIENCE	3,083.50	41,897.25	13.59	11.01	15%	9.14	7.80	1.16	1.41	1.22	19%
ASTRONOMY AND ASTROPHYSICS	1,826.25	25,954.00	14.21	8.98	15%	9.91	11.03	0.87	0.77	0.89	37%
BASIC LIFE SCIENCES	9,799.25	197,949.75	20.20	15.93	8%	15.82	14.81	1.02	1.16	1.14	21%
BASIC MEDICAL SCIENCES	1,053.00	11,252.50	10.69	7.58	14%	9.04	9.68	0.93	0.82	0.88	29%
BIOLOGICAL SCIENCES	4,879.75	62,546.75	12.82	9.87	15%	9.49	8.82	1.08	1.16	1.08	23%
BIOMEDICAL SCIENCES	9,426.00	157,318.25	16.69	13.36	9%	13.02	12.82	1.04	1.09	1.05	20%
CHEMISTRY AND CHEMICAL ENGINEERING	8,563.00	95,371.00	11.14	8.09	19%	8.90	7.82	0.99	1.10	1.11	27%
CIVIL ENGINEERING AND CONSTRUCTION	347.50	1,724.00	4.96	4.03	30%	5.12	4.90	0.75	0.96	1.28	19%
CLINICAL MEDICINE	21,179.50	408,033.50	19.27	16.11	10%	13.82	12.05	1.09	1.31	1.20	16%
COMPUTER SCIENCES	3,272.75	14,305.00	4.37	3.36	42%	3.63	3.50	0.96	1.02	1.06	23%
CREATIVE ARTS, CULTURE AND MUSIC	225.50	415.25	1.84	1.19	65%	1.17	1.18	1.00	2.34	2.33	35%
EARTH SCIENCES AND TECHNOLOGY	3,252.75	43,970.25	13.52	8.96	16%	8.56	7.78	1.04	1.19	1.15	34%
ECONOMICS AND BUSINESS	1,065.75	5,466.50	5.13	4.41	32%	4.71	5.26	0.86	0.85	0.99	14%
EDUCATIONAL SCIENCES	506.50	3,098.00	6.12	4.72	29%	4.88	4.23	0.99	1.14	1.16	23%
ELECTRICAL ENGINEERING & TELECOMMUNICATION	3,252.25	18,475.50	5.68	4.37	35%	4.15	4.17	1.12	1.10	0.98	23%
ENERGY SCIENCE AND TECHNOLOGY	1,447.50	11,356.25	7.85	5.29	30%	5.66	5.04	1.05	1.05	1.00	33%
ENVIRONMENTAL SCIENCES AND TECHNOLOGY	7,052.75	90,606.00	12.85	9.68	13%	9.71	8.69	1.00	1.14	1.14	25%
GENERAL AND INDUSTRIAL ENGINEERING	884.75	4,780.00	5.40	4.27	27%	4.14	4.29	1.07	1.05	0.98	21%
HEALTH SCIENCES	2,483.25	24,766.75	9.97	8.22	17%	8.06	7.97	1.00	1.05	1.05	18%
HISTORY, PHILOSOPHY AND RELIGION	460.25	730.00	1.59	1.33	57%	1.51	1.77	0.92	1.12	1.22	16%
INFORMATION AND COMMUNICATION SCIENCES	373.00	2,124.00	5.69	4.77	27%	4.78	4.09	1.08	1.31	1.22	16%
INSTRUMENTS AND INSTRUMENTATION	987.75	8,250.25	8.35	5.11	33%	5.30	5.01	0.93	0.86	0.92	39%
LANGUAGE AND LINGUISTICS	279.25	939.00	3.36	2.55	55%	2.58	3.24	0.84	0.72	0.85	24%
LAW AND CRIMINOLOGY	190.00	1,354.00	7.13	5.69	19%	5.08	5.68	1.04	1.06	1.01	20%
LITERATURE	61.75	22.00	0.36	0.24	85%	0.40	0.57	0.54	0.97	1.81	32%
MANAGEMENT AND PLANNING	698.25	3,865.00	5.54	4.77	29%	4.88	5.11	0.94	0.91	0.97	14%
MATHEMATICS	1,758.50	8,340.00	4.74	3.09	38%	2.95	2.90	1.15	1.17	1.02	35%
MECHANICAL ENGINEERING AND AEROSPACE	961.50	5,390.50	5.61	4.00	31%	4.34	4.39	0.97	0.93	0.95	29%
MULTIDISCIPLINARY JOURNALS	386.00	28,557.75	73.98	60.27	7%	57.60	39.51	1.08	1.74	1.60	19%
PHYSICS AND MATERIALS SCIENCE	10,133.00	118,335.50	11.68	8.34	24%	7.77	6.61	1.07	1.19	1.11	29%
POLITICAL SCIENCE AND PUBLIC ADMINISTRATION	224.00	634.00	2.83	2.45	39%	3.23	3.38	0.75	0.73	0.98	14%
PSYCHOLOGY	1,557.75	16,966.50	10.89	8.68	16%	9.08	8.90	0.99	1.11	1.12	20%
SOCIAL & BEHAVIORAL SCIENCES, INTERDISCIPLINARY	417.50	3,262.50	7.81	6.65	25%	6.98	6.27	0.86	1.05	1.22	15%
SOCIOLOGY AND ANTHROPOLOGY	349.25	1,568.00	4.49	3.62	34%	4.25	4.60	0.79	0.80	1.00	19%
STATISTICAL SCIENCES	821.75	5,252.25	6.39	4.97	27%	5.10	4.83	1.05	1.10	1.05	22%

Bibliometric statistics for Norway and its benchmark countries across disciplines, Iceland, 2001-2009/2010

