STRUCTURAL CHARACTERISTICS OF THE MTA RESEARCH NETWORK'S SCIENTIFIC PERFORMANCE 2015

BASED ON WEB OF SCIENCE AND MTMT DATA

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Department of Science Policy and Scientometrics 2016

Introduction

The aim of the below analysis is to provide an overview of the MTA research network's (henceforth MTA) internationally measurable publication performance and its structure. This article focuses on 2015 and the 2013-2015 period as its context. The source material is a thoroughly cleansed MTA output data scope from the WoS and MTMT databases. The overview relies on several other international databases (with regard to disciplinary classification, reference value etc.). The main parts of the annual survey are the following:

- With regard to the qualitative representation of MTA publications the quartile score system (Q1-Q4) will be applied (the system has been recently introduced by the MTMT), providing an alternative to the so-called "aggregated impact factor."

- Open Access publications ("Gold OA") and their characteristics will appear as an additional viewpoint.

- The overview of the MTA's co-operation with national higher educational institutions (MTA-FOI relations) is an addition to the performance structure analysis.

- Success indicators will be supported by *stability intervals* in order to give a more reliable overview of performance structure (cf. CWTS Leiden Ranking: http://www.leidenranking.com/methodology/indicators).

Applied databases and other sources:

MTMT: The Hungarian Scientific Bibliography

Web of Science: citation databases (SCI, SSCI, A&HCI), bibliographic data

Journal Citation Reports (JCR): impact factor rates (JIF), and disciplinary categorization to assess JIF-quartiles

Essential Science Indicators (TR): ESI categorization of disciplines, disciplinary reference values

DOAJ: Directory of Open Access Journals

Characteristics of the Internationally Visible Publication Strategy

The quality of international journal publications and the success of publication strategies can be measured through the journals' status within the given discipline. A recent method for this is the ranking of publications with regard to the quality and status of journals. Quartile scoring is an internationally wide-spread method recently introduced by the MTMT. This method starts out from the journal's position within the disciplinary journal ranking, and while it still relies on the impact factor, it is less misleading than the previously applied "aggregated impact factor." (In MTMT practice the SJR indicator has replaced JIF, whereas the present analysis relies on impact factors.)

60% of the research network's 2015 publications (all registered in the

- Quartile Scores:

Q1 denotes the top 25% of the IF distribution,

Q2 for middle-high position (between top 50% and top 25%),

Q3 middle-low position (top 75% to top 50%), MTMT and have a calculated impact factor) were published in "excellent" journals, ~80% of the total output appeared in "excellent" or "good" journals (Figure 2). Proportions stayed relatively the same during the past five years (Figure 3). Taking a look at data for each discipline (ESI system, Figure 1) reveals the outstanding success of multidisciplinary research, mostly due to the high-ranking journals in this field (most publications appeared in *Plos One*). Physics research is mostly published in excellent, Q1 journals (materials science and space research), the same is true for clinical science, psychological science and neuroscience. At least half of the total output belongs to the excellent or good (Q1 and Q2) category (economy and social science score an outstanding 60%).

Golden Open Access publications (OA publications) give a more varied picture (Figure 5). Apart from PloS (OA journal) dominated multidisciplinary research, those fields publish in "excellent" OA journals where OA-publishing is an internationally established practice (physics, life sciences – significant share in OA-publishing), as well as those fields the output of which is more evenly distributed among the quality categories (Figure 4). With regard to publication strategy, the latter group has a rather "generalist" approach as opposed to the "specialists" of those fields that strive to publish in Q1 journals.

Q4 the lowest position (bottom 25% of the IF distribution)

- Applied Indicator: Journal Impact Factor

- In case of a few disciplines a higher quartile score has been applied when available ("optimistic approach")

Figure 1

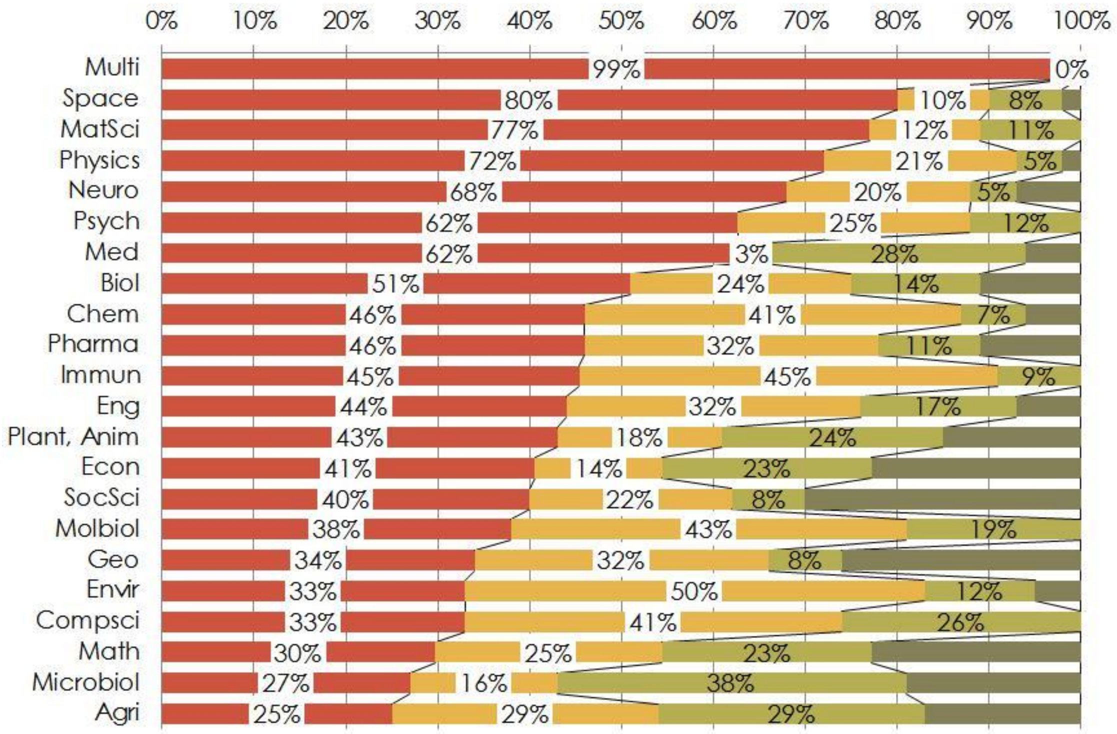
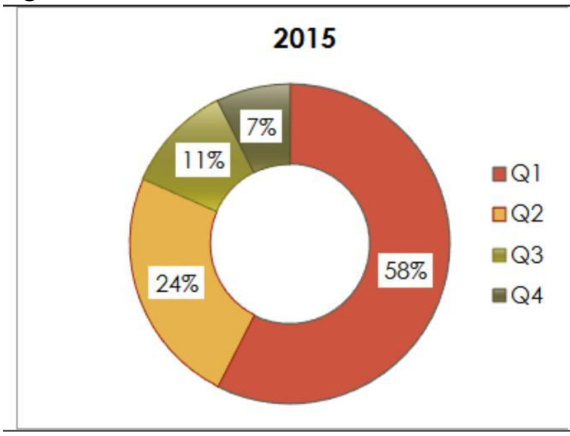


Figure 2



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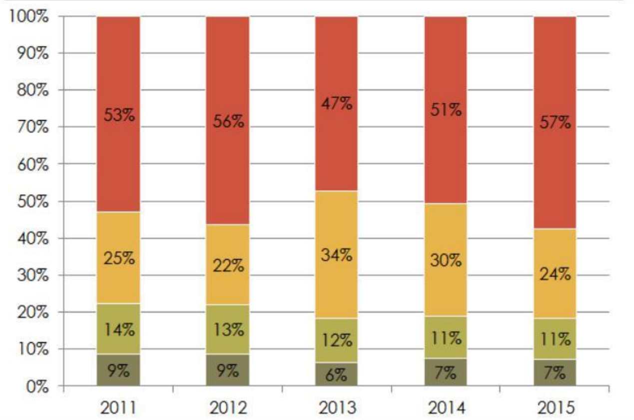


Figure 4

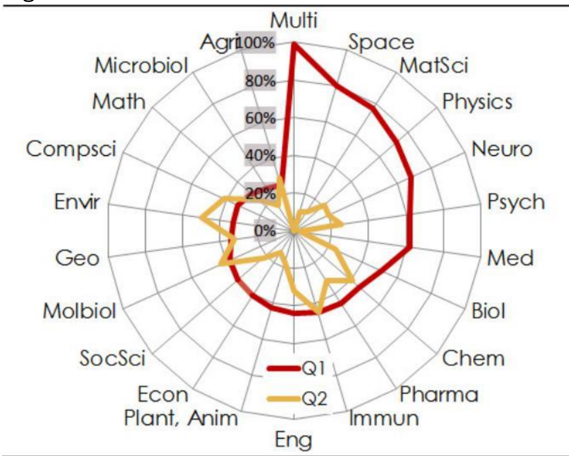
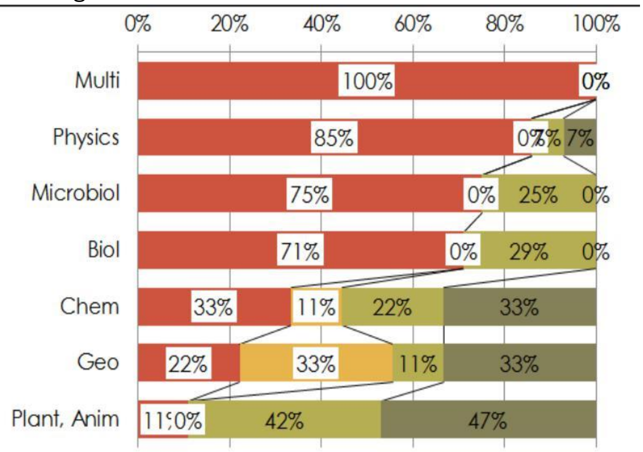


Figure 5



Output and Impact indicators of the Internationally Visible Performance

In order to measure the research network's international output and citation impact, two indicators will be applied. In the following, the output will be shown through (1) each discipline's share in the total national output and (2) through specialization index (it describes the relations to international trends). In accordance with international practice, citation impact will be represented by (1) mean normalised citation score (MNCS) and (2) the 10% excellence index (the percentage of publications belonging to the most cited 10%). In addition to enabling the commensurability of disciplines, the latter method reveals the relations to international trends. To achieve a more reliable picture, attempts were made to compensate the variability of the indicators: output will be shown in a 3-year time window (2013-2015), and the maximum and minimum values of this period can be seen next to the 2015 data.

Specialization index: it correlates the institutional (in this case this means the MTA's research network) share of each discipline to their shares on an international level. International reference value =1.

MNCS: the number of citations in MTA publications in the current

With regard to impact, a two-three years' citation window was chosen (the minimum time during which the citation rate of most fields sets in), including 2013-2014 publications. Variability is characterised through counