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Uppsala University Annual Bibliometric Monitoring

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Table of Contents

Abstract

Uppsala University Annual Bibliometric Monitoring produces statistics on publication volume, publishing level, citation impact, collaboration (in terms of co-publishing) and open access. The aggregation level is primarily department, which means that it is primarily the departments of Uppsala University that are the units of analysis in the monitoring. Two main data sources are used: the local publication database of Uppsala University, DiVA, and the in-house version of the Web of Science database available at the Centre for Science and Technology Studies at Leiden University, the Netherlands. The considered publication period is 2012-2020. The results are presented in graphs or in tables, and in the next to last section, the results are briefly summarized. Regarding the domain Humanities and Social Sciences, and the indicator proportion of publication fractions at level 2 (in the Norwegian model), the departments *Archeology and Ancient History*, *Gender Research* and *Philosophy* all have an increase of between 15 and 16 percentage units from the publication period 2013-2015 to the period 2018-2020. The highest values on the citation indicators, with respect to the domain Medicine and Pharmacy and the whole publication period, are observed for the three departments *Medical Biochemistry and Microbiology*, *Immunology, Genetics and Pathology* and *Pharmacy*. For the domain Science and Technology, the three biology departments, *Cell and Molecular Biology*, *Ecology and Genetics* and *Organismal Biology*, all have high values on the citation indicators with respect to the whole publication period.

1 Introduction

Uppsala University (UU) *Annual Bibliometric Monitoring* (ABM) produces statistics on publication volume, publishing level, citation impact, collaboration (in terms of co-publishing) and open access (OA). The aggregation level is primarily department, which means that it is primarily the departments of UU that are the units of analysis in ABM. However, the first subsection of the results section below reports outcomes for UU as a whole.

Values of several bibliometric indicators are obtained for the departments included in ABM. Indicator values are obtained by publication year. However, 3-year moving averages are generally applied.

In "Quality and Renewal 2017" ("Kvalitet och förnyelse 2017") (Malmberg et al., 2017), the peer assessments were complemented with a bibliometric report. One conclusion of the exercise was that an annual bibliometric report was desirable. The ABMs are a response to this conclusion and present extensive bibliometric statistics with regard to the UU departments.

UU has six development goals to renew education and research.[1] For goal 2, "Develop research excellence", the citation impact indicator *proportion of frequently cited publications (top 10%)*, an indicator described in Section 2.2, is particularly relevant among the indicators included in ABM. The two collaboration indicators of ABM (Section 2.3)–*proportion of international collaborative publications* and *proportion of publications with industry*–are both relevant for goals 3 and 6, "Strengthen transdisciplinary and challenge-driven research" and "Develop collaboration", respectively.

The remainder of this report is structured as follows. Section 2 treats the data and methods of ABM. The results of ABM are reported in Section 3, whereas the results are briefly summarized in Section 4. Concluding remarks are given in Section 5.

2 Data and methods

Two main data sources are used in ABM: the local publication database of UU, DiVA, and the in-house version of the Web of Science (WoS) database available at the Centre for Science and Technology Studies (CWTS) at Leiden University, the Netherlands. The latter database is accessed via CWTS Monitor, a tool for bibliometric analysis of WoS publications and provided by CWTS. We

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[1] https://uu.se/en/about-uu/mission-goals-strategies/mission-goals-strategies/

used version 2021/2 in ABM 2021. DiVA data, or more precisely DiVA data as it appears in GLIS (*Generellt Lednings Informations System*), is used for the analysis according to the Norwegian model, and for obtaining the publication volume tables of the results section, whereas CWTS Monitor is used for the analysis of citation impact and collaboration. For the OA analysis, we use the same DiVA/GLIS data used for the Norwegian model analysis, combined with OA data from Unpaywall, OpenAPC and Sherpa Romeo.

In the Norwegian model, as well as in the citation analyses in ABM, author fractionalization is used. An author of a publication is assigned $1/n$ of the publication, where n is the number of authors of the publication. The fraction of the publication assigned to a given UU department is the sum of the author fractions with regard to the authors affiliated to the department. Note, though, that if an author is affiliated to m ($m \geq 2$) UU departments in a publication, the author contributes with $1/(n \times m)$ author fraction to all m departments (the author fraction an UU department has of a publication is more formally defined in Appendix 1).

In the citation analyses and in the collaboration analyses of ABM, only the WoS publication types "Article" and "Review" are taken into account. Further, in these two types of analyses, only core publications are used. Core publications are publications in international scientific journals in fields that are suitable for citation analysis.[2] In the citation analyses, author self-citations are excluded. A citation is counted as an author self-citation if the citing and the cited publication have at least one common author name.

For OA, we use full counts at the department level: each affiliated department is assigned the publication. OA is measured by defining the open access status for each publication and counting the number of publications affiliated to each department.

We use the following condition for department inclusion in the Norwegian model, the collaboration and the OA analyses:

(a) The researchers of the department have not their main affiliation to another unit.

Information on (a) was obtained from the offices for the three scientific domains of UU. These three domains are Humanities and Social Sciences (HumSam), Medicine and Pharmacy (MedFarm), and Science and Technology (TekNat).

With regard to the citation analyses of ABM, the following two inclusion conditions are applied:

(a) the researchers of the department have not their main affiliation to another unit, and
(b) the department has at least 40 (core) publications (of the types "Article" and "Review") in the period 2012-2019.

For each table below that reports citation analysis results, the expression "null" in a cell indicates that condition (a), but not condition (b), is satisfied by the department corresponding to the row of the cell.

2.1 The Norwegian Model

The Norwegian model considers publishing volume and publishing level. For level, the model does not use citations. Instead, the model takes into account the extent to which publications from a unit of analysis are published in publishing channels with large prestige. The channels that are considered in the model are journals, publishers and series. A large number of channels have been assessed in Norway by subject experts and assigned to one of three levels: level 0 (non-scientific channel), level 1 (scientific channel), and level 2 (scientific channel with extra-large prestige).

The Norwegian model comprises three publication types: article in journal or series, article in anthology and monograph. Conference papers are taken into account. If the host publication of a conference paper belongs to a series, the paper is classified as article in journal or series, otherwise the paper is classified as article in anthology. The weight of a publication is determined by its type and by the level of its channel. How publications are weighted is reported in Table 1.

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[2] For more on core journals, see the CWTS Leiden Ranking page
https://www.leidenranking.com/information/indicators.

Table 1. The weights of the Norwegian model as a function of publication type and publishing level.

Publication type	Level 1	Level 2
Article in journal or series	1	3
Article in anthology	0,7	1
Monograph	5	8

The publishing channels at level 2 in a given research field should publish a certain proportion (20%) of the publications of the field. By this rule, comparisons across fields are fairer, compared to if a certain number of channels, constant across fields, had been stipulated for level 2. The reason for this is that the access to level 2 channels becomes more equal across fields. Note that the proportion publications at level 2 for a given unit of analysis can be seen as a quality indicator (Schneider, 2009).

Some publications are excluded in analyses according to the Norwegian model, for instance:

- Letter to the editor

- Working reports

- Publications where the author has editorship

- Popular scientific publications

Each unit of analysis is assigned a publication score, a weighted expression for publishing volume and publishing level. The scores are obtained by multiplying author fractions by weights. For example, the publication score for a department, for a given publication year, with respect to articles published in level 2 journals is equal to the sum of the department author fractions over the articles (published in the year) multiplied by 3, the weight for a an article published in a level 2 journal (Table 1).

In ABM, each considered UU department is assigned a publication score for each considered publication year. In the application of the Norwegian model, the publication period is 2013-2020.

2.2 Field Normalized Citation Impact

An important principle in evaluative bibliometrics is to compare like with like. It is a fact that citation volumes are not equal across research fields. For instance, the volumes are considerably larger in biomedicine than in pure mathematics. This is due to different citation practices in the two fields. If publications from fields as these two should be compared with regard to citation impact, some form of normalization of raw citation scores should be performed. In ABM, all used citation impact indicators are *field normalized*.

The publication period used for the citation analyses is 2012-2019. The end publication year in the version of CWTS Monitor used is 2019. Further, a later end year than 2019 would not be proper due to an inappropriately short citation window.

ABM makes use of two kinds of field normalized citation indicators: publication-level indicators and journal-level indicators. In the next section, we treat the former ones, whereas the latter ones are treated in the section after the next section.

2.2.1 Publication-level indicators

Two publication-level indicators are used, namely *mean normalized number of citations per publication* (MNCS) and *proportion of frequently cited publications (top 10%)* (PP(top 10%)). These two indicators, which complements each other, are used, for instance, in the CWTS Leiden Ranking 2021.[3] For both MNCS and PP(top 10%), and for the two journal-level indicators described below, a subject classification of publications is used for normalization purposes. The classification is generated by application of an advanced clustering methodology, in which a publication-publication relatedness measure based on direct citations between publications is utilized (Waltman & van Eck, 2012). The

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classification, which contains about 4,000 classes, is such that each publication belongs to exactly one class.[4]

Regarding MNCS, and for each publication from a given department, the citation score of the publication is divided by the mean citation score across the publications, published in the same year as the publication, in the class to which the publication belongs. The resulting value is a (field) normalized citation score (NCS) for the publication. The MNCS for the department is then obtained by dividing the weighted sum of NCS values over the publications from the department–where the weight of a publication consists of the author fraction the department has of the publication–by the sum of the department author fractions over the publications. If the department has a MNCS of, say, 1.2, the department performs 20% above world average (= 1).

For PP(top 10%), and publication i from the department, the same class in the classification is used as in the calculation of the NCS for i. The citation score distribution for the class, with respect to publications published the same year as i, is obtained, and the extent to which i belongs to the 10% most frequently cited publications is determined. The result for i is a value in the interval [0, 1], say (top 10%)$_i$.[5] PP(top 10%) for the department is then obtained by dividing the weighted sum of (top 10%) values over the publications from the department–where the weight of a publication consists of the author fraction the department has of the publication–by the sum of the department author fractions over the publications (cf. the calculation of MNCS). If the department has a PP(top 10%) value of, say, 8, the department performs 20% below the world average (= 10).

2.2.2 Journal-level indicators

The two publication-level citation indicators are complemented by two corresponding journal-level citation indicators, namely *mean normalized journal impact score per publication* (MNJS) and *mean journal proportion of top 10% publications* (MJPP(top 10%)).

For MNJS, each journal is first assigned an impact score, NJS, for each of the considered publication years. NJS, for a given year, is equal to the mean across the NCSs of the publications in the journal published that year. Thus, NJS is a field normalized variant of the well-known Journal Impact Factor, values of which is available in Journal Citation Reports (provided by Clarivate Analytics). The latter indicator is not field normalized, however. Now, for a department and each publication from the department, the department author fraction of the publication is multiplied by the NJS of the journal of the publication with respect to the publication year of the publication. These operations yield a weighted sum over the publications from the department, and this sum is divided by the sum of the department author fractions over the publications. The result of the division is the MNJS for the department. Like MNCS, the world average for its journal-level counterpart, MNJS, is equal to 1.

The MJPP(top 10%) indicator is calculated as follows. For each combination of a journal, a class, and a publication year, the proportion of the publications in that journal, class, and year that belong (to a degree in the interval [0, 1]) to the 10% most frequently cited publications in that class and year is determined. This yields a PP(top 10%) value for each combination of a journal, a class, and a year. This value is assigned to all publications in that journal, class, and year. In this way, each publication obtains a JPP(top 10%) value. The MJPP(top 10%) value of a department is obtained dividing the weighted sum of JPP(top 10%) values over the publications from the department–where the weight of a publication consists of the author fraction the department has of the publication–by the sum of the department author fractions over the publications.

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[4] The traditional approach to field normalization typically uses the journal subject categories in WoS. However, one problem with the traditional approach is that the subfields of a certain field, where the fields are defined at a given level of granularity, might differ substantially from each other in terms of citation volume (e.g., van Eck et al., 2013). Moreover, it is clearly more reasonable to group the publications themselves into subject classes than to group the publications into such classes based on subject class membership of their journals.

[5] The approach to assign fractions of publications to the (for instance) 10% most frequently cited publications is described and discussed by Waltman and Schreiber (2013). The approach has the property to produce exactly 10% top 10% publications. In Appendix 1, we show how the extent to which publication i belongs to the 10% most frequently cited publications is calculated.

2.3 Collaboration

ABM uses two collaboration indicators: *proportion of international collaborative publications* (PP(int collab)) and *proportion of publications with industry* (PP(industry)). PP(int collab) for a department is the proportion of its publications that have been co-authored with two or more countries, whereas PP(industry) for a department is the proportion of its publications that have been co-authored with one or more industrial organizations. All private sector for profit business enterprises, covering all manufacturing and services sectors, are regarded as industrial organizations.

Here, and normally, full counts (and not fractional counts) are used for collaboration analysis. This means, taken international collaboration as an example, that if an UU department publication has at least one foreign address, relative to Sweden, the department is assigned one international collaborative publication, regardless of the author fraction the department has of the publication. If fractional counts are used, collaboration might be underestimated. However, publications with many organizations, like some of the publications in certain subfields of physics, do not indicate, to any larger extent, collaboration between the involved organizations. Such publications are included in the analysis.

For the collaboration part of ABM, the publication period is 2012-2019.

2.4 Open Access

Explained in a simple way, OA is the concept of publications distributed online, free of cost or other access barriers to the reader. In the research policy bill "Forskning, frihet, framtid" (Prop. 2020/21:60), the Government's national direction towards open science states that scientific publications, which are the result of research financed with public funds, should be published using immediate OA, with effect from year 2021. It is a shared responsibility for all actors in the research system that the direction towards immediate OA is followed and achieved. Large national and international funders, such as the Swedish Research Council and Horizon 2020 (European Commission), also mandate OA publishing. This makes it relevant to measure the trend of OA publishing at UU.

How far the shift to OA publishing has come and the possibility and simplicity to achieve OA differs greatly between fields and publication patterns (Piwowar et al., 2018). It should be kept in mind that the results for OA presented in ABM are not field normalized, so direct comparisons between different fields or departments should be avoided.

There are different ways for a researcher to achieve OA and different ways to define a source of a publication as being OA. In ABM, we use the following definitions with respect to OA types of publications:

Gold OA: Articles published in an OA journal, in which all articles are accessible directly and freely on the journal or publisher website; books and book chapters accessible directly and freely on the publisher website. Gold OA may or may not involve publication fees (APC).

Hybrid OA: Articles published in a subscription journal but that are immediately free to read under an open license, in exchange for publication fees (APC).

Green OA: Accepted author manuscript versions or versions of record of articles published in a journal, but self-archived in open institutional or subject specific repositories, usually after an embargo period; self-archived books and book chapters. Green OA publications that also satisfies the definition for Gold or Hybrid OA are only assigned to these latter types and are thereby not counted as Green OA in ABM.

Bronze OA: Publications free to read on the journal or publisher website, but lack a clearly identifiable license or other open access-information. Bronze OA is not included in ABM.

In ABM, we use DiVA, OpenAPC and Unpaywall as primary sources to determine if a publication is OA, and, if this is the case, to determine the OA type of the publication. A publication *P* is considered to be OA in ABM if at least one of the following three conditions is satisfied:

1) *P* is classified as "gold", "hybrid" or "green" OA in Unpaywall (preprints excluded from "green").
2) *P* is classified as "gold" or "hybrid" in OpenAPC.
3) The full text of *P* is published OA in DiVA.

Some publications are reclassified as "hybrid" from "green" if data in both DiVA and Sherpa Romeo supports the reclassification.

For the OA part of ABM, the publication period is 2013-2020. The publication types taken into account are the same that are used in the Norwegian model analysis, i.e. article in journal or series, article in anthology and monograph.

3 Results

In this section, we report the results of ABM. We first give, as a background, some results for UU as a whole. We then report the results for the UU departments, grouped by scientific domain.

Each of the sections 3.2-3.4, which corresponds to scientific domains, initially puts forward tables, which correspond to faculties and which report publication volumes (absolute and relative) and WoS coverage by department and publication type. Regarding WoS coverage, the validity of bibliometric indicators are in general higher if the coverage is high compared to low. Within a given section corresponding to a scientific domain, like Section 3.2, the other results are grouped based on what is analyzed: publishing volume and publishing level (the Norwegian model), field normalized citation impact, collaboration, and OA. Within a group of the indicated kind, the results are grouped by faculty. Regarding the Norwegian model analysis, publication volumes per department and year are reported in Appendix 2.

Note that, as is indicated in the section "Data and methods", the results for publication volume, the Norwegian model and OA are based on DiVA, whereas the results for citation impact and collaboration are based on the in-house version of WoS available at CWTS.

3.1 UU as a whole

In Figure 1, an overview of the subject profile of UU is given.[6] In the map of the figure, all WoS subject categories in which UU has at least one publication of the types "Article" or "Review" and published in the period 2010-2019 are represented (239 categories). The size of a node indicates the publication output of UU in the corresponding category, whereas the color of a node indicates citation impact, measured by the indicator MNCS. Note that the MNCS is determined only by the locally relevant scientific neighborhoods of the publications, i.e. by the classes of the publications (cf. Section 2.2), instead of the subject categories at large. The color coding is as follows:

- Blue: The MNCS, determined as indicated above, of the UU publications selected based on the subject category is far below world average
- Green: The MNCS, determined as indicated above, of the UU publications selected based on the subject category is around world average.
- Red: The MNCS, determined as indicated above, of the UU publications selected based on the subject category is far above world average.

Observe that the number of publications in some subject categories is very low. In such cases, the color of the category should be interpreted with caution.

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[6] The subject profile overview was inspired by the CWTS web page at the following address: https://www.vosviewer.com/university-profile-maps.
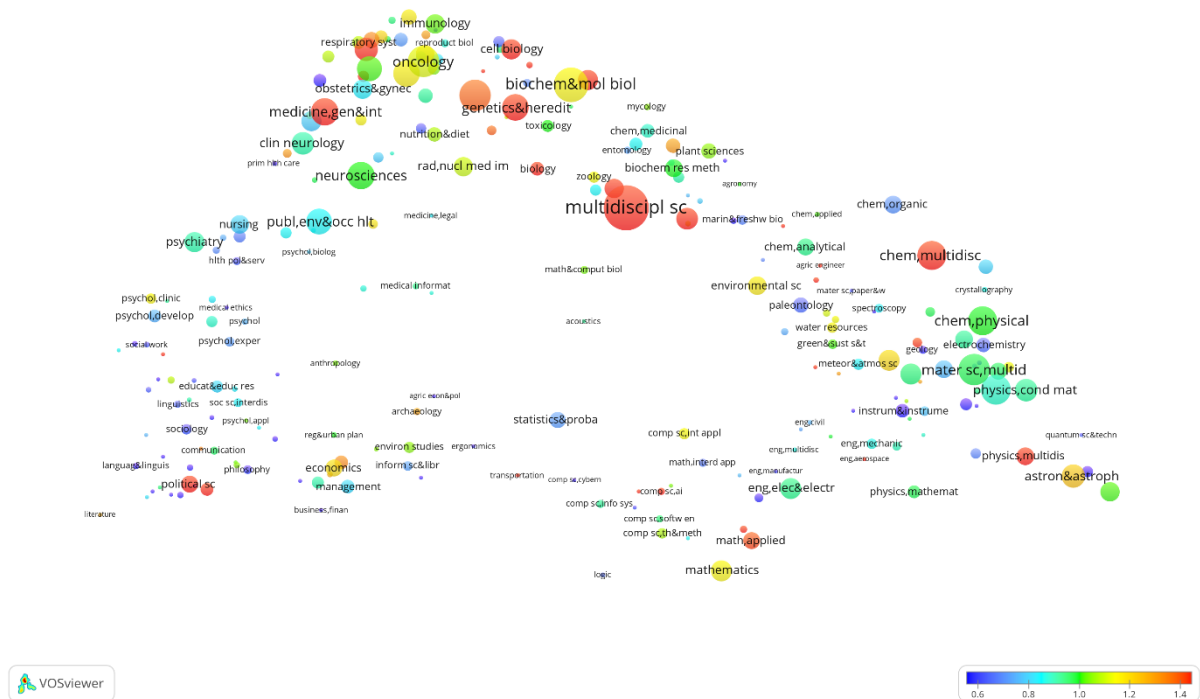
Figure 1. Subject profile map for UU. Publication period: 2010-2019.

In Figure 2, UUs proportion (in %) of the total number of publication fractions (P) for UU in combination with 10 benchmarking universities (see Table 2) is shown by publication year. The figure also shows UUs proportion of the total number of publication fractions belonging to the top 10% most frequently cited (P(top 10%)) for the same combination, where class (and thereby subject) and publication year of the publications are taken into account. The figure can be interpreted as the research production of UU over time, relative to a comparable set of universities.
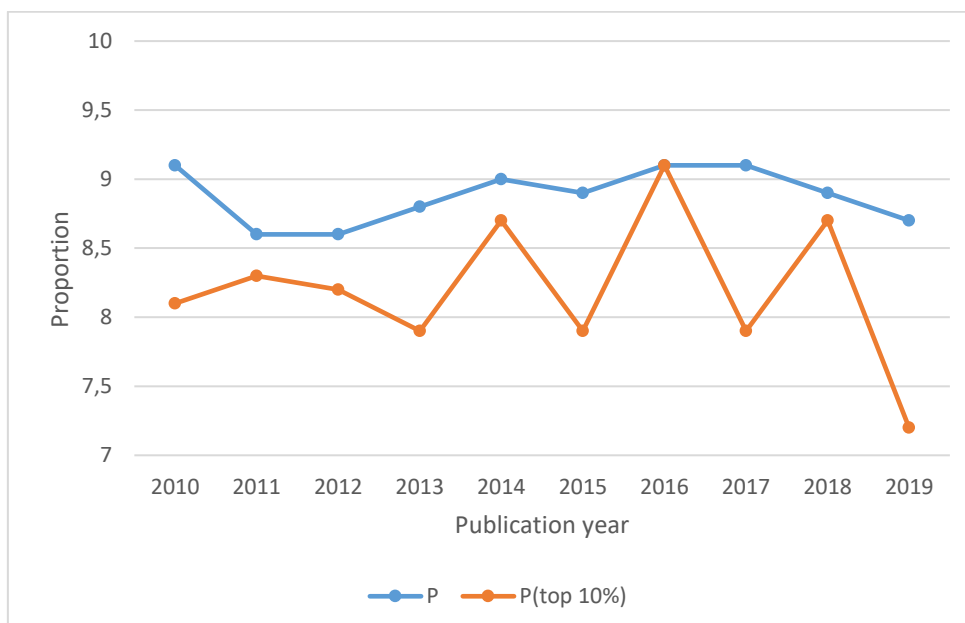

Figure 2. UUs proportion of publication fractions and of publication fractions belonging to the top 10% most frequently cited, by publication year and with regard to UU in combination with 10 benchmarking universities. Publication period: 2010-2019.

In Table 2, the 10 benchmarking universities are listed, together with a brief motivation for their inclusion.

Table 2. The 10 benchmarking universities.

Benchmark university	Brief motivation for inclusion
Durham University	European reference, belonging to the Matariki[7] network
Eberhard Karls University Tübingen	European reference, belonging to the Matariki and Guild[8] networks
Ghent University	European reference, belonging to U4Society[9] and Guild
Lund University	Swedish reference, belonging to the SLUG[10] network
Stockholm University	Swedish reference, belonging to the SLUG network
University of Copenhagen	Nordic reference
University of Gothenburg	Swedish reference, belonging to the SLUG network
University of Groningen	European reference, belonging to U4Society and Guild
University of Helsinki	Nordic reference
University of Oslo	Nordic reference

In Figure 3, UUs proportion of OA publications, and UUs proportion by OA type, relative to the total publication output are shown (the proportions are given as percentages). For UU as a whole, the proportion of OA publications is increasing during the considered publication period (the uppermost curve). Note that, for a given publication period, the proportion Total OA is equal to the sum of the proportions across the three OA types.
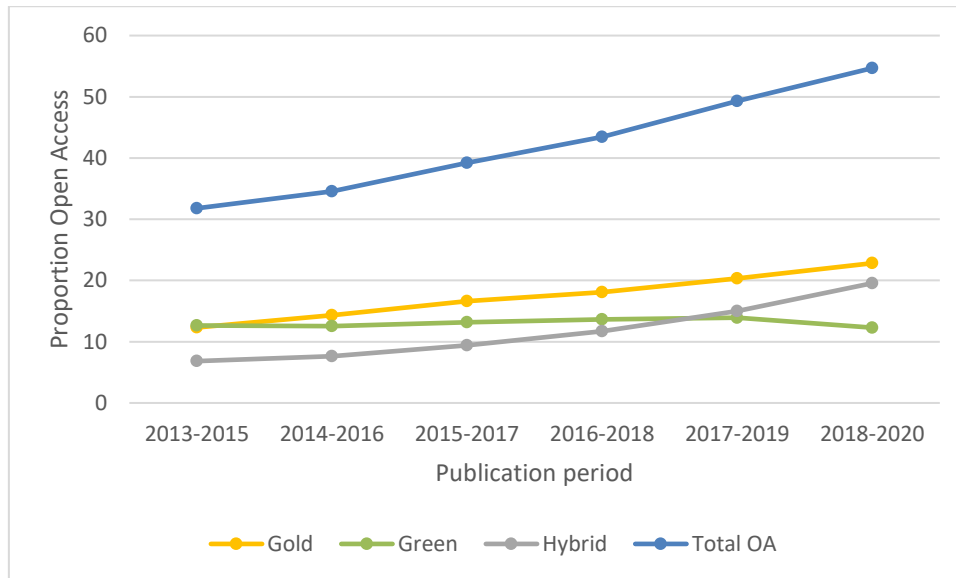

Figure 3. UUs proportion of OA publications, and UUs proportion by OA type, relative to the total publication output. Publication period: 2013-2020. 3-year moving average.

3.2 Humsam

The number of HumSam units of analysis included in ABM is 31: 28 departments and three faculties. For the latter, *Faculty of Law* and *Faculty of Theology* consists of only one large department each, responsible for all publications, and nearly all the publications of the *Faculty of Education* belong to the *Department of Education*.

Tables 3-6 report publication volume in terms of both fractional counts and full counts (within parentheses) by department (by faculty for Table 4) and publication type, and WoS coverage. WoS

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[7] The Matariki network is an international group of seven universities.

[8] The Guild is a network of 21 European universities.

[9] U4Society is a collaboration between five European universities.

[10] SLUG is a Swedish network of the Stockholm, Lund, Uppsala and Gothenburg universities.

coverage concerns the number of WoS publications of the four types represented in the tables relative to all publications of these types for the department.

Table 3. Faculty of Arts. Publication volume by publication type, and WoS coverage (in %). Publication period: 2012-2020.

Department	Publication type					
	Article	Article in anthology	Monograph	Conference paper	Total	WoS coverage
ALM	87,6 (127)	70 (88)	6,3 (8)	17 (32)	180,9 (255)	27,5
Archeology and Ancient History	191,4 (307)	236 (258)	20,2 (25)	20,1 (28)	467,7 (618)	20,9
Art History	76 (99)	76,7 (79)	7,8 (9)	19,2 (30)	179,7 (217)	21,1
Cultural Anthropology and Ethnology	107,9 (131)	123,6 (142)	27,2 (36)	4,3 (5)	263 (314)	11,3
Game Design	13,7 (22)	0,3 (1)	50 (50)	13,5 (22)	77,5 (95)	9,9
Gender Research	117 (163)	102,4 (130)	10,2 (13)	8,1 (14)	237,9 (320)	22,5
History	179,8 (203)	247,4 (273)	29,8 (35)	17,6 (19)	474,7 (530)	18,7
History of Sciences and Ideas	123,1 (137)	127,4 (140)	11,7 (15)	2,3 (3)	264,5 (295)	17,4
Literature	104,8 (118)	245 (268)	41,8 (45)	4,1 (6)	395,7 (437)	3,2
Musicology	79,5 (84)	59,5 (63)	8,3 (9)	1 (1)	148,3 (157)	12,9
Philosophy	167,6 (179)	132,6 (145)	13,1 (15)	10,5 (11)	323,8 (350)	26,8

Table 4. Faculty of Education, Faculty of Law and Faculty of Theology. Publication volume by publication type, and WoS coverage (in %). Publication period: 2012-2020.

Faculty	Publication type					
	Article	Article in anthology	Monograph	Conference paper	Total	WoS coverage
Faculty of Education	348,6 (515)	290,9 (375)	34,7 (47)	46,5 (72)	720,7 (1009)	22,2
Faculty of Law	537 (603)	567,8 (599)	107,7 (129)	8,6 (11)	1221,1 (1342)	4,7
Faculty of Theology	288,5 (331)	384,1 (414)	69 (80)	15 (16)	756,6 (841)	15,1

Table 5. Faculty of Languages. Publication volume by publication type, and WoS coverage (in %). Publication period: 2012-2020.

Department	Publication type					
	Article	Article in anthology	Monograph	Conference paper	Total	WoS coverage
English	129,1 (145)	118,3 (128)	15,8 (17)	5 (6)	268,1 (296)	23,8
Linguistics and Philology	260 (323)	281,5 (313)	49,8 (56)	127,6 (192)	718,8 (884)	11,7
Modern Languages	210,5 (231)	227,4 (243)	14,5 (18)	29,5 (35)	481,9 (527)	9,4
Scandinavian Languages	299,3 (331)	150,7 (169)	15,3 (19)	53,6 (63)	519 (582)	4,7

Table 6. Faculty of Social Sciences. Publication volume by publication type, and WoS coverage (in %). Publication period: 2012-2020.

Department	Publication type					
	Article	Article in anthology	Monograph	Conference paper	Total	WoS coverage
Business Studies	244,5 (376)	240,1 (320)	41,5 (60)	99,1 (131)	625,2 (887)	26,1
Economic History	116,9 (153)	171,4 (201)	30,8 (38)	21,8 (29)	341 (421)	18,9
Economics	163,8 (301)	5,5 (8)	2,7 (4)	0,0 (0)	172 (313)	82,8
Food Studies, Nutrition and Dietetics	63,6 (154)	36,8 (43)	1,5 (2)	2,2 (4)	104,1 (203)	49,7
Government	313,8 (453)	208,8 (251)	31,7 (36)	25,5 (28)	579,8 (768)	39,0
Housing and Urban Research	165,2 (293)	134,1 (175)	15,7 (20)	32 (40)	347 (528)	26,4
Informatics and Media	102,9 (157)	97,8 (123)	9,4 (12)	69,5 (112)	279,7 (404)	28,0
Peace and Conflict Studies	238,6 (303)	149,6 (178)	21,3 (27)	12,3 (16)	421,7 (524)	44,2
Psychology	357,1 (777)	30,2 (40)	4,2 (6)	13,8 (20)	405,2 (843)	77,6
Russian and Eurasian Studies	227,5 (274)	138,3 (152)	18,9 (22)	10,8 (12)	395,5 (460)	22,1
Social and Economic Geography	141,2 (208)	55,8 (69)	8,3 (10)	5,5 (7)	210,8 (294)	52,7
Sociology	229,9 (338)	146,1 (191)	20,1 (28)	24,7 (33)	420,9 (590)	32,4
Statistics	76,1 (169)	1 (1)	1 (2)	2,5 (9)	80,5 (181)	88,7

3.2.1 Publishing Volume and Publishing Level – The Norwegian Model
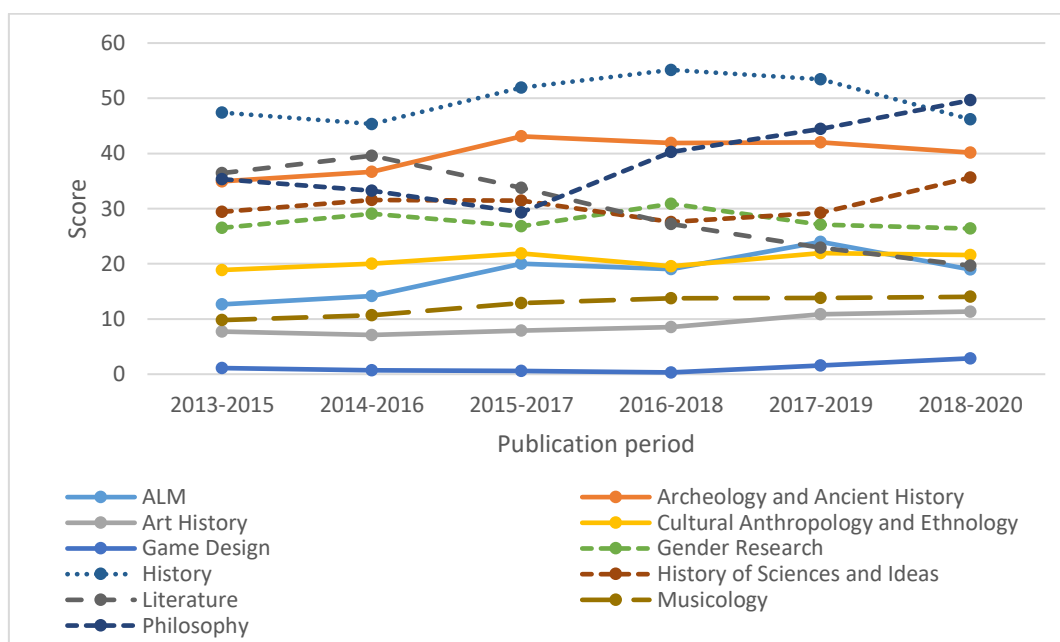
Faculty of Arts

Figure 4. Faculty of Arts. Norwegian score by publication period. 3-year moving average.

Table 7. Faculty of Arts. Proportion (in %) publication fractions at level 2 relative to the sum of publication fractions across levels 1 and 2 (given within parentheses) by publication period. 3-year moving average.

Department	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020
ALM	44,7 (23,7)	33,5 (28,6)	37,7 (32,4)	32,7 (32,8)	47,8 (40,4)	45,6 (39,3)
Archeology and Ancient History	32,7 (91,9)	36,9 (90,7)	39,5 (96,4)	50,1 (86,4)	46,5 (86,6)	48,2 (89,3)
Art History	6,9 (22,9)	7,6 (20,8)	3,5 (22,7)	12,5 (20,7)	17,9 (25,1)	20,4 (25,7)
Cultural Anthropology and Ethnology	38,8 (37,3)	37,8 (41,5)	38 (46,6)	26,6 (50,7)	19,1 (53,8)	20,4 (48,9)
Game Design	0 (4)	0 (2,1)	0 (1,8)	0 (1,1)	7,3 (4,6)	34,5 (5,3)
Gender Research	21,8 (58,3)	19,5 (61,9)	27,2 (56,7)	28,6 (68,9)	34,9 (55,1)	36,9 (60,9)
History	24,9 (101,6)	33,7 (91,9)	40 (93,6)	43,6 (96,7)	40,1 (90,3)	36,2 (88,3)
History of Sciences and Ideas	32,2 (63,7)	30,9 (71,1)	30,3 (62,1)	24,4 (65)	37 (59,5)	37,7 (71,6)
Literature	12,6 (95)	10,1 (84)	7,4 (67,3)	12,4 (56,6)	15,7 (50,9)	13,2 (47,8)
Musicology	34,7 (20,2)	39,5 (15,2)	34,5 (23,2)	39 (29,5)	37,3 (33,5)	45,4 (29,8)
Philosophy	36,5 (77,7)	47,4 (75,7)	49,4 (57,3)	50 (71)	48,7 (77)	52,1 (88,4)

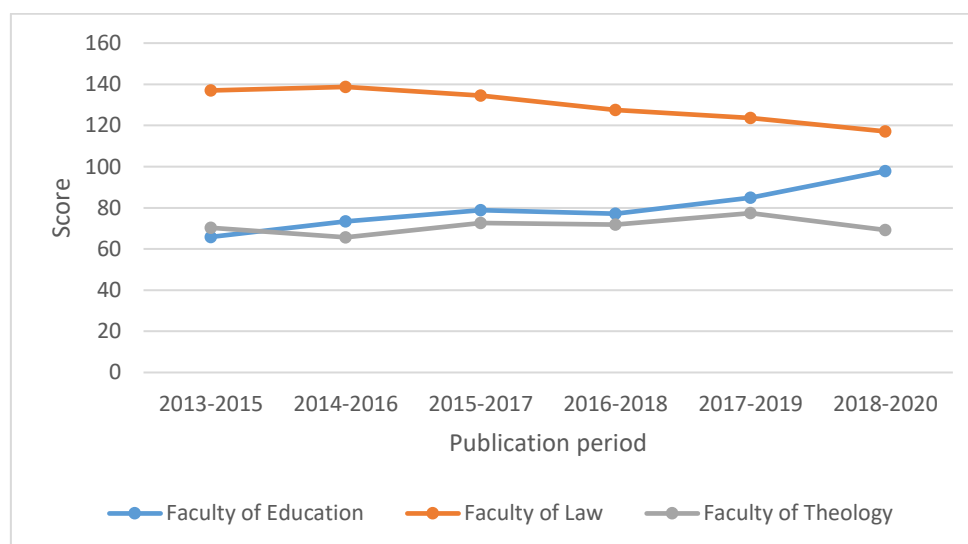*Faculty of Education, Faculty of Law and Faculty of Theology*

Figure 5. Faculty of Education, Faculty of Law and Faculty of Theology. Norwegian score by publication period. 3-year moving average.

Table 8. Faculty of Education, Faculty of Law and Faculty of Theology. Proportion (in %) publication fractions at level 2 relative to the sum of publication fractions across levels 1 and 2 (given within parentheses) by publication period. 3-year moving average.

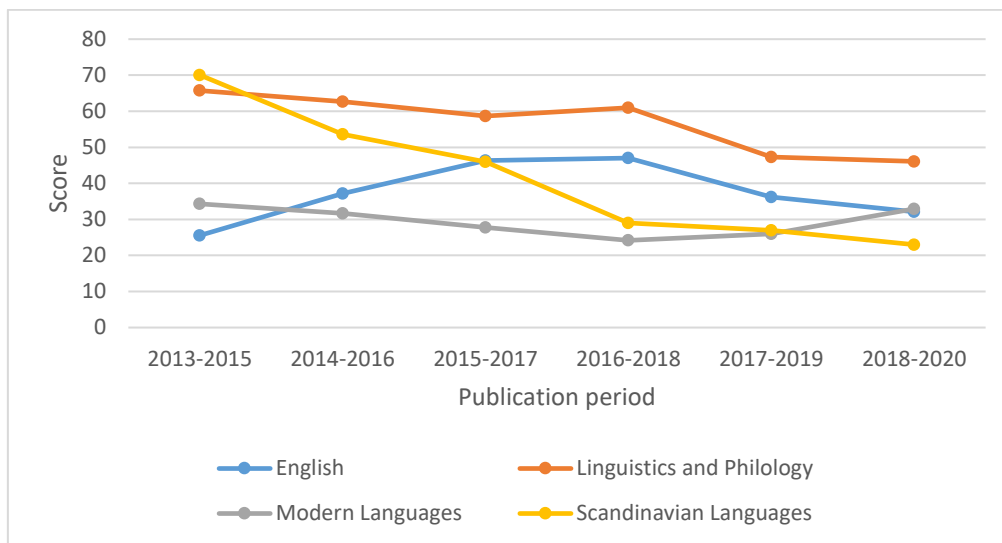| Department	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020
Faculty of Education	15,9 (143,7)	18,7 (165)	26,3 (158,8)	27,4 (146,9)	29,2 (159,1)	26,5 (187,8)
Faculty of Law	19,4 (292,3)	24,6 (308,9)	23,7 (286,9)	20,8 (284,6)	17,3 (264,3)	15,2 (256,4)
Faculty of Theology	35,2 (158,1)	34,2 (143,2)	31,1 (158,4)	38,4 (149,6)	35,6 (161)	33,2 (148,9)

Faculty of Languages

Figure 6. Faculty of Languages. Norwegian score by publication period. 3-year moving average.

Table 9. Faculty of Languages. Proportion (in %) publication fractions at level 2 relative to the sum of publication fractions across levels 1 and 2 (given within parentheses) by publication period. 3-year moving average.

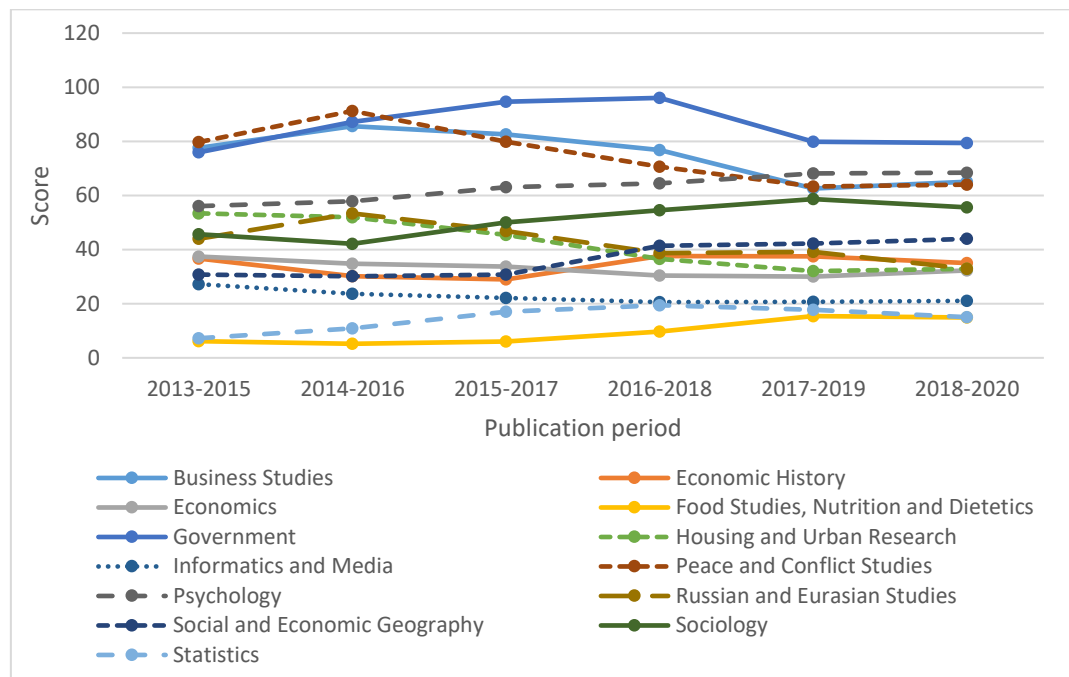| Department	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020
English	34,8 (62,5)	41,2 (65)	43,1 (74,3)	40,7 (73,3)	43,8 (64,7)	47 (66,3)
Linguistics and Philology	52,8 (128,9)	56,2 (114,7)	49,6 (107,2)	54,9 (111,9)	46,7 (109,6)	45,2 (114,1)
Modern Languages	16,7 (94,8)	15,7 (89)	19,1 (77,8)	17,7 (79,3)	24,4 (73,8)	28,5 (82,4)
Scandinavian Languages	30,5 (132,7)	27,1 (107,1)	19,6 (106,2)	12,6 (74)	12 (70,4)	13,6 (58,8)

Faculty of Social Sciences

Figure 7. Faculty of Social Sciences. Norwegian score by publication period. 3-year moving average.