Discipline	P	C+sc	CPP+sc	CPP	% Pnc	JCSm	FCSm	MNCS/ MNJS	MNCS	MNJS	% Self Citations
AGRICULTURE AND FOOD SCIENCE	200.50	2,650.25	13.22	9.95	15%	8.27	7.74	1.08	1.30	1.20	25%
ASTRONOMY AND ASTROPHYSICS	53.25	1,109.00	20.83	13.80	6%	13.83	11.74	1.13	1.14	1.01	34%
BASIC LIFE SCIENCES	480.00	17,678.50	36.83	31.32	9%	21.45	13.99	1.21	2.64	2.19	15%
BASIC MEDICAL SCIENCES	77.00	751.00	9.75	6.99	21%	6.44	9.60	1.18	0.90	0.76	28%
BIOLOGICAL SCIENCES	497.25	5,417.25	10.89	8.28	15%	7.96	8.13	0.96	1.07	1.11	24%
BIOMEDICAL SCIENCES	432.25	6,944.25	16.07	12.96	11%	11.97	13.22	1.13	1.21	1.07	19%
CHEMISTRY AND CHEMICAL ENGINEERING	195.25	1,924.00	9.85	6.97	21%	7.62	8.08	0.97	0.96	0.99	29%
CIVIL ENGINEERING AND CONSTRUCTION	23.00	84.00	3.65	3.26	43%	2.80	3.28	1.44	1.06	0.73	11%
CLINICAL MEDICINE	1,314.50	25,242.50	19.20	16.40	14%	12.84	10.68	1.13	1.47	1.30	15%
COMPUTER SCIENCES	131.00	477.00	3.64	2.67	50%	2.63	2.62	1.19	1.18	0.99	27%
CREATIVE ARTS, CULTURE AND MUSIC	16.25	31.00	1.91	1.78	69%	1.58	0.94	0.70	1.77	2.53	6%
EARTH SCIENCES AND TECHNOLOGY	724.50	10,999.50	15.18	10.94	15%	8.88	7.26	1.15	1.46	1.27	28%
ECONOMICS AND BUSINESS	43.00	215.00	5.00	4.67	37%	6.05	5.43	0.86	0.70	0.82	7%
EDUCATIONAL SCIENCES	34.00	153.00	4.50	3.82	53%	3.51	3.67	0.70	0.69	0.99	15%
ELECTRICAL ENGINEERING & TELECOMMUNICATION	59.00	511.00	8.66	6.47	39%	4.21	3.66	1.92	2.04	1.06	25%
ENERGY SCIENCE AND TECHNOLOGY	24.25	202.00	8.33	6.52	9%	5.10	7.76	1.13	0.86	0.76	22%
ENVIRONMENTAL SCIENCES AND TECHNOLOGY	314.25	4,406.00	14.02	11.16	14%	8.41	8.25	1.10	1.22	1.12	20%
GENERAL AND INDUSTRIAL ENGINEERING	26.00	75.00	2.88	1.81	58%	2.46	2.81	0.82	0.68	0.83	37%
HEALTH SCIENCES	178.50	1,551.00	8.69	7.28	18%	6.18	6.57	1.12	1.21	1.07	16%
HISTORY, PHILOSOPHY AND RELIGION	50.00	123.00	2.46	1.88	66%	1.69	1.99	0.52	0.78	1.49	24%
INFORMATION AND COMMUNICATION SCIENCES	12.00	50.00	4.17	3.67	17%	3.99	4.38	1.25	1.37	1.10	12%
INSTRUMENTS AND INSTRUMENTATION	9.00	56.00	6.22	4.11	22%	7.50	5.57	0.74	0.73	0.99	34%
LANGUAGE AND LINGUISTICS	17.00	40.00	2.35	1.76	47%	1.85	1.82	1.00	1.17	1.17	25%
LAW AND CRIMINOLOGY	28.00	274.00	9.79	5.39	21%	5.71	5.71	0.87	1.05	1.21	45%
LITERATURE	9.00	6.00	0.67	0.33	67%	0.23	0.32	1.10	1.12	1.01	50%
MANAGEMENT AND PLANNING	11.00	36.00	3.27	3.00	45%	5.78	3.73	0.71	1.17	1.65	8%
MATHEMATICS	99.00	315.00	3.18	2.28	54%	2.49	2.38	0.92	0.88	0.96	28%
MECHANICAL ENGINEERING AND AEROSPACE	21.00	99.00	4.71	3.52	29%	4.08	3.66	0.67	0.79	1.18	25%
MULTIDISCIPLINARY JOURNALS	40.50	4,501.25	111.14	93.86	3%	68.26	32.34	1.53	4.12	2.70	16%
PHYSICS AND MATERIALS SCIENCE	291.00	2,995.00	10.29	7.79	27%	6.69	5.95	1.24	1.31	1.06	24%
POLITICAL SCIENCE AND PUBLIC ADMINISTRATION	30.00	105.00	3.50	2.87	37%	3.89	3.56	0.75	0.89	1.18	18%
PSYCHOLOGY	139.00	1,166.00	8.39	5.45	29%	6.16	7.13	0.73	0.78	1.06	35%
SOCIAL & BEHAVIORAL SCIENCES, INTERDISCIPLINARY	27.00	195.00	7.22	6.52	41%	7.30	6.00	0.67	1.11	1.65	10%
SOCIOLOGY AND ANTHROPOLOGY	47.00	260.00	5.53	4.28	36%	4.40	3.95	0.95	1.28	1.36	23%
STATISTICAL SCIENCES	50.00	309.00	6.18	5.24	42%	5.35	3.59	1.23	1.66	1.34	15%

Bibliometric statistics for Norway and its benchmark countries across disciplines, the Netherlands, 2001-2009/2010

