Uppsala University Annual Bibliometric Monitoring 2019

Per Ahlgren¹, Leif Eriksson¹, Daniel Wadskog², and Erik Åkesson Kågedal²

¹ Planning Division, Uppsala University

² Uppsala University Library

1 Introduction

Nowadays, and in several countries in the world, bibliometric evaluation of research is performed to a quite large extent. In the Swedish context, bibliometric analysts at Karolinska Institutet and KTH Royal Institute of Technology, for instance, perform annual bibliometric analyses of the publication output of these universities.

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 ABM 2019 is a response to this conclusion and presents extensive bibliometric statistics with regard to the UU departments.

The remainder of this report is structured as follow. Section 2 treats the data and methods of ABM. The results of ABM are reported in Section 3, whereas the results are briefly discussed 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 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 used version 2019/2 in ABM 2019. DiVA data, or more precisely DiVA data as it appear in GLIS (*Generellt Lednings Informations System*), are used for the analysis according to the Norwegian model, whereas CWTS Monitor is used for the analysis of citation impact and collaboration. For OA, DiVA data is used from DiVA directly but combined with data from GLIS, WoS¹, and Directory of Open Access Journals (DOAJ).

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 (see Appendix 2).

¹ Since WoS does not cover all UU publications, the levels of different OA classes might vary between different research fields. We use, however, information in DiVA and DOAJ to classify all UU publications, even those not covered by WoS.

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 open access, we use whole 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 publications (of the types “Article” and “Review”) in the period 2010-2017.

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.

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

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

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 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 2011-2018.

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 citations scores should be performed. In ABM, all used citation impact indicators are *field normalized*.

The publication period used for the citation analyses is 2010-2017. The end publication year in the version of CWTS Monitor used is 2017. Further, a later end year than 2017 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.

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 2019.³ 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 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

³ <http://www.leidenranking.com/>

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.

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%).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 ($= 10$).

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 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.

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.

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 2, we show how the extent to which publication i belongs to the 10% most frequently cited publications is calculated.

Here, and normally, whole 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.

For the collaboration part of ABM, the publication period is 2010-2017.

2.4 Open access

Open access (OA) in the simplest explanation is the concept of publications being available freely online without any costs or other access barriers to the reader. In the research policy bill “Collaborating for knowledge” (Prop. 2016/17:50), the Government presents a national goal that all scientific publications that are the result of publicly funded research should be published immediately open access, and it is stated that it is a shared responsibility for all actors in the research system to strive to achieve this goal. Also large national, and international, funders such as the Swedish Research Council and Horizon 2020 (European Commission) mandate OA publishing. This makes it relevant to measure the trend of OA publishing at UU.

There are different ways for a researcher to achieve OA publication and many different ways to define or source a publication as being OA. In ABM, we use information from DiVA, DOAJ and WoS as primary sources to distinguish between the different classes of OA. Gold OA is defined as a publication made freely available online by the publisher through its own services. Gold hybrid OA is defined as a publication published in a traditional subscription-based journal that is immediately freely available online through the publisher. In ABM, Gold hybrid is a subset of Gold OA. Green OA is defined as any publication available freely online through other services than the ones provided by the journal itself, often a postprint in an institutional repository. In ABM, a publication P is considered to be open access if at least one of the following four conditions is satisfied:

- 1) The full text of P is published OA in DiVA
- 2) P is included in a journal classified as OA journal in DiVA
- 3) P is included in a journal classified as OA journal in DOAJ
- 4) P is classified as “gold” or “green” OA in WoS⁶

For the OA part of ABM, the publication period is 2011-2018.

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.

⁶ WoS classify OA through a third party service, Unpaywall
<https://clarivate.com/webofsciencegroup/solutions/open-access/>

3.1 UU as a whole

In Figure 1, an overview of the subject profile of UU is given.⁷ 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 2008-2017 are represented (237 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, relative to the world average, of the publications in the category. Citation impact is measured by the indicator MNCS. The color coding is as follows:

- Blue: The impact of a university in a subject category is far below world average
- Green: The impact of a university in a subject category is around world average.
- Red: The impact of a university in a 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.

Figure 1. Subject profile map for UU. Publication period: 2008-2017.

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.

⁷ The subject profile overview was inspired by the CWTS web page at the following address: <https://www.vosviewer.com/university-profile-maps>.

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: 2008-2017.

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 ⁸ network
Eberhard Karls University Tübingen	European reference, belonging to the Matariki and Guild ⁹ networks
Ghent University	European reference, belonging to U4Society ¹⁰ and Guild
Lund University	Swedish reference, belonging to the SLUG ¹¹ 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 in different OA-classes compared to the total production is shown. We count the total production as articles, reviews, books, book chapters and conference proceedings. Full counts are used. For Uppsala University as a whole, the proportion of OA publishing is increasing during the entire period, but are well below 40% during the entire period even though the large Swedish and European funders mandate immediate OA. The major part of the increase is Gold Hybrid publications.

⁸ The Matariki network is an international group of seven universities.

⁹ The Guild is a network of 21 European universities.

¹⁰ U4Society is a collaboration between five European universities.

¹¹ SLUG is a Swedish network of the Stockholm, Lund, Uppsala and Gothenburg universities.

Figure 3. UUs proportion of different OA-classes compared to the total scientific production of UU. Publication period: 2011-2018. 3-year moving average.

3.2 HumSam

The number of HumSam units of analysis included in ABM is 31: 28 departments and three faculties. *Faculty of Law* and *Faculty of Theology* consists of only one large department each, responsible for all publications. Nearly all the publications of the *Faculty of Education* belong to the *Department of Education*, and the few remaining ones belong to *SWEDESD*. For practical reasons, the faculty is therefore regarded as one unit in the ABM.

Tables 3-6 report publication volume in terms of both fractional counts and full counts (within parentheses) by department (by faculty for Table 5) 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 3. Faculty of Arts. Publication volume by publication type, and WoS coverage (in %). Publication period: 2010-2018. Data source: GLIS.

Department	Publication type				Total	WoS coverage
	Article	Article in anthology	Monograph	Conference paper		
ABM	91,6 (120)	51,8 (60)	5,8 (7)	19,3 (26)	168,5 (213)	26,9
Archeology and Ancient History	221,2 (306)	239,4 (262)	16,7 (21)	39,1 (48)	516,4 (637)	14,6
Art History	67,1 (85)	96,9 (102)	10,8 (13)	17,0 (25)	191,8 (225)	13,1
Cultural Anthropology and Ethnology	117,8 (133)	113,7 (127)	26,4 (32)	6,3 (6)	264,2 (298)	6,9
Game Design	10,9 (16)	1,3 (2)	50,0 (50)	14,8 (23)	77,0 (91)	5,0
Gender Research	130,4 (177)	131,3 (157)	13,4 (18)	15,6 (20)	290,7 (372)	14,8
History	186,7 (205)	283,8 (288)	37,2 (43)	33,4 (36)	541,1 (572)	12,4
History of Sciences and Ideas	150,3 (161)	135,7 (147)	15,2 (19)	1,0 (1)	302,1 (328)	10,7
Literature	187,3 (201)	283,9 (297)	71,5 (74)	6,6 (8)	549,2 (580)	1,9
Musicology	110,0 (116)	68,0 (70)	10,0 (10)	2,5 (3)	190,5 (199)	10,3
Philosophy	160,1 (170)	138,0 (140)	12,8 (15)	10,5 (11)	321,5 (336)	18,6

Table 4. Faculty of Languages. Publication volume by publication type, and WoS coverage (in %). Publication period: 2010-2018. Data source: GLIS.

Department	Publication type				Total	WoS coverage
	Article	Article in anthology	Monograph	Conference paper		
English	123,1 (131,0)	101,4 (108)	15,7 (17)	5,5 (6)	245,6 (262)	23,0
Linguistics and Philology	319,5 (369)	274,7 (301)	61,3 (70)	130,1 (194)	785,7 (934)	8,6
Modern Languages	255,8 (275)	225,9 (233)	20,5 (26)	37,9 (41)	540,1 (575)	7,7
Scandinavian Languages	427,6 (460)	214,4 (231)	25,8 (31)	72,5 (79)	740,4 (801)	2,3

Table 5. Faculty of Education, Faculty of Law and Faculty of Theology. Publication volume by publication type, and WoS coverage (in %). Publication period: 2010-2018. Data source: GLIS.

Faculty	Publication type				Total	WoS coverage
	Article	Article in anthology	Monograph	Conference paper		
Faculty of Education	309,6 (442)	281,7 (358)	46,4 (68)	52,1 (70)	689,8 (938)	14,6
Faculty of Law	537,8 (583)	516,1 (537)	123,8 (140)	11,1 (13)	1188,5 (1273)	3,1
Faculty of Theology	356,1 (389)	456,4 (477)	77,0 (89)	19,1 (23)	908,6 (978)	8,8

Table 6. Faculty of Social Sciences. Publication volume by publication type, and WoS coverage (in %). Publication period: 2010-2018. Data source: GLIS.

Department	Publication type				Total	WoS coverage
	Article	Article in anthology	Monograph	Conference paper		
Business Studies	292,2 (409)	275,1 (348)	53,9 (75)	155,0 (195)	776,2 (1027)	17,6
Russian and Eurasian Studies	243,1 (282)	153,1 (166)	22,4 (25)	9,8 (11)	428,4 (484)	15,2
Economic History	121,9 (150)	242,2 (267)	33,8 (40)	29,0 (35)	427,0 (492)	11,8
Economics	164,2 (290)	18,0 (23)	6,1 (9)	1,0 (1)	189,3 (323)	68,1
Food Studies, Nutrition and Dietetics	67,4 (133)	45,4 (49)	1,0 (3)	7,1 (11)	120,9 (196)	35,4
Government	336,0 (452)	266,5 (300)	33,5 (40)	38,0 (42)	674,0 (834)	27,5
Housing and Urban Research	175,2 (293)	158,6 (200)	18,5 (25)	82,7 (97)	435,0 (615)	19,0
Informatics and Media	125,0 (173)	104,5 (126)	14,7 (18)	111,9 (151)	356,1 (458)	17,7
Peace and Conflict Studies	241,3 (293)	180,4 (206)	24,3 (29)	39,0 (42)	484,9 (570)	31,5
Psychology	354,7 (689)	35,7 (47)	3,0 (5)	18,1 (26)	411,5 (767)	70,5
Social and Economic Geography	152,5 (213)	58,6 (69)	7,7 (12)	20,2 (24)	238,9 (318)	44,4
Sociology	237,6 (324)	147,1 (188)	29,9 (43)	66,3 (79)	480,9 (634)	23,4
Statistics	53,6 (114)	1,5 (2)	1,0 (2)	0,5 (1)	56,6 (119)	86,8

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	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018
ABM	39,9 (23,4)	26,8 (19,9)	42,9 (24,7)	32,9 (29,1)	37,2 (31,4)	32,3 (31,7)
Archeology and Ancient History	27,7 (65,6)	33,2 (71,6)	31,9 (90,1)	36,1 (88,4)	40,4 (94,1)	47,7 (88,6)
Art History	1,4 (23,7)	8,6 (19,9)	6,7 (23,7)	8,3 (19,0)	3,6 (21,9)	12,6 (20,5)
Cultural Anthropology and Ethnology	33,0 (31,8)	33,0 (31,8)	37,8 (38,3)	38,0 (40,0)	38,2 (45,0)	27,9 (46,5)
Game Design	0,0 (2,0)	0,0 (3,0)	0,0 (4,0)	0,0 (2,1)	0,0 (1,8)	47,5 (2,1)
Gender Research	37,8 (65,0)	31,0 (61,4)	23,1 (60,0)	20,0 (63,8)	29,3 (60,0)	29,6 (73,3)
History	23,7 (92,8)	19,6 (104,5)	23,9 (104,1)	32,3 (92,9)	36,1 (95,5)	41,9 (98,1)
History of Sciences and Ideas	20,6 (52,7)	27,3 (56,2)	28,3 (60,2)	28,8 (64,2)	27,4 (57,7)	17,7 (61,2)
Literature	6,8 (95,8)	11,7 (93,8)	13,1 (91,5)	10,4 (81,5)	5,9 (68,1)	11,6 (55,8)
Musicology	35,1 (18,5)	16,7 (30,0)	14,2 (35,2)	12,8 (31,2)	21,3 (28,2)	32,8 (29,0)
Philosophy	32,5 (80,0)	39,4 (91,3)	36,0 (76,3)	45,6 (76,8)	50,0 (58,0)	51,0 (74,5)

Faculty of Languages

Figure 5. Faculty of Languages. Norwegian score by publication period. 3-year moving average.

