

PROGRESS BIBLIOMETRIC REPORT AT CEITEC MU IN 2011 – 2017

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Purpose of the document

This document has the ambition to complete the system of evaluation of scientific results at CEITEC MU. At present, the scientific performance of CEITEC MU is evaluated by (i) external scientific evaluation, which takes place every 4 years, and, (ii) the publication results of particular research group are reflected in the bonus system every year. The document summarizes the publication results in 2017, the trends in publishing activities from 2011 to 2017 and compares them with other similar institutions at national and international levels. It might help to strategic institutional planning and monitoring.

It is intended for various purposes, according to which it will be modified, however primarily for the management of CEITEC MU. Part(s) of the document will be further used by the different departments/bodies (e.g. OAP - for writing NPUII and other reports; GO - information for writing projects; Director's Office/PR team - for various short messages, annual report; the parts can be used for strategic partners; and the Director's Board for assessing the progress of CEITEC MU and controlling strategies).

The document will be updated every year to obtain a perspective of progress. Moreover, the new analysis and indicators will be added in the future. The report will be enlarged in 2019 by detailed analysis of RGL's publications, detailed analysis of publications in collaboration and analysis of open access publications.

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General information

Bibliometric analysis is processed to obtain the quantity and quality indicators of performance in research. It can also provide measurements of connections between researchers and research areas through statistical analysis of co-publications and citations. However, bibliometric indicators should be one of several tools used for evaluations. This could be evident when publications containing very new or unconventional research results are included in an assessment. These will not yet have been cited, which means that any assessment based solely on bibliometric indicators will not discover the possible potential of the research groups in question. This report includes bibliometric analysis of the publication dataset of CEITEC MU, benchmarked against similar institutions, particularly within Alliance4Life institutions.

Benchmark institutions were selected on the basis of similarities in research topics and the number of results (hundreds of results per year).

Benchmark institutions:

- Institute of Organic Chemistry and Biochemistry of the CAS (Czech Republic)
- Flanders Institute for Biotechnology (Belgium)
- Friedrich Miescher Institute for Biomedical Research (Switzerland)

Alliance4Life institutions:

- St. Anne's University Hospital Brno/ ICRC (Czech Republic)
- Biomedical Research Center SAS (Slovakia)
- Medical University of Lodz (Poland)
- School of Medicine - University of Zagreb (Croatia)
- University of Tartu (Estonia)
- Vilnius University (Lithuania)
- Latvian Institute of Organic Synthesis (Latvia)
- University of Ljubljana (Slovenia)
- Semmelweis University (Hungary)

Data sources

Sources:	Web of Science, InCites
Dataset:	Affiliation of at least one of the authors to CEITEC MU, manual refinement of dataset AD=(CEITEC OR Cent European Inst Technol OR Stredoevropsky Technol Inst OR CEITEC Cent European OR Cent European Inst Technol) AND OG=(Masaryk University Brno)
Document Types:	Article, Review, Letter
Publication Window:	2011-2017
Citation Window:	Not defined

Indicators

General notes on the definitions and the calculation of indicators:

- Inclusion or exclusion of self-citations might affect the resulting indicator values, but not the method of calculating the indicators. Data in this report do not remove self-citations when calculating indicator values.
- Czech system of evaluation (RIV) used fractionalization in previous years. There is no fractionalization or weighting used in this report when calculating indicator values.

Journal Impact Factor (JIF) – is defined as all citations to the journal in the current Journal Citation Reports® year to items published in the previous two years, divided by the total number of scholarly items published in the journal in the previous two years.

Average JIF Percentile – transforms the rank in category by Journal Impact Factor into a percentile value, allowing more meaningful cross-category comparison.

Subject Categories – are assigned automatically to articles by Web of Science based on the journal in which the article is published. An article may be assigned to multiple subject categories.

Category Normalized Citation Impact (CNCI) – determines the citation impact of the article relative to the average number of citations of all articles of the same type in the same subject category and in the same publication year as the article under review. A value greater than 1 indicates that the number of citations is greater than the average of the subject category.

Citation Impact – is the average (mean) number of citations per paper. It gives an indication of the average scientific impact of a unit's published articles, but it does not take into account that older articles are usually more cited and that citation rates vary between document types and subject areas.

Highly Cited Papers – shows the volume of papers that are classified as highly cited in Essential Science IndicatorsSM (ESI). ESI is a separate service also hosted on the InCites platform and should not be confused with the subject scheme of the same name. Highly cited papers are the top 1% in each of the 22 ESI subject areas per year. They are based on the most recent 10 years of publications. Highly Cited Papers are considered to be indicators of scientific excellence and top performance and can be used to benchmark research performance against field baselines worldwide. Although Highly Cited Papers are synonymous with % Documents in the Top 1% in InCites, they are not identical because of differences in subject scheme, time period and document type.

Productivity

As observed in Table 1, the greatest increase in the number of CEITEC MU publications was in the first two years since the establish of CEITEC MU in 2011. In the following years, the number of publications slightly increased, with an annual growth rate of 3% in 2014, 7% in 2015 and 2% in 2016, which roughly corresponds to the average annual increase rate of the number of publications in the Czech Republic of approximately 2%. In 2017, there was a slight decrease in the number of publications (7%). This decrease could have been caused by the change in the number of research groups (cancellation of research groups after evaluation and establishment of new research groups), and the change of the national [Methodology 13+](#) and its modifications which focused more on quality than quantity.

This trend continued for the percentage of publications in top journals. The contribution of publications in Q4 significantly decreased (from 20% in 2011 to 6% in 2017), contributions in Q3 and Q2 remained approximately the same, and the contribution in Q1 increased from 34% in 2011 to 54% in 2017.

According to the percentage of publications in Q1, the quality of publications may seem to have been the same since 2015, but the detailed view on contributions of publications in the 1%, 5% and 10% top journals show an increasing in quality (see tab. 2).

The above median percentage of publications in Q1 and Q2 has been continually increasing since 2011 from 63% in 2011 to 81% in 2017.

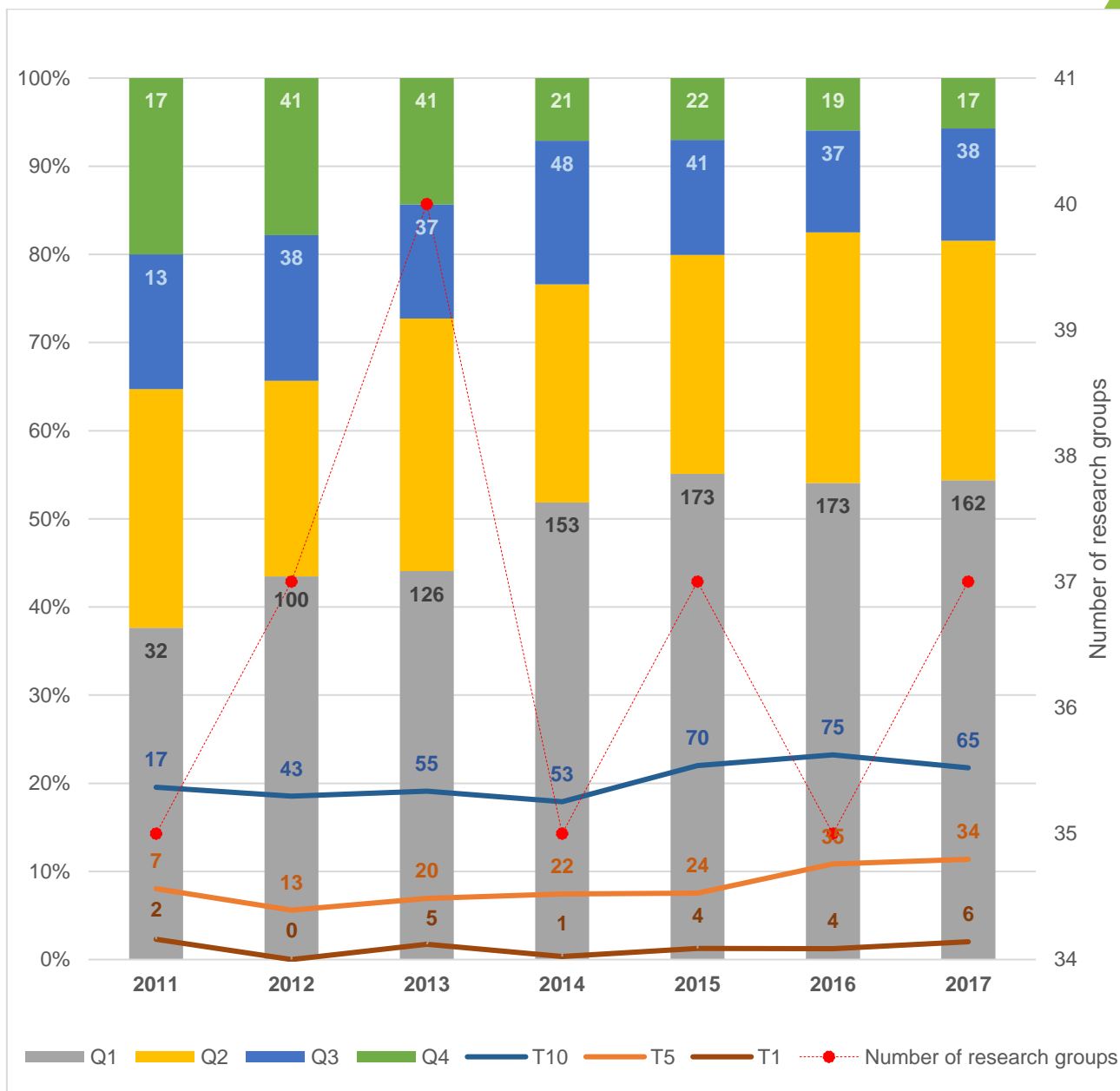
Tab. 1: Number and percentage of CEITEC MU publications in quartiles by year