Discipline	P	C+sc	CPP+sc	CPP	% Pnc	JCSm	FCSm	MNCS/ MNJS	MNCS	MNJS	% Self Citations
AGRICULTURE AND FOOD SCIENCE	7,729.00	99,735.50	12.90	10.47	14%	9.51	7.92	1.13	1.41	1.25	19%
ASTRONOMY AND ASTROPHYSICS	5,630.25	121,972.50	21.66	14.91	11%	12.61	12.21	1.20	1.24	1.03	31%
BASIC LIFE SCIENCES	26,485.00	601,561.75	22.71	18.46	7%	17.15	14.98	1.11	1.39	1.25	19%
BASIC MEDICAL SCIENCES	3,305.00	44,941.50	13.60	10.73	12%	10.16	9.50	1.12	1.20	1.07	21%
BIOLOGICAL SCIENCES	11,862.25	177,065.00	14.93	11.64	12%	10.74	9.45	1.13	1.34	1.19	22%
BIOMEDICAL SCIENCES	30,552.25	552,465.75	18.08	14.61	9%	13.83	12.77	1.08	1.23	1.14	19%
CHEMISTRY AND CHEMICAL ENGINEERING	19,701.50	343,342.25	17.43	13.84	11%	12.84	9.11	1.12	1.56	1.39	21%
CIVIL ENGINEERING AND CONSTRUCTION	1,275.00	8,034.25	6.30	4.89	27%	4.65	4.00	1.16	1.27	1.09	22%
CLINICAL MEDICINE	70,054.25	1,338,443.75	19.11	15.82	10%	14.03	11.62	1.11	1.39	1.25	17%
COMPUTER SCIENCES	7,870.50	47,757.00	6.07	4.82	36%	4.25	3.56	1.24	1.28	1.03	21%
CREATIVE ARTS, CULTURE AND MUSIC	648.00	718.25	1.11	0.87	70%	0.68	0.75	1.02	1.92	1.89	21%
EARTH SCIENCES AND TECHNOLOGY	8,388.75	113,303.75	13.51	9.89	15%	8.59	7.41	1.13	1.40	1.24	27%
ECONOMICS AND BUSINESS	5,188.50	37,764.25	7.28	6.24	25%	5.86	5.47	1.07	1.15	1.08	14%
EDUCATIONAL SCIENCES	1,908.25	13,954.25	7.31	5.82	24%	5.66	4.61	1.04	1.33	1.27	20%
ELECTRICAL ENGINEERING & TELECOMMUNICATION	5,603.50	38,213.25	6.82	5.33	30%	5.02	4.36	1.10	1.23	1.11	22%
ENERGY SCIENCE AND TECHNOLOGY	2,754.50	23,257.50	8.44	6.43	26%	5.43	5.02	1.28	1.36	1.06	24%
ENVIRONMENTAL SCIENCES AND TECHNOLOGY	11,150.50	150,732.25	13.52	10.66	12%	9.44	8.13	1.16	1.36	1.18	21%
GENERAL AND INDUSTRIAL ENGINEERING	1,940.75	11,818.75	6.09	4.81	26%	4.39	4.25	1.10	1.15	1.05	21%
HEALTH SCIENCES	6,542.50	68,433.50	10.46	8.46	15%	7.66	7.32	1.07	1.19	1.11	19%
HISTORY, PHILOSOPHY AND RELIGION	1,933.25	4,633.50	2.40	1.96	53%	1.78	2.38	1.03	1.23	1.19	18%
INFORMATION AND COMMUNICATION SCIENCES	1,002.75	7,393.00	7.37	6.21	25%	4.85	4.03	1.29	1.71	1.33	16%
INSTRUMENTS AND INSTRUMENTATION	1,884.00	17,584.75	9.33	6.69	26%	5.68	5.57	1.25	1.17	0.94	28%
LANGUAGE AND LINGUISTICS	905.25	5,118.00	5.65	4.49	36%	4.41	3.91	1.01	1.58	1.57	21%
LAW AND CRIMINOLOGY	707.00	3,772.00	5.34	4.19	34%	3.60	4.50	1.09	0.98	0.90	21%
LITERATURE	455.00	339.00	0.75	0.62	74%	0.64	0.57	1.00	1.60	1.60	16%
MANAGEMENT AND PLANNING	2,410.00	18,669.00	7.75	6.60	22%	6.31	5.88	1.07	1.17	1.09	15%
MATHEMATICS	4,202.00	22,564.50	5.37	3.91	34%	3.68	3.54	1.11	1.13	1.02	27%
MECHANICAL ENGINEERING AND AEROSPACE	3,940.25	27,329.00	6.94	5.16	29%	4.60	4.27	1.15	1.22	1.06	26%
MULTIDISCIPLINARY JOURNALS	1,539.50	135,221.75	87.83	75.69	4%	67.20	41.75	1.15	1.91	1.67	14%
PHYSICS AND MATERIALS SCIENCE	23,521.00	342,434.50	14.56	11.16	19%	9.48	7.07	1.19	1.68	1.41	23%
POLITICAL SCIENCE AND PUBLIC ADMINISTRATION	1,057.50	5,734.00	5.42	4.60	30%	3.83	3.47	1.17	1.41	1.20	15%
PSYCHOLOGY	8,669.75	107,016.25	12.34	9.69	16%	9.48	8.43	1.03	1.18	1.14	22%
SOCIAL & BEHAVIORAL SCIENCES, INTERDISCIPLINARY	1,748.00	13,069.00	7.48	6.25	21%	6.13	5.49	1.07	1.29	1.21	16%
SOCIOLOGY AND ANTHROPOLOGY	1,417.50	8,024.00	5.66	4.63	29%	4.63	4.28	1.04	1.31	1.27	18%
STATISTICAL SCIENCES	3,870.25	24,162.00	6.24	4.93	28%	5.04	4.95	1.03	1.05	1.02	21%

Bibliometric statistics for Norway and its benchmark countries across disciplines, New Zealand, 2001-2009/2010

Discipline	P	C+sc	CPP+sc	CPP	% Pnc	JCSm	FCSm	MNCS/ MNJS	MNCS	MNJS	% Self Citations
AGRICULTURE AND FOOD SCIENCE	3,984.50	36,797.75	9.24	7.38	19%	7.31	6.97	1.04	1.12	1.07	20%
ASTRONOMY AND ASTROPHYSICS	423.00	6,256.00	14.79	9.40	13%	9.94	10.56	1.08	0.94	0.87	36%
BASIC LIFE SCIENCES	4,767.50	80,588.75	16.90	13.79	10%	13.36	13.51	1.04	1.09	1.05	18%
BASIC MEDICAL SCIENCES	625.25	7,397.50	11.83	9.48	14%	8.95	9.38	1.00	0.98	0.97	20%
BIOLOGICAL SCIENCES	6,815.75	71,323.25	10.46	8.15	17%	8.09	8.37	1.03	1.02	0.99	22%
BIOMEDICAL SCIENCES	4,985.75	68,753.00	13.79	11.41	12%	11.69	12.45	0.96	0.97	1.01	17%
CHEMISTRY AND CHEMICAL ENGINEERING	3,736.75	40,109.00	10.73	8.21	16%	9.14	8.20	0.95	1.08	1.15	24%
CIVIL ENGINEERING AND CONSTRUCTION	402.25	2,229.00	5.54	4.42	34%	4.21	4.16	0.98	0.97	0.99	20%
CLINICAL MEDICINE	10,680.00	157,424.25	14.74	12.56	14%	11.41	10.52	1.06	1.25	1.18	15%
COMPUTER SCIENCES	1,542.75	6,173.25	4.00	3.12	45%	3.20	3.35	0.97	0.93	0.95	22%
CREATIVE ARTS, CULTURE AND MUSIC	238.50	200.50	0.84	0.70	68%	0.59	0.49	1.15	2.25	1.95	16%
EARTH SCIENCES AND TECHNOLOGY	4,216.75	46,426.25	11.01	8.19	15%	7.91	7.58	1.04	1.13	1.09	26%
ECONOMICS AND BUSINESS	1,106.75	5,729.25	5.18	4.50	31%	5.39	5.54	0.91	0.90	0.99	13%
EDUCATIONAL SCIENCES	695.00	3,244.75	4.67	4.04	36%	4.08	4.40	1.00	0.93	0.93	13%
ELECTRICAL ENGINEERING & TELECOMMUNICATION	941.25	5,044.75	5.36	4.39	35%	4.72	4.28	0.89	0.99	1.11	18%
ENERGY SCIENCE AND TECHNOLOGY	374.00	2,494.00	6.67	5.62	22%	5.60	5.41	1.02	1.13	1.11	16%
ENVIRONMENTAL SCIENCES AND TECHNOLOGY	4,594.75	54,530.75	11.87	9.51	14%	9.30	8.37	1.04	1.18	1.14	20%
GENERAL AND INDUSTRIAL ENGINEERING	501.75	2,937.75	5.86	4.66	26%	4.56	4.49	1.03	1.12	1.09	20%
HEALTH SCIENCES	1,920.50	15,838.00	8.25	6.98	20%	6.63	7.15	1.05	1.05	1.00	15%
HISTORY, PHILOSOPHY AND RELIGION	683.25	1,424.00	2.08	1.65	51%	1.97	2.12	0.88	1.09	1.25	21%
INFORMATION AND COMMUNICATION SCIENCES	313.00	1,483.00	4.74	4.09	32%	4.52	4.26	0.97	1.01	1.04	14%
INSTRUMENTS AND INSTRUMENTATION	282.75	1,333.50	4.72	3.13	30%	3.88	4.50	0.94	0.81	0.87	34%
LANGUAGE AND LINGUISTICS	246.50	1,422.50	5.77	4.68	35%	3.68	3.57	1.27	1.56	1.22	19%
LAW AND CRIMINOLOGY	305.25	1,679.50	5.50	4.26	24%	4.34	5.28	0.97	1.01	1.05	23%
LITERATURE	240.25	119.00	0.50	0.36	81%	0.35	0.39	0.89	0.95	1.07	28%
MANAGEMENT AND PLANNING	655.25	3,823.00	5.83	5.17	26%	5.70	6.04	0.93	0.91	0.98	11%
MATHEMATICS	1,251.00	4,939.00	3.95	2.63	42%	2.79	2.96	0.99	0.92	0.92	33%
MECHANICAL ENGINEERING AND AEROSPACE	628.75	4,397.75	6.99	5.51	30%	4.31	4.21	1.16	1.21	1.04	21%
MULTIDISCIPLINARY JOURNALS	497.25	22,074.50	44.39	36.97	13%	37.92	51.41	1.03	0.91	0.88	17%
PHYSICS AND MATERIALS SCIENCE	3,305.75	30,856.75	9.33	6.95	27%	6.75	6.13	1.06	1.12	1.06	26%
POLITICAL SCIENCE AND PUBLIC ADMINISTRATION	335.25	908.00	2.71	2.18	43%	2.72	3.75	0.80	0.65	0.81	19%
PSYCHOLOGY	1,951.75	19,290.50	9.88	8.05	21%	8.11	8.48	0.99	0.98	0.99	19%
SOCIAL & BEHAVIORAL SCIENCES, INTERDISCIPLINARY	424.50	2,628.75	6.19	5.31	23%	6.76	6.05	0.86	1.05	1.23	14%
SOCIOLOGY AND ANTHROPOLOGY	734.00	3,596.00	4.90	3.99	27%	4.30	4.77	0.99	1.00	1.01	19%
STATISTICAL SCIENCES	685.75	3,449.00	5.03	3.94	31%	4.89	5.28	0.95	0.86	0.90	22%

Bibliometric statistics for Norway and its benchmark countries across disciplines, Norway, 2001-2009/2010