Table 10. Faculty of Social Sciences. Proportion (in %) publication fractions at level 2 relative to the sum of publication fractions across levels 1 and 2 (given within parentheses) by publication period. 3-year moving average.

Department	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020
Business Studies	31,9 (143,5)	34,5 (166,7)	38,2 (160,8)	39,5 (157,2)	36,2 (122,9)	30,6 (127,2)
Economic History	27,7 (83,1)	33,5 (68,7)	34,2 (66,7)	40,1 (68,3)	42,9 (57,2)	42,9 (53,5)
Economics	46,3 (56,5)	48,3 (53,7)	52,1 (49,5)	52,1 (44,7)	58,4 (41,5)	56,2 (45,7)
Food Studies, Nutrition and Dietetics	13,1 (19,1)	14,9 (15,1)	12,9 (16,1)	7,9 (26,5)	11 (44)	11,6 (42)
Government	43,4 (152,5)	40 (165)	44,4 (167,1)	44,9 (178,6)	43,6 (152,7)	34,6 (156,1)
Housing and Urban Research	33,5 (105,9)	31,1 (101)	31 (92,7)	34 (71,5)	40,4 (61,8)	32 (61,6)
Informatics and Media	34,1 (59,9)	35 (50)	22,3 (49,3)	31,2 (51)	28,2 (61,5)	30,2 (63,4)
Peace and Conflict Studies	52,4 (123,1)	57,9 (139,3)	54 (132,2)	56,3 (130,2)	52,5 (112,4)	50 (105,3)
Psychology	22,1 (118,7)	25,1 (122,2)	26,1 (132,5)	28,1 (130,9)	31,6 (126,5)	33,4 (122)
Russian and Eurasian Studies	32,5 (86,1)	31,6 (112,2)	33,9 (102,6)	28,6 (78,3)	34,7 (63,1)	33,1 (58,7)
Social and Economic Geography	41,4 (58,5)	47,5 (58,3)	44,2 (60,5)	45,4 (69,5)	37,9 (73,1)	33,7 (71,6)
Sociology	27,5 (104,8)	23,7 (102,5)	26,4 (110,7)	31,9 (118,1)	38,8 (126,3)	36,6 (122,6)
Statistics	16,9 (15,2)	18,2 (21)	29,3 (29,6)	34,5 (32,9)	30,3 (33,1)	26,2 (29,6)

3.2.2 Field Normalized Citation Impact

In each graph in this section, the label of the vertical axis that corresponds to the world average for the citation indicator of the graph is in green color.

Faculty of Arts

Table 11. Faculty of Arts. Publication fractions (P; full counts within parentheses), MNCS, PP(top 10%), MNJS and MJPP(top10%) for the whole publication period 2012-2019.

| Department	Indicator				
	P	**MNCS**	**PP(top 10%)**	**MNJS**	**MJPP(top 10%)**
ALM	33 (53)	0,91	10,4	0,82	8,1
Archeology and Ancient History	40,6 (113)	1,41	17,5	1,08	11,6
Art History	4,7 (14)	null	null	null	null
Cultural Anthropology and Ethnology	11,3 (15)	null	null	null	null
Game Design	0,4 (3)	null	null	null	null
Gender Research	21,6 (39)	null	null	null	null
History	16,9 (23)	null	null	null	null
History of Sciences and Ideas	4,6 (8)	null	null	null	null
Literature	0 (0)	null	null	null	null
Musicology	0,2 (1)	null	null	null	null
Philosophy	37,3 (40)	0,56	2,7	0,88	8,6
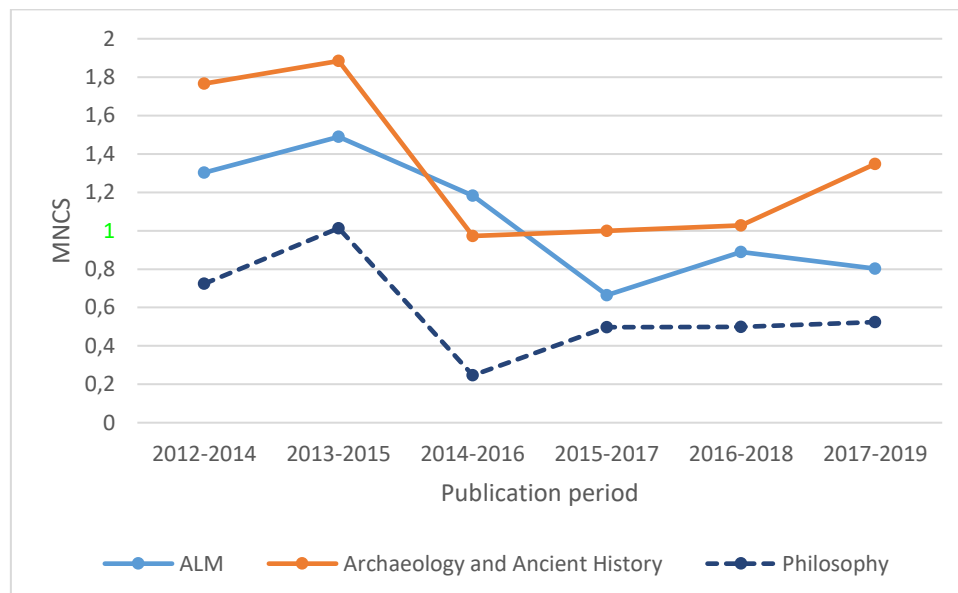
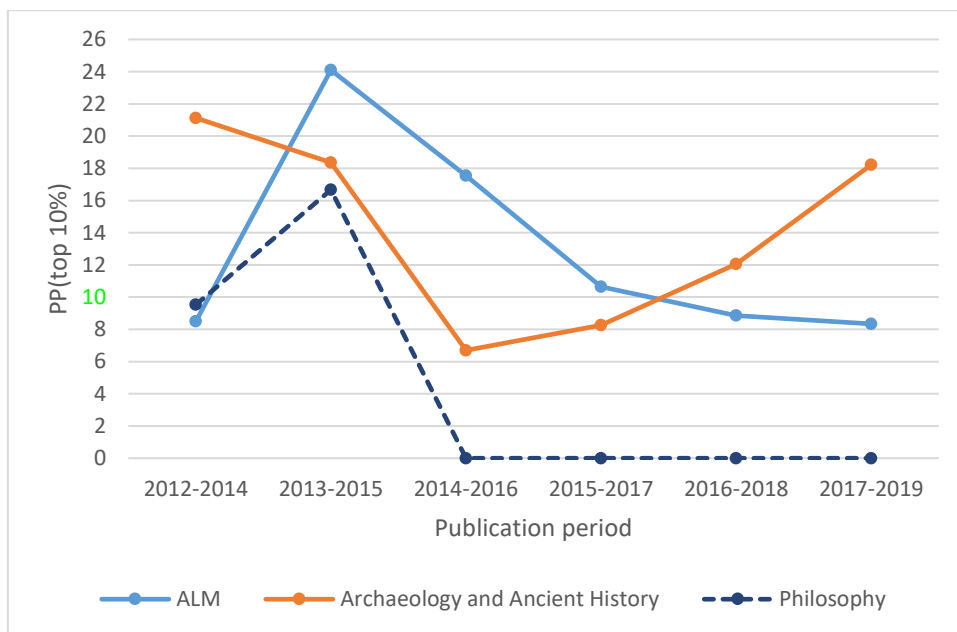Figure 8. Faculty of Arts. MNCS by publication period. 3-year moving average.

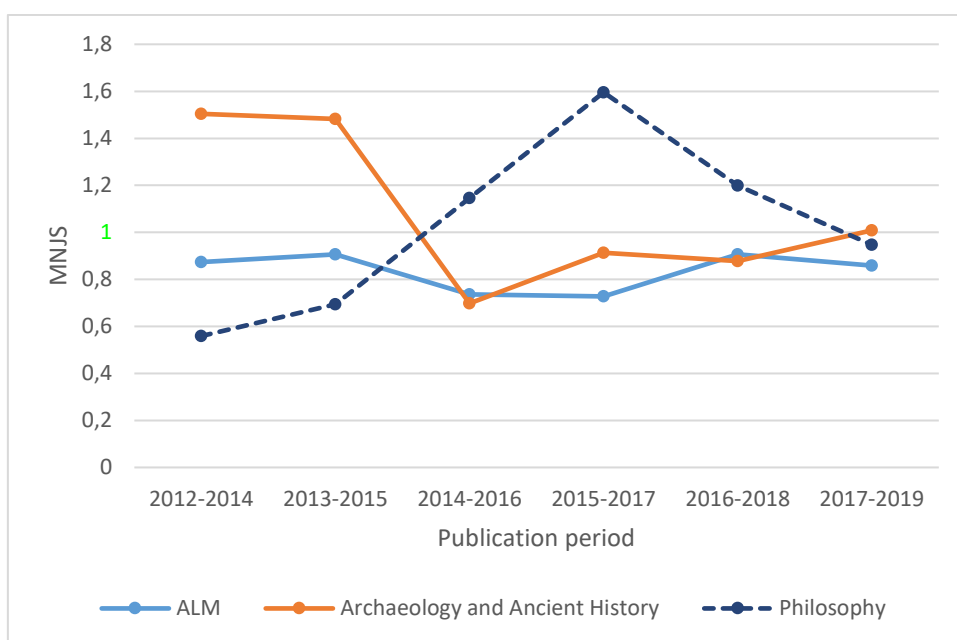Figure 9. Faculty of Arts. PP(top 10%) by publication period. 3-year moving average.

Figure 10. Faculty of Arts. MNJS by publication period. 3-year moving average.
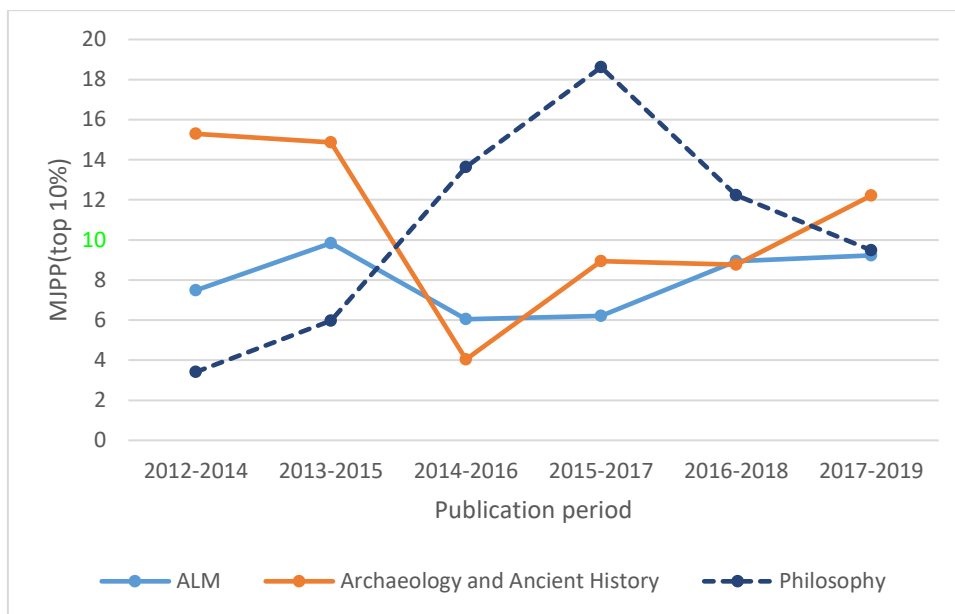
Figure 11. Faculty of Arts. MJPP(top 10%) by publication period. 3-year moving average.

Faculty of Education, Faculty of Law and Faculty of Theology

Table 12. Faculty of Education, Faculty of Law and Faculty of Theology. Publication fractions (P; full counts within parentheses), MNCS, PP(top 10%), MNJS and MJPP(top10%) by department and for the whole publication period 2012-2019.

Department	Indicator				
	P	MNCS	PP(top 10%)	MNJS	MJPP(top 10%)
Faculty of Education	78,7 (141)	0,71	4,1	0,83	8
Faculty of Law	20,7 (33)	null	null	null	null
Faculty of Theology	14,7 (29)	null	null	null	null

Figure 12. Faculty of Education. MNCS by publication period. 3-year moving average.

Figure 13. Faculty of Education. PP(top 10%) by publication period. 3-year moving average.
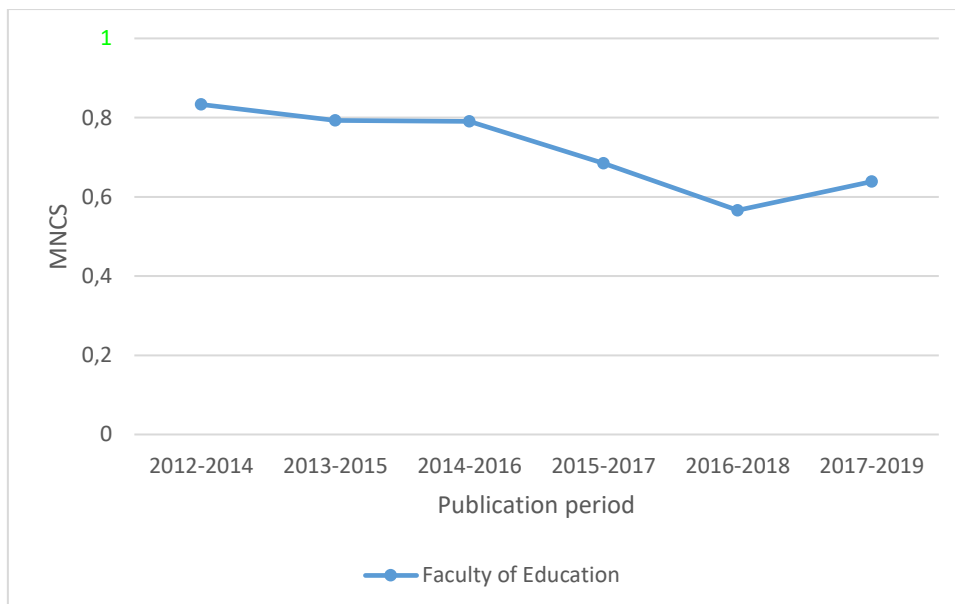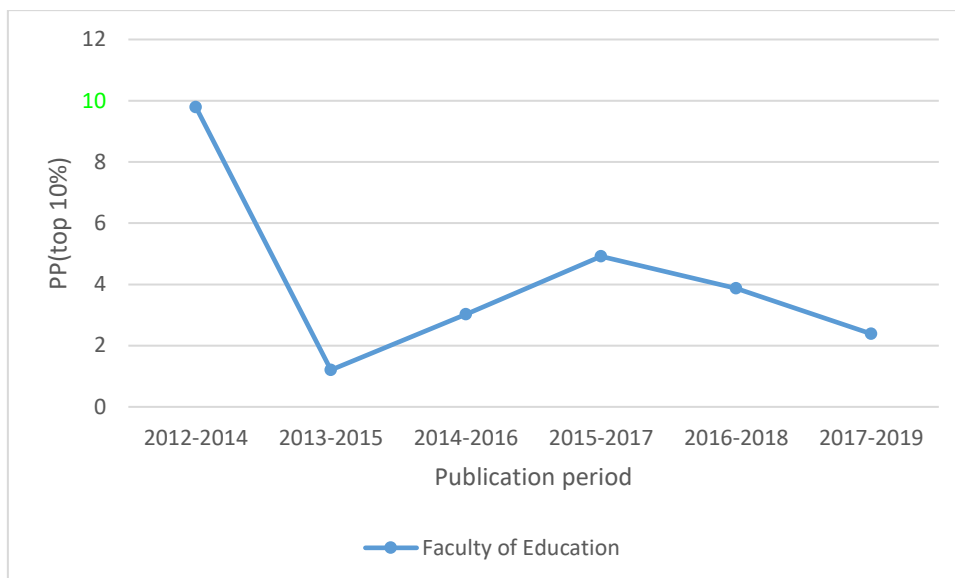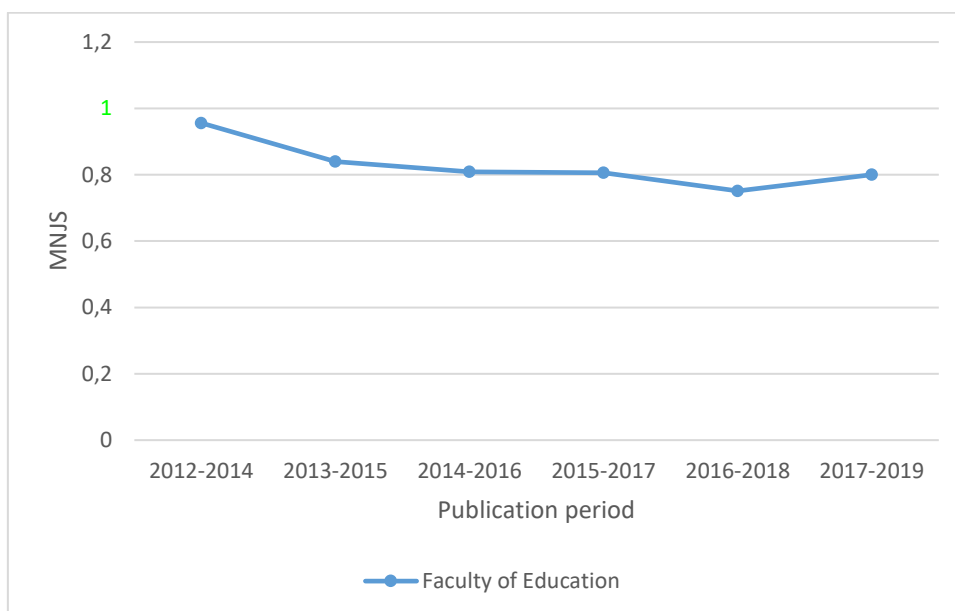

Figure 14. Faculty of Education. MNJS by publication period. 3-year moving average.
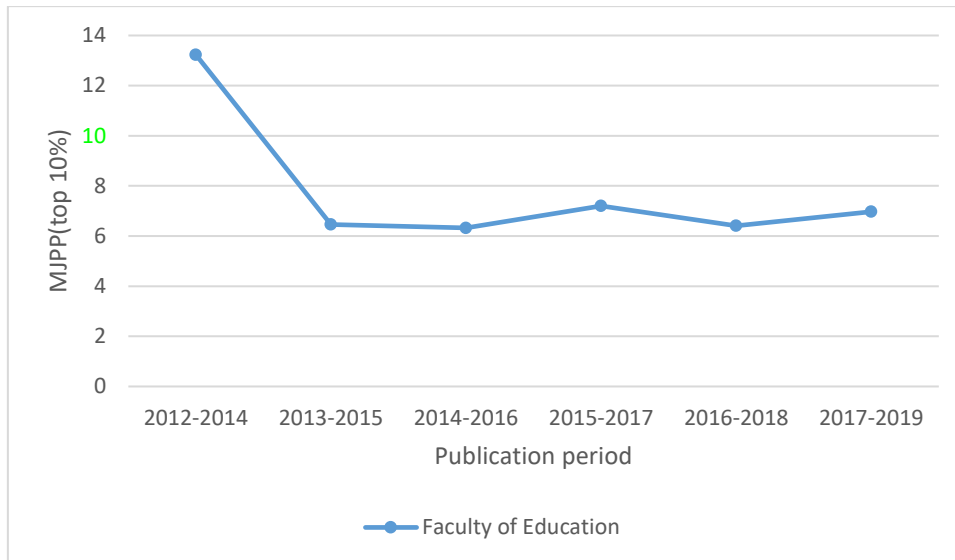
Figure 15. Faculty of Education. MJPP(top 10%) by publication period. 3-year moving average.

Faculty of Languages

Each of the four departments of the faculty has less than 40 publications for the publication period 2012-2019. This yields that the four departments are excluded from the citation analysis of ABM.

Table 13. Faculty of Languages. Publication fractions (P; full counts within parentheses), MNCS, PP(top 10%), MNJS and MJPP(top10%) for the whole publication period 2012-2019.

Department	Indicator				
	P	MNCS	PP(top 10%)	MNJS	MJPP(top 10%)
English	10,3 (12)	null	null	null	null
Linguistics and Philology	18,5 (35)	null	null	null	null
Modern Languages	3,3 (6)	null	null	null	null
Scandinavian Languages	9 (17)	null	null	null	null

Faculty of Social Sciences

Table 14. Faculty of Social Sciences. Publication fractions (P; full counts within parentheses), MNCS, PP(top 10%), MNJS and MJPP(top10%) by department and for the whole publication period 2012-2019.

Department	Indicator				
	P	MNCS	PP(top 10%)	MNJS	MJPP(top 10%)
Business Studies	91,1 (171)	0,92	11,2	0,95	8,7
Economic History	22,7 (37)	null	null	null	null
Economics	90,8 (202)	1,19	15,5	1,18	13,9
Food Studies, Nutrition and Dietetics	40,9 (108)	0,53	1,0	0,70	5,7
Government	137 (228)	0,97	9,6	1,01	8,6
Housing and Urban Research	61 (133)	1,57	18,0	1,43	16,1
Informatics and Media	26,7 (50)	0,96	7,0	0,73	5,9
Peace and Conflict Studies	113,4 (163)	2,36	25,3	1,41	16,9
Psychology	247 (538)	1,07	10,3	1,09	9,9
Russian and Eurasian Studies	24,8 (41)	0,79	3,6	0,92	9,1
Social and Economic Geography	79,5 (126)	1,07	14,1	1,23	15,1
Sociology	70,2 (118)	0,72	3,7	0,82	5,1
Statistics	45,4 (106)	0,47	3,2	0,63	5,2

Figure 16. Faculty of Social Sciences. MNCS by publication period. 3-year moving average.