	TOTAL	Q1	Q1%	Q2	Q2%	Q3	Q3%	Q4	Q4%
2011	87	32	37%	23	26%	13	15%	17	20%
2012	232	100	43%	51	22%	38	16%	41	18%
2013	288	126	44%	82	28%	37	13%	41	14%
2014	296	153	52%	73	25%	48	16%	21	7%
2015	318	173	54%	78	25%	41	13%	22	7%
2016	323	173	54%	91	28%	37	11%	19	6%
2017	299	162	54%	81	27%	38	13%	17	6%

Tab. 2: Number and percentage of CEITEC MU publications in 1%, 5% and 10% top journals by year

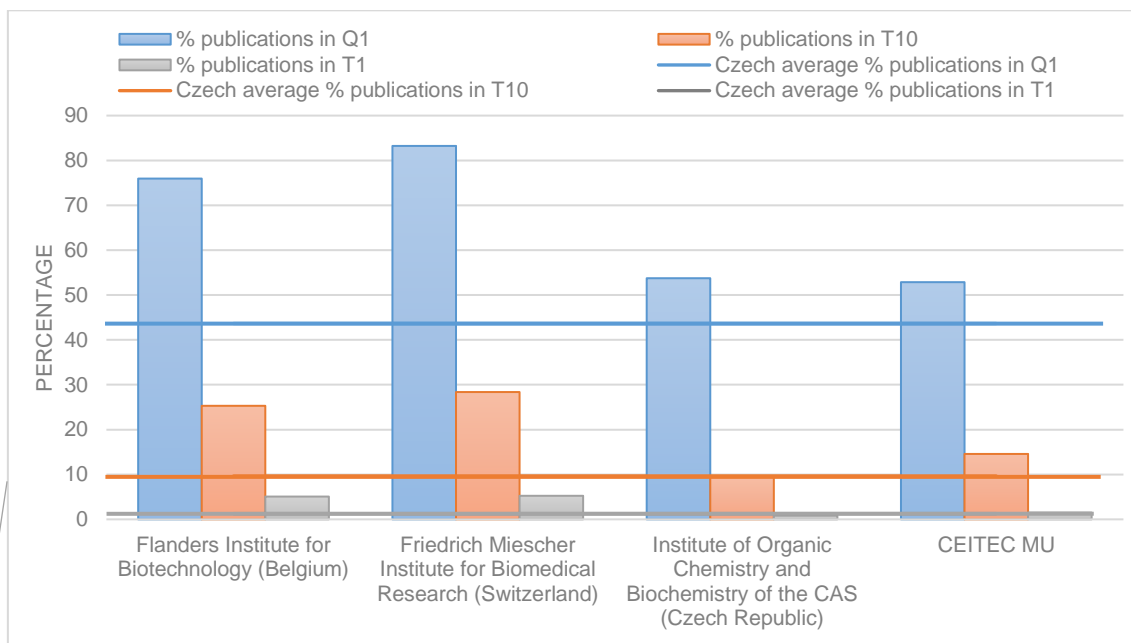
	TOTAL	T10	T10%	T5	T5%	T1	T1%
2011	87	17	20%	7	8.0%	2	2.3%
2012	232	43	19%	13	5.6%	0	0.0%
2013	288	55	19%	20	6.9%	5	1.7%
2014	296	53	18%	22	7.4%	1	0.3%
2015	318	70	22%	24	7.5%	4	1.3%
2016	323	75	23%	35	10.8%	4	1.2%
2017	299	65	22%	34	11.4%	6	2.0%

Graph 1: Number and percentage of CEITEC MU publications by year

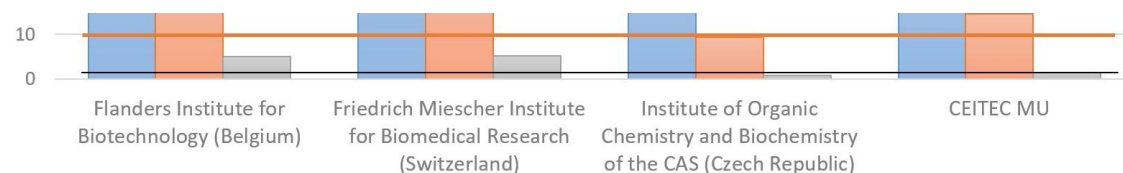


The data in graph 2 is benchmarked against data sets of different institutions/units and the Czech national average. The percentage of CEITEC MU publications exceeds the Czech averages in all three indicators. Moreover, it exceeds the Czech comparable institution IOCB. However, comparison with European institutions shows reserves in the quality of publications: the percentage of CEITEC MU publications in T1 and T10 is half that of comparable European institutions.

Graph 2: Percentage of publications in Q1, T10 and T1



Detail of T1 and T5 in Graph 2

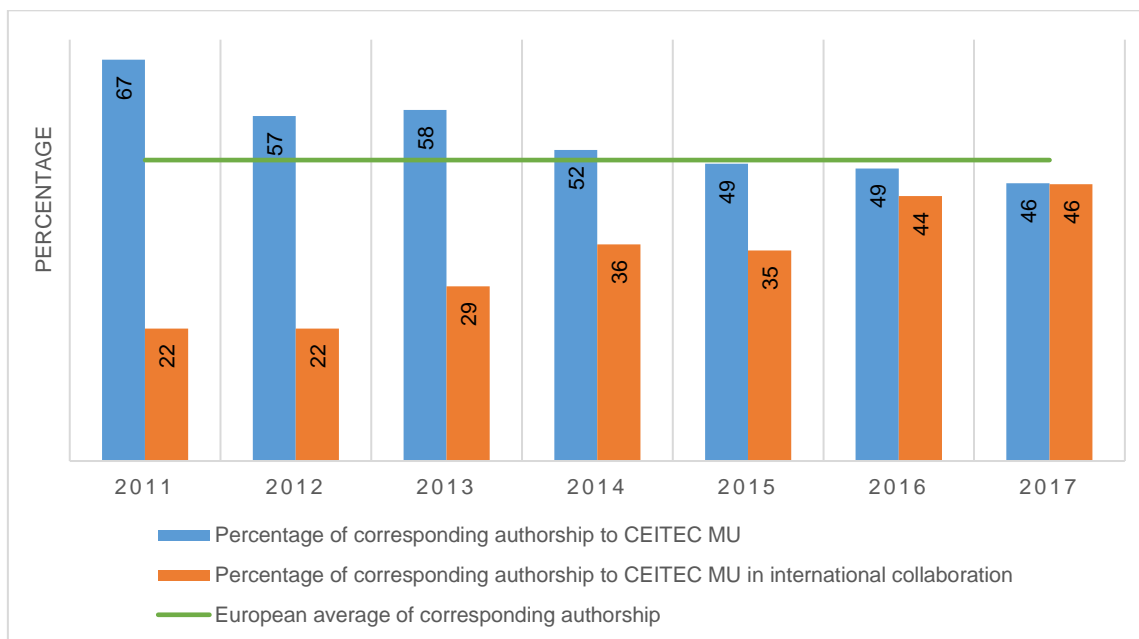


Corresponding Authorship

An important indicator is the number of publications with the corresponding author affiliated with CEITEC MU. As can be seen in graph 3, the percentage of publications, where the CEITEC MU author is a reprint author, has slightly decreased over time: 2017 reached 46%, which is slightly below the European average (50%¹). The decrease was probably caused by dwindling number of publications in Q4, higher engagement of CEITEC MU in consortial projects, and a change in the number of research groups (cancellation of research groups after evaluation and establishment of new research groups). On the other hand, the percentage of publication published in collaboration with authors from foreign institutions with corresponding author from CEITEC MU grew since 2011.

¹ CEITEC Summary Bibliometric Analysis 2017, authors: M. Sieberova, M. Petr, Rector's Office MU

Graph 3: Percentage of publications with CEITEC MU corresponding authorship



As can be seen in tab. 3 the trend for the percentage of publications with CEITEC MU corresponding authorship is similar as for dataset of all CEITEC MU publications. The percentage of publications with CEITEC MU corresponding authorship in Q1 increased from 28% in 2011 to 58% in 2017 and concurrently, the percentage of publications with CEITEC MU corresponding authorship in Q4 significantly decreased over time.