Discipline	P	C+sc	CPP+sc	CPP	% Pnc	JCSm	FCSm	MNCS/ MNJS	MNCS	MNJS	% Self Citations
AGRICULTURE AND FOOD SCIENCE	2,497.50	29,662.00	11.88	9.30	15%	8.21	7.32	1.08	1.28	1.18	22%
ASTRONOMY AND ASTROPHYSICS	934.25	14,871.50	15.92	10.32	16%	9.83	10.18	1.11	1.08	0.98	35%
BASIC LIFE SCIENCES	6,256.50	119,197.25	19.05	15.29	8%	14.26	14.15	1.11	1.16	1.05	20%
BASIC MEDICAL SCIENCES	550.50	5,611.25	10.19	7.80	15%	8.16	8.57	0.97	0.95	0.98	23%
BIOLOGICAL SCIENCES	6,504.75	77,666.00	11.94	8.97	14%	8.43	7.95	1.09	1.21	1.11	25%
BIOMEDICAL SCIENCES	6,951.50	108,437.00	15.60	12.41	10%	11.52	12.09	1.08	1.10	1.02	20%
CHEMISTRY AND CHEMICAL ENGINEERING	4,724.00	52,918.50	11.20	8.33	17%	8.60	7.85	1.06	1.18	1.12	26%
CIVIL ENGINEERING AND CONSTRUCTION	564.75	2,603.00	4.61	3.41	32%	4.09	4.08	0.94	1.00	1.06	26%
CLINICAL MEDICINE	17,160.25	304,309.75	17.73	14.65	11%	12.12	11.01	1.13	1.33	1.17	17%
COMPUTER SCIENCES	2,059.75	8,708.75	4.23	3.14	44%	3.61	3.32	0.92	0.97	1.04	26%
CREATIVE ARTS, CULTURE AND MUSIC	171.25	86.25	0.50	0.37	83%	0.49	0.56	0.67	0.97	1.45	27%
EARTH SCIENCES AND TECHNOLOGY	6,208.75	72,259.25	11.64	8.29	17%	7.64	6.99	1.08	1.27	1.18	29%
ECONOMICS AND BUSINESS	1,358.25	8,372.00	6.16	5.29	28%	5.59	5.34	0.98	0.99	1.01	14%
EDUCATIONAL SCIENCES	434.00	2,374.00	5.47	4.44	29%	4.10	3.85	1.16	1.27	1.09	19%
ELECTRICAL ENGINEERING & TELECOMMUNICATION	1,465.50	8,404.50	5.73	4.57	36%	4.67	3.66	0.99	1.15	1.16	20%
ENERGY SCIENCE AND TECHNOLOGY	1,114.00	7,966.25	7.15	5.10	26%	4.65	4.75	1.07	1.32	1.23	29%
ENVIRONMENTAL SCIENCES AND TECHNOLOGY	5,692.00	69,982.25	12.29	9.38	13%	9.01	8.17	1.06	1.20	1.12	24%
GENERAL AND INDUSTRIAL ENGINEERING	504.25	2,852.00	5.66	4.32	26%	4.05	3.93	1.07	1.14	1.06	24%
HEALTH SCIENCES	2,282.00	22,411.00	9.82	8.11	18%	6.77	6.85	1.13	1.18	1.04	17%
HISTORY, PHILOSOPHY AND RELIGION	613.75	1,284.75	2.09	1.64	54%	1.49	1.82	1.08	1.27	1.18	22%
INFORMATION AND COMMUNICATION SCIENCES	197.00	920.00	4.67	4.06	26%	4.42	3.84	1.03	1.16	1.13	13%
INSTRUMENTS AND INSTRUMENTATION	410.25	3,514.00	8.57	4.78	31%	5.19	5.13	0.96	0.98	1.02	44%
LANGUAGE AND LINGUISTICS	184.00	423.00	2.30	1.75	49%	2.15	2.45	0.88	1.00	1.14	24%
LAW AND CRIMINOLOGY	156.00	1,198.00	7.68	5.76	24%	3.97	4.89	1.27	1.25	0.98	25%
LITERATURE	107.00	45.00	0.42	0.35	82%	0.23	0.41	1.67	1.20	0.72	18%
MANAGEMENT AND PLANNING	540.75	2,802.00	5.18	4.50	28%	5.02	5.03	0.99	1.03	1.04	13%
MATHEMATICS	1,573.25	7,917.00	5.03	3.47	38%	3.24	2.99	1.13	1.20	1.06	31%
MECHANICAL ENGINEERING AND AEROSPACE	1,100.50	6,930.50	6.30	4.69	29%	4.30	4.30	1.15	1.12	0.98	25%
MULTIDISCIPLINARY JOURNALS	415.75	29,448.50	70.83	59.35	11%	55.43	40.55	1.05	1.42	1.35	16%
PHYSICS AND MATERIALS SCIENCE	4,990.00	55,221.75	11.07	7.74	22%	7.73	6.45	1.06	1.23	1.15	30%
POLITICAL SCIENCE AND PUBLIC ADMINISTRATION	639.50	3,809.00	5.96	5.06	30%	3.99	3.33	1.05	1.46	1.38	15%
PSYCHOLOGY	1,532.75	13,878.75	9.05	7.29	19%	7.38	8.53	1.05	0.93	0.88	19%
SOCIAL & BEHAVIORAL SCIENCES, INTERDISCIPLINARY	591.00	3,918.25	6.63	5.58	27%	5.67	5.25	1.00	1.09	1.09	16%
SOCIOLOGY AND ANTHROPOLOGY	530.25	2,771.00	5.23	4.39	29%	4.42	4.47	1.00	1.06	1.06	16%
STATISTICAL SCIENCES	887.75	5,761.00	6.49	5.07	28%	5.18	4.71	1.06	1.14	1.08	22%

Bibliometric statistics for Norway and its benchmark countries across disciplines, Sweden, 2001-2009/2010