Table 8. 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	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018
English	21,9 (51,0)	25,6 (53,8)	33,2 (59,5)	39,9 (57,0)	42,9 (65,3)	41,4 (62,3)
Linguistics and Philology	43,9 (122,9)	53,2 (135,5)	52,7 (129,9)	55,6 (110,7)	47,5 (101,4)	53,5 (105,2)
Modern Languages	16,9 (87,0)	15,9 (99,3)	16,4 (96,8)	15,2 (92,0)	18,4 (80,8)	13,1 (83,8)
Scandinavian Languages	28,4 (121,6)	30,9 (119,9)	29,1 (133,9)	25,6 (107,6)	17,9 (108,2)	12,6 (73,8)

Faculty of Education, Faculty of Law and Faculty of Theology

Figure 6. Faculty of Education, Faculty of Law and Faculty of Theology. Norwegian score by publication period. 3-year moving average.

Table 9. 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	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018
Faculty of Education	10,4 (129,6)	11,7 (137,0)	16,1 (142,8)	19,5 (164,6)	25,4 (159,0)	27,8 (136,3)
Faculty of Law	10,4 (246,6)	13,5 (273,1)	20,2 (278,3)	26,0 (290,4)	24,6 (274,5)	21,7 (266,6)
Faculty of Theology	28,3 (177,8)	33,4 (156,3)	35,1 (148,6)	33,7 (139,0)	32,3 (159,8)	39,0 (152,1)

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	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018
Business Studies	31,8 (144,3)	34,5 (131,2)	31,0 (142,7)	33,8 (164,6)	36,4 (159,7)	37,3 (155,8)
Russian and Eurasian Studies	25,2 (49,5)	21,8 (69,0)	33,3 (84,1)	31,8 (108,4)	34,1 (99,3)	28,6 (78,5)
Economic History	14,4 (100,7)	20,6 (89,6)	27,3 (78,6)	32,7 (62,7)	33,9 (60,0)	40,6 (62,7)
Economics	32,1 (71,5)	38,3 (74,2)	44,3 (57,4)	46,3 (53,5)	51,0 (48,9)	50,3 (42,9)
Food Studies, Nutrition and Dietetics	11,8 (21,5)	8,0 (25,0)	10,1 (24,7)	14,0 (16,1)	12,9 (16,1)	7,7 (26,9)
Government	43,0 (146,8)	46,2 (153,7)	44,5 (16,0)	41,3 (170,4)	45,0 (167,4)	44,7 (175,7)
Housing and Urban Research	25,7 (62,9)	37,4 (81,2)	33,7 (105,4)	31,3 (100,5)	30,7 (92,6)	31,2 (75,6)
Informatics and Media	29,0 (98,0)	37,0 (70,9)	32,7 (59,4)	33,6 (49,0)	22,2 (49,5)	31,3 (50,7)
Peace and Conflict Studies	42,5 (135,9)	46,8 (144,5)	51,3 (125,6)	57,1 (141,3)	54,3 (131,6)	58,4 (130,2)
Psychology	28,9 (117,4)	21,9 (113,7)	21,6 (115,3)	23,9 (116,0)	25,4 (124,4)	29,1 (122,9)
Social and Economic Geography	31,2 (47,1)	38,0 (47,1)	41,2 (58,7)	46,8 (57,1)	44,0 (58,0)	45,3 (66,9)
Sociology	30,0 (97,1)	26,4 (100,7)	28,4 (101,6)	24,8 (97,2)	28,3 (106,1)	33,9 (115,6)
Statistics	25,4 (12,1)	22,1 (15,5)	17,4 (13,9)	20,0 (18,3)	31,1 (26,3)	34,6 (30,4)

3.2.2 Field normalized citation impact

Faculty of Arts

Table 11. Faculty of Arts. Publication fractions (P; full counts within parentheses), MNCS, PP(top 10%), MNJS and MJPPtop10% for the whole publication period 2010-2017.

Department	Indicator				
	P	MNCS	PP(top 10%)	MNJS	MJPPtop10%
ABM	31,4 (43)	0,72	3,2	0,91	9,4
Archeology and Ancient History	30,0 (70)	0,98	8,4	0,91	10,2
Art History	3,2 (9)	null	null	null	null
Cultural Anthropology and Ethnology	7,5 (11)	null	null	null	null
Game Design	0,1 (1)	null	null	null	null
Gender Research	12,1 (24)	null	null	null	null
History	13,1 (17)	null	null	null	null
History of Sciences and Ideas	3,4 (6)	null	null	null	null
Literature	0,0 (0)	null	null	null	null
Musicology	0,7 (2)	null	null	null	null
Philosophy	24,1 (27)	null	null	null	null

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. MJPPtop10% 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 2010-2017. This yields that the four departments are excluded from the citation analysis of ABM.

Table 12. Faculty of Languages. Publication fractions (P; full counts within parentheses), MNCS, PP(top 10%), MNJS and MJPPtop10% for the whole publication period 2010-2017.

Department	Indicator				
	P	MNCS	PP(top 10%)	MNJS	MJPPtop10%
English	8,5 (9)	null	null	null	null
Linguistics and Philology	16,2 (30)	null	null	null	null
Modern Languages	11,3 (14)	null	null	null	null
Scandinavian Languages	6,1 (12)	null	null	null	null

Faculty of Education, Faculty of Law and Faculty of Theology

Table 13. Faculty of Education, Faculty of Law and Faculty of Theology. Publication fractions (P; full counts within parentheses), MNCS, PP(top 10%), MNJS and MJPPtop10% by department and for the whole publication period 2010-2017.

Department	Indicator				
	P	MNCS	PP(top 10%)	MNJS	MJPPtop10%
Faculty of Education	57,0 (97)	0,68	3,5	0,81	7,3
Faculty of Law	12,2 (20)	null	null	null	null
Faculty of Theology	11,8 (23)	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. MJPPtop10% by publication period. 3-year moving average.

Faculty of Social Sciences

Table 14. Faculty of Social Sciences. Publication fractions (P; full counts within parentheses), MNCS, PP(top 10%), MNJS and MJPPtop10% by department and for the whole publication period 2010-2017.