As is shown in table 4, the percentage of publications with CEITEC MU corresponding authorship in 1%, 5% and 10% top journals increases. The comparison of the percentages of all CEITEC MU publications and percentages of publications with CEITEC MU corresponding authorship in 1%, 5% and 10% top journals by year is shown in graph 5.

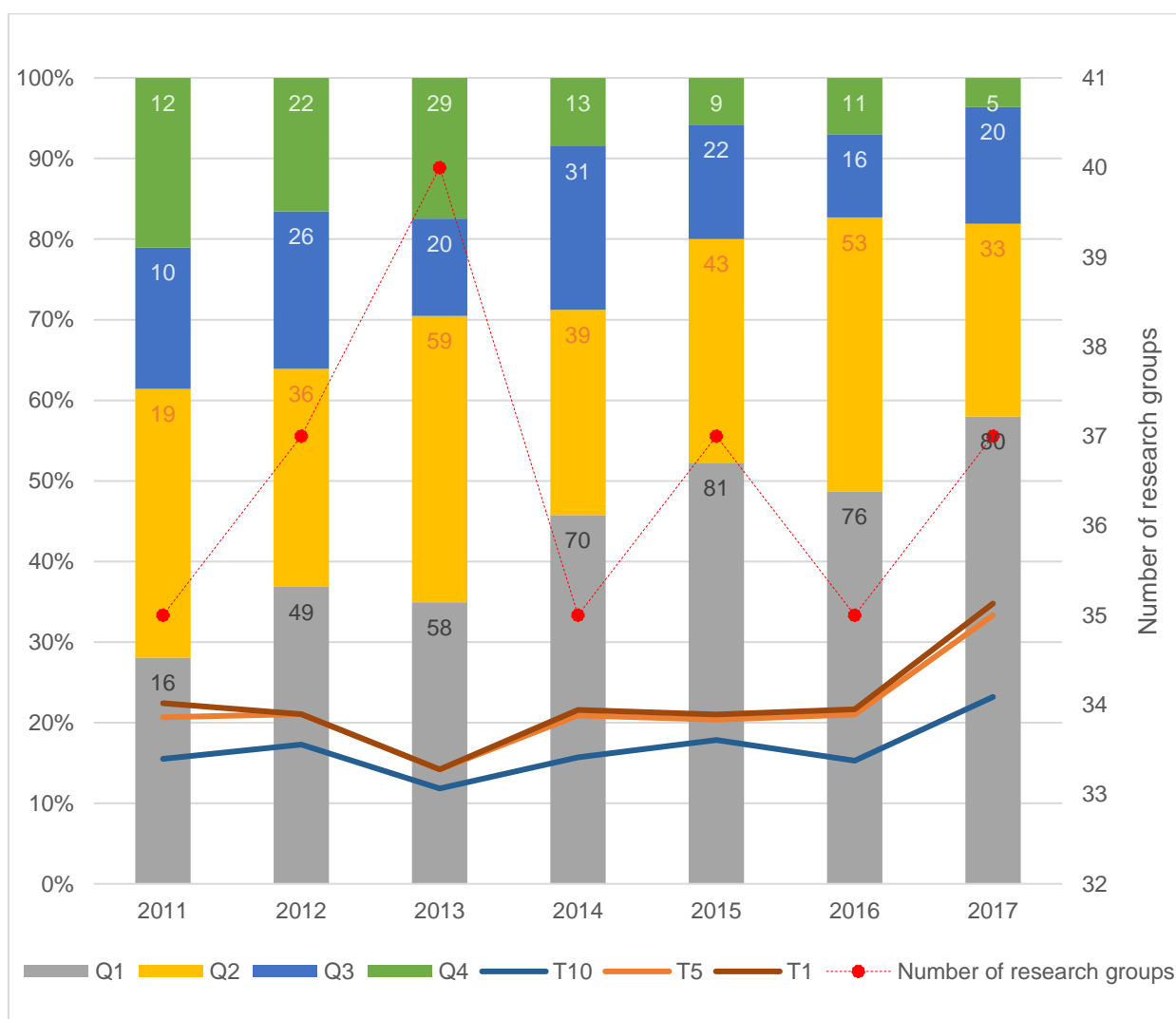
Tab. 3: Number and percentage of CEITEC MU publications with CEITEC MU corresponding authorship in quartiles by year

	TOTAL	Q1	Q1%	Q2	Q2%	Q3	Q3%	Q4	Q4%
2011	58	16	28%	19	33%	10	17%	12	21%
2012	133	49	37%	36	27%	26	20%	22	17%
2013	169	58	34%	59	35%	20	12%	29	17%
2014	153	70	46%	39	25%	31	20%	13	8%
2015	157	81	52%	43	27%	22	14%	9	6%
2016	157	76	48%	53	34%	16	10%	11	7%
2017	138	80	58%	33	24%	20	14%	5	4%

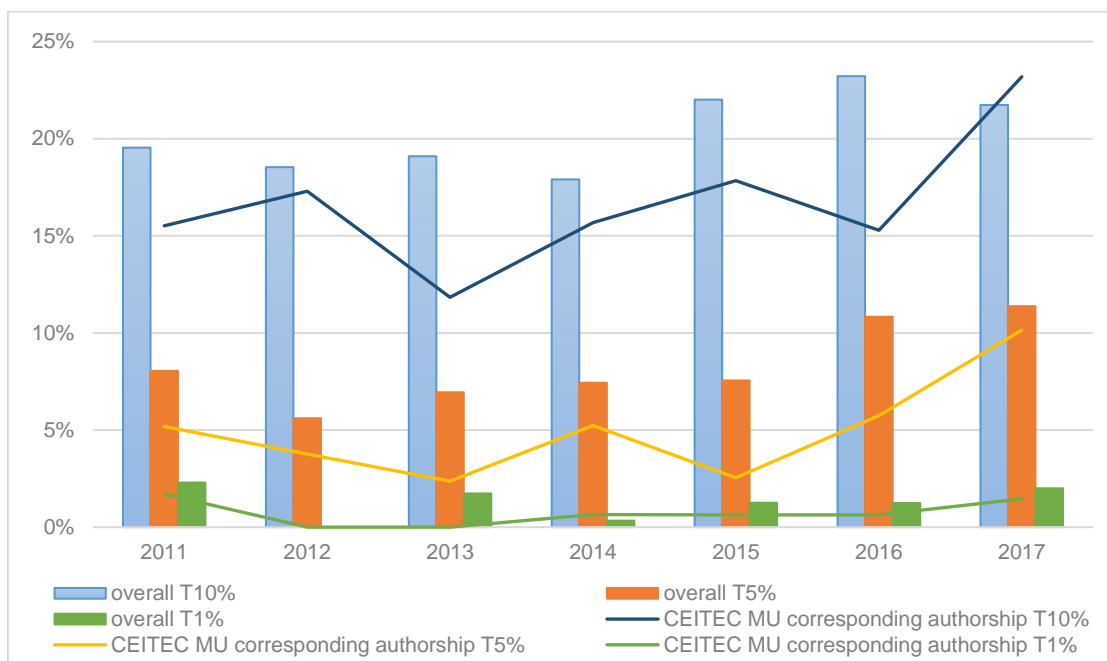
Tab. 4: Number and percentage of CEITEC MU publications with CEITEC MU corresponding authorship in 1%, 5% and 10% top journals by year

	TOTAL	T10	T10%	T5	T5%	T1	T1%
2011	57	9	16	3	5.3%	1	1.7%
2012	133	23	17	5	3.8%	0	0.0%
2013	169	20	12	4	2.4%	0	0.0%
2014	153	24	16	8	5.2%	1	0.7%
2015	157	28	18	4	2.5%	1	0.6%
2016	157	24	15	9	5.7%	1	0.6%
2017	138	32	23	14	10.1%	2	1.4%

Graph 4: Number and percentage of CEITEC MU publications with CEITEC MU corresponding authorship by year



Graph 5: Comparison of percentage of all CEITEC MU publication and percentage of publication with CEITEC MU corresponding authorship in 1%, 5% and 10% top journal by year



Subject Categories

Every journal covered by Web of Science is assigned to at least one of the 252 subject categories. Subject category is assigned automatically to articles by Web of Science based on the journal in which the article is published and following analyses are based on this assignment.

Graph 6 represents the top 10 research areas based on the total number of CEITEC MU publications. The most often subject categories are *Biochemistry molecular biology* (11%), *Neurosciences* (10%), *Chemistry multidisciplinary* (9%) and *Chemistry physical* (8%).