Discipline	P	C+sc	CPP+sc	CPP	% Pnc	JCSm	FCSm	MNCS/ MNJS	MNCS	MNJS	% Self Citations
AGRICULTURE AND FOOD SCIENCE	4,463.25	58,005.25	13.00	10.42	12%	9.68	8.14	1.09	1.34	1.23	20%
ASTRONOMY AND ASTROPHYSICS	2,510.00	44,718.75	17.82	12.16	15%	9.98	11.29	1.12	1.00	0.90	32%
BASIC LIFE SCIENCES	22,116.00	485,159.00	21.94	17.82	7%	16.32	15.21	1.08	1.24	1.15	19%
BASIC MEDICAL SCIENCES	2,183.50	26,507.75	12.14	9.32	14%	9.50	9.61	1.01	1.03	1.02	23%
BIOLOGICAL SCIENCES	9,431.50	157,357.00	16.68	13.48	11%	11.10	9.52	1.16	1.42	1.22	19%
BIOMEDICAL SCIENCES	21,422.25	371,337.25	17.33	13.98	9%	13.13	13.42	1.07	1.12	1.04	19%
CHEMISTRY AND CHEMICAL ENGINEERING	16,721.25	241,451.75	14.44	11.16	14%	10.84	8.74	1.06	1.33	1.25	23%
CIVIL ENGINEERING AND CONSTRUCTION	888.75	5,867.00	6.60	5.33	28%	4.80	4.62	1.12	1.18	1.05	19%
CLINICAL MEDICINE	46,403.00	853,522.25	18.39	15.29	10%	12.91	11.93	1.13	1.31	1.16	17%
COMPUTER SCIENCES	3,893.00	22,761.50	5.85	4.75	40%	4.44	3.69	1.00	1.10	1.10	19%
CREATIVE ARTS, CULTURE AND MUSIC	303.75	361.00	1.19	0.98	74%	0.71	1.06	0.81	1.56	1.92	17%
EARTH SCIENCES AND TECHNOLOGY	6,062.25	74,045.25	12.21	8.54	15%	8.05	7.56	1.08	1.21	1.12	30%
ECONOMICS AND BUSINESS	2,200.00	16,206.75	7.37	6.50	25%	6.07	5.52	1.07	1.18	1.11	12%
EDUCATIONAL SCIENCES	628.25	2,598.75	4.14	3.44	34%	3.76	3.76	0.96	1.06	1.10	17%
ELECTRICAL ENGINEERING & TELECOMMUNICATION	4,626.75	30,143.75	6.52	5.15	29%	4.78	4.24	1.12	1.24	1.10	21%
ENERGY SCIENCE AND TECHNOLOGY	3,048.25	25,451.00	8.35	5.78	23%	5.48	5.27	1.11	1.23	1.11	31%
ENVIRONMENTAL SCIENCES AND TECHNOLOGY	10,363.75	149,303.00	14.41	11.50	12%	10.07	8.86	1.11	1.32	1.20	20%
GENERAL AND INDUSTRIAL ENGINEERING	1,690.50	10,314.00	6.10	4.75	24%	4.85	4.63	1.01	1.08	1.06	22%
HEALTH SCIENCES	5,870.25	59,147.75	10.08	8.31	17%	7.39	7.48	1.11	1.13	1.02	18%
HISTORY, PHILOSOPHY AND RELIGION	707.00	1,483.00	2.10	1.61	51%	1.96	2.02	0.82	1.05	1.28	23%
INFORMATION AND COMMUNICATION SCIENCES	289.00	1,547.25	5.35	4.66	29%	4.42	4.08	0.99	1.22	1.24	13%
INSTRUMENTS AND INSTRUMENTATION	1,555.00	13,384.50	8.61	5.59	27%	4.92	5.67	1.09	1.05	0.96	35%
LANGUAGE AND LINGUISTICS	300.25	973.25	3.24	2.56	46%	3.06	3.19	0.95	1.09	1.14	21%
LAW AND CRIMINOLOGY	333.75	2,789.25	8.36	6.75	20%	5.00	5.65	1.26	1.28	1.02	19%
LITERATURE	245.25	79.00	0.32	0.25	85%	0.29	0.66	0.65	0.43	0.66	23%
MANAGEMENT AND PLANNING	1,066.00	6,670.00	6.26	5.54	26%	5.47	5.97	0.99	0.99	1.00	12%
MATHEMATICS	3,203.00	18,106.75	5.65	4.14	38%	3.39	3.21	1.17	1.30	1.10	27%
MECHANICAL ENGINEERING AND AEROSPACE	3,273.00	20,457.75	6.25	4.78	26%	4.73	4.46	1.04	1.10	1.06	24%
MULTIDISCIPLINARY JOURNALS	1,322.75	100,060.50	75.65	63.57	4%	61.76	42.16	1.05	1.57	1.49	16%
PHYSICS AND MATERIALS SCIENCE	22,780.50	261,233.75	11.47	8.29	23%	8.09	6.84	1.04	1.22	1.17	28%
POLITICAL SCIENCE AND PUBLIC ADMINISTRATION	547.00	3,037.00	5.55	4.93	30%	3.83	3.39	1.13	1.53	1.35	11%
PSYCHOLOGY	2,615.75	27,498.25	10.51	8.54	17%	8.16	8.56	1.05	1.11	1.05	19%
SOCIAL & BEHAVIORAL SCIENCES, INTERDISCIPLINARY	941.75	6,999.75	7.43	6.17	19%	6.94	5.94	0.89	1.11	1.24	17%
SOCIOLOGY AND ANTHROPOLOGY	803.25	3,349.00	4.17	3.44	32%	4.08	4.49	0.94	0.91	0.97	18%
STATISTICAL SCIENCES	1,444.00	9,574.25	6.63	5.52	28%	5.18	4.94	0.97	1.08	1.11	17%

Bibliometric statistics for Norway and its benchmark countries across disciplines, Switzerland, 2001-2009/2010