Figure 17. Faculty of Social Sciences. PP(top 10%) by publication period. 3-year moving average.
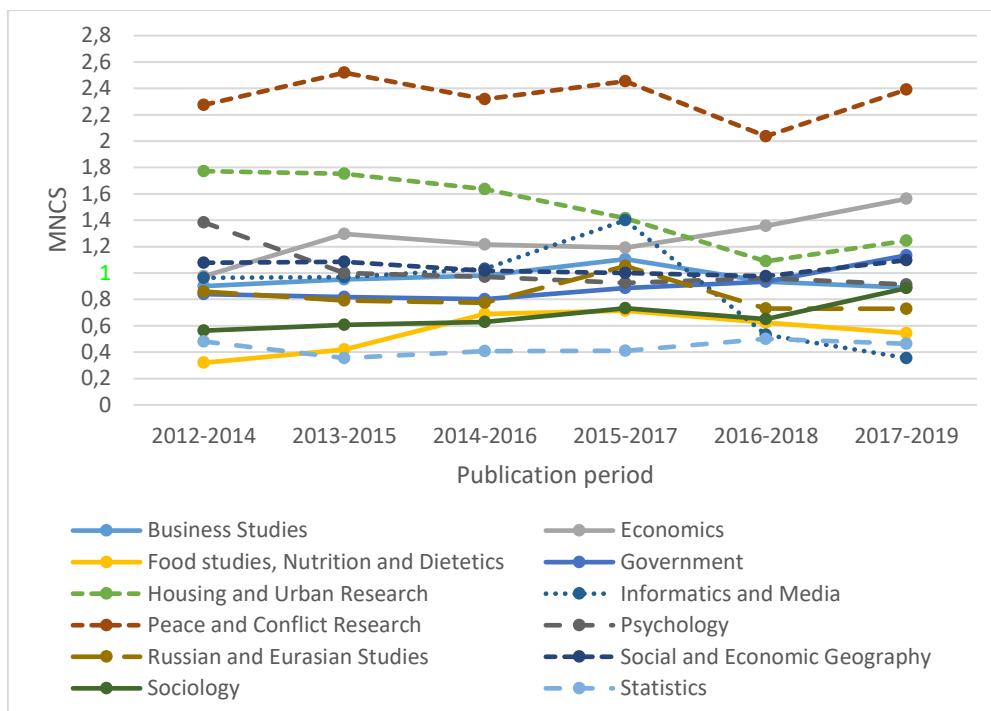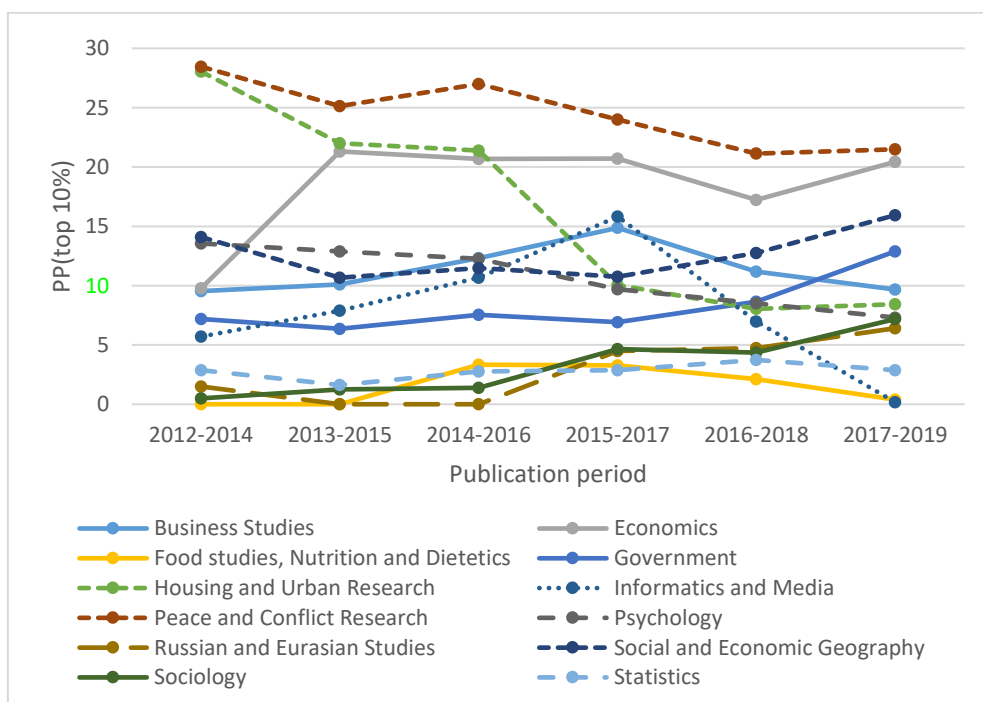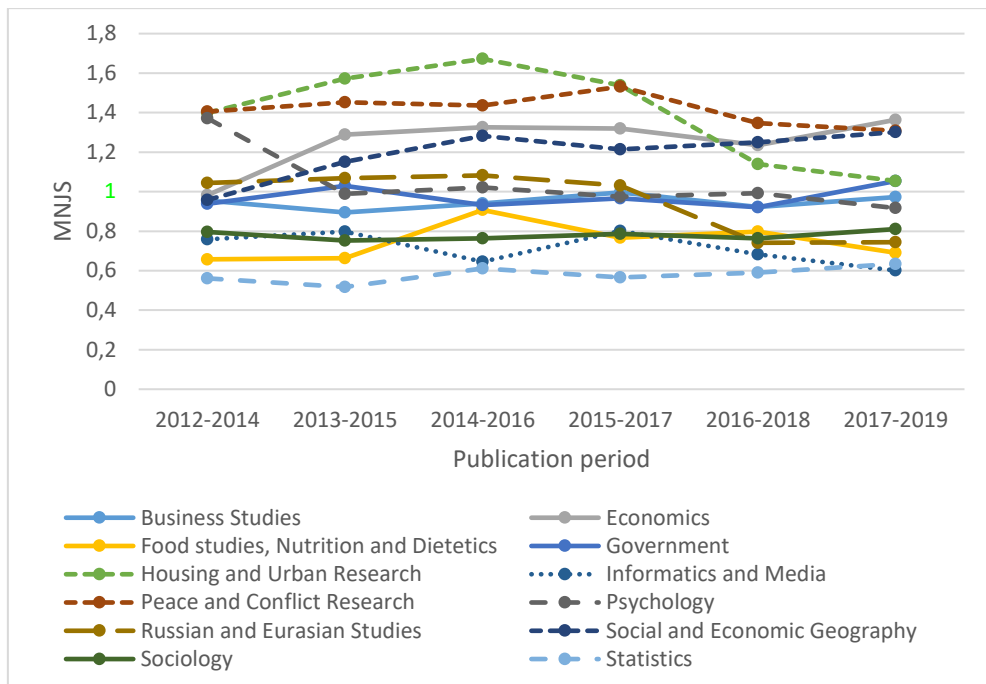
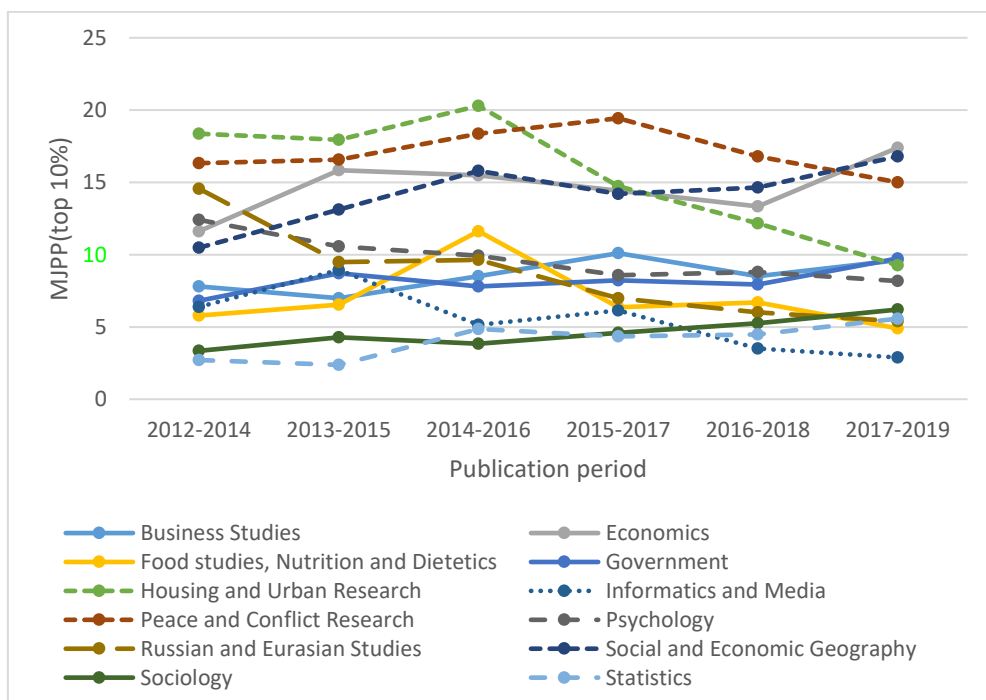Figure 18. Faculty of Social Sciences. MNJS by publication period. 3-year moving average.

Figure 19. Faculty of Social Sciences. MJPP(top 10%) by publication period. 3-year moving average.

3.2.3 Collaboration

For all tables in this section, PP(int collab) and PP(industry) are given as percentages.

Faculty of Arts

Table 15. Faculty of Arts. Publications (P, full counts), PP(int collab) and PP(industry) for the whole publication period 2012-2019.

Department	Indicator		
	P	**PP(int collab)**	**PP(industry)**
ALM	53	41,5	0
Archeology and Ancient History	113	76,1	2,7
Art History	14	78,6	0
Cultural Anthropology and Ethnology	15	6,7	0
Game Design	3	66,7	33,3
Gender Research	39	25,6	5,1
History	23	26,1	0
History of Sciences and Ideas	8	25	0
Literature	0	-	-
Musicology	1	100	0
Philosophy	40	5	0

In Tables 16 and 20, which gives values of PP(int collab) and PP(industry) by publication period, "-" in a table cell indicates that indicator values for the corresponding department and period cannot be obtained, since the department has no WoS publications (of the type "Article" or "Review") in the period.

Table 16. Faculty of Arts. PP(int collab) and PP(industry) (within parentheses) by publication period. 3-year moving average.

Department	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019
ALM	44,4 (0)	53,9 (0)	37,5 (0)	40 (0)	34,6 (0)	42 (0)
Archeology and Ancient History	55 (5)	66,7 (0)	76,7 (0)	76,2 (0)	76,4 (3,6)	80 (2,9)
Art History	100 (0)	100 (0)	100 (0)	88,9 (0)	80 (0)	57,2 (0)
Cultural Anthropology and Ethnology	0 (0)	20 (0)	14,3 (0)	14,3 (0)	0 (0)	0 (0)
Game Design	-	-	100 (100)	100 (100)	100 (50)	50 (0)
Gender Research	28,6 (0)	25 (0)	38,5 (7,7)	18,8 (6,3)	25 (5)	23,8 (4,8)
History	20 (0)	20 (0)	25 (0)	12,5 (0)	33,3 (0)	40 (0)
History of Sciences and Ideas	0 (0)	0 (0)	0 (0)	20 (0)	16,7 (0)	33,3 (0)
Literature	-	-	-	-	-	-
Musicology	-	100 (0)	100 (0)	100 (0)	-	-
Philosophy	9,1 (0)	0 (0)	0 (0)	16,7 (0)	8,3 (0)	4 (0)

Faculty of Education, Faculty of Law and Faculty of Theology

Table 17. Faculty of Education, Faculty of Law and Faculty of Theology. Publications (P, full counts), PP(int collab) and PP(industry) for the whole publication period 2012-2019.

Department	Indicator		
	P	**PP(int collab)**	**PP(industry)**
Faculty of Education	141	31,2	0
Faculty of Law	33	24,2	0
Faculty of Theology	29	44,8	0

Table 18. Faculty of Education, Faculty of Law and Faculty of Theology. PP(int collab) and PP(industry) (within parentheses) by publication period. 3-year moving average.

Department	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019
Faculty of Education	14,8 (0)	18,2 (0)	30,6 (0)	27,1 (0)	38,6 (0)	37,2 (0)
Faculty of Law	37,5 (0)	30 (0)	28,6 (0)	16,7 (0)	22,2 (0)	23,5 (0)
Faculty of Theology	25 (0)	30 (0)	40 (0)	41,7 (0)	54,6 (0)	61,6 (0)

Faculty of Languages

Table 19. Faculty of Languages. Publications (P, full counts), PP(int collab) and PP(industry) for the whole publication period 2012-2019.

Department	Indicator		
	P	PP(int collab)	PP(industry)
English	12	16,7	0
Linguistics and Philology	35	65,7	5,7
Modern Languages	6	0,0	0
Scandinavian Languages	17	17,6	0

Table 20. Faculty of Languages. PP(int collab) and PP(industry) (within parentheses) by publication period. 3-year moving average.

Department	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019
English	50 (0)	50 (0)	25 (0)	0 (0)	11,1 (0)	12,5 (0)
Linguistics and Philology	50 (14,3)	50 (12,5)	66,7 (11,1)	69,2 (0)	76,9 (0)	85,7 (0)
Modern Languages	0 (0)	0 (0)	0 (0)	0 (0)	-	-
Scandinavian Languages	50 (0)	33,3 (0)	11,1 (0)	0 (0)	0 (0)	16,7 (0)

Faculty of Social Sciences

Table 21. Faculty of Social Sciences. Publications (P, full counts), PP(int collab) and PP(industry) for the whole publication period 2012-2019.

Department	Indicator		
	P	PP(int collab)	PP(industry)
Business Studies	171	56,7	0,6
Economic History	37	43,2	0
Economics	202	46,5	1,5
Food Studies, Nutrition and Dietetics	108	60,2	1,9
Government	228	34,2	2,2
Housing and Urban Research	133	53,4	2,3
Informatics and Media	50	42,0	4,0
Peace and Conflict Studies	163	40,5	0
Psychology	538	43,5	2,4
Russian and Eurasian Studies	41	43,9	0,0
Social and Economic Geography	126	34,1	0,8
Sociology	118	28,8	0
Statistics	106	38,7	1,0

Table 22. Faculty of Social Sciences. PP(int collab) and PP(industry) (within parentheses) publication period. 3-year moving average.

Department	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019
Business Studies	51,7 (0)	56,4 (0)	62,3 (0)	62,7 (0)	60,6 (1,4)	55,2 (1,5)
Economic History	42,9 (0)	42,9 (0)	42,9 (0)	30 (0)	35,7 (0)	47,1 (0)
Economics	43,6 (3,9)	46,2 (0)	47 (0)	40,3 (0)	46 (0)	49,3 (0)
Food Studies, Nutrition and Dietetics	21,1 (0)	39,1 (0)	53,8 (0)	65,8 (5,3)	69,6 (3,6)	68,1 (2,9)
Government	31 (1,7)	29,8 (1,5)	35,3 (2,4)	35,5 (1,1)	40,7 (2,7)	37,2 (2,7)
Housing and Urban Research	41,2 (3,9)	43,9 (1,8)	50 (0)	52,9 (0)	63,3 (0)	64,5 (2,2)
Informatics and Media	25,9 (7,4)	41,7 (8,3)	63,1 (10,5)	83,3 (0)	63,6 (0)	42,9 (0)
Peace and Conflict Studies	36,1 (0)	41,1 (0)	39 (0)	39,6 (0)	41,2 (0)	45,6 (0)
Psychology	42,5 (2,9)	41,7 (2,8)	48,1 (3,7)	43,2 (2,9)	40,5 (1,9)	42,1 (1,3)
Russian and Eurasian Studies	33,3 (0)	25 (0)	30,8 (0)	45,5 (0)	76,9 (0)	50 (0)
Social and Economic Geography	20 (0)	28,3 (0)	35 (0)	34,9 (0)	39,7 (1,7)	39,4 (1,5)
Sociology	18,9 (0)	19,5 (0)	17,1 (0)	26,6 (0)	25,5 (0)	42,6 (0)
Statistics	34,6 (0)	25 (0)	44,1 (0)	40,4 (0)	42,1 (1,8)	35,7 (1,8)

3.2.4 Open Access

For all figures in this section, proportion OA publications is given as a percentage. Total OA is defined as publications belonging to any type of OA (gold, hybrid or green).
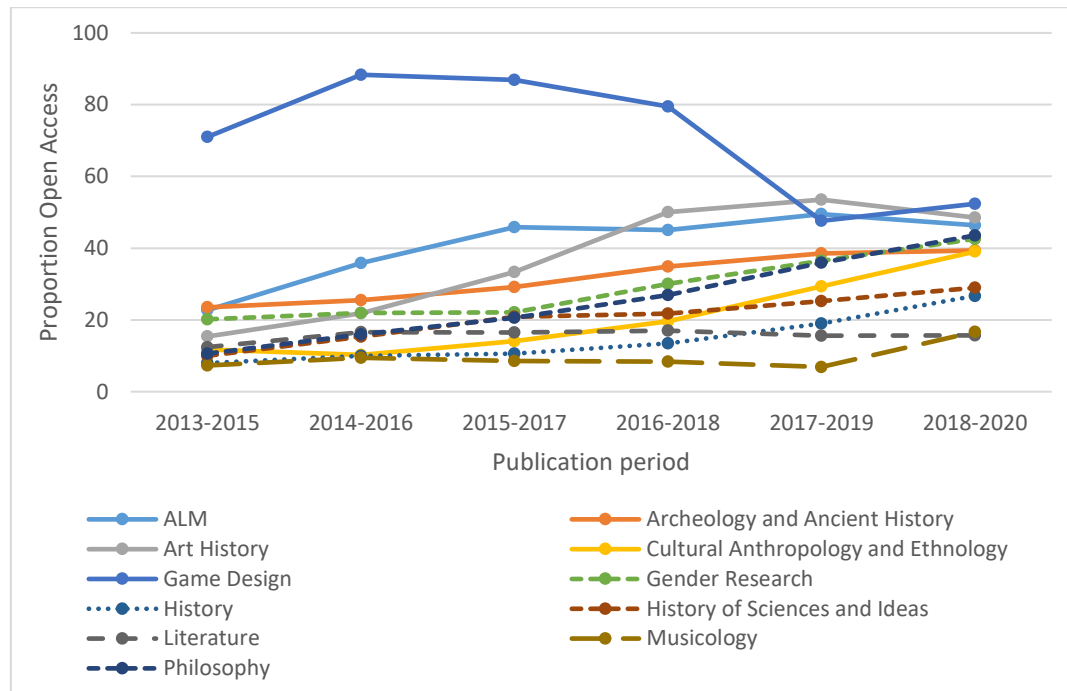
Faculty of Arts

Figure 20. Faculty of Arts. Total OA by publication period. 3-year moving average.

Faculty of Education, Faculty of Law and Faculty of Theology
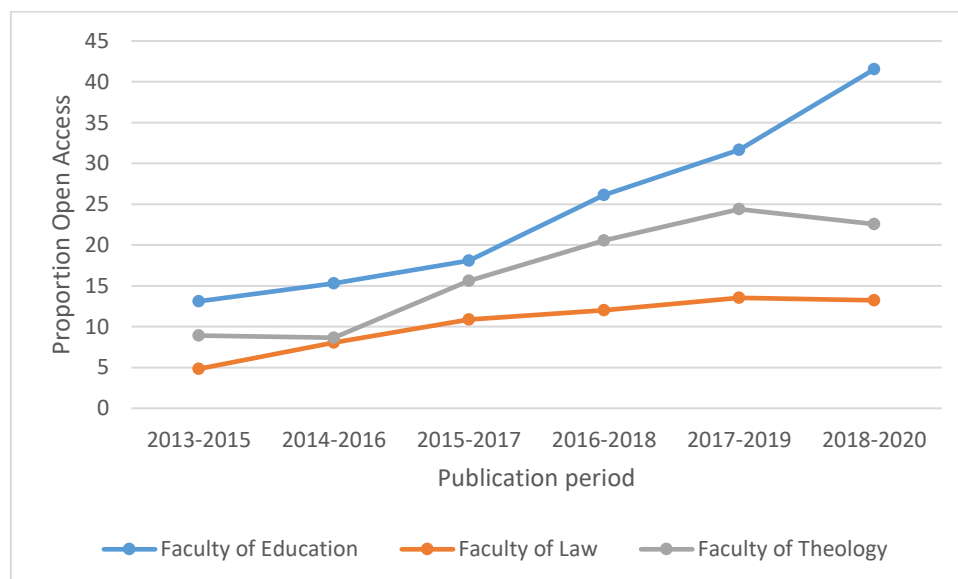

Figure 21. Faculty of Education, Faculty of Law and Faculty of Theology. Total OA by publication period. 3-year moving average.

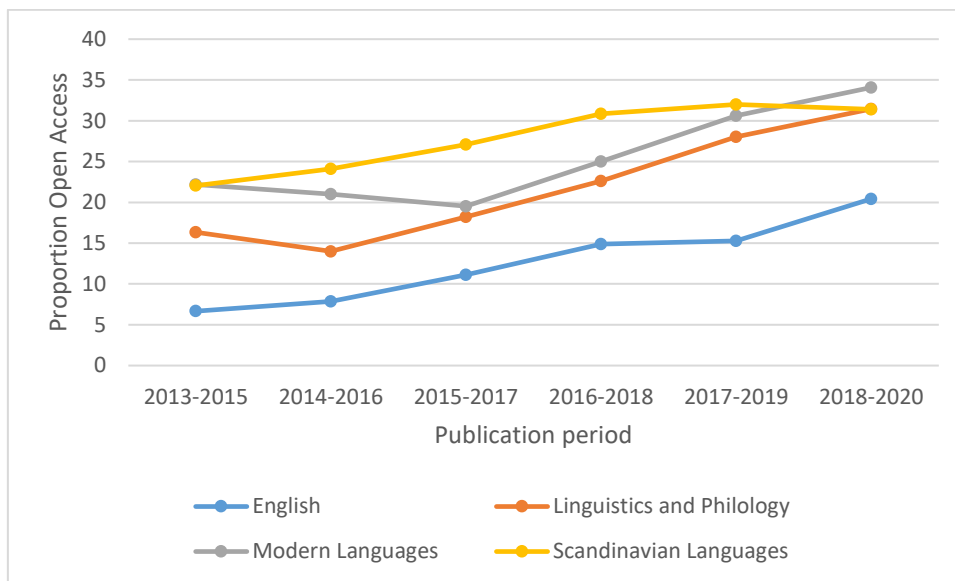*Faculty of Languages*

Figure 22. Faculty of Languages. Total OA Access by publication period. 3-year moving average.
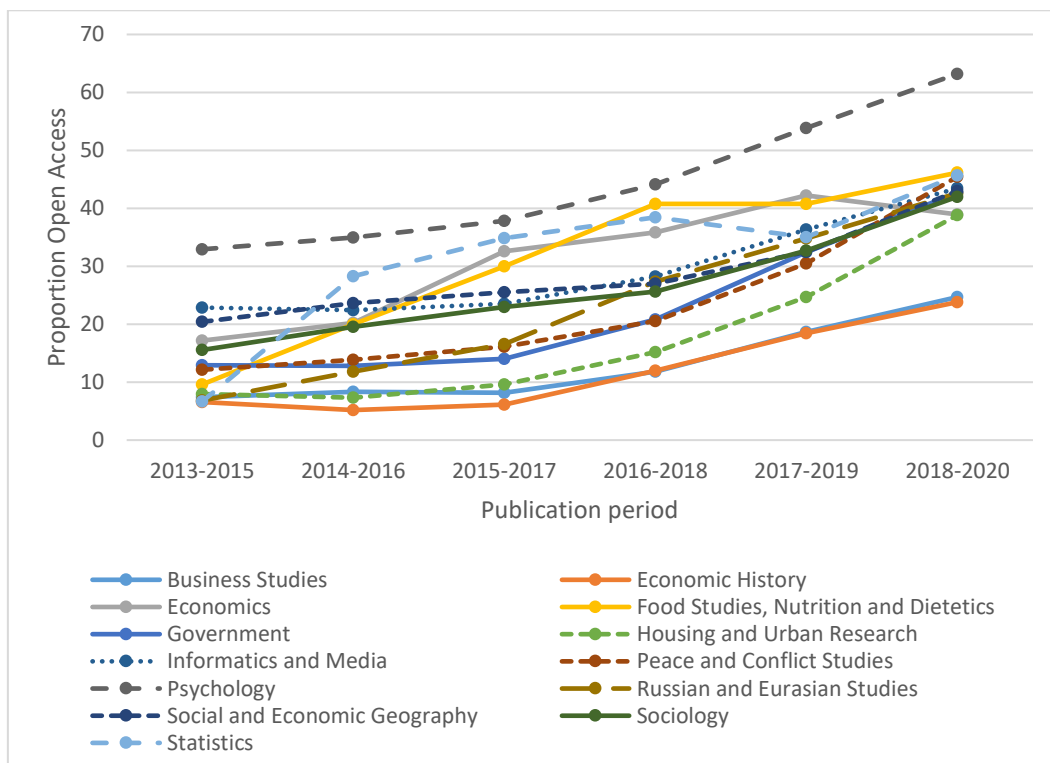
Faculty of Social Sciences

Figure 23. Faculty of Social Sciences. Total OA by publication period. 3-year moving average.

3.3 Medfarm

The number of MedFarm departments included in ABM is 11. Tables 23-24 report publication volume in terms of both fractional counts and full counts (within parentheses) by department and publication type, and WoS coverage. WoS coverage concerns the number of WoS publications of the four types represented in the tables relative to all publications of these types for the department.

Table 23. Faculty of Medicine. Publication volume by publication type, and WoS coverage (in %). Publication period: 2012-2020.

Department	Publication type					
	Article	Article in anthology	Monograph	Conference paper	Total	WoS coverage
Immunology, Genetics and Pathology	893 (2997)	18,2 (30)	0 (0)	6,2 (17)	917,4 (3044)	93,9
Medical Biochemistry and Microbiology	492,2 (1349)	11,6 (23)	0,3 (1)	1,2 (3)	505,4 (1376)	94,1
Medical Cell Biology	254,7 (542)	5,4 (19)	0 (0)	1,5 (2)	261,6 (563)	94,8
Medical Sciences	1419,9 (5389)	20,3 (28)	0,5 (1)	5,5 (12)	1446,3 (5430)	90,2
Neuroscience	988,7 (2243)	20,7 (33)	3,3 (5)	10,5 (25)	1023,3 (2306)	90,7
Public Health and Caring Sciences	844,6 (2370)	65,5 (93)	7,3 (10)	7,3 (19)	924,8 (2492)	78,9
Surgical Sciences	1442,3 (4109)	69,3 (116)	3 (3)	11,9 (30)	1526,5 (4258)	84,8
Women's and Children's Health	919,8 (2422)	40,9 (53)	5,3 (7)	2,9 (8)	968,9 (2490)	87,7

Table 24. Faculty of Pharmacy. Publication volume by publication type, and WoS coverage (in %). Publication period: 2012-2020.

Department	Publication type					
	Article	Article in anthology	Monograph	Conference paper	Total	WoS coverage
Medicinal Chemistry	310,3 (801)	11,9 (15)	0 (0)	0,8 (2)	323 (818)	92
Pharmaceutical Biosciences	446,9 (1047)	15,4 (17)	0 (0)	6,6 (14)	468,9 (1078)	91,3
Pharmacy	221 (467)	4,2 (6)	0 (0)	0 (0)	225,2 (473)	92,9

3.3.1 Publishing Volume and Publishing Level – The Norwegian Model
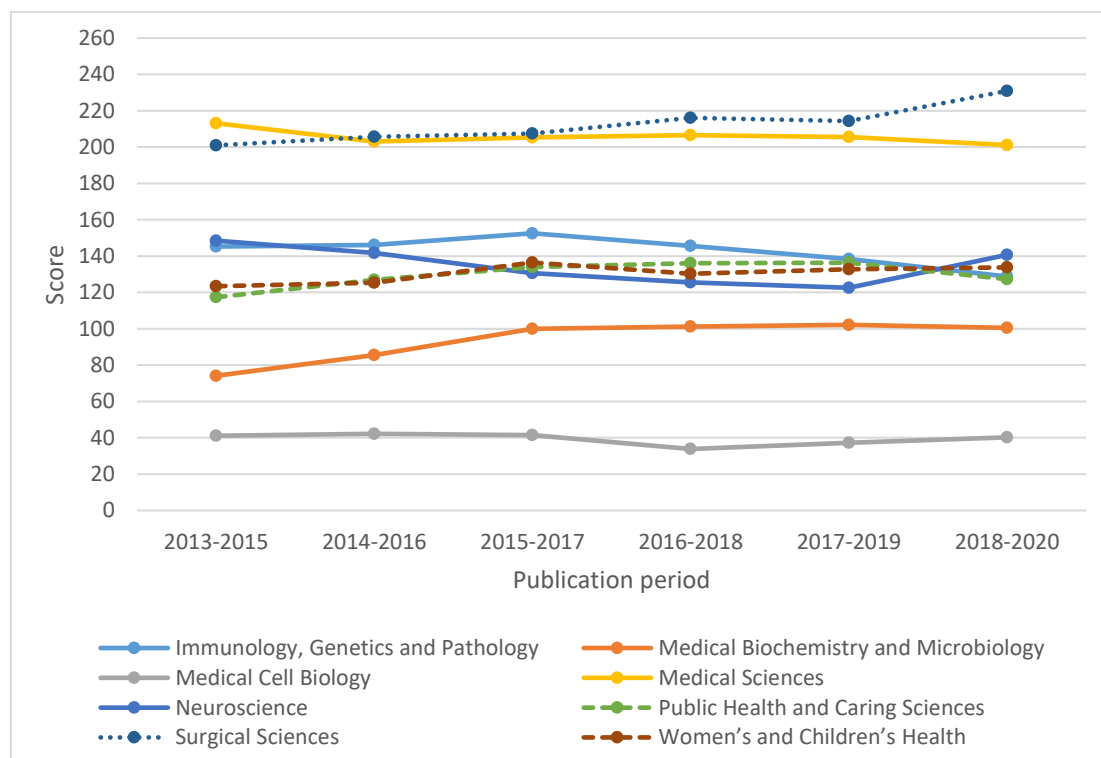
Faculty of Medicine

Figure 24. Faculty of Medicine. Norwegian score by publication period. 3-year moving average.

Table 25. Faculty of Medicine. Proportion (in %) publication fractions at level 2 relative to the sum of publication fractions across levels 1 and 2 (given within parentheses) by publication period. 3-year moving average.

| Department	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020
Immunology, Genetics and Pathology	21,4 (307,4)	22,4 (304,7)	24,3 (309,6)	25,6 (289,6)	25,7 (274,9)	23,4 (263,4)
Medical Biochemistry and Microbiology	32,7 (134)	32,5 (155,3)	35 (176,7)	33,8 (181,4)	32,7 (185,6)	30,5 (188)
Medical Cell Biology	19,5 (89)	18,7 (92,2)	17,9 (91,9)	18,2 (74,4)	24 (75,5)	30,9 (75)
Medical Sciences	19,2 (466,6)	17,7 (451,6)	16,7 (463,1)	17 (463,7)	18 (453,6)	18,3 (440,9)
Neuroscience	15,9 (339)	15,6 (325,1)	14,5 (305,2)	13,2 (296,6)	14,1 (285,8)	15,7 (317,9)
Public Health and Caring Sciences	13,7 (279)	15,7 (294,2)	16,4 (309,3)	17,5 (305,9)	18,9 (300,5)	18,1 (281)
Surgical Sciences	18,7 (438,1)	18,6 (449,5)	17,2 (466,6)	16,9 (487,9)	15 (499,5)	18,8 (507,7)
Women's and Children's Health	13,6 (291,8)	12,4 (302)	11,7 (333)	12,2 (315,9)	12,2 (322,6)	13,7 (317,3)

Faculty of Pharmacy
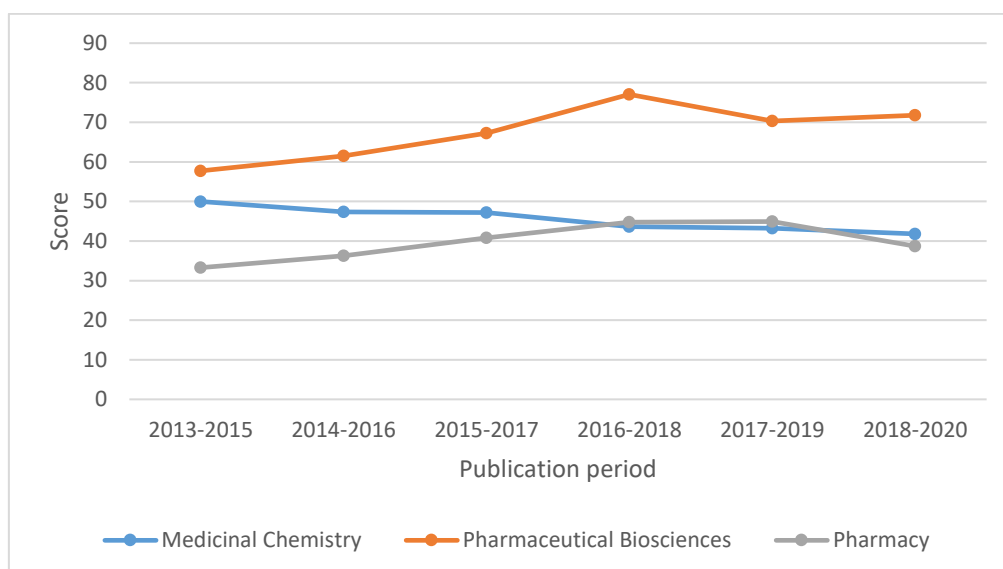
Figure 25. Faculty of Pharmacy. Norwegian score by publication period. 3-year moving average.

Table 26. Faculty of Pharmacy. Proportion (in %) publication fractions at level 2 relative to the sum of publication fractions across levels 1 and 2 (given within parentheses) by publication period. 3-year moving average.

Department	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020
Medicinal Chemistry	18,6 (109,8)	16,6 (107,7)	18,8 (103,5)	19,3 (95,2)	18,4 (95,1)	16,8 (94,1)
Pharmaceutical Biosciences	16,3 (132,6)	18,8 (135,8)	20,3 (144)	22,3 (160)	22,5 (145,5)	23,9 (145,7)
Pharmacy	28,1 (65,5)	29,3 (70,1)	29 (77,6)	32,3 (81,8)	31,6 (82,7)	29,6 (73)

3.3.2 Field Normalized Citation Impact

In each graph in this section, the label of the vertical axis that corresponds to the world average for the citation indicator of the graph is in green color.

Faculty of Medicine

Table 27. Faculty of Medicine. Publication fractions (P; full counts within parentheses), MNCS, PP(top 10%), MNJS and MJPP(top10%) for the whole publication period 2012-2019.

Department	Indicator				
	P	MNCS	PP(top 10%)	MNJS	MJPP(top 10%)
Immunology, Genetics and Pathology	747,9 (2656)	1,33	13,8	1,33	14,0
Medical Biochemistry and Microbiology	364,1 (1081)	1,46	16,7	1,48	17,0
Medical Cell Biology	201,2 (446)	1,06	10,5	1,06	11,2
Medical Sciences	1023 (4224)	1,16	11,7	1,16	11,8
Neuroscience	722,8 (1742)	0,91	8,8	0,97	9,2
Public Health and Caring Sciences	507,4 (1787)	0,98	8,6	0,98	9,3
Surgical Sciences	899,1 (2780)	1,01	10,0	1,09	11,1
Women's and Children's Health	638 (1895)	0,85	7,1	0,93	8,6

Figure 26. Faculty of Medicine. MNCS by publication period. 3-year moving average.

Figure 27. Faculty of Medicine. PP(top 10%) by publication period. 3-year moving average.
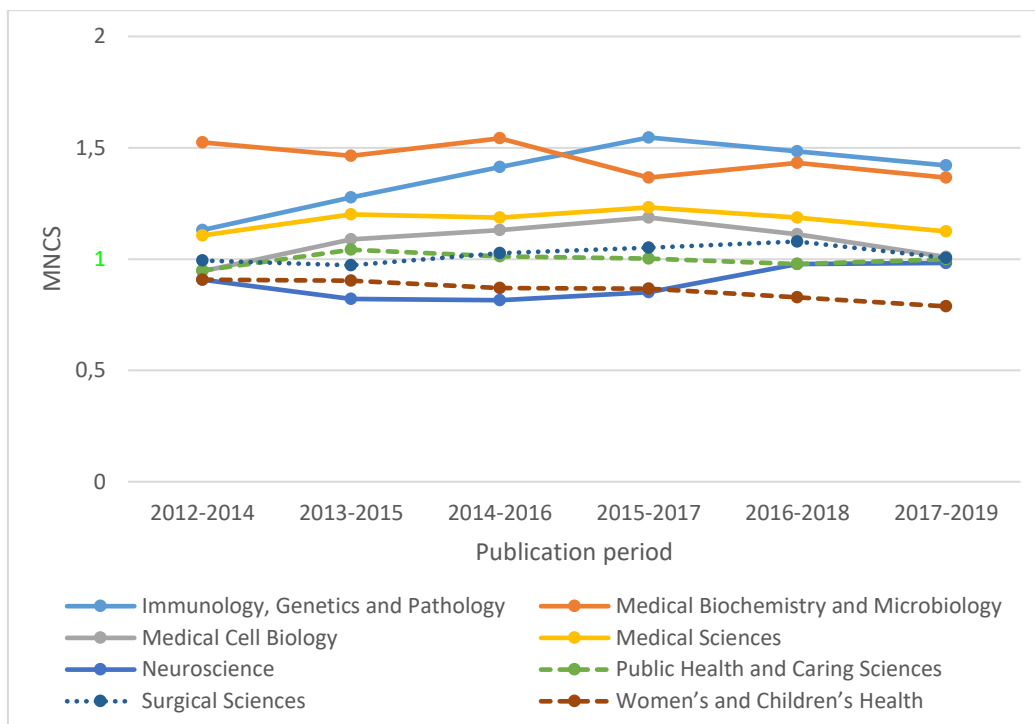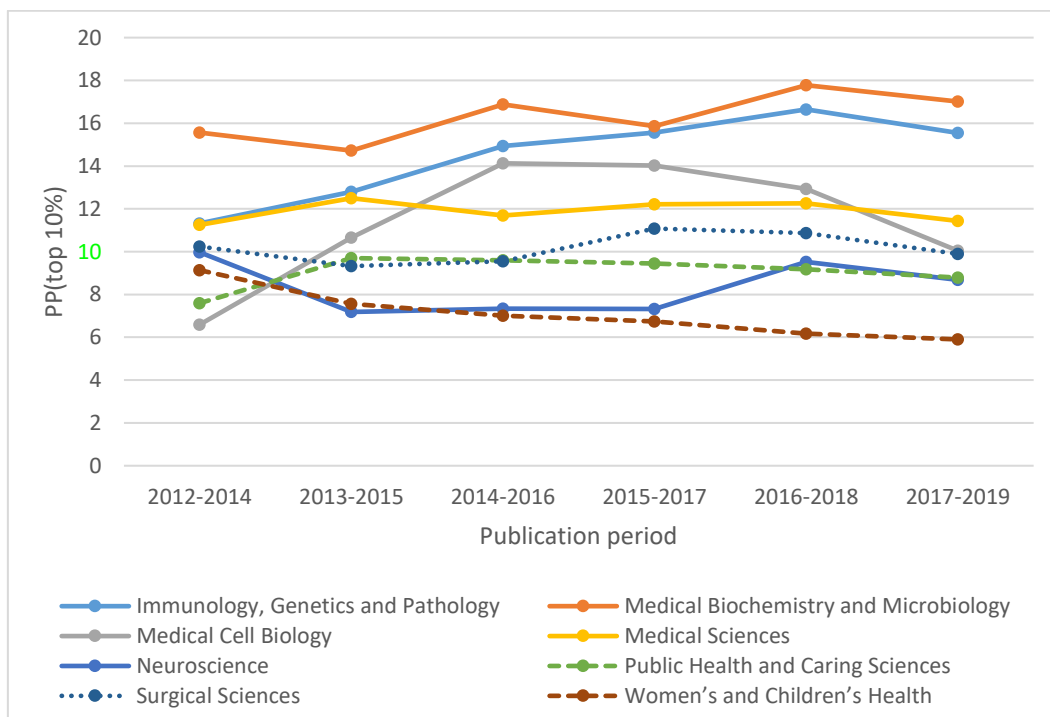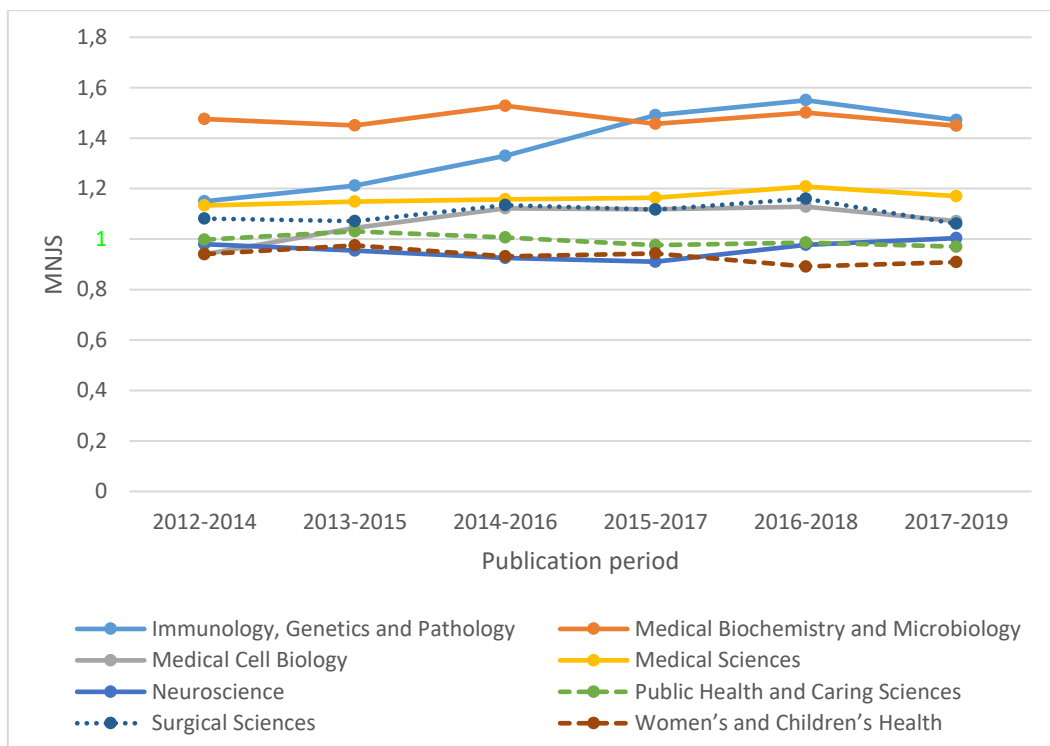
Figure 28. Faculty of Medicine. MNJS by publication period. 3-year moving average.
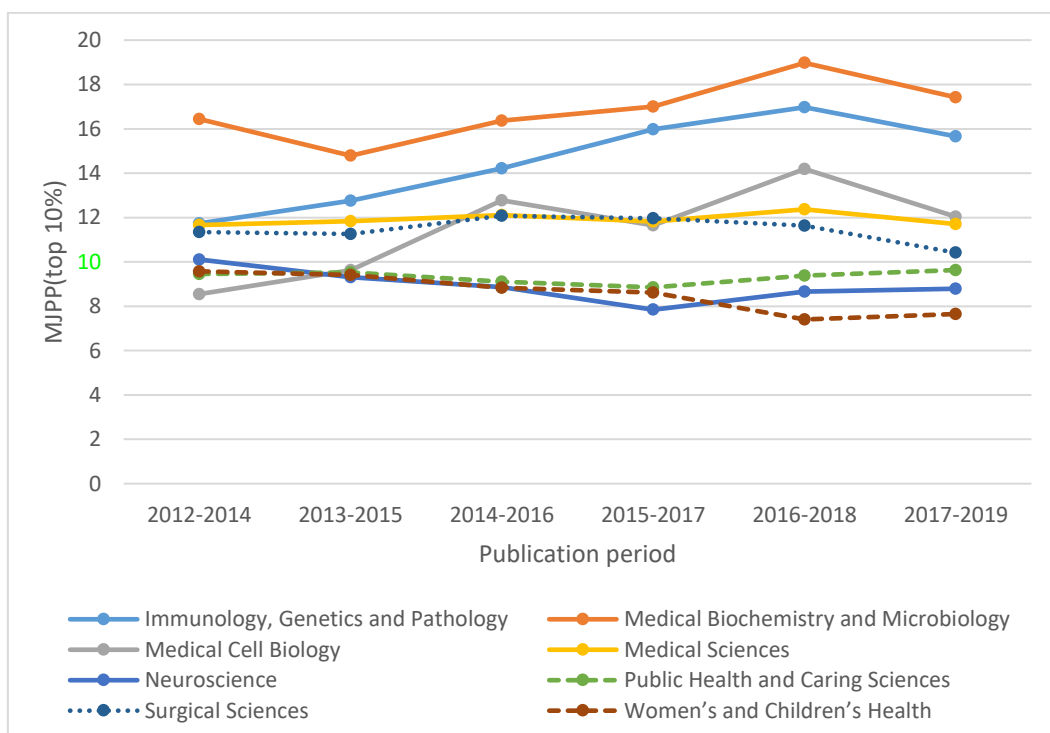
Figure 29. Faculty of Medicine. MJPP(top 10%) by publication period. 3-year moving average.

Faculty of Pharmacy

Table 28. Faculty of Pharmacy. Publication fractions (P; full counts within parentheses), MNCS, PP(top 10%), MNJS and MJPP(top10%) for the whole publication period 2012-2019.

Department	Indicator				
	P	**MNCS**	**PP(top 10%)**	**MNJS**	**MJPP(top 10%)**
Medicinal Chemistry	227,2 (634)	0,88	7,1	0,92	7,2
Pharmaceutical Biosciences	334,6 (839)	1,05	9,6	1,13	11,6
Pharmacy	170 (387)	1,27	17,9	1,36	16,1

Figure 30. Faculty of Pharmacy. MNCS by publication period. 3-year moving average.

Figure 31. Faculty of Pharmacy. PP(top 10%) by publication period. 3-year moving average.

Figure 32. Faculty of Pharmacy. MNJS by publication period. 3-year moving average.

Figure 33. Faculty of Pharmacy. MJPP(top 10%) by publication period. 3-year moving average.
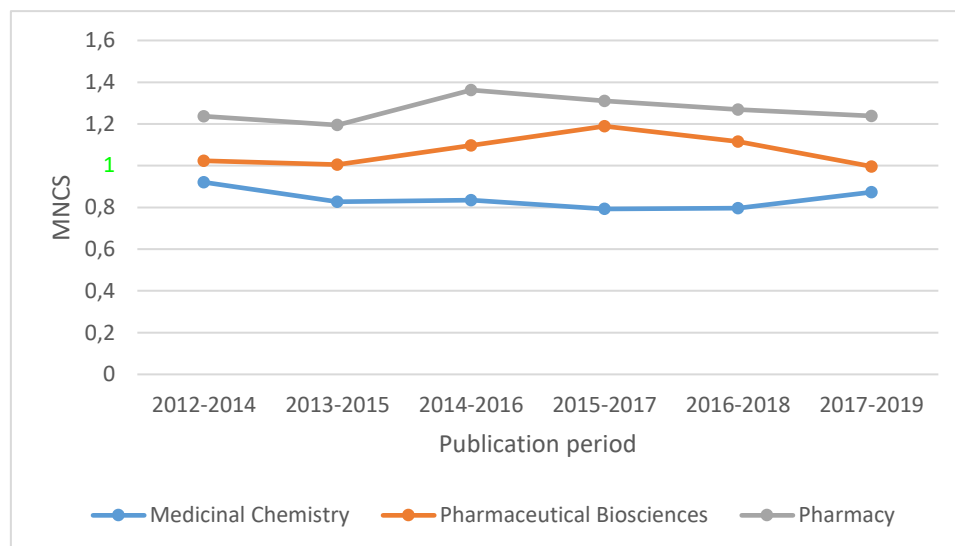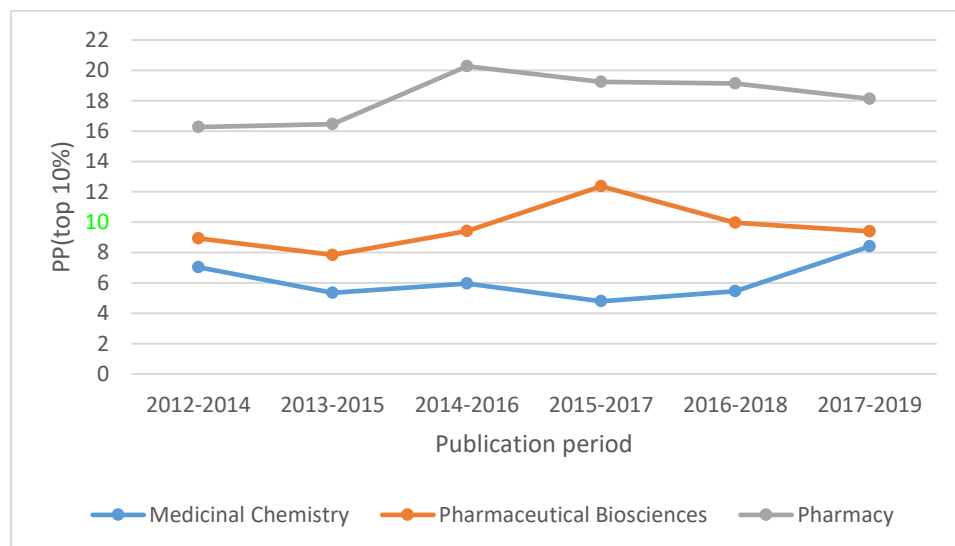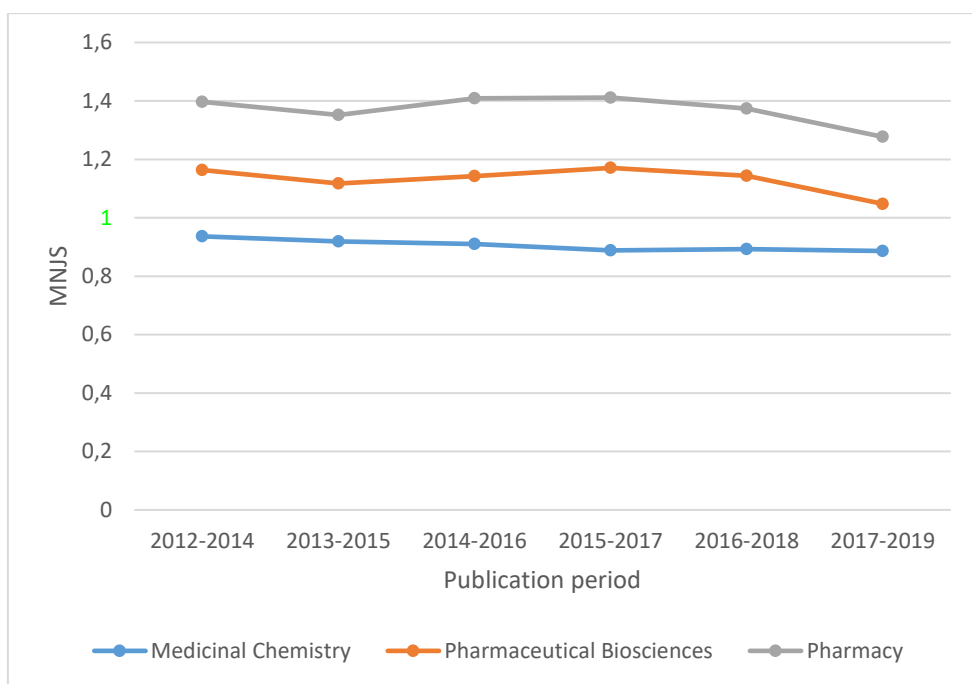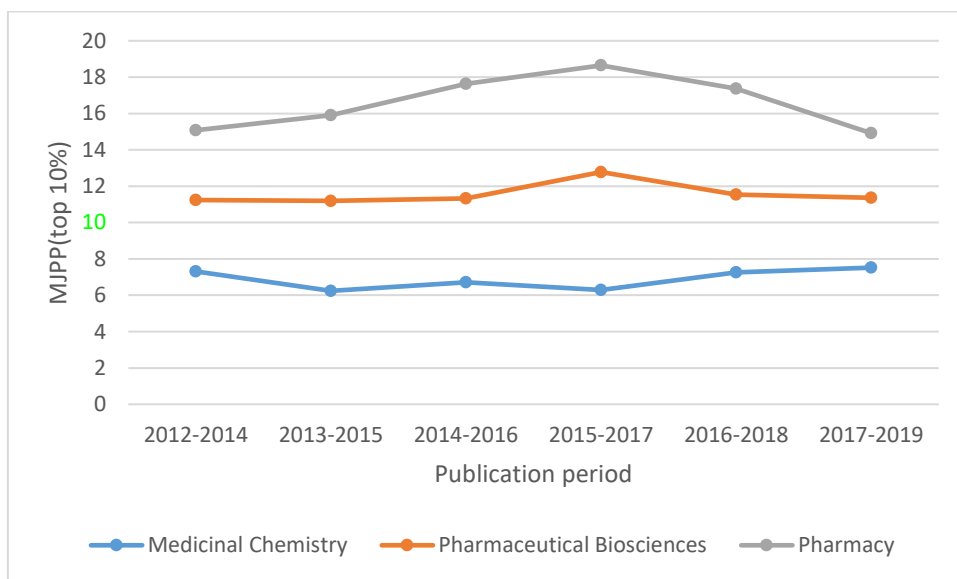
3.3.3 Collaboration

For all tables in this section, PP(int collab) and PP(industry) are given as percentages.

Faculty of Medicine

Table 29. Faculty of Medicine. Publications (P, full counts), PP(int collab) and PP(industry) for the whole publication period 2012-2019.

Department	Indicator		
	P	**PP(int collab)**	**PP(industry)**
Immunology, Genetics and Pathology	2656	60,6	13,5
Medical Biochemistry and Microbiology	1081	68,5	6,4
Medical Cell Biology	446	47,3	7,6
Medical Sciences	4224	57,7	17,0
Neuroscience	1742	45,9	4,3
Public Health and Caring Sciences	1787	49,1	10,5
Surgical Sciences	2780	49,2	9,8
Women's and Children's Health	1895	50,1	5,1

Table 30. Faculty of Medicine. PP(int collab) and PP(industry) (within parentheses) by publication period. 3-year moving average.

Department	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019
Immunology, Genetics and Pathology	57 (14)	57,5 (13,3)	60,4 (13,3)	61,7 (13,7)	63,2 (14,5)	63,1 (13,4)
Medical Biochemistry and Microbiology	64,6 (8)	63,2 (7,3)	66,1 (6,7)	66,3 (5,5)	69 (5,7)	72,9 (5,7)
Medical Cell Biology	45,3 (7,3)	40,2 (4,8)	44,8 (4)	45,6 (5)	49,3 (8,4)	51,2 (11,5)
Medical Sciences	54,3 (16,3)	55,1 (17,1)	56,6 (18,6)	57,9 (17,2)	60 (17,4)	60,6 (17,3)
Neuroscience	40,8 (4)	39,9 (3,9)	43 (3)	47,3 (3,6)	49,8 (4,8)	49,5 (5,2)
Public Health and Caring Sciences	46,6 (10,8)	46,8 (11)	48,4 (11)	47 (10,1)	50,3 (10,7)	52,1 (10,6)
Surgical Sciences	44,3 (11,9)	45,7 (10,5)	48,5 (9,4)	51,4 (9,3)	51,3 (9)	51,8 (8,6)
Women's and Children's Health	43,7 (5,1)	46,7 (6,3)	48,2 (6,7)	50,4 (5,6)	52 (4,2)	54,9 (4,2)

Faculty of Pharmacy

Table 31. Faculty of Pharmacy. Publications (P, full counts), PP(int collab) and PP(industry) for the whole publication period 2012-2019.

Department	Indicator		
	P	**PP(int collab)**	**PP(industry)**
Medicinal Chemistry	634	51,4	18,8
Pharmaceutical Biosciences	839	61,4	26,1
Pharmacy	387	55,3	32,6

Table 32. Faculty of Pharmacy. PP(int collab) and PP(industry) (within parentheses) by publication period. 3-year moving average.

Department	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019
Medicinal Chemistry	43,6 (26)	43,6 (20,5)	46,1 (16,1)	50,4 (14,3)	52 (16,3)	56 (16,1)
Pharmaceutical Biosciences	62 (27,6)	59,3 (28,3)	61,4 (26,4)	59 (25,1)	61 (23,9)	61,6 (24,4)
Pharmacy	46 (28,5)	49,2 (27,4)	58,3 (33,1)	59,1 (35,8)	62 (38,1)	60 (37,6)

3.3.4 Open Access

For all figures in this section, proportion OA publications is given as a percentage. Total OA is defined as publications belonging to any type of OA (gold, hybrid or green).

Faculty of Medicine
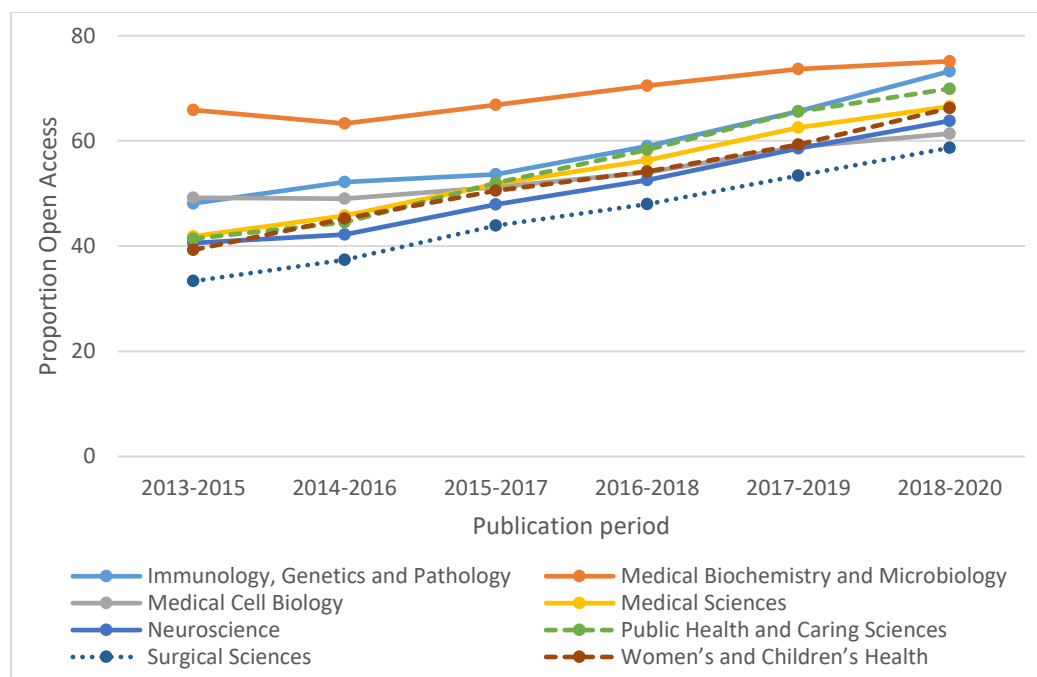
Figure 34. Faculty of Medicine. Total OA by publication period. 3-year moving average.

Faculty of Pharmacy
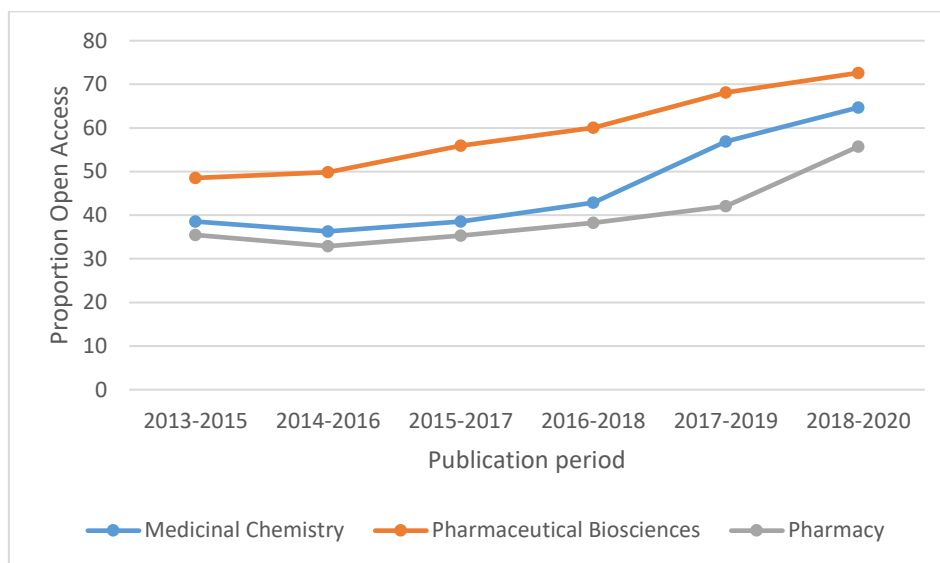
Figure 35. Faculty of Pharmacy. Total OA by publication period. 3-year moving average.

3.4 Teknat

The number of TekNat departments included in ABM is 12. Table 33 reports publication volume, fractional counts and full counts (within parentheses) by department and publication type, and WoS coverage. WoS coverage concerns the number of WoS publications of the four types represented in the table relative to all publications of these types for the department.

Table 33. Faculty of Science and Technology. Publication volume by publication type, and WoS coverage (in %). Publication period: 2012-2020.