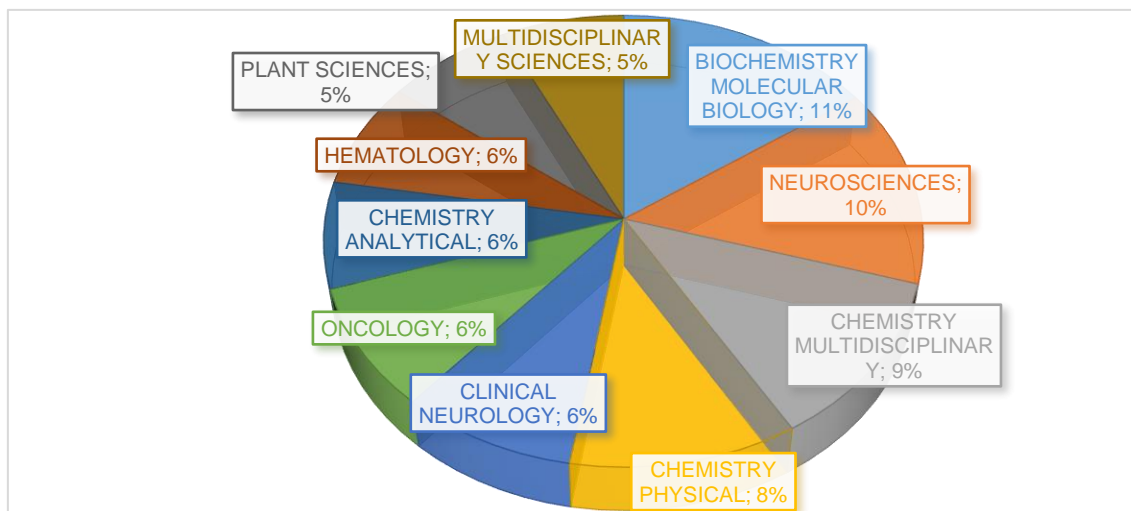
Percentage of publications in 10% top journals are for these most productive subject categories: 19% for *Biochemistry molecular biology*, 4% for *Neurosciences*, 8% for *Chemistry multidisciplinary* and 17% for *Chemistry physical*.

Graphs 7 and 8 show the percentage of CEITEC MU publications in Q1 and T10 by the subject categories (threshold minimum 20 CEITEC MU publications for subject category) and Czech and world average. As can be seen in graph 7, CEITEC MU publications in the subject categories of *Plant sciences* and *Spectroscopy* have more than a 40% higher percentage of publications in Q1 than the Czech and world averages. In contrast, CEITEC MU publications in the subject categories of *Neurosciences*, *Clinical neurology* and *Behavioral sciences* are more than 40% below the Czech and world average in the percentage of publications in Q1.

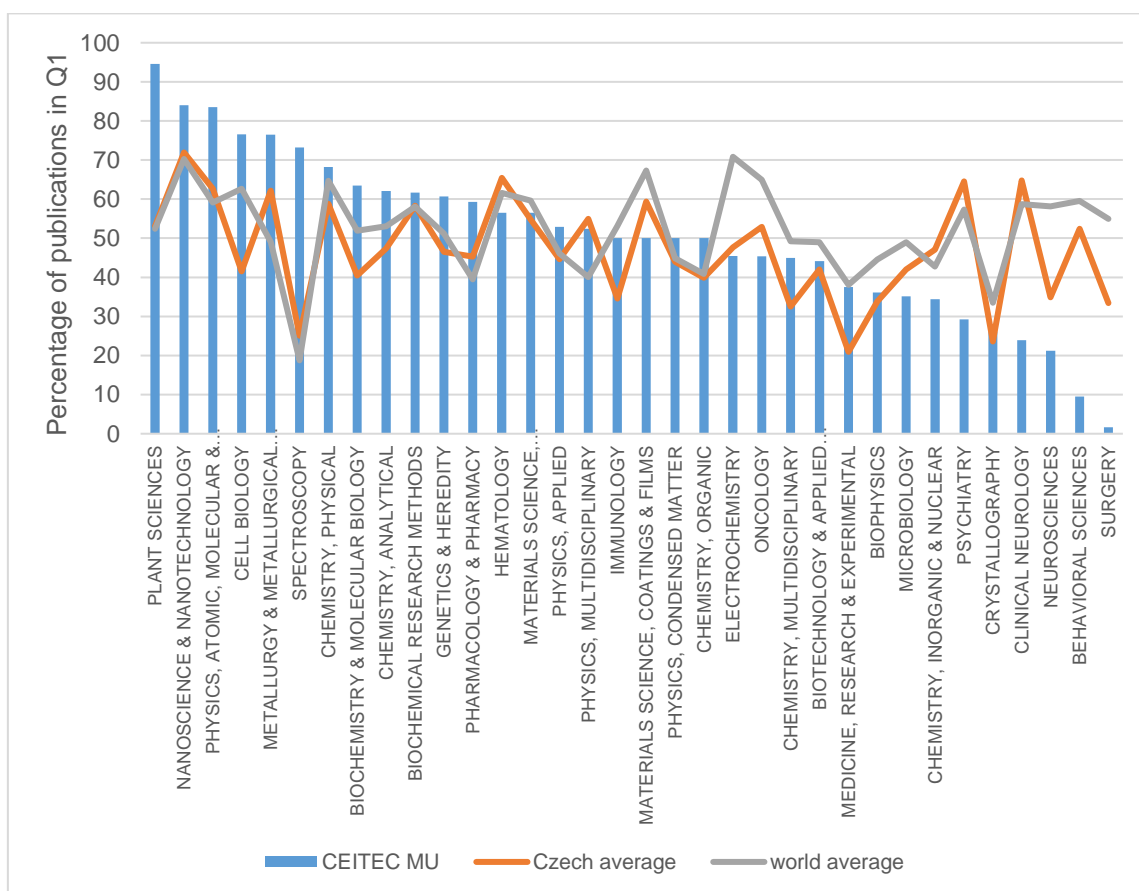
The category of *Neurosciences* is strongly influenced by a large number of publications in Czech journal *Česká a slovenská neurologie a neurochirurgie* (Q4 journal) which are produced especially by students and a PI linked with the journal without awareness of RGLs. The percentage of Q1 for the category of *Neurosciences* without publications in ČSNN is 34.81% which corresponding to the Czech average. The international and Czech national results in the category of *Clinical neurology* is influenced by publications supported by industry with a large number of authors, which increase the Czech and world average.

Graph 8 illustrates the percentage of publications in top 10% journals by subject categories. The percentage is more than three times higher for CEITEC MU publications than the Czech and world average in the subject categories of *Cell biology* and *Immunology*, while the CEITEC MU publications in the subject category of *Behavioral sciences* are more than 10% below the Czech and world average.

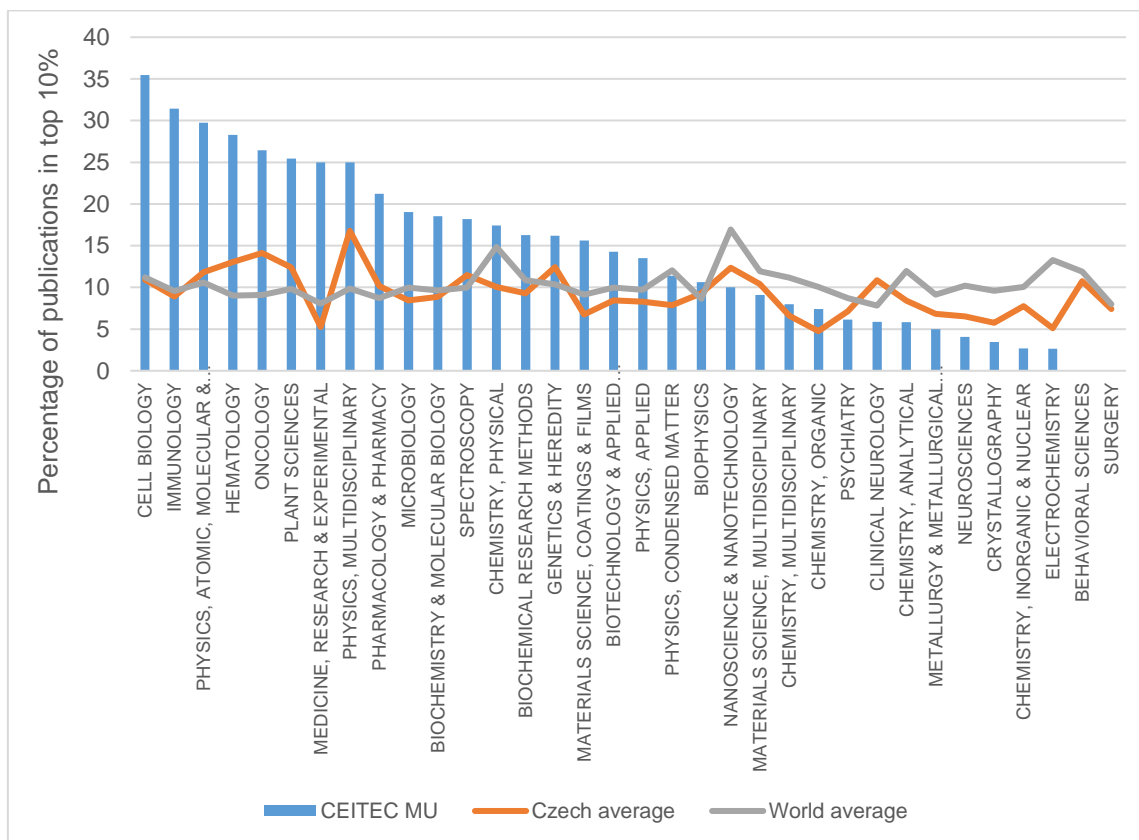
Graph 6: 10 most common subject categories by number of CEITEC MU publications



Graph 7: Quality of CEITEC MU publications in the subject categories: percentage of publications in Q1



Graph 8: Quality of CEITEC MU publications in the subject categories: percentage of publications in T10



Citation Analysis

Generally, citations reach their peak three years after publishing and then there is an annual decline rate of 10%. It leads to increasing of citations non-linearly. The distribution of citations for CEITEC MU publications is shown in graph 9. Overall 85% of CEITEC MU papers were cited at least once or more (Czech average: 58%, world average: 53%) and the most cited subject categories were *Medicine, research and experimental* and *Physics, atomic, molecular and chemical* (96.43% papers cited).