Department	Indicator				
	P	MNCS	PP(top 10%)	MNJS	MJPPtop10%
Business Studies	83,1 (146)	0,98	10,0	1,02	9,9
Russian and Eurasian Studies	16,7 (30)	null	null	null	null
Economic History	17,7 (29)	null	null	null	null
Economics	85,6 (184)	1,03	11,0	1,07	11,4
Food Studies, Nutrition and Dietetics	28,7 (69)	0,57	4,0	0,75	7,3
Government	111,4 (180)	0,87	8,2	1,00	9,3
Housing and Urban Research	63,2 (130)	1,50	13,1	1,20	10,0
Informatics and Media	28,5 (49)	0,97	6,0	0,79	4,0
Peace and Conflict Studies	95,7 (135)	2,05	23,1	1,33	14,6

Psychology	229,4 (478)	1,11	11,4	1,12	10,6
Social and Economic Geography	71,4 (110)	1,04	11,0	1,11	14,2
Sociology	58,5 (94)	0,68	1,5	0,79	5,0
Statistics	35,1 (79)	0,58	5,1	0,63	5,3

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. MJPPtop10% 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 2010-2017

Department	Indicator		
	P	PP(int collab)	PP(industry)
ABM	43	34,9	0,0
Archeology and Ancient History	70	68,6	1,4
Art History	9	88,9	0,0
Cultural Anthropology and Ethnology	11	18,2	0,0
Game Design	1	100,0	100,0
Gender Research	24	25,0	4,2
History	17	11,8	0,0

History of Sciences and Ideas	6	16,7	0,0
Literature	0	-	-
Musicology	2	100	0,0
Philosophy	27	11,1	0,0

In Table 16, 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	2010-2012	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017
ABM	25,0 (0,0)	38,5 (0,0)	44,4 (0,0)	53,9 (0,0)	37,6 (0,0)	40,0 (0,0)
Archeology and Ancient History	61,1 (5,6)	50,0 (5,6)	55,0 (5,0)	66,7 (0,0)	75,8 (0,0)	77,5 (0,0)
Art History	-	-	100,0 (0,0)	100,0 (0,0)	100,0 (0,0)	87,6 (0,0)
Cultural Anthropology and Ethnology	33,3 (0,0)	0,0 (0,0)	0,0 (0,0)	20,0 (0,0)	16,7 (0,0)	16,7 (0,0)
Game Design	-	-	-	-	100 (100,0)	100 (100,0)
Gender Research	25,0 (0,0)	0,0 (0,0)	28,6 (0,0)	25,0 (0,0)	38,5 (7,7)	21,4 (7,1)
History	0 (0,0)	0 (0,0)	20,0 (0,0)	20,0 (0,0)	25,0 (0,0)	0,0 (0,0)
History of Sciences and Ideas	-	-	0,0 (0,0)	0,0 (0,0)	0,0 (0,0)	20,0 (0,0)
Literature	-	-	-	-	-	-
Musicology	100 (0,0)	100 (0,0)	-	100 (0,0)	100 (0,0)	100 (0,0)
Philosophy	13,3 (0,0)	8,3 (0,0)	10,0 (0,0)	0,0 (0,0)	0,0 (0,0)	16,7 (0,0)

Faculty of Languages

Table 17. Faculty of Languages. Publications (P, full counts), PP(int collab) and PP(industry) for the whole publication period 2010-2017.

Department	Indicator		
	P	PP(int collab)	PP(industry)
English	9	11,1	0,0
Linguistics and Philology	30	60,0	6,7
Modern Languages	14	0,0	0,0
Scandinavian Languages	12	16,7	0,0

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

Department	2010-2012	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017
English	0,0 (0,0)	0,0 (0,0)	50,0 (0,0)	50,0 (0,0)	25,0 (0,0)	0,0 (0,0)
Linguistics and Philology	60,0 (0,0)	50,0 (7,1)	50,0 (14,3)	50,0 (12,5)	66,7 (11,1)	69,2 (0,0)
Modern Languages	0,0 (0,0)	0,0 (0,0)	0,0 (0,0)	0,0 (0,0)	0,0 (0,0)	0,0 (0,0)
Scandinavian Languages	-	50,0 (0,0)	50,0 (0,0)	33,3 (0,0)	11,1 (0,0)	0,0 (0,0)

Faculty of Education, Faculty of Law and Faculty of Theology

Table 19. 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 2010-2017.

Department	Indicator		
	P	PP(int collab)	PP(industry)
Faculty of Education	97	21,7	0,0
Faculty of Law	20	35,0	0,0
Faculty of Theology	23	39,1	0,0

Table 20. 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	2010-2012	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017
Faculty of Education	12,0 (0,0)	8,0 (0,0)	14,8 (0,0)	18,2 (0,0)	30,6 (0,0)	27,3 (0,0)
Faculty of Law	25,0 (0,0)	20,0 (0,0)	50,0 (0,0)	40,0 (0,0)	41,7 (0,0)	22,2 (0,0)
Faculty of Theology	33,3 (0,0)	25,0 (0,0)	28,6 (0,0)	33,3 (0,0)	40,0 (0,0)	41,7 (0,0)

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 2010-2017.

Department	Indicator		
	P	PP(int collab)	PP(industry)
Business Studies	146	54,8	0,7
Russian and Eurasian Studies	30	43,3	0,0
Economic History	29	37,9	0,0
Economics	184	41,8	2,2
Food Studies, Nutrition and Dietetics	69	46,4	1,5
Government	180	33,3	1,1
Housing and Urban Research	130	50,0	1,5
Informatics and Media	49	40,8	4,1
Peace and Conflict Studies	135	38,5	0,0
Psychology	478	42,3	2,5
Social and Economic Geography	110	29,1	0,0
Sociology	94	24,5	0,0
Statistics	79	38,0	0,0

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

Department	2010-2012	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017
Business Studies	47,2 (1,9)	45,6 (1,8)	51,7 (0,0)	57,4 (0,0)	63,1 (0,0)	64,2 (0,0)
Russian and Eurasian Studies	50,0 (0,0)	66,7 (0,0)	40,0 (0,0)	25,0 (0,0)	30,8 (0,0)	45,5 (0,0)
Economic History	33,3 (0,0)	40,0 (0,0)	42,9 (0,0)	42,9 (0,0)	42,9 (0,0)	30,0 (0,0)
Economics	41,6 (6,2)	40,9 (5,6)	44,9 (5,1)	46,2 (0,0)	47,0 (0,0)	40,3 (0,0)
Food Studies, Nutrition and Dietetics	22,2 (0,0)	27,3 (0,0)	21,1 (0,0)	40,9 (0,0)	56,0 (0,0)	67,6 (2,7)
Government	26,7 (0,0)	27,4 (0,0)	31,0 (1,7)	29,8 (1,5)	35,8 (2,5)	36,4 (1,1)
Housing and Urban Research	55,0 (2,5)	47,4 (5,3)	41,2 (3,9)	43,9 (1,8)	50,0 (0,0)	51,9 (0,0)

Informatics and Media	26,3 (0,0)	23,8 (0,0)	26,9 (7,7)	41,7 (8,3)	63,1 (10,5)	83,3 (0,0)
Peace and Conflict Studies	33,4 (0,0)	38,5 (0,0)	36,1 (0,0)	41,1 (0,0)	39,0 (0,0)	38,5 (0,0)
Psychology	42,6 (3,1)	38,8 (2,3)	43,1 (2,9)	42,3 (2,8)	48,4 (3,2)	42,9 (2,5)
Social and Economic Geography	24,3 (0,0)	24,3 (0,0)	20,0 (0,0)	30,5 (0,0)	37,5 (0,0)	37,2 (0,0)
Sociology	26,1 (0,0)	18,5 (0,0)	21,6 (0,0)	19,5 (0,0)	17,1 (0,0)	26,6 (0,0)
Statistics	50,0 (0,0)	40,0 (0,0)	34,6 (0,0)	25,0 (0,0)	44,1 (0,0)	40,4 (0,0)

3.2.4 Open access

For all figures in this section, proportion OA is given as percentages. OA is defined as publications belonging to any class of OA (Gold, green or hybrid). All OA measures use full counts.