Discipline	P	C+sc	CPP+sc	CPP	% Pnc	JCSm	FCSm	MNCS/ MNJS	MNCS	MNJS	% Self Citations
AGRICULTURE AND FOOD SCIENCE	3,971.25	47,481.25	11.96	9.87	20%	8.35	7.37	1.19	1.35	1.13	17%
ASTRONOMY AND ASTROPHYSICS	3,832.75	88,103.00	22.99	16.31	10%	11.86	11.27	1.36	1.50	1.10	29%
BASIC LIFE SCIENCES	20,271.25	525,519.00	25.92	21.48	6%	19.39	15.71	1.15	1.47	1.28	17%
BASIC MEDICAL SCIENCES	2,923.25	46,646.00	15.96	12.68	11%	10.32	9.63	1.22	1.34	1.10	21%
BIOLOGICAL SCIENCES	7,979.50	136,197.25	17.07	13.63	12%	11.32	9.46	1.21	1.59	1.32	20%
BIOMEDICAL SCIENCES	21,007.00	438,850.25	20.89	17.26	9%	15.48	13.30	1.15	1.36	1.18	17%
CHEMISTRY AND CHEMICAL ENGINEERING	19,589.75	322,161.25	16.45	12.42	14%	11.46	9.32	1.16	1.43	1.23	24%
CIVIL ENGINEERING AND CONSTRUCTION	918.50	6,118.75	6.66	4.89	31%	4.21	4.17	1.13	1.15	1.02	27%
CLINICAL MEDICINE	41,880.50	779,537.00	18.61	15.59	13%	12.87	11.30	1.18	1.39	1.18	16%
COMPUTER SCIENCES	5,145.50	34,647.25	6.73	5.40	33%	4.10	3.41	1.48	1.65	1.12	20%
CREATIVE ARTS, CULTURE AND MUSIC	414.75	238.25	0.57	0.48	80%	0.50	0.65	0.77	1.14	1.47	16%
EARTH SCIENCES AND TECHNOLOGY	7,517.25	107,526.25	14.30	10.26	13%	8.34	7.28	1.24	1.47	1.18	28%
ECONOMICS AND BUSINESS	1,984.75	14,310.25	7.21	6.32	27%	5.21	4.97	1.27	1.32	1.03	12%
EDUCATIONAL SCIENCES	356.25	1,340.25	3.76	2.73	42%	3.10	4.63	1.06	0.75	0.70	27%
ELECTRICAL ENGINEERING AND TELECOMMUNICATION	4,568.00	35,711.00	7.82	6.09	30%	4.69	4.27	1.26	1.49	1.18	22%
ENERGY SCIENCE AND TECHNOLOGY	3,721.50	28,438.50	7.64	4.84	31%	4.02	4.68	1.25	1.12	0.90	37%
ENVIRONMENTAL SCIENCES AND TECHNOLOGY	7,565.00	118,473.25	15.66	12.21	12%	10.16	8.27	1.18	1.48	1.25	22%
GENERAL AND INDUSTRIAL ENGINEERING	910.25	6,880.50	7.56	5.59	24%	4.99	4.13	1.17	1.36	1.17	26%
HEALTH SCIENCES	2,710.50	30,509.50	11.26	8.88	17%	7.78	7.72	1.13	1.19	1.05	21%
HISTORY, PHILOSOPHY AND RELIGION	850.50	1,418.00	1.67	1.36	61%	1.33	1.77	0.98	0.92	0.94	18%
INFORMATION AND COMMUNICATION SCIENCES	250.25	1,792.00	7.16	5.53	26%	4.69	3.79	1.37	1.94	1.42	23%
INSTRUMENTS AND INSTRUMENTATION	2,907.00	23,783.00	8.18	5.13	29%	4.15	5.22	1.29	1.06	0.83	37%
LANGUAGE AND LINGUISTICS	272.25	768.25	2.82	2.16	57%	2.13	2.60	0.89	0.74	0.83	24%
LAW AND CRIMINOLOGY	604.00	3,347.00	5.54	4.14	36%	3.83	5.19	1.12	0.85	0.76	25%
LITERATURE	279.75	72.00	0.26	0.21	86%	0.30	0.44	0.86	0.67	0.78	18%
MANAGEMENT AND PLANNING	596.50	3,994.00	6.70	5.81	27%	5.54	5.59	1.21	1.17	0.97	13%
MATHEMATICS	2,881.00	14,400.25	5.00	3.57	36%	3.28	2.94	1.10	1.22	1.11	29%
MECHANICAL ENGINEERING AND AEROSPACE	2,215.75	16,712.50	7.54	5.38	26%	4.89	4.48	1.13	1.27	1.12	29%
MULTIDISCIPLINARY JOURNALS	1,869.25	148,640.75	79.52	68.51	7%	68.10	43.72	1.04	1.70	1.64	14%
PHYSICS AND MATERIALS SCIENCE	28,067.75	409,498.00	14.59	10.84	20%	9.11	7.11	1.22	1.54	1.26	26%
POLITICAL SCIENCE AND PUBLIC ADMINISTRATION	568.50	2,167.00	3.81	3.24	40%	3.11	3.27	1.05	1.11	1.06	15%
PSYCHOLOGY	2,556.25	22,252.00	8.70	6.59	22%	6.58	7.69	1.07	0.98	0.92	24%
SOCIAL AND BEHAVIORAL SCIENCES, INTERDISCIPLINARY	414.25	3,223.00	7.78	6.68	26%	5.77	5.59	1.04	1.23	1.19	14%
SOCIOLOGY AND ANTHROPOLOGY	483.00	2,389.00	4.95	3.98	32%	3.99	4.60	1.01	1.01	0.99	20%
STATISTICAL SCIENCES	1,385.75	9,282.00	6.70	5.31	28%	4.59	4.52	1.27	1.33	1.04	21%

Appendix 6: Bibliometric statistics for RCN, Decision versus Field, 2001-2009/2010.

Decision / Fielde	P	C+sc	CPP+sc	CPP	% Pnc	MNCS/ MNJS	MNCS	MNJS	% Self Cit
3 - Bevilgning / Humaniora	733.25	10,872.00	14.83	10.73	21%	1.02	1.18	1.15	28%
3 - Bevilgning / Landbruks- og fiskerifag	3,605.50	46,940.50	13.02	9.82	12%	1.13	1.35	1.20	25%
3 - Bevilgning / Matematikk og naturvitenskap	8,786.50	140,148.50	15.95	11.74	14%	1.11	1.38	1.24	26%
3 - Bevilgning / Medisinske fag	7,832.50	166,849.25	21.30	17.28	9%	1.15	1.41	1.22	19%
3 - Bevilgning / Samfunnsvitenskap	3,392.50	46,012.75	13.56	10.25	17%	1.12	1.34	1.20	24%
3 - Bevilgning / Teknologi	8,395.50	121,882.50	14.52	11.08	16%	1.08	1.27	1.18	24%
3 - Bevilgning / Annet	1,416.25	18,911.50	13.35	10.01	15%	1.11	1.39	1.26	25%
3 - Bevilgning / Ukjent	378.75	7,490.00	19.78	15.57	9%	1.46	1.68	1.15	21%
4 - Avsluttet / Humaniora	2,237.75	32,266.75	14.42	10.85	22%	1.10	1.30	1.18	25%
4 - Avsluttet / Landbruks- og fiskerifag	8,131.50	120,496.75	14.82	11.30	12%	1.13	1.34	1.18	24%
4 - Avsluttet / Matematikk og naturvitenskap	18,137.00	268,139.50	14.78	11.01	15%	1.08	1.27	1.17	25%
4 - Avsluttet / Medisinske fag	14,520.00	280,472.25	19.32	15.70	10%	1.11	1.29	1.16	19%
4 - Avsluttet / Samfunnsvitenskap	8,339.00	107,195.00	12.85	10.02	17%	1.08	1.23	1.15	22%
4 - Avsluttet / Teknologi	18,407.75	267,911.25	14.55	11.32	16%	1.09	1.26	1.15	22%
4 - Avsluttet / Annet	5,453.00	84,619.75	15.52	11.29	14%	1.10	1.33	1.22	27%
4 - Avsluttet / Ukjent	321.75	4,567.50	14.20	10.88	11%	1.07	1.26	1.17	23%
6 - Avslag / Humaniora	4,074.00	59,730.25	14.66	11.57	21%	1.12	1.31	1.17	21%
6 - Avslag / Landbruks- og fiskerifag	10,142.75	139,139.75	13.72	10.53	13%	1.12	1.28	1.14	23%
6 - Avslag / Matematikk og naturvitenskap	25,797.75	368,795.00	14.30	10.89	16%	1.08	1.23	1.14	24%

6 - Avslag / Medisinske fag	22,016.00	380,742.50	17.29	13.95	11%	1.11	1.26	1.13	19%
6 - Avslag / Samfunnsvitenskap	13,757.00	185,472.25	13.48	10.49	17%	1.08	1.24	1.14	22%
6 - Avslag / Teknologi	21,576.00	322,017.75	14.92	11.63	15%	1.09	1.26	1.16	22%
6 - Avslag / Annet	2,098.00	34,983.00	16.67	12.32	12%	1.13	1.45	1.28	26%
6 - Avslag / Ukjent	333.25	2,659.25	7.98	5.89	29%	0.86	0.96	1.11	26%

Humaniora	Humanities
Landbruks- og fiskerifag	Agriculture & Fisheries
Matematikk og naturvitenskap	Mathematics & natural sciences
Medisinske fag	Medical sciences
Samfunnsvitenskap	Social sciences
Teknologi	Engineering sciences
Annet	Other
Ukjent	Unknown

Appendix 7: Bibliometric statistics for RCN, Decision versus Field, 2001-2009/2010.

Decision		P	C+sc	CPP+sc	CPP	Pnc	MNCS/ MNJS	MNCS	MNJS	% Self Citations
Annet	Never/sometimes	1,930	30,164	15.63	11.30	13%	1.08	1.42	1.10	28%
Annet	Often	4,785	77,566	16.21	12.04	13%	1.13	1.36	1.13	26%
Annet	Frequent/always	843	9,512	11.29	8.05	19%	1.01	1.21	1.02	29%
Humaniora	Never/sometimes	2,348	35,767	15.23	12.17	22%	1.11	1.27	1.15	20%
Humaniora	Often	2,154	29,635	13.76	10.62	19%	1.15	1.37	1.22	23%
Humaniora	Frequent/always	435	12,378	28.46	19.66	15%	1.17	2.01	1.34	31%
Landbruks- og fiskerifag	Never/sometimes	5,441	69,029	12.69	9.58	14%	1.08	1.20	1.08	24%
Landbruks- og fiskerifag	Often	7,193	106,538	14.81	11.34	12%	1.14	1.33	1.13	23%
Landbruks- og fiskerifag	Frequent/always	1,913	30,615	16.01	12.22	13%	1.20	1.53	1.25	24%
Matematikk og naturvitenskap	Never/sometimes	14,268	199,265	13.97	10.52	16%	1.05	1.18	1.04	25%
Matematikk og naturvitenskap	Often	16,330	246,056	15.07	11.38	15%	1.11	1.30	1.08	24%
Matematikk og naturvitenskap	Frequent/always	3,417	53,289	15.60	11.47	16%	1.11	1.38	1.13	26%
Medisinske fag	Never/sometimes	14,859	248,115	16.70	13.44	11%	1.09	1.22	1.09	20%
Medisinske fag	Often	12,383	228,660	18.47	14.88	10%	1.13	1.31	1.11	19%
Medisinske fag	Frequent/always	2,820	56,142	19.91	16.28	10%	1.13	1.36	1.15	18%
Samfunnsvitenskap	Never/sometimes	7,372	98,621	13.38	10.45	18%	1.06	1.16	1.05	22%
Samfunnsvitenskap	Often	8,348	115,377	13.82	10.67	15%	1.10	1.30	1.11	23%
Samfunnsvitenskap	Frequent/always	2,124	34,820	16.39	12.33	16%	1.16	1.51	1.21	25%
Teknologi	Never/sometimes	11,295	169,676	15.02	11.62	15%	1.09	1.26	1.10	23%
Teknologi	Often	16,304	245,884	15.08	11.69	15%	1.10	1.29	1.09	22%
Teknologi	Frequent/always	4,782	70,138	14.67	11.36	18%	1.09	1.32	1.13	23%
Ukjent	Never/sometimes	225	3,406	15.14	11.16	12%	1.21	1.37	1.18	26%
Ukjent	Often	629	8,624	13.72	10.69	18%	1.18	1.35	1.13	22%

Ukjent	Frequent/always	46	549	11.93	10.13	15%	1.21	1.56	1.24	15%

Humaniora	Humanities
Landbruks- og fiskerifag	Agriculture & Fisheries
Matematikk og naturvitenskap	Mathematics & natural sciences
Medisinske fag	Medical sciences
Samfunnsvitenskap	Social sciences
Teknologi	Engineering sciences
Annet	Other
Ukjent	Unknown