Average citation impact (citations per publication) for CEITEC MU publications is 12.17. The five subject categories with the highest citation impact are shown in Table 5. Table 6 shows the comparison of citation impact and CNCI with selected institutions. Citation impact is less than half that of European institutions, and is slightly lower than IOCB. In the case of CNCI, CEITEC MU slightly exceeds the average. Table 7 shows a trend of the CNCI of CEITEC MU publications compared to the Czech average.

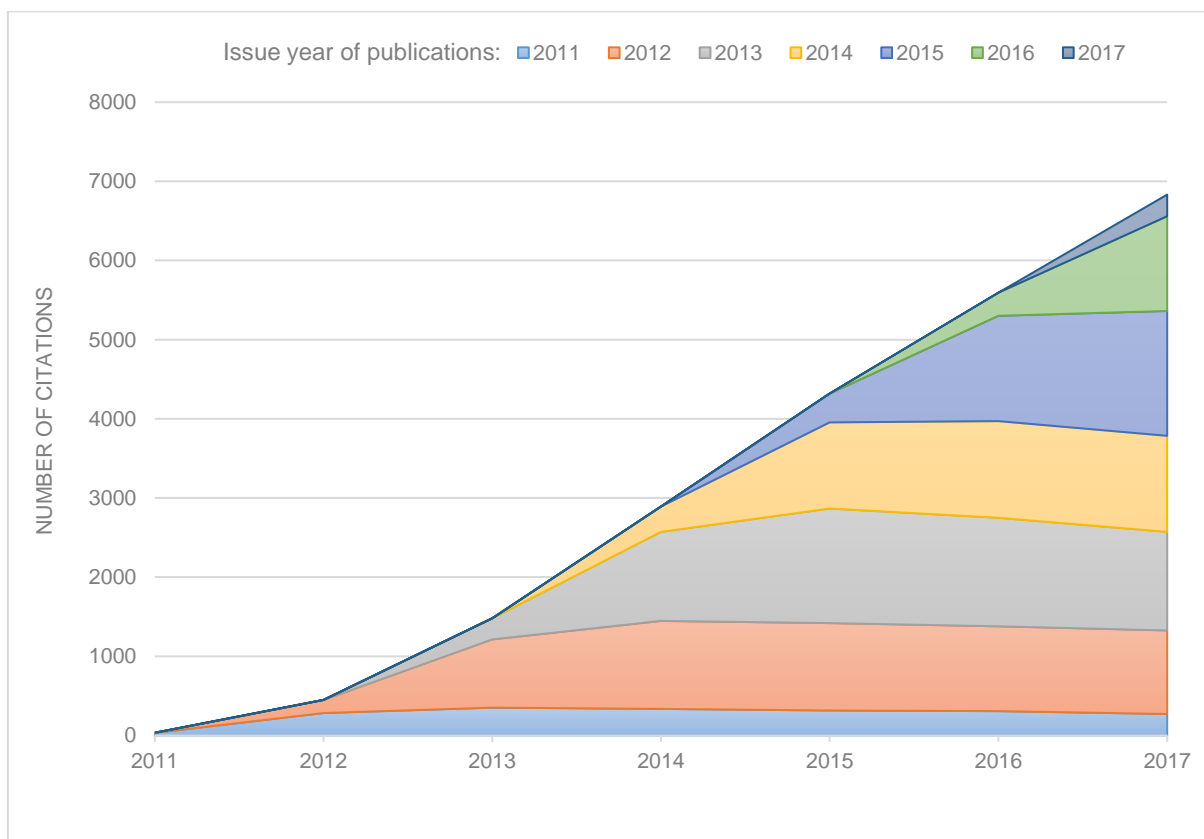
Tab. 5: CEITEC MU subject categories with the highest citations impact

Subject category	Citation impact	World average
Physics, multidisciplinary	45.04	8.36
Cell biology	28.35	11.28
Hematology	23.11	5.50
Medicine, research and experimental	21.21	6.51
Genetics and heredity	18.78	11.19

Tab. 6: Citation impact and CNCI of institutions

	Citation impact	CNCI
Flanders Institute for Biotechnology (Belgium)	27.68	2.41
Friedrich Miescher Institute for Biomedical Research (Switzerland)	24.39	1.94
Institute of Organic Chemistry and Biochemistry of the CAS (Czech Republic)	15.14	0.96
CEITEC MU	12.17	1.2

Graph 9: Distribution of CEITEC MU citations in years by the year of issue



Tab. 7: Comparison of CNCI of CEITEC MU and Czech average from 2011 to 2017

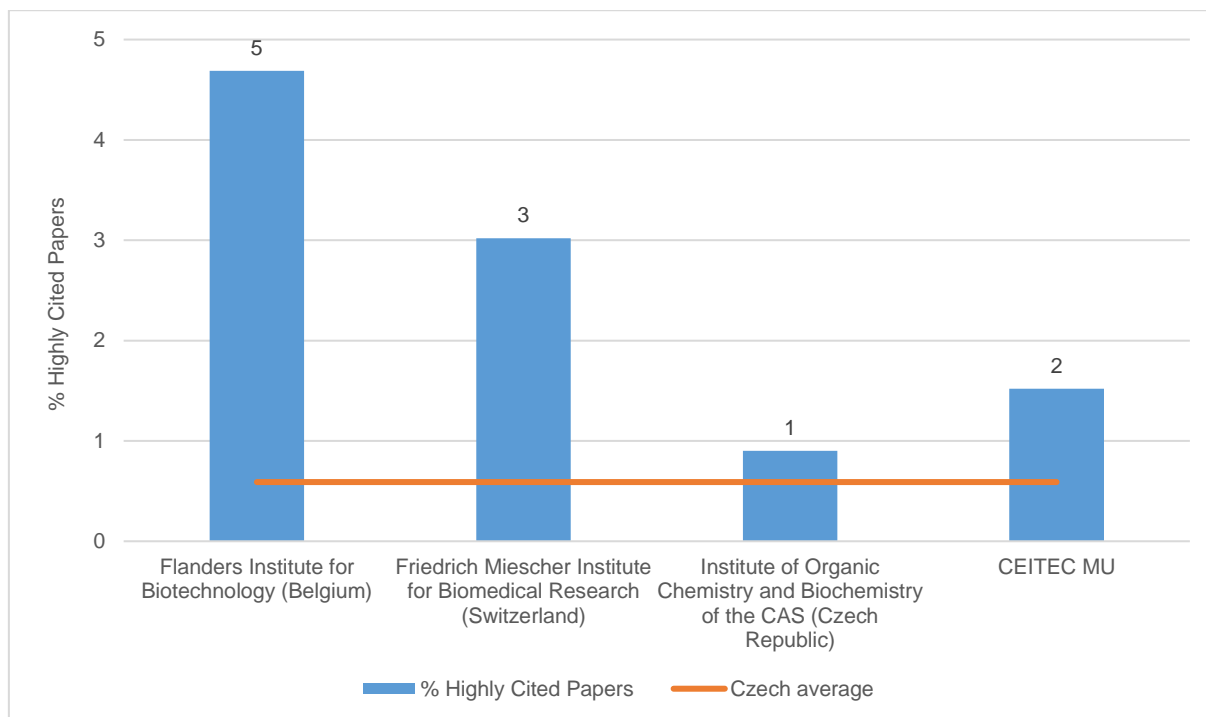
	2011	2012	2013	2014	2015	2016	2017	Overall
CEITEC MU	0.95	1.31	1.19	1.15	1.34	1.22	1.06	1.20
Czech average	1.15	1.16	1.26	1.16	1.17	1.17	1.18	1.18

Further, one of the main citation indicator in Essential Science Indicators (Web of Science) is presented: Highly Cited Papers. The numbers of CEITEC MU Highly Cited Papers by year are presented in table 8. As can be seen, the number of CEITEC MU Highly Cited Papers are single cases. 2012 and 2015 had the most highly cited papers.

Graph 10 shows the comparison of the percentage of Highly Cited Papers between select institutions/units and the Czech average. The percentage of CEITEC MU Highly Cited Papers are double the Czech average and is higher than IOCB. However, in comparison with other European institutions, CEITEC MU has a low value of this indicator.