Department	Publication type					
	Article	Article in anthology	Monograph	Conference paper	Total	WoS coverage
Cell and Molecular Biology	502,5 (1179)	17,5 (23)	1,2 (2)	2,6 (11)	523,8 (1215)	95,2
Chemistry - BMC	352,4 (925)	7,3 (14)	0 (0)	3,9 (9)	363,5 (948)	94,4
Chemistry - Ångström Laboratory	1044,9 (2156)	35 (59)	4 (7)	11,7 (31)	1095,6 (2253)	93,1
Civil and Industrial Engineering	98,6 (172)	30,2 (46)	12,5 (15)	58,5 (80)	199,9 (313)	36,8
Earth Sciences	871,9 (2137)	33,9 (72)	4,2 (7)	62,7 (112)	972,6 (2328)	83,3
Ecology and Genetics	856,6 (2055)	15,1 (31)	3,8 (5)	1 (1)	876,5 (2092)	94,0
Electrical Engineering	531,2 (981)	12 (21)	1,8 (3)	199,9 (340)	745 (1345)	74,3
Information Technology	613,3 (1237)	63,5 (93)	4,8 (9)	826,7 (1332)	1508,3 (2671)	64,6
Materials Science and Engineering	1004,2 (1982)	37,2 (48)	5 (11)	148,3 (238)	1194,7 (2279)	78,4
Mathematics	515,3 (856)	6 (6)	2,5 (3)	10 (18)	533,8 (883)	91,1
Organismal Biology	359,5 (946)	30,1 (36)	3,5 (4)	6,4 (11)	399,6 (997)	82,2
Physics and Astronomy	2931,7 (6462)	29,1 (39)	4,7 (6)	173,5 (352)	3139 (6859)	93,6

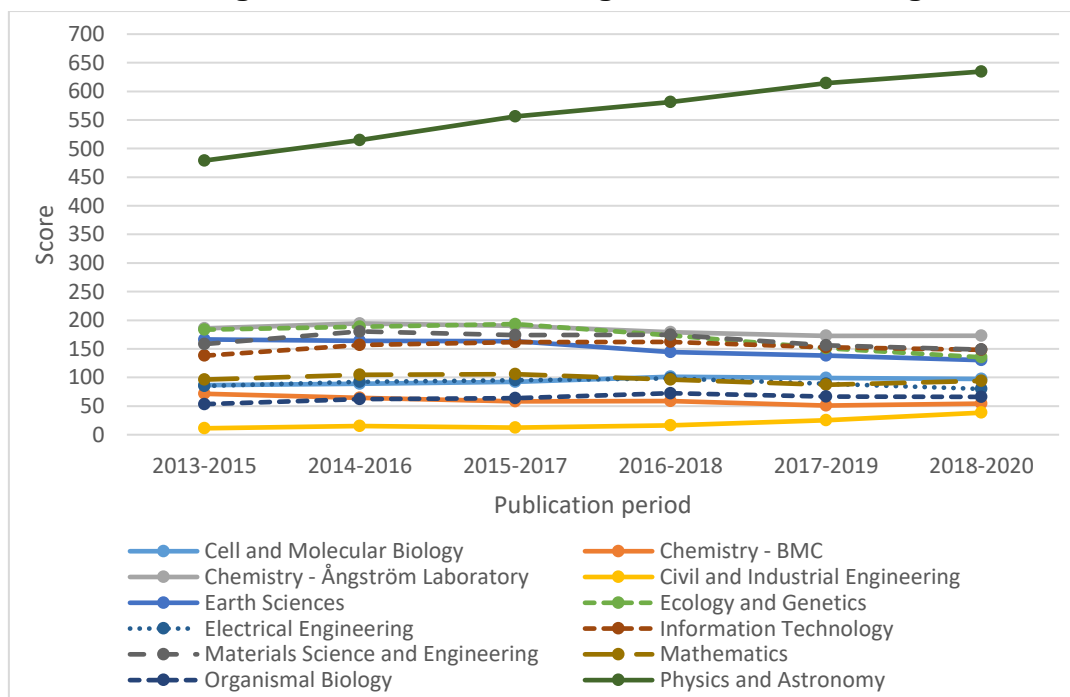## 3.4.1 Publishing Volume and Publishing Level – The Norwegian Model

Figure 36. Faculty of Science and Technology. Norwegian score by publication period. 3-year moving average.

Table 34. Faculty of Science and Technology. Proportion (in %) publication fractions at level 2 relative to the sum of publication fractions across levels 1 and 2 (given within parentheses) by publication period. 3-year moving average.

Department	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020
Cell and Molecular Biology	34,5 (152,1)	32,8 (160,9)	32,5 (168,2)	31,8 (186,7)	30,5 (185,5)	30,1 (183,1)
Chemistry-BMC	35,3 (126,3)	32,8 (117,1)	31,1 (108,5)	29,2 (111,5)	27,1 (99,7)	29,5 (103,7)
Chemistry - Ångström Laboratory	33,1 (333,5)	31,8 (355)	29,9 (354,4)	25,7 (352,1)	21,9 (358,8)	20,8 (367,1)
Civil and Industrial Engineering	18 (25)	26,5 (32,9)	26 (33,5)	25,4 (36,8)	22,6 (48,7)	21,7 (74,4)
Earth Sciences	30,3 (313,5)	30,7 (305,4)	28,6 (313,1)	26,7 (284,7)	26,3 (277,3)	26,5 (261)
Ecology and Genetics	40,8 (303,6)	44,7 (301,4)	47 (301,3)	44,4 (278,5)	40,6 (252,1)	37,8 (231,6)
Electrical Engineering	22,4 (177,2)	23,8 (189)	22,2 (200,1)	23,8 (203,2)	21,9 (191,7)	22 (171,3)
Information Technology	17,4 (323)	18,9 (359,1)	16,2 (387,9)	16,6 (382,2)	15,2 (368,7)	17,7 (341)
Materials Science and Engineering	23,8 (325,6)	25,4 (357,8)	24,9 (346,2)	23,9 (349,9)	18,8 (338,3)	17 (330)
Mathematics	29,7 (181,7)	34,7 (185,4)	34,5 (188,1)	35,1 (169,8)	31,3 (161,1)	37,8 (160,3)
Organismal Biology	27,6 (103,6)	27,5 (120,7)	25,5 (127,9)	30,8 (135,4)	31,9 (122)	32,8 (120)
Physics and Astronomy	38,6 (815,5)	35 (913,6)	30,6 (1041)	29,1 (1106,3)	30,1 (1152,2)	36,4 (1102)

3.4.2 Field Normalized Citation Impact

In each graph in this section, the label of the vertical axis that corresponds to the world average for the citation indicator of the graph is in green color.

Table 35. Faculty of Science and Technology. Publication fractions (P; full counts within parentheses), MNCS, PP(top 10%), MNJS and MJPP(top10%) for the whole publication period 2012-2019.

Department	Indicator				
	P	MNCS	PP(top 10%)	MNJS	MJPP(top 10%)
Cell and Molecular Biology	396,4 (1001)	1,40	15,6	1,40	15,6
Chemistry - BMC	275,6 (764)	0,96	9,5	1,03	11,0
Chemistry - Ångström Laboratory	829,4 (1775)	1,04	10,8	1,13	12,0
Civil and Industrial Engineering	31,7 (59)	0,71	3,9	0,89	8,3
Earth Sciences	564,4 (1647)	0,91	7,2	1,03	10,4
Ecology and Genetics	660,6 (1758)	1,55	17,2	1,44	16,4
Electrical Engineering	385,1 (756)	0,83	7,7	1,02	10,3
Information Technology	402,3 (889)	1,01	10,2	1,02	10,0
Materials Science and Engineering	758,2 (1589)	0,95	7,6	1,05	10,6
Mathematics	358,8 (653)	1,11	11,9	1,05	10,9
Organismal Biology	235,4 (686)	1,49	13,2	1,45	12,6
Physics and Astronomy	1292,4 (5471)	1,01	9,7	1,04	10,3

Figure 37. Faculty of Science and Technology. MNCS by publication period. 3-year moving average.

Figure 38. Faculty of Science and Technology. PP(top 10%) by publication period. 3-year moving average.
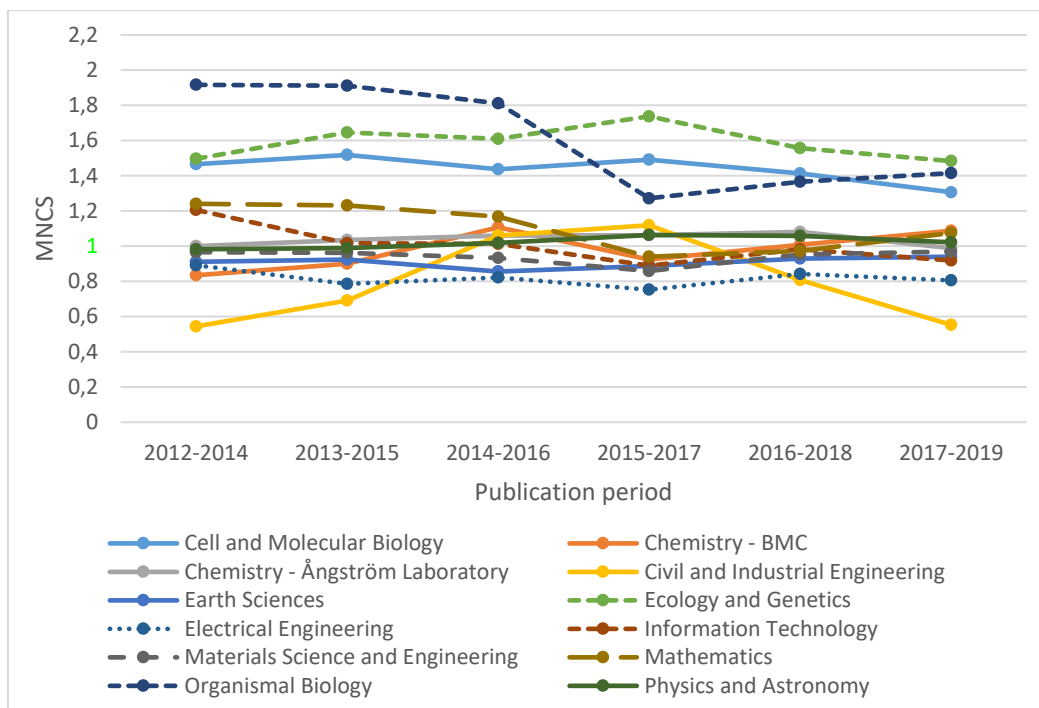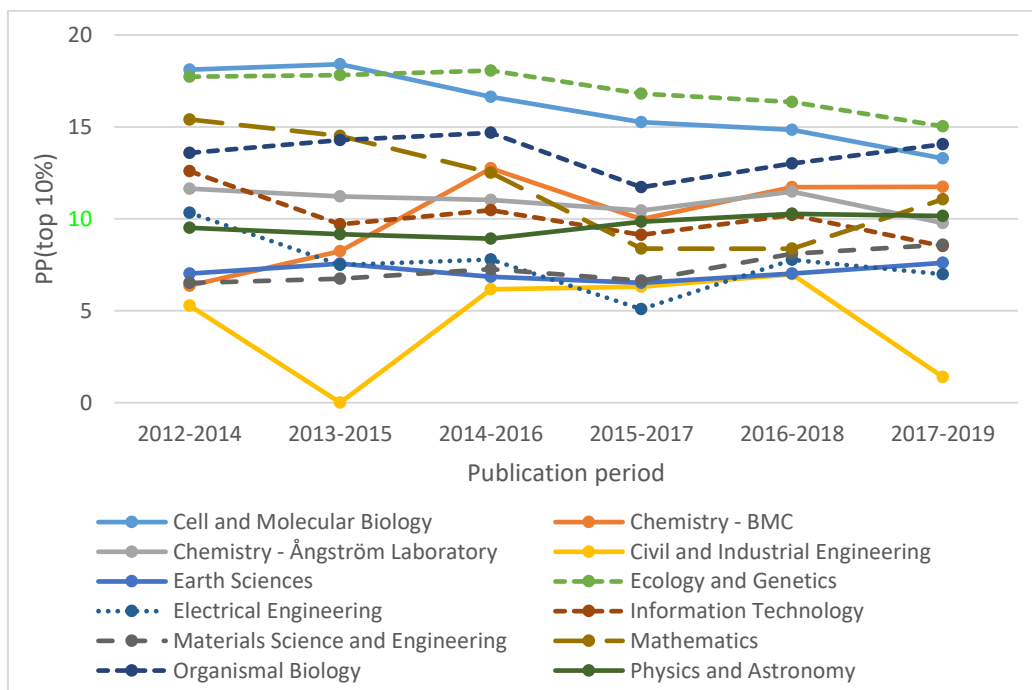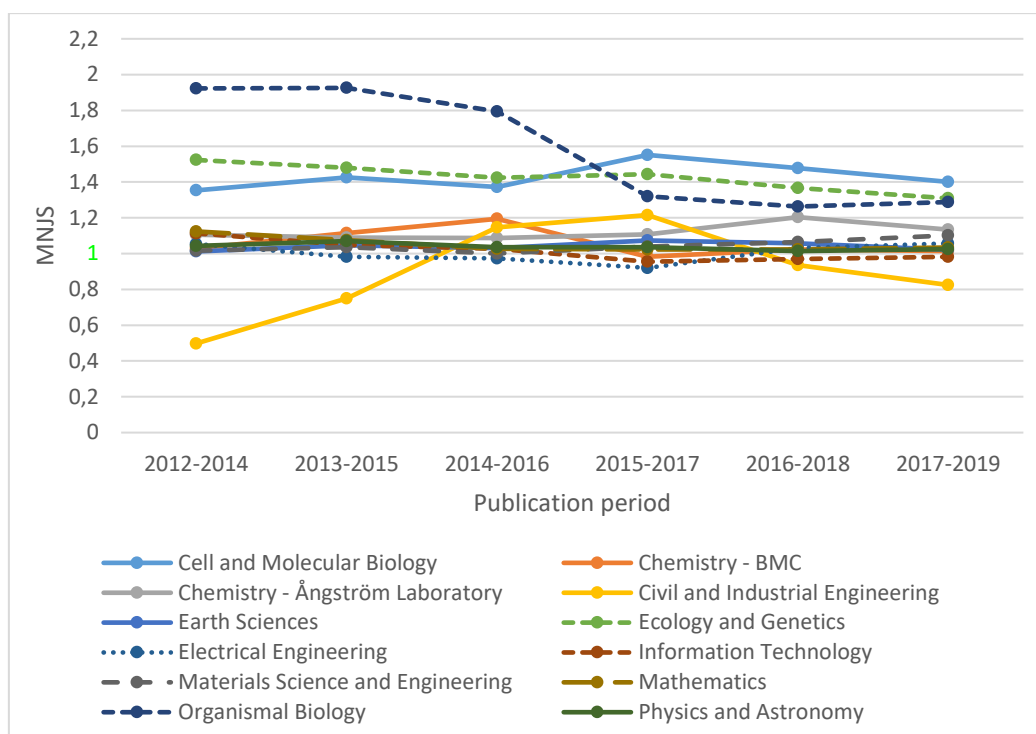
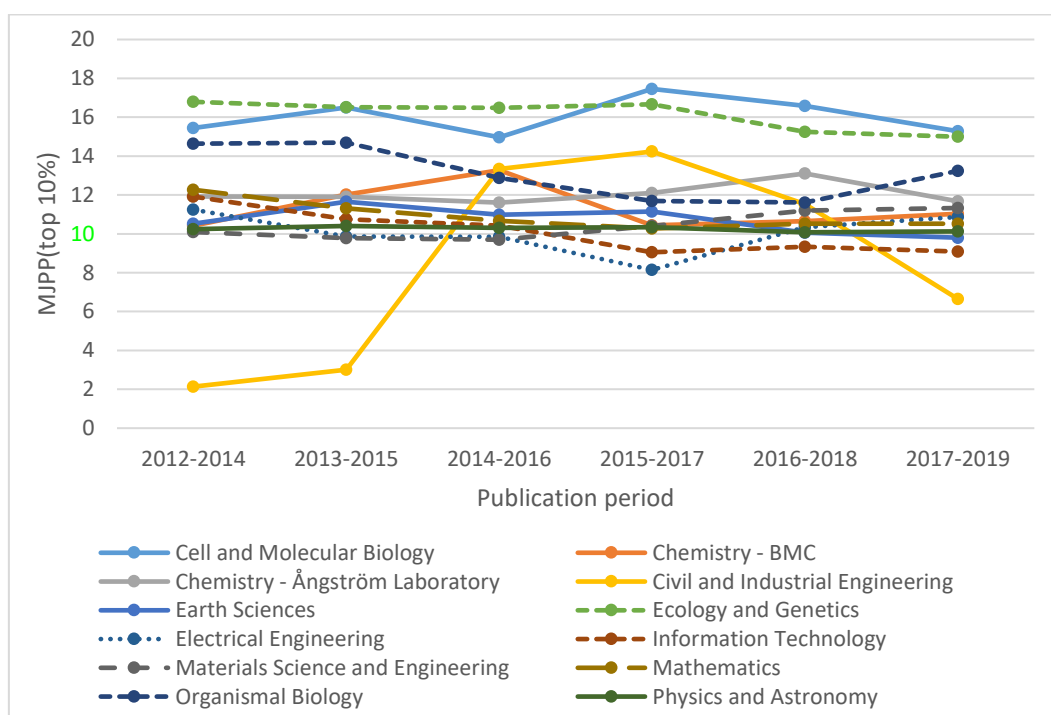Figure 39. Faculty of Science and Technology. MNJS by publication period. 3-year moving average.

Figure 40. Faculty of Science and Technology. MJPP(top 10%) by publication period. 3-year moving average.

3.4.3 Collaboration

For all tables in this section, PP(int collab) and PP(industry) are given as percentages.

Table 36. Faculty of Science and Technology. Publications (P, full counts), PP(int collab) and PP(industry) for the whole publication period 2012-2019.

Department	Indicator		
	P	PP(int collab)	PP(industry)
Cell and Molecular Biology	1001	68,2	7,6
Chemistry - BMC	764	57,5	11,0
Chemistry - Ångström Laboratory	1775	62,7	5,9
Civil and Industrial Engineering	59	47,5	3,4
Earth Sciences	1647	80,6	7,2
Ecology and Genetics	1758	76,4	4,2
Electrical Engineering	756	53,8	12,7
Information Technology	889	60,5	6,7
Materials Science and Engineering	1589	51,6	10,9
Mathematics	653	63,1	2,0
Organismal Biology	686	75,1	2,9
Physics and Astronomy	5471	87,8	7,5

Table 37. Faculty of Science and Technology. PP(int collab) and PP(industry) (within parentheses) by publication period. 3-year moving average.

Department	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019
Cell and Molecular Biology	63,3 (8,8)	66,5 (6,1)	67,6 (7,3)	68,1 (6,7)	70 (7)	72,7 (6,9)
Chemistry - BMC	51,5 (10,7)	48,8 (7,6)	52,3 (11)	56,3 (11)	60,9 (14)	65,4 (10,8)
Chemistry - Ångström Laboratory	59,4 (5,7)	58,8 (4,2)	60,2 (4,6)	61,1 (4,8)	63,5 (6,5)	66,4 (6,8)
Civil and Industrial Engineering	66,7 (0)	56,2 (0)	61,9 (4,8)	55 (5)	40 (8)	34,4 (3,1)
Earth Sciences	79,4 (6)	78,1 (6)	79,6 (7,4)	80,7 (7,4)	80,9 (8,6)	81 (8,4)
Ecology and Genetics	70,6 (2,8)	73,1 (3,4)	76,2 (4,8)	78,4 (4,4)	80,2 (5,4)	81,9 (5,2)
Electrical Engineering	48,2 (10,8)	50,9 (11,6)	52,4 (11,4)	53,8 (11,2)	54 (13,5)	60,4 (14,5)
Information Technology	56,1 (3,5)	60,6 (5)	60,3 (6,5)	59,5 (9)	62,7 (8,5)	64,2 (7,9)
Materials Science and Engineering	42,1 (12,1)	45,9 (11,6)	49,5 (11,2)	53,9 (10,7)	57,3 (9,8)	59,4 (9,8)
Mathematics	63,4 (1,3)	61,6 (1,9)	59,7 (2,2)	63,4 (2,1)	64,2 (2,3)	66,3 (2,1)
Organismal Biology	70,1 (1,5)	69,3 (2,3)	73,7 (3)	78,2 (3,4)	80 (4,1)	79,1 (3,4)
Physics and Astronomy	87,1 (3,6)	87,8 (4,3)	87,8 (5,4)	87 (5,4)	87,4 (9,7)	88,3 (11,6)

3.4.4. Open Access

In Figure 41, proportion OA publications is given as a percentage. Total OA is defined as publications belonging to any type of OA (gold, hybrid or green).
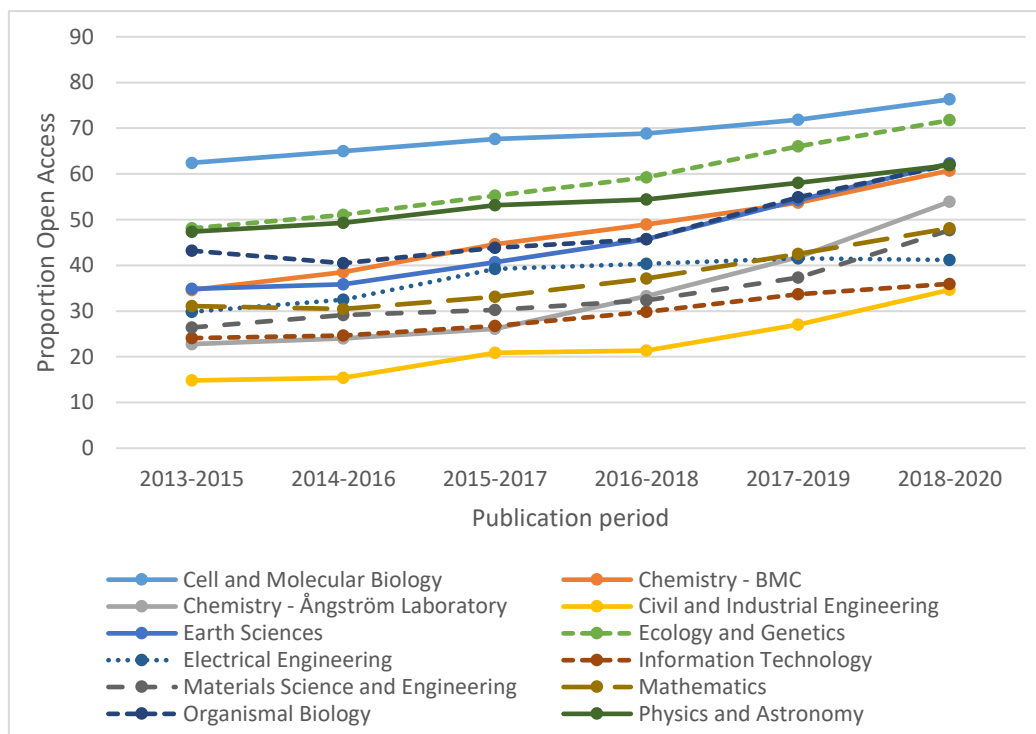

Figure 41. Faculty of Science and Technology. Total OA by publication period. 3-year moving average.