Faculty of Arts

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

Faculty of Languages

Figure 21. Faculty of Languages. Total Open Access by publication period. 3-year moving average.

Faculty of Education, Faculty of Law and Faculty of Theology

Figure 22. Faculty of Education, Faculty of Law and Faculty of Theology. Total Open Access by publication period. 3-year moving average.

Figure 23. Faculty of Social Sciences. Total Open Access 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 Pharmacy. Publication volume by publication type, and WoS coverage (in %). Publication period: 2010-2018. Data source: GLIS.

Department	Publication type				Total	WoS coverage
	Article	Article in anthology	Monograph	Conference paper		
Medicinal Chemistry	276,9 (663)	15,4 (18)	0,0 (0)	2,9 (5)	295,2 (686)	90,2
Pharmaceutical Biosciences	441,4 (999)	22,4 (24)	0,9 (1)	5,5 (12)	470,2 (1036)	88,4
Pharmacy	220,2 (469)	4,8 (6)	0,0 (0)	0,0 (0)	225,0 (475)	91,3

Table 24. Faculty of Medicine. Publication volume by publication type, and WoS coverage (in %). Publication period: 2010-2018. Data source: GLIS.

Department	Publication type				Total	WoS coverage
	Article	Article in anthology	Monograph	Conference paper		
Immunology, Genetics and Pathology	671,9 (2500)	20,2 (31)	0,3 (1)	5,6 (19)	698,0 (2551)	90,6
Medical Biochemistry and Microbiology	382,2 (1162)	9,8 (19)	0,3 (1)	1,1 (4)	393,4 (1186)	92,8
Medical Cell Biology	245,5 (510)	7,3 (11)	0,0 (0)	3,5 (4)	256,3 (525)	92,2
Medical Sciences	1395,0 (4974)	33,5 (44)	2,9 (3)	7,2 (16)	1438,6 (5037)	86,3
Neuroscience	965,7 (2116)	31,6 (43)	6,5 (11)	11,8 (31)	1015,7 (2201)	87,6
Public Health and Caring Sciences	850,1 (2284)	77,9 (108)	12,1 (17)	16,4 (35)	956,5 (2444)	72,5
Surgical Sciences	1212,3 (3309)	67,0 (89)	3,1 (4)	18,5 (38)	1330,9 (3440)	78,8
Women's and Children's Health	853,0 (2139)	48,8 (58)	5,8 (8)	1,2 (5)	908,8 (2210)	84,4

3.3.1 Publishing volume and publishing level–The Norwegian model

Faculty of Pharmacy

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

Table 25. 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	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018
Medicinal Chemistry	29,4 (80,9)	24,1 (99,4)	18,2 (106,0)	16,3 (103,3)	18,8 (99,5)	19,4 (90,9)
Pharmaceutical Biosciences	19,5 (156,8)	16,8 (149,1)	16,2 (131,4)	19,0 (133,6)	20,6 (141,6)	22,2 (156,2)
Pharmacy	28,6 (67,9)	29,8 (64,8)	26,9 (63,7)	28,3 (68,0)	28,1 (74,4)	31,9 (78,6)

Faculty of Medicine

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

Table 26. 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	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018
Immunology, Genetics and Pathology	20,1 (201,4)	20,8 (203,6)	21,4 (220,7)	22,2 (236,0)	23,5 (251,7)	24,5 (239,7)
Medical Biochemistry and Microbiology	35,0 (102,5)	31,2 (111,5)	32,4 (118,6)	32,0 (139,0)	34,5 (159,3)	34,5 (157,5)
Medical Cell Biology	19,4 (83,4)	18,3 (79,0)	19,8 (85,8)	19,3 (88,5)	18,6 (87,6)	19,0 (71,3)
Medical Sciences	19,0 (455,6)	19,7 (446,6)	18,8 (448,6)	17,2 (427,2)	16,3 (437,9)	16,8 (437,3)
Neuroscience	18,5 (339,0)	16,6 (350,3)	15,7 (339,2)	15,5 (324,5)	14,2 (307,3)	12,8 (298,6)
Public Health and Caring Sciences	14,9 (249,1)	13,5 (257,1)	13,7 (278,3)	15,9 (290,6)	16,6 (302,9)	17,5 (295,6)
Surgical Sciences	15,5 (335,4)	17,1 (348,6)	17,9 (359,2)	16,5 (387,1)	15,2 (430,7)	15,6 (464,4)

Women's and Children's Health	18,1 (249,4)	15,0 (256,6)	13,6 (290,0)	12,3 (300,1)	11,6 (333,1)	12,1 (318,0)
-------------------------------------	--------------	--------------	--------------	--------------	--------------	--------------

3.3.2 Field normalized citation impact

Faculty of Pharmacy

Table 27. Faculty of Pharmacy. Publication fractions (P; full counts within parentheses), MNCS, PP(top 10%), MNJS and MJPPtop10% for the whole publication period 2010-2017.

Department	Indicator				
	P	MNCS	PP(top 10%)	MNJS	MJPPtop10%
Medicinal Chemistry	215,6 (526)	0,89	8,2	0,90	8,1
Pharmaceutical Biosciences	331,4 (781)	1,02	8,3	1,02	9,4
Pharmacy	166,9 (367)	1,20	19,0	1,34	17,5

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

Figure 27. Faculty of Pharmacy. PP(top 10%) by publication period. 3-year moving average.

Figure 28. Faculty of Pharmacy. MNJS by publication period. 3-year moving average.

Figure 29. Faculty of Pharmacy. MJPPtop10% by publication period. 3-year moving average.