Tab. 8: Number of CEITEC MU Highly Cited Papers by year

	2011	2012	2013	2014	2015	2016	2017	Overall
Highly Cited Papers	1	6	5	4	6	2	4	28

Graph 10: Percentage of Highly Cited Papers


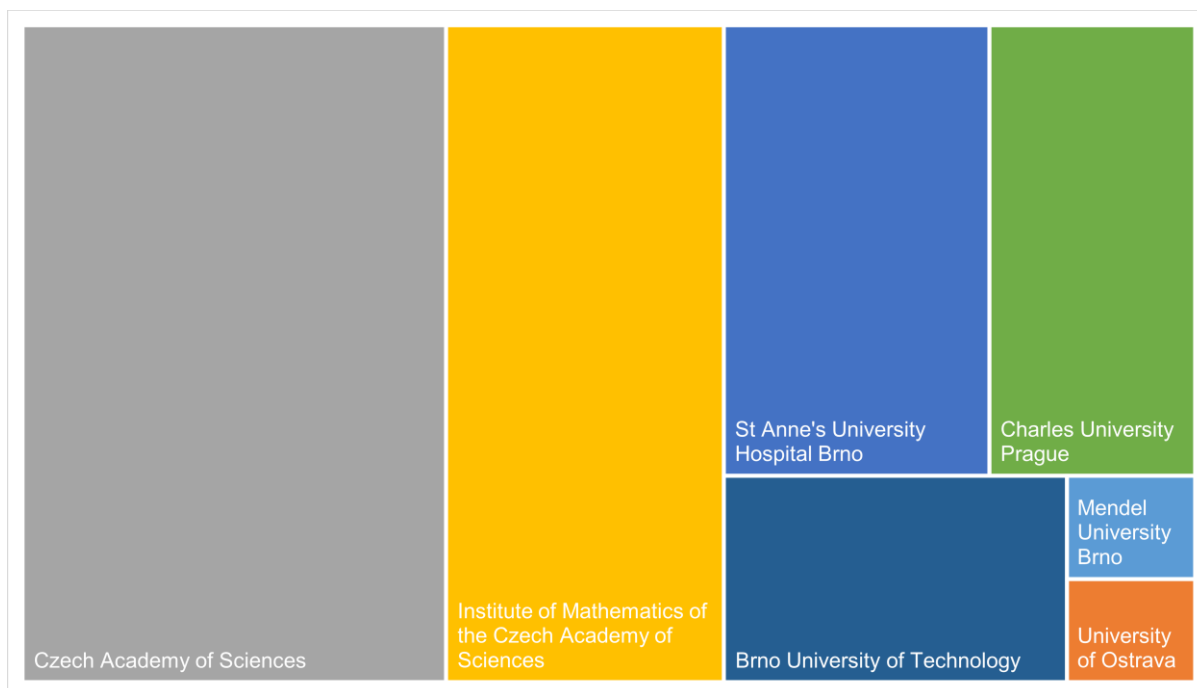
Collaboration

Another important indicator is the number of publications published in collaboration with other institutions. Graphs 11 and 12 show the most frequent Czech and foreign collaborations according to number of publications. Graph 11 (most frequent collaboration with Czech institutions) is influenced by author affiliation with more than one Czech institution.

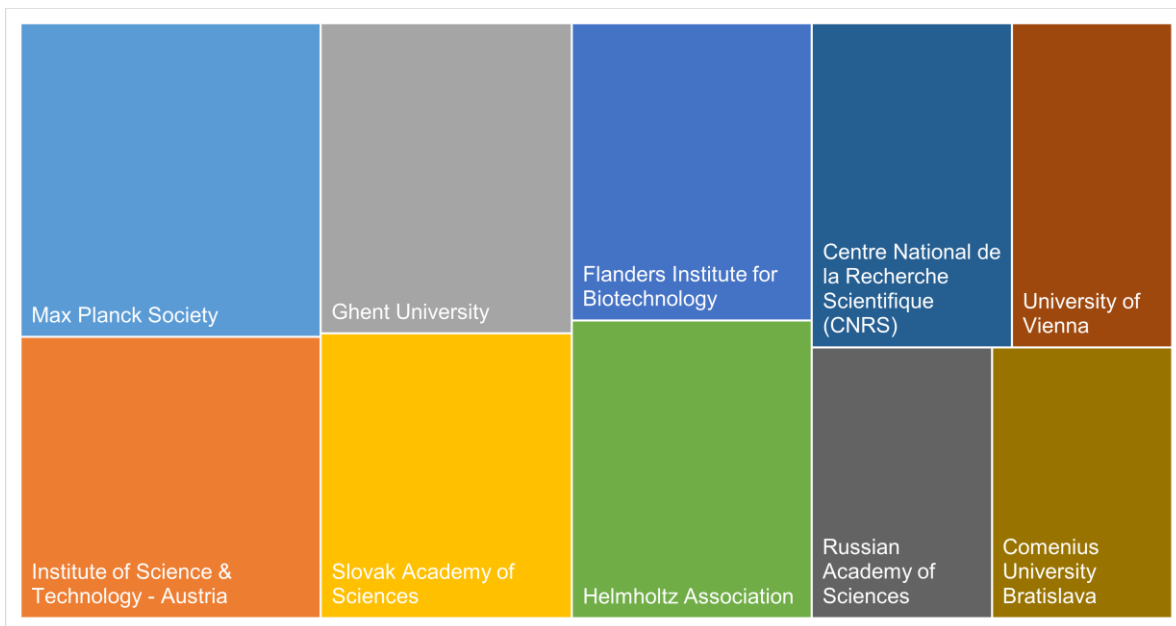
Graph 12 shows the most frequent collaboration with international institutions. The number of international publications may be related to many factors, such as new international grants or partnerships, or incoming researchers with links to previous labs. The greatest numbers of publications with international collaboration are with Max Planck Society, IST Austria and Ghent University (threshold max 10 authors per publication was chosen to exclusion consortial publications).

Citation impact of publications with Czech and international collaboration is presented in graph 13. As can be seen, the most cited publications are those published in collaboration with Uppsala University and Ghent University.

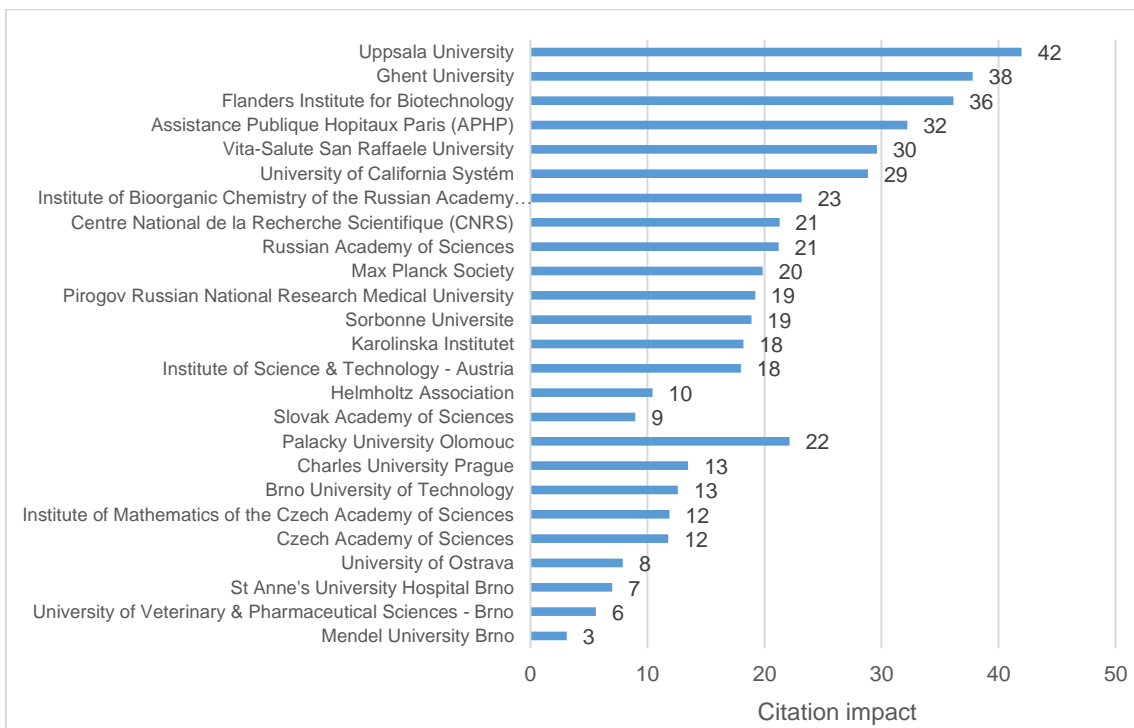
Graph 11: The most frequent collaboration with Czech institutions



Graph 12: The most frequent collaboration with foreign institutions



Graph 13: Citation impact of set of publications with most frequent Czech and foreign collaboration