4 Brief summary of the results

Humsam

Regarding the Norwegian model, the increase in proportion of publication fractions at level 2 for some departments in the *Faculty of Arts* is quite high (Table 7*). Archeology and Ancient History, Gender Research* and *Philosophy* all have an increase of between 15 and 16 percentage units from the publication period 2013-2015 to the publication period 2018-2020. *English* and *Modern Languages* have an increase of about 12 percentage units for the same periods (Table 9). In the *Faculty of Social Sciences*, the corresponding increase is most noteworthy for *Economic History* and *Psychology* (about 11 percentage units for both departments) (Table 10). The highest observed value for the indicator across the considered publication periods is the value for *Economics* (58,4%, for the period 2017-2019).

When it comes to citation indicators, *Peace and Conflict Studies* is worth mentioning, since the department has high figures for all four indicators with respect to the whole publication period, in particular for the two publication-level indicators, MNCS and PP(top 10%) (Table 14). Moreover, the proportion of publication fractions at level 2 is high for this department, regardless of publication period (Table 10).

In general, the HumSam departments/faculties have an increasing trend for proportion OA. The extreme OA trend for *Game Design* under the *Faculty of Arts* is mostly explained by a two-year period (2015-2016) with quite many book chapters made freely available.

Medfarm

Regarding the *Faculty of Medicine*, the highest values on the citation indicators, with respect to the whole publication period, are observed for the two departments *Medical Biochemistry and Microbiology* and *Immunology, Genetics and Pathology* (Table 27). *Medical Biochemistry and Microbiology* has the highest PP(top 10%) values across the periods (Figure 27), as well as the highest proportion of publication fractions at level 2 for the five first considered periods (Table 25). Interestingly, for this indicator, *Medical Cell Biology* has the highest value for the last period. In general, the departments of the faculty have an increasing trend for proportion OA (Figure 34).

For the *Faculty of Pharmacy*, the *Pharmacy* department has high values on the PP(top 10%) indicator in all six publication periods, values in the interval 16-20 (Figure 31). *Pharmacy* further have high values of the collaboration indicator PP(industry), especially in the next to last period (2016-2018): about 38% of its publications in the period have been co-authored with one or more industrial organizations (Tables 31 and 32).

TekNat

For the *Faculty of Science and Technology*, the three biology departments, *Cell and Molecular Biology*, *Ecology and Genetics* and *Organismal Biology*, all have high values on the citation indicators with respect to the whole publication period (Table 35). With regard to the Norwegian model, *Ecology and Genetics* and *Mathematics* show the highest figures with regard to proportion of publication fractions at level 2 for the latest considered period, 2018-2020 (Table 34).

High values are observed on the international collaboration indicator, PP(int collab), for the three departments *Earth Sciences*, *Organismal Biology* and *Physics and Astronomy* (Tables 36 and 37).

The overall trend for proportion OA is increasing for the entire faculty.

5 Concluding remarks

In this report, we have described the data and methods used in UU ABM 2021, and we have reported results on publication volume, publishing level, citation impact, collaboration (in terms of co-publishing) and OA. For the measurement of citation impact, four advanced bibliometric indicators were used.

We believe that the results of ABM are of interest, not only for the university management, but also for the heads of the departments of UU. However, bibliometric statistics should be interpreted with great caution when underlying publication sets are small. For some of the departments covered by ABM, this is the case.

In our view, and as is pointed out in the Leiden Manifesto for research metrics (Hicks et al., 2015), bibliometric statistics should support peer review assessments, not replace such assessments. The use of bibliometric statistics can indeed strengthen peer review, since such statistics can be used to question bias tendencies in peer review. As is also pointed out by the Leiden Manifesto for research metrics, variation by field in publication and citation practices should be controlled for in bibliometric research evaluation. In UU ABM 2021, and with respect to citation impact, this principle is taken into account.

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Appendix 1 Formal definitions of citation indicators used in UU ABM

In this appendix, we describe the calculation of the four field normalized citation impact indicators used in UU ABM.

The following indicators are defined in this appendix:

- Mean normalized number of citations per publication (MNCS).
- Proportion of frequently cited publications (top 10%) (PP(top 10%)).
- Mean normalized journal impact score per publication (MNJS).
- Mean journal proportion of top 10% publications (MJPP(top 10%)).

MNCS and PP(top 10%) are publication-level indicators, whereas MNJS and MJPP(top 10%) are journal-level indicators.

Regardless of indicator, a subject classification of publications is used for field normalization purposes. The classification is generated by application of an advanced clustering methodology, in which a publication-publication relatedness measure based on direct citations between publications is utilized (Waltman & van Eck, 2012). The classification, which contains about 4,000 classes, is such that each publication belongs to exactly one class.[11] The classification has been created by CWTS, Leiden University, Netherlands.

This appendix treats the case, in which fractional counts are used in the calculations of indicator values. In case whole counts should be used in the calculations, a_i in Eq. (1) below is set to 1.

Let A be a unit of analysis, and n the number of publications for A. Let r_i be the number of authors of the ith publication for A. Let a_i be the *author fraction* A has of the ith publication. We consider two cases.

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[11] Cf. footnote 4 in this report.

(**a**) A is a department. a_i is then defined as

$$a_i = \sum_{j=1}^{m_i} \frac{uuaff_j}{totaff_j} \times \frac{1}{d_j} \times \frac{1}{r_i} \qquad (1)$$

where m_i is the number of authors affiliated to A regarding the ith publication, d_j the number of UU department affiliations of the jth of these A authors, $uuaff_j$ the number of UU affiliations listed in WoS for the jth author, and $totaff_j$ the total number of affiliations listed in WoS for the jth author. Note that the right-hand side in Eq. (1) is equal to m_i / r_i when each A author has exactly one affiliation in the ith publication.[12]

(**b**) A is an individual author. a_i is in this case defined as $1/r_i$.

We define MNCS for A, MNCS(A), as

$$\text{MNCS(A)} = \frac{\sum_{i=1}^{n} a_i \text{NCS}_i}{\sum_{i=1}^{n} a_i} \qquad (2)$$

$$\text{NCS}_i = c_i / \mu_{sc\_i}$$

$$\mu_{sc\_i} = \frac{1}{k_i} \sum_{j=1}^{k_i} c_j$$

where NCS_i is the normalized citation score for the ith publication of A, c_i is the citation score of the ith publication, sc_i the subject class to which the ith publication has been (algorithmically) assigned, k_i the number of publications in sc_i with the same publication year as the ith publication, and c_j the citation score of the jth publication among these latter publications. μ_{sc_i} is the field reference value that c_i is normalized against. The normalization gives rise to a normalized citation score for the ith publication. Clearly, MNCS(A) is a weighted mean across the publications of A, a fact that also holds for the other three citation indicators treated in this report (Section 2.2).

We define PP(top 10%) for A, PP(top 10%)(A), as

$$\text{PP(top 10\%)(A)} = \frac{\sum_{i=1}^{n} a_i b_i}{\sum_{i=1}^{n} a_i} \qquad (3)$$

$$b_i = \frac{\max(y_{sc\_i}^{c_i+1} - \max(0.9, y_{sc\_i}^{c_i}), 0)}{y_{sc\_i}^{c_i+1} - y_{sc\_i}^{c_i}}$$

where $y_{sc\_i}^{c_i}$ ($y_{sc\_i}^{c_i+1}$) is the proportion publications–with respect to the citation distribution, which concerns the publications in sc_i with the same publication year as the ith publication of A–with less than c_i ($c_i + 1$) citations. $\max(y_{sc\_i}^{c_i+1} - \max(0.9, y_{sc\_i}^{c_i}), 0) / y_{sc\_i}^{c_i+1} - y_{sc\_i}^{c_i}$ is the fraction of the ith publication with which the publication is assigned to the 10% most frequently cited publications (Waltman & Schreiber, 2013).

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[12] The data source we use with respect to the Norwegian model, i.e. DiVA/GLIS, has typically not information on the total number of affiliations listed in WoS for an author that is affiliated to UU in a publication covered by WoS. Therefore, the leftmost factor in Eq. (1) is dropped regarding author fractionalization and the Norwegian model.

We define MNJS for A, MNJS(A), as

$$\text{MNJS(A)} = \frac{\sum_{i=1}^{n} a_i \text{NJS}_i}{\sum_{i=1}^{n} a_i} \tag{4}$$

$$\text{NJS}_i = \frac{\sum_{j=1}^{p_i} \text{NCS}_j}{p_i}$$

$$\text{NCS}_j = c_j / \mu_{sc\_j}$$

$$\mu_{sc\_j} = \frac{1}{k_j} \sum_{l=1}^{k_j} c_l$$

where NJS_i is the normalized journal score of the journal, say J_i, of the ith publication, p_i the number of publications in J_i, NCS_j (c_j) the normalized citation score (citation score) of the jth publication in J_i, say P_j, sc_j the subject class to which P_j has been assigned, k_j the number of publications in sc_j with the same publication year as P_j, and c_l the citation rate of the lth of these latter publications. μ_{sc_j} is the field reference value that the citation score of P_j, c_j, is normalized against, and the normalization gives rise to a field normalized citation score for P_j (cf. the definition of MNCS above).

We define the MJPP(top 10%) for A, MJPP(top 10%)(A), as

$$\text{MJPP(top 10\%)(A)} = \frac{\sum_{i=1}^{n} a_i \text{JPP(top 10\%)}_i}{\sum_{i=1}^{n} a_i} \tag{5}$$

$$\text{JPP(top 10\%)}_i = \frac{\sum_{j=1}^{q_i} b_j}{q_i}$$

$$b_j = \frac{\max(y_{sc\_i}^{c_j+1} - \max(0.9, y_{sc\_i}^{c_j}), 0)}{y_{sc\_i}^{c_j+1} - y_{sc\_i}^{c_j}}$$

where q_i is the number of publications in sc_i with (a) the same publication year as the ith publication of A, and (b) belonging to the journal of the ith publication of A. $\max(y_{sc\_i}^{c_j+1} - \max(0.9, y_{sc\_i}^{c_j}), 0) / y_{sc\_i}^{c_j+1} - y_{sc\_i}^{c_j}$ is the fraction of the jth publication, in sc_i and satisfying the conditions (a) and (b), with which the publication is assigned to the 10% most frequently cited publications with respect to the citation distribution determined by sc_i and the publication year of the ith publication of A.

JPP(top 10%)i is then the extent, on average, to which the publications that belong to sc_i, with the same publication year as the ith publication of A and belonging to the same journal as the ith publication of A, belong to the 10% most frequently cited publications with respect to the citation distribution determined by sc_i and the publication year of the ith publication.

Appendix 2 The Norwegian Model: Publication volume per department and year

Tables A2-1 (HumSam), A2-2 (MedFarm) and A2-3 (TekNat) report publication volume in terms of both fractional counts and full counts (within parentheses) by department and year. Note that volume values are given also for year 2012, a year that is not included in the Norwegian model analysis.

Table A2-1. **HumSam**. Publication volume by department and year.

Department	2012	2013	2014	2015	2016	2017	2018	2019	2020
ALM	14,1 (18)	17,8 (20)	17 (22)	14,4 (24)	21,3 (32)	23,1 (29)	19 (30)	26,5 (38)	27,6 (42)
Archeology and Ancient History	43,6 (54)	59,9 (71)	57,3 (63)	65,2 (83)	43,3 (58)	48,8 (68)	56,3 (86)	39,9 (64)	53,4 (71)
Art History	16,3 (18)	22 (24)	17 (22)	38 (45)	17,2 (20)	18,7 (22)	22,1 (28)	15,7 (21)	12,5 (17)
Business Studies	88,6 (116)	89,9 (117)	66,4 (97)	81,7 (110)	83,1 (129)	54,8 (79)	68,1 (96)	43,7 (61)	48,9 (82)
Cultural Anthropology and Ethnology	28,8 (32)	23,8 (25)	28,5 (31)	39,1 (46)	32,5 (40)	28,5 (35)	29,8 (37)	36,4 (44)	15,5 (24)
Economic History	44,7 (51)	57,5 (66)	40,1 (48)	30,2 (38)	39,4 (49)	33,2 (43)	38,9 (50)	29,5 (37)	27,7 (39)
Economics	31,8 (53)	21,4 (34)	21,3 (39)	16,4 (26)	18,1 (34)	16,8 (32)	11,3 (26)	14,5 (32)	20,4 (37)
English	29,5 (31)	32 (35)	34,8 (38)	29,8 (32)	31 (32)	33,3 (35)	24,8 (27)	20,3 (23)	32,6 (43)
Faculty of Education	76,1 (100)	58,4 (79)	83,9 (116)	90,9 (133)	75,7 (104)	82,8 (111)	80,6 (118)	77,5 (112)	94,9 (136)
Faculty of Law	115,9 (125)	173,4 (188)	164,5 (173)	138,7 (156)	162,6 (181)	123,4 (141)	115,9 (128)	120 (130)	106,6 (120)
Faculty of Theology	93,2 (99)	98,9 (107)	85,7 (90)	77,4 (84)	82,3 (92)	96,5 (112)	72,8 (83)	78,3 (92)	71,4 (82)
Food Studies, Nutrition and Dietetics	4,5 (7)	8,2 (12)	16,8 (20)	12,6 (20)	6,4 (15)	10,7 (25)	15,7 (36)	22,6 (42)	6,5 (26)
Game Design	0,9 (2)	4,4 (7)	3,4 (4)	27 (27)	27,2 (29)	1,9 (5)	3,3 (5)	6,4 (11)	3 (5)
Gender Research	23,3 (28)	32,6 (40)	28,9 (38)	23,2 (36)	34,5 (49)	22,9 (28)	32,1 (46)	16,6 (22)	23,7 (33)
Government	51,4 (68)	77,3 (88)	58,1 (81)	63,6 (79)	95,6 (121)	53,7 (78)	67,7 (94)	53,8 (78)	58,5 (81)
History	57 (61)	70,8 (75)	59,3 (63)	41,9 (50)	40,9 (48)	63,7 (72)	52,7 (58)	38,3 (44)	50,3 (59)
History of Sciences and Ideas	27,3 (30)	26,7 (28)	30 (34)	25,3 (28)	34,1 (36)	25,6 (32)	30,5 (33)	32,7 (38)	32,3 (36)
Housing and Urban Research	35,2 (50)	43,5 (62)	47,1 (66)	54,5 (73)	41,1 (66)	36,5 (59)	42,3 (66)	17,2 (33)	29,7 (53)
Informatics and Media	60,2 (75)	33 (46)	23,7 (36)	23,7 (36)	22,6 (35)	23,5 (31)	35 (51)	37,2 (61)	21 (33)
Linguistics and Philology	80,8 (96)	87 (105)	89,7 (109)	87,1 (104)	73,7 (87)	78,6 (100)	74,2 (96)	74,1 (93)	73,5 (94)
Literature	57,7 (61)	53,5 (57)	51 (53)	49 (59)	52,8 (57)	42 (48)	36,1 (42)	29,2 (32)	24,5 (28)
Modern Languages	61,2 (64)	57,2 (62)	45 (53)	63,5 (70)	50,5 (53)	43,2 (46)	71 (77)	44,7 (50)	45,7 (52)
Musicology	12 (12)	15,5 (18)	8,5 (9)	26,5 (28)	16 (16)	25 (26)	15,5 (18)	14 (14)	15,3 (16)
Peace and Conflict Studies	70,5 (79)	42,9 (54)	53,7 (62)	47,7 (57)	59,6 (76)	39,6 (53)	40,1 (51)	35,8 (47)	31,8 (45)
Philosophy	41,5 (43)	32 (36)	43,6 (45)	28,8 (32)	40 (42)	25 (28)	41,5 (45)	37,5 (41)	33,9 (38)
Psychology	47,1 (90)	47,2 (88)	34 (70)	48 (88)	55,3 (111)	46 (97)	44,6 (98)	46,7 (102)	36,3 (99)

Russian and Eurasian Studies	44,6 (51)	64,1 (70)	59,7 (68)	59,2 (67)	52 (60)	28,6 (36)	27,4 (32)	37,1 (44)	22,9 (32)
Scandinavian Languages	76,5 (81)	78,2 (86)	68,2 (75)	87,8 (93)	44,7 (52)	47,8 (58)	43,2 (52)	35,3 (40)	37,2 (45)
Social and Economic Geography	15,5 (20)	19,7 (30)	22,7 (32)	26,9 (36)	21,6 (25)	24,9 (37)	34,9 (49)	23,7 (31)	21 (34)
Sociology	61,3 (77)	48,3 (63)	36 (54)	46,1 (63)	49,8 (67)	42 (66)	49,5 (70)	51,8 (69)	36,1 (61)
Statistics	7,3 (13)	5,2 (10)	5,9 (11)	4,3 (9)	11,6 (26)	14,3 (31)	9 (21)	12,1 (28)	10,7 (32)

Table A2-2. **MedFarm**. Publication volume by department and year.

Department	2012	2013	2014	2015	2016	2017	2018	2019	2020
Immunology, Genetics and Pathology	105,2 (312)	109,7 (320)	105,4 (338)	107,1 (354)	110,6 (389)	108,4 (352)	83,9 (302)	90,5 (333)	96,8 (344)
Medical Biochemistry and Microbiology	50,5 (116)	36,9 (88)	44,8 (112)	56,2 (169)	59 (174)	66,4 (170)	62,7 (185)	62,4 (177)	66,6 (185)
Medical Cell Biology	31,8 (64)	29,7 (55)	23,9 (50)	42,6 (82)	31,7 (70)	23,6 (53)	22,1 (51)	33,7 (71)	22,4 (67)
Medical Sciences	151,1 (476)	181,8 (596)	154,5 (568)	161,9 (566)	166,9 (620)	167,4 (691)	153 (602)	153 (642)	156,7 (669)
Medicinal Chemistry	34,9 (78)	38,6 (75)	40,9 (78)	38,9 (83)	36,4 (98)	36,4 (86)	28,8 (96)	33,4 (101)	34,7 (123)
Neuroscience	120,5 (236)	121,6 (254)	125,2 (236)	111,5 (237)	104,9 (245)	108 (269)	104,6 (266)	90,1 (240)	136,8 (323)
Pharmaceutical Biosciences	57 (129)	60,3 (119)	47 (98)	40,1 (90)	61,2 (137)	52,3 (136)	56 (130)	40,9 (107)	54,1 (132)
Pharmacy	23,8 (49)	23 (43)	23,3 (57)	23,8 (41)	26,1 (54)	30 (55)	26 (61)	28,2 (60)	20,9 (53)
Public Health and Caring Sciences	85 (205)	98,2 (258)	110,8 (299)	110,8 (281)	107,7 (299)	115,9 (299)	103 (295)	100,4 (294)	93 (262)
Surgical Sciences	158,9 (394)	157,7 (403)	167,1 (442)	164,2 (451)	168,8 (476)	179,3 (526)	174 (503)	166,3 (492)	190,1 (571)
Women's and Children's Health	81,3 (199)	112,3 (259)	99 (244)	115,2 (261)	108,8 (289)	123,9 (305)	96 (268)	115,3 (329)	117,1 (336)

Table A2-3. **TekNat**. Publication volume by department and year.

Department	2012	2013	2014	2015	2016	2017	2018	2019	2020
Cell and Molecular Biology	57,1 (123)	45,2 (103)	52,8 (118)	57,8 (125)	59,1 (137)	60,4 (149)	78,8 (173)	52,9 (140)	59,7 (147)
Chemistry - BMC	46,8 (112)	49,9 (119)	43,7 (101)	38,4 (92)	40,7 (124)	35,3 (107)	41,3 (98)	27,4 (80)	40 (115)
Chemistry - Ångström Laboratory	89,5 (201)	103,1 (202)	124,1 (245)	129,9 (238)	128,5 (263)	127,9 (253)	123 (259)	137,1 (292)	132,6 (300)
Civil and Industrial Engineering	13,6 (21)	15 (25)	13,2 (18)	22 (38)	23 (35)	15,1 (23)	26,7 (45)	32 (43)	39,2 (65)
Earth Sciences	100,1 (227)	114 (278)	115,8 (271)	130,1 (309)	113,7 (270)	119,1 (267)	92 (222)	95,4 (241)	92,5 (243)
Ecology and Genetics	110,7 (255)	112,9 (230)	105,9 (251)	95,9 (232)	105,9 (263)	106,8 (245)	72,1 (211)	81 (198)	85,1 (207)
Electrical Engineering	98,9 (163)	85,4 (153)	77,9 (135)	81,6 (141)	96,4 (161)	87,9 (157)	83,7 (158)	73,8 (152)	59,4 (125)
Information Technology	156,4 (246)	169,9 (296)	154,1 (267)	193 (338)	175,5 (323)	187 (325)	178,6 (327)	141,5 (266)	152,3 (283)
Materials Science and Engineering	131,9 (232)	132,9 (238)	143 (261)	129,3 (247)	153,3 (291)	139,1 (272)	125,9 (256)	129,3 (254)	110 (228)
Mathematics	48,7 (81)	55,7 (88)	62,7 (105)	76,2 (122)	59 (98)	65,4 (121)	53,4 (83)	50,4 (83)	62,2 (102)
Organismal Biology	48,4 (104)	35,3 (90)	36,4 (97)	39,6 (109)	59,6 (140)	45,5 (107)	48,3 (118)	44,7 (110)	41,8 (122)
Physics and Astronomy	303,2 (644)	258,5 (591)	283,3 (653)	353,5 (791)	371 (825)	412,7 (897)	404,9 (884)	396,3 (796)	355,5 (778)