Faculty of Medicine

Table 28. Faculty of Medicine. Publication fractions (P; full counts within parentheses), MNCS, PP(top 10%), MNJS and MJPPtop10% for the whole publication period 2010-2017.

Department	P	MNCS	Indicator PP(top 10%)	MNJS	MJPPtop10%
Immunology, Genetics and Pathology	796,1 (2624)	1,33	13,9	1,31	14,1
Medical Biochemistry and Microbiology	320,6 (924)	1,48	15,7	1,54	16,1
Medical Cell Biology	195,9 (421)	1,03	11,6	0,99	10,1
Medical Sciences	1027,1 (3892)	1,16	12,4	1,14	12,1
Neuroscience	773,2 (1853)	0,96	9,2	1,00	9,6
Public Health and Caring Sciences	492,4 (1639)	0,97	9,2	0,99	9,9
Surgical Sciences	816,7 (2398)	1,09	11,1	1,10	11,5
Women's and Children's Health	588,7 (1670)	0,91	8,4	0,94	8,9

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

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

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

Figure 33. Faculty of Medicine. MJPPtop10% 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 Pharmacy

Table 29. Faculty of Pharmacy. Publications (P, full counts), PP(int collab) and PP(industry) for the whole publication period 2010-2017.

Department	Indicator		
	P	PP(int collab)	PP(industry)
Medicinal Chemistry	526	46,0	20,2
Pharmaceutical Biosciences	781	59,7	26,4
Pharmacy	367	49,0	33,3

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

Department	2010-2012	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017
Medicinal Chemistry	49,7 (28,9)	50,3 (28,7)	43,3 (25,6)	43,4 (20,1)	45,8 (14,8)	50,0 (12,7)
Pharmaceutical Biosciences	60,4 (30,2)	59,7 (28,2)	62,8 (27,0)	59,5 (26,9)	61,4 (24,9)	58,8 (23,3)
Pharmacy	39,8 (33,4)	39,0 (25,0)	46,7 (28,5)	49,2 (27,4)	58,3 (33,1)	59,1 (35,8)

Faculty of Medicine

Table 31. Faculty of Medicine. Publications (P, full counts), PP(int collab) and PP(industry) for the whole publication period 2010-2017.

Department	Indicator		
	P	PP(int collab)	PP(industry)
Immunology, Genetics and Pathology	2624	58,9	14,7
Medical Biochemistry and Microbiology	924	67,1	6,4
Medical Cell Biology	421	46,8	5,9
Medical Sciences	3892	54,9	15,4
Neuroscience	1853	47,3	4,3
Public Health and Caring Sciences	1639	46,4	10,7
Surgical Sciences	2398	48,2	10,2
Women's and Children's Health	1670	46,2	4,5

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

Department	2010-2012	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017
Immunology, Genetics and Pathology	57,1 (16,6)	56,5 (15,3)	57,2 (13,7)	57,6 (13,0)	60,3 (13,0)	61,5 (13,4)
Medical Biochemistry and Microbiology	69,7 (7,3)	66,4 (8,1)	64,8 (7,7)	62,9 (7,1)	66,1 (6,1)	66,7 (4,7)
Medical Cell Biology	52,1 (9,7)	46,1 (7,1)	45,3 (7,3)	40,2 (4,8)	44,8 (3,4)	45,6 (2,8)
Medical Sciences	51,3 (13,4)	54,3 (14,4)	54,4 (15,8)	55,2 (16,5)	56,6 (17,7)	57,7 (16,0)
Neuroscience	51,4 (4,9)	48,3 (5,0)	43,0 (4,3)	42,5 (4,1)	45,1 (3,1)	48,3 (3,7)
Public Health and Caring Sciences	45,2 (12,9)	44,1 (9,3)	46,7 (9,8)	46,8 (9,8)	48,2 (9,3)	46,8 (9,3)
Surgical Sciences	48,7 (11,6)	46,8 (13,4)	44,4 (11,8)	45,6 (10,2)	48,4 (8,8)	51,1 (8,5)
Women's and Children's Health	40,7 (4,1)	42,3 (3,8)	43,7 (4,4)	46,9 (5,7)	48,4 (5,8)	50,7 (4,9)

3.3.4 Open access

For both figures in this section, proportion OA is given as percentages. OA is defined as publications belonging to any class of OA (Gold, green or hybrid). All OA measures use full counts.

Faculty of Pharmacy

Figure 34. Faculty of Pharmacy. Total Open Access by publication period. 3-year moving average.

Faculty of Medicine

Figure 35. Faculty of Medicine. Total Open Access by publication period. 3-year moving average.

3.4 TekNat

The number of TekNat departments included in ABM is 10. 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: 2010-2018. Data source: GLIS.

Department	Publication type				Total	WoS coverage
	Article	Article in anthology	Monograph	Conference paper		
Cell and Molecular Biology	438,5 (1128)	18,1 (25)	1,2 (2)	4,9 (15)	462,6 (1170)	91,9
Chemistry - BMC	272,3 (730)	7,2 (14)	1,0 (1)	2,2 (6)	282,6 (751)	91,7
Chemistry - Ångström Laboratory	784,3 (1605)	27,3 (44)	5,0 (8)	9,1 (25)	825,6 (1682)	90,9
Earth Sciences	883,8 (2095)	46,7 (87)	5,4 (12)	99,3 (170)	1036,0 (2364)	73,7
Ecology and Genetics	888,6 (2074)	19,8 (41)	1,8 (3)	0,4 (1)	910,6 (2119)	92,4
Engineering Sciences	1567,4 (2754)	120,9(159)	20,9 (32)	576,1 (862)	2285,3 (3807)	60,9
Information Technology	578,3 (1131)	73,2 (102)	5,5 (9)	868,8 (1365)	1525,8 (2607)	56,3
Mathematics	511,5 (839)	9,2 (10)	5,0 (6)	10,9 (17)	536,5 (872)	85,2
Organismal Biology	370,8 (880)	38,7 (47)	2,2 (3)	29,5 (42)	441,1 (972)	69,6
Physics and Astronomy	2451,0 (5744)	46,3 (59)	8,2 (10)	214,5 (412)	2720,0 (6225)	85,5