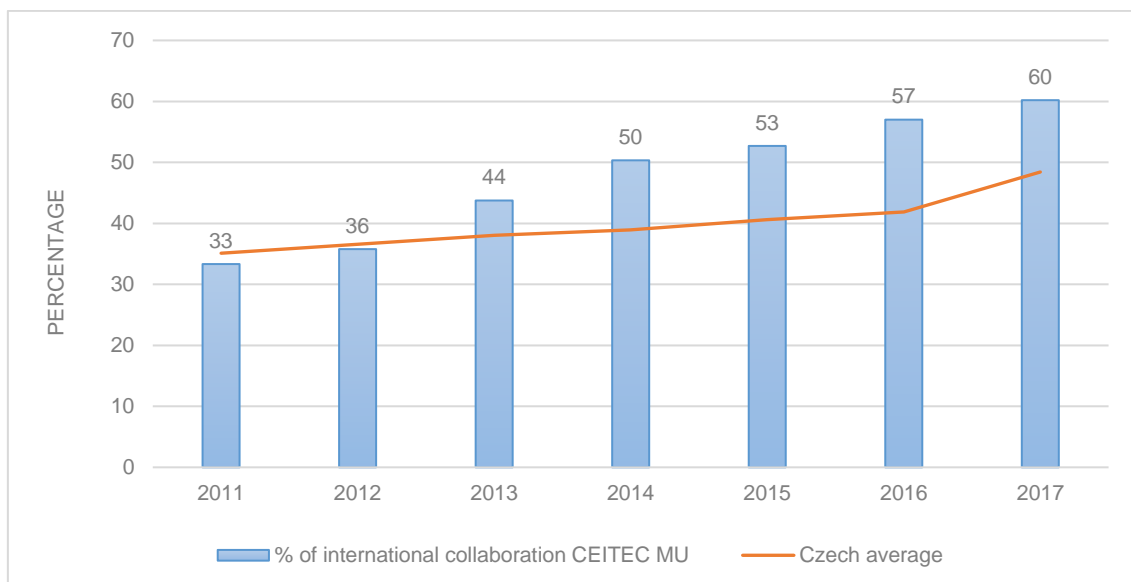


Graph 14 shows the percentage of CEITEC MU publications with international collaboration (one or more authors affiliated with foreign institution co-authored at least one article with affiliation with CEITEC MU). As can be seen, international collaboration of CEITEC MU has steadily been

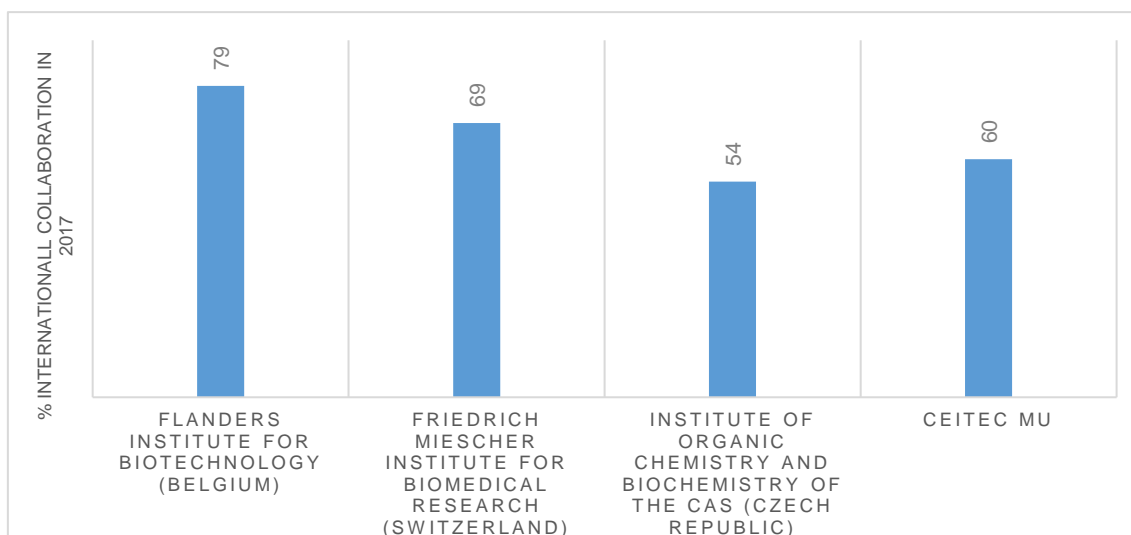
increasing from 33% in 2011 to 60% in 2017. CEITEC MU data has been significantly exceeding the Czech average.

However, in comparison with similar European institutions, the percentage of international collaboration of CEITEC MU publications is slightly lower (graph 15).

Graph 14: International collaboration of CEITEC MU by year



Graph 15: Comparison of international collaboration in 2017



Open Access

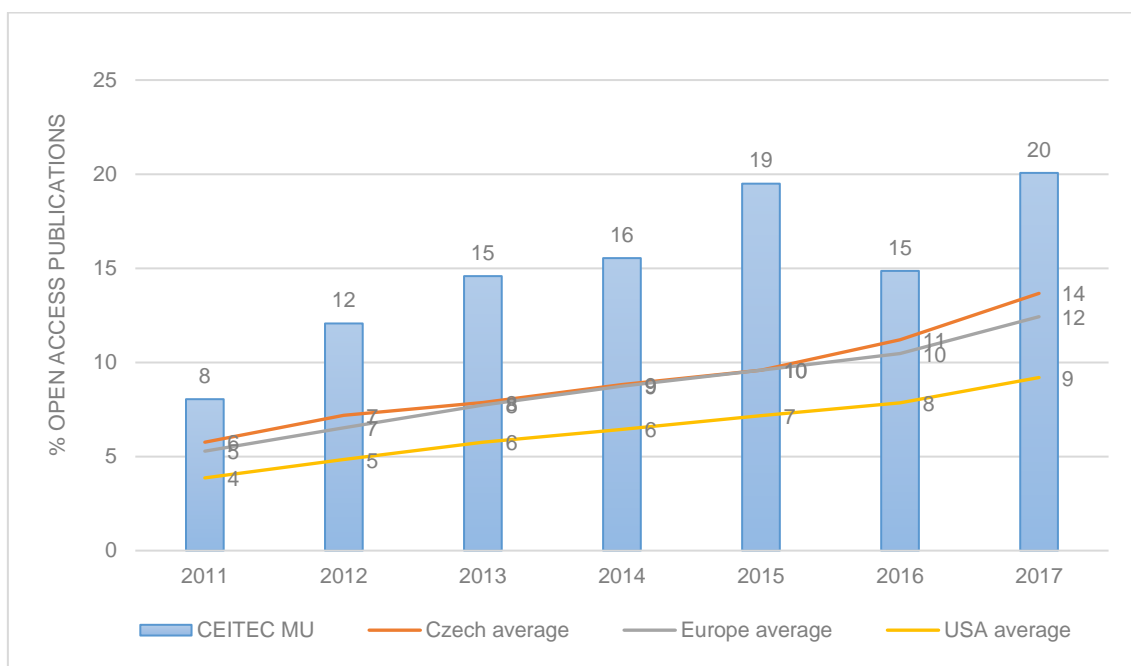
Graph 16 shows the percentage of CEITEC MU open access publications (source: InCites, type of publishing: Gold Open Access) in comparison with Czech, European and USA averages. The

percentage of CEITEC MU open access publications has increased over time (except for a decline in 2016), and is significantly higher than Czech, European and world averages.

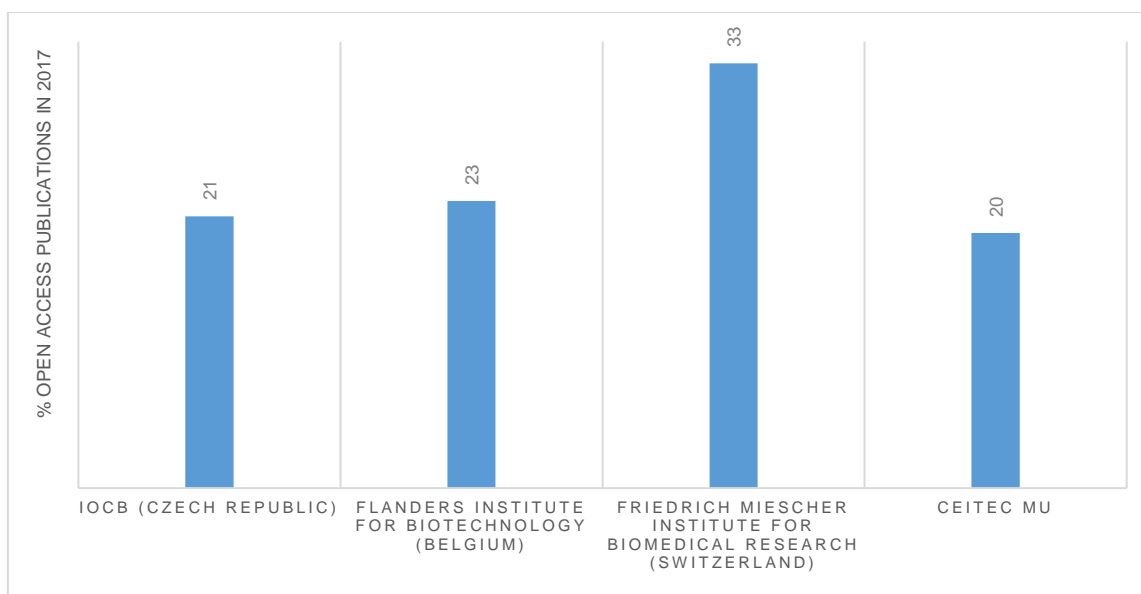
Graph 17 shows comparison CEITEC MU with selected institutions in terms of the percentage of open access publications. CEITEC MU has lower numbers than benchmarked institutions, but is slowly catching up to them.

Presented data include only GOLD OA, overall view on open access (green and gold OA) could be different. Detailed analysis of OA will be reported in OA Report.

Graph 16: Percentage of CEITEC MU open access publications



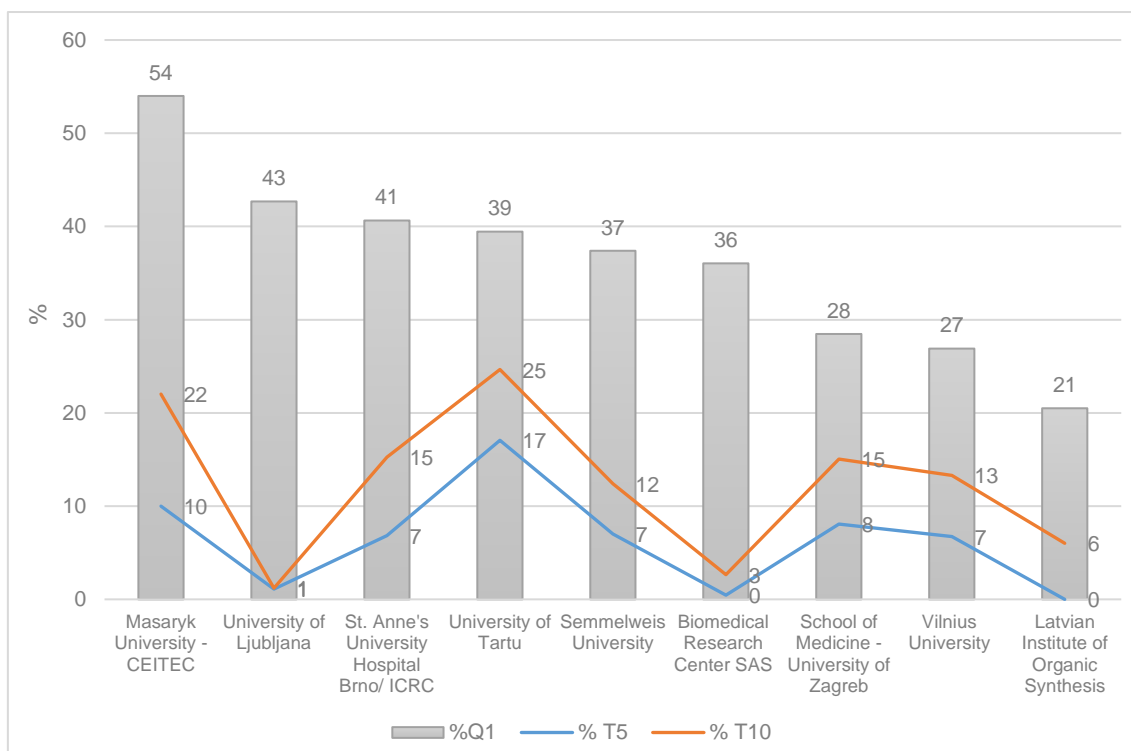
Graph 17: Comparison of the percentage of open access publications in 2017



Benchmark within Alliance4Life

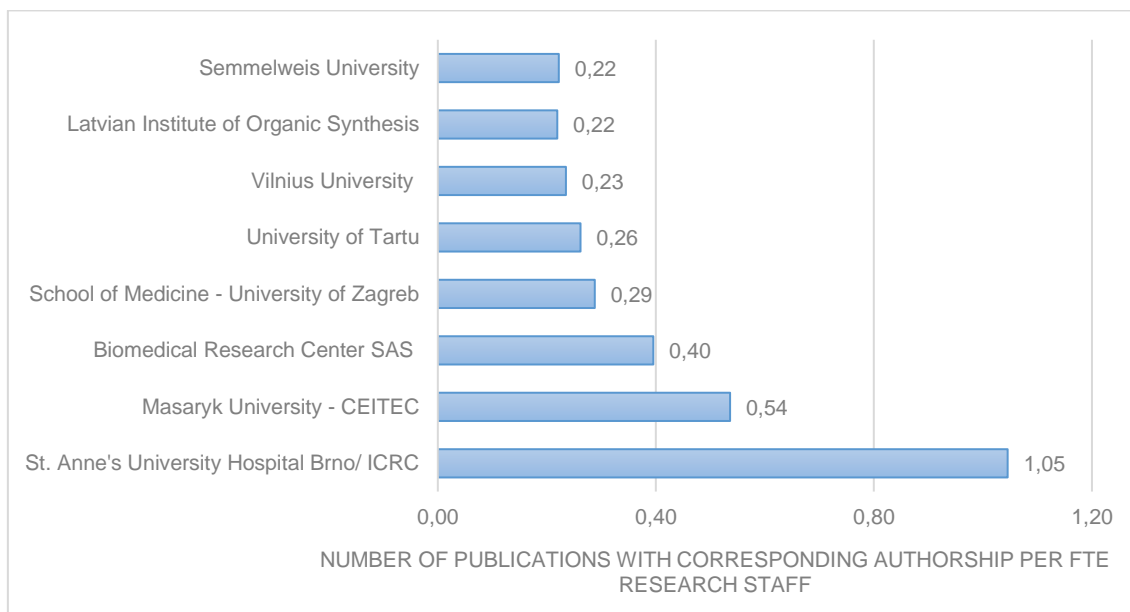
In this part, benchmark with institutions involved in the initiative Alliance4Life is presented. Graph 18 shows the percentage of publications in Q1, T5, and T10. As can be seen, CEITEC MU has a much higher percentage of publications in Q1 than other institutions. In the percentage of publications in T5 and T10, CEITEC MU has the second highest values after the University of Tartu.

Graph 18: Percentage of publications in Q1, T5 and T10



Graph 19 shows an average number of publications with the corresponding authorship per research FTE. CEITEC MU exceeds all A4L institutions except FNUSA-ICRC and shows half of publications with the corresponding authorship per one research FTE.

Graph 19: Average number of publications with corresponding authorship per research FTE



Conclusion

- Quality of CEITEC MU publications increased since 2011, especially in the contribution of publications in top 5% and 10% top journals. The number of publications in 1% top journals is not sufficiently significant for statistical analysis.
- Percentage of publications above median increased by 18% from 2011 but the share of publication below median is still high especially in some fields and therefore publication strategy need to be changed.
- Quality of CEITEC MU publications is comparable with IOCB and exceeds Czech average, but it is still lower than similar institutions in Western Europe.
- Overall percentage of publications with CEITEC MU corresponding authorship decreased from 67% in 2011 to 46% in 2017 – this was probably caused by a decrease in the number of publications in Q4, which were mostly with corresponding authors from CEITEC MU.
- The corresponding authorship of CEITEC MU publications is slightly lower than European average. The percentage of publication published in collaboration with authors from foreign institutions with corresponding authors from CEITEC MU grew and also the percentage of publications with CEITEC MU corresponding authorship in 5% and 10% top journals increased. It is recommended to support the publishing of papers in top journals with CEITEC MU corresponding authorships.
- CEITEC MU publications are published mostly in the subject categories of Biochemistry, Molecular biology, Neurosciences, Chemistry multidisciplinary and Chemistry physical.
- CEITEC MU shows very high quality in the subject categories of Plant sciences, Spectroscopy, Cell biology and Immunology.
- CEITEC MU citation analysis shows slightly higher values than the Czech average.
- The percentage of CEITEC MU publications that were cited once or more approximately exceeds 30% of the Czech and world averages.
- The highest citation impact shows CEITEC MU publications in the following research fields: Physics, multidisciplinary, Cell biology, Hematology, Medicine, research and experimental and Genetics and heredity. The citation impact of these research fields significantly exceeds the world average.

- The international collaboration of CEITEC MU gradually had increased and is approaching similar institutions in Western Europe. The highest citation impact of international collaboration shows Uppsala University, Ghent University and VIB the highest citation impact of national collaboration show Palacky University, Charles University and BUT.
- The percentage of CEITEC MU GOLD OA publications has increased, exceeding Czech and European averages and is comparable with similar institutions in Western Europe. Presented data include only GOLD OA, overall view on open access (green and gold OA) could be different.
- CEITEC MU research group leaders with the highest citation impact are Blažek, Lysák and Vaňáčková.
- Comparison within A4L shows a good position of CEITEC MU among monitored institutions.