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	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018
Cell and Molecular Biology	44,2 (125,9)	44,1 (132,1)	35,0 (133,2)	32,7 (145,0)	30,9 (148,6)	30,4 (165,2)
Chemistry-BMC	36,1 (84,9)	35,9 (124,8)	35,5 (122,0)	33,5 (111,3)	31,3 (103,3)	29,9 (104,6)
Chemistry - Ångström Laboratory	31,1 (181,3)	31,9 (288,8)	33,3 (327,3)	31,7 (350,2)	29,5 (352,1)	25,4 (350,9)
Earth Sciences	28,0 (269,2)	29,3 (283,5)	30,4 (313,7)	31,2 (302,5)	29,3 (309,5)	27,4 (283,2)
Ecology and Genetics	38,1 (309,8)	39,6 (326,0)	41,3 (305,8)	45,1 (299,5)	47,5 (297,0)	44,7 (272,2)
Engineering Sciences	23,5 (450,7)	24,0 (489,0)	22,8 (530,6)	24,9 (583,1)	23,8 (585,1)	23,8 (587,6)
Information Technology	18,0 (255,1)	18,6 (268,5)	17,4 (321,1)	19,1 (355,2)	16,5 (383,6)	16,9 (379,8)
Mathematics	34,3 (157,9)	28,4 (154,1)	29,6 (180,7)	34,3 (183,4)	34,2 (185,1)	35,4 (165,8)
Organismal Biology	22,9 (112,7)	22,8 (99,6)	23,4 (97,7)	25,0 (115,3)	24,0 (123,0)	30,1 (130,7)
Physics and Astronomy	36,8 (754,9)	38,7 (769,4)	40,1 (779,1)	39,2 (807,4)	37,1 (849,0)	36,3 (880,5)

3.4.2 Field normalized citation impact

Table 35. Faculty of Science and Technology. Publication fractions (P; full counts within parentheses), MNCS, PP(top 10%), MNJS and MJPPtop10% for the whole publication period 2010-2017.

Department	Indicator				
	P	MNCS	PP(top 10%)	MNJS	MJPPtop10%
Cell and Molecular Biology	330,6 (907)	1,50	16,7	1,52	16,6
Chemistry - BMC	309,9 (818)	0,86	8,7	1,03	10,9
Chemistry - Ångström Laboratory	757,0 (1604)	1,09	11,9	1,12	11,4
Earth Sciences	553,6 (1567)	0,93	7,7	1,01	10,1
Ecology and Genetics	697,1 (1750)	1,57	17,7	1,52	17,1
Engineering Sciences	1040,9 (1931)	0,91	7,4	1,05	10,3
Information Technology	377,6 (794)	0,99	9,7	0,98	9,7
Mathematics	364,1 (647)	1,06	10,1	1,08	11,0
Organismal Biology	232,6 (637)	1,51	15,7	1,48	14,1
Physics and Astronomy	1268,6 (4882)	1,00	10,4	1,04	10,2

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. MJPPtop10% 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 2010-2017.

Department	Indicator		
	P	PP(int collab)	PP(industry)
Cell and Molecular Biology	907	65,8	8,0
Chemistry - BMC	1604	60,0	12,5
Chemistry - Ångström Laboratory	818	54,2	4,9
Earth Sciences	1567	81,2	5,4
Ecology and Genetics	1750	74,9	3,0
Engineering Sciences	1931	50,0	11,6
Information Technology	794	57,9	6,0
Mathematics	647	61,8	1,5
Organismal Biology	637	72,2	2,5
Physics and Astronomy	4882	86,7	3,8

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

Department	2010-2012	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017
Cell and Molecular Biology	62,8 (12,3)	62,6 (10,9)	63,9 (8,8)	66,7 (6,0)	67,6 (5,3)	68,1 (4,6)
Chemistry - BMC	55,8 (17,7)	56,6 (12,9)	51,5(10,4)	48,8 (7,2)	52,4 (10,0)	56,3 (9,9)
Chemistry - Ångström Laboratory	59,2 (5,5)	60,5 (5,0)	59,6 (5,7)	58,8 (4,2)	60,2 (4,4)	60,9 (4,6)
Earth Sciences	83,2 (6,0)	83,1 (5,1)	80,9 (5,3)	79,4 (4,9)	80,3 (5,5)	81,0 (5,1)
Ecology and Genetics	71,5 (2,9)	72,4 (1,9)	73,4 (2,5)	75,3 (2,8)	77,6 (3,9)	78,9 (3,3)
Engineering Sciences	45,8 (14,3)	45,2 (12,6)	46,0 (11,1)	48,4 (10,8)	51,1 (10,9)	54,0 (10,5)
Information Technology	51,3 (6,6)	52,5 (5,5)	56,9 (3,8)	61,5 (4,8)	60,7 (5,5)	59,8 (7,5)
Mathematics	57,8 (1,5)	63,1 (0,9)	65,1 (0,9)	62,7 (1,5)	60,1 (2,2)	63,9 (2,1)
Organismal Biology	65,4 (3,2)	67,0 (1,6)	71,9 (0,5)	69,2 (0,9)	73,5 (1,5)	78,1 (2,8)
Physics and Astronomy	85,5 (3,3)	86,5 (3,1)	87,3 (3,5)	88,0 (4,1)	87,9 (4,6)	87,1 (4,3)

3.4.4 Open access

For Figure 41, proportion OA is given as percentages. OA is defined as publications belonging to any class of OA (Gold, green or hybrid). All OA measures use full counts.

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

4 Brief discussion of the results

HumSam

One interesting trend is the increase in WoS coverage noticed for some departments in the *Faculty of Arts*. This result is further examined in Appendix 1.

Regarding the Norwegian model, the increase in proportion of publication fractions at level 2 for some departments in the *Faculty of Arts* is noteworthy (Table 7). *Archeology and Ancient History*, *History* and *Philosophy* all have an increase in the interval 18-20 percentage units from the publication period 2011-2013 to the period 2016-2018. This is also the case for *English* in the *Faculty of Languages* (Table 8). In addition, *Faculty of Education* and *Faculty of Theology* show an increase in the proportion of publication fractions at level 2 (of about 17 and 15 percentage units, respectively) (Table 9). In the *Faculty of Social Sciences*, the increase is most noteworthy for *Economic History* (25 percentage units), *Economics* (18 percentage units), *Peace and Conflict Studies* (16 percentage units) and *Social and Economic Geography* (14 percentage units) (Table 10).

When it comes to citation indicators, *Peace and Conflict Studies* is worth mentioning, since the department has very high figures for all four indicators with respect to the whole publication period (Table 14). Moreover, the proportion of author fractions at level 2 is also high for this department, especially for the period 2016-2018 (about 58%; Table 10). Thus, there is, for this department, an agreement between the citation impact performance and the Norwegian model performance.

The extreme OA trend for *Game Design* under the *Faculty of Arts* is mostly explained by a two-year period with approximately 50 book chapters made freely available. The faculty overall has an increasing trend in OA, apart from *Game Design* (Figure 20). Further, the *Faculty of Education* has a remarkably increasing development (Figure 22).

MedFarm

For the *Faculty of Pharmacy*, the *Pharmacy* department has very high values on the MNCS and PP(top 10%) indicators, especially in the last two publication periods (Figures 26 and 27). With regard to the Norwegian model, *Pharmacy* has a quite high proportion of author fractions at level 2, and this result is most pronounced in the period 2016-2018 (Table 25).

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 28). Regardless of citation indicator, the latter department has an upward trend across the six considered periods, while the former one has quite stable values across the six periods (Figures 30-33). *Medical Biochemistry and Microbiology* has an unparalleled high OA level compared to all other institutions at UU throughout the entire time period (Figure 35).

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 period (Table 35). With regard to the Norwegian model, *Ecology and Genetics* shows high figures with regard to proportion of author fractions at level 2 (Table 34).

Noteworthy is also the high values on the international collaboration indicator, PP(int collab), for the two departments *Earth Sciences* and *Physics and Astronomy* (Tables 36 and 37).

The overall trend for OA is increasing for the entire faculty. Noteworthy is the department of *Cell and Molecular Biology*, which has the second highest proportion of OA at UU during the entire time series (Figure 41).

5 Concluding remarks

In this report, we have we have described the data and methods used in UU ABM 2019, and we have reported results on publication volume, publishing level, citation impact, collaboration (in terms of co-publishing) and open access. 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 Leiden Manifesto for research metrics, variation by field in publication and citation practices should be controlled for in bibliometric research evaluation. In UU ABM 2019, and with respect to citation impact, this principle is taken into account.

References

- Hicks, D., Wouters, P., Waltman, L., de Rijcke, S., and Rafols, I. (2015). The Leiden Manifesto for research metrics. *Nature*, 520(7548), 429-431.
- Malmberg, A., Kettis, Å., & Maandi, C. (Eds.). (2017). *Quality and Renewal 2017 (Kvalitet och förnyelse 2017) : Research Environment Evaluation at Uppsala University*. Uppsala.

Prop. 2016/17:50. *Kunskap i samverkan – för samhällets utmaningar och stärkt konkurrenskraft*. <https://www.regeringen.se/4adad0/contentassets/72faaf7629a845af9b30fde1ef6b5067/kunskap-i-samverkan--for-samhallets-utmaningar-och-starkt-konkurrenskraft-prop.-20161750.pdf>

Schneider, J. W. (2009). An outline of the bibliometric indicator used for performance-based funding of research institutions in Norway. *European Political Science*, 8(3), 364-378.

van Eck, N. J., Waltman, L., van Raan, A. F. J., Klautz, R. J. M., & Peul, W. C. (2013). Citation analysis may severely underestimate the impact of clinical research as compared to basic research. *PLOS ONE*, 8(4), e62395.

Waltman, L., & van Eck, N. J. (2012). A new methodology for constructing a publication-level classification system of science. *Journal of the American Society for Information Science and Technology*, 63(12), 2378-2392.

Waltman, L., & Schreiber, M. (2013). On the calculation of percentile-based bibliometric indicators. *Journal of the American Society for Information Science and Technology*, 64(2), 372-379.

Appendix 1 Faculty of Arts: WoS coverage for a sample of departments

An interesting result in ABM is the substantial increase in WoS coverage for some of the departments within the humanities. In Figure 42, the WoS coverage for the publication period 2010-2018 is presented for those departments of the *Faculty of Arts* that have a substantial increase in coverage. The vertical axis in the diagram of the figure represents index numbers, where the base period is set to the period 2010-2012. Note that some departments have a rather low output (for instance *Art History* and *Cultural Anthropology and Ethnology*), so the coverage values should be interpreted with caution. A few departments, like *ABM* and *Philosophy*, have a large proportion of their articles represented in WoS but show no, or a small, increase across the periods. In view of this, such departments are not represented in the figure.

Figure 42. Sample humanities departments. WoS coverage by publication period. Index numbers, base period = 2010-2012. 3-year moving average. Data source: GLIS.

All five departments represented in the figure show a quite remarkable increase in publishing articles in journals covered by WoS (and the same trend is also notable for a few departments belonging to other faculties in the scientific domain HumSam). For example, three of the five departments have increased their coverage with 15% or more relative to the base period. In later years, we have observed a decrease in the publishing of books and articles in anthologies. This might indicate a shift in the publishing patterns in at least some parts of HumSam.

Appendix 2 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.¹² 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 i th publication for A . Let a_i be the *author fraction* A has of the i th publication. We consider two cases.

(a) A is an organization, for instance a department. a_i is then defined as

$$a_i = \sum_{j=1}^{m_i} \frac{1}{r_i s_j} \quad (1)$$

where m_i is the number of authors affiliated to A regarding the i th publication, and s_j the number of affiliations of the j th of these A authors. Note that the right-hand side in Eq. (1) is equal to m_i/r_i when each A author has exactly one affiliation.

(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

¹² Cf. footnote 4 in this report.

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

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

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

where NCS_i is the normalized citation score for the i th publication of A, c_i is the citation score of the i th publication, sc_i the subject class to which the i th publication has been (algorithmically) assigned, k_i the number of publications in sc_i with the same publication year as the i th publication, and c_j the citation score of the j th 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 i th publication. Clearly, $\text{MNCS}(\text{A})$ is a weighted mean across the publications of A, a fact that also holds for the other three citation indicators treated in this document (Sections 2.2-2.4).

We define $\text{PP}(\text{top } 10\%)$ for A, $\text{PP}(\text{top } 10\%)(\text{A})$, as

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

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

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 i th 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 i th publication with which the publication is assigned to the 10% most frequently cited publications (Waltman & Schreiber, 2013).

We define MNJS for A, $\text{MNJS}(\text{A})$, as

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

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

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

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

where NJS_i is the normalized journal score of the journal, say J_i , of the i th publication, p_i the number of publications in J_i , NCS_j (c_j) the normalized citation score (citation score) of the j th 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 l th 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 MJPPtop10% for A, MJPP(top 10%)(A), as

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

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

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

where k_i is as in Eq. (2), q_i the number of publications in sc_i with (a) the same publication year as the i th publication of A, and (b) belonging to the journal of the i th 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 j th 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 i th publication of A.

$\text{JPP}(\text{top } 10\%)_i$ is then the extent, on average, to which the publications that belong to sc_i , with the same publication year as the i th publication of A and belonging to the same journal as the i th 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 i th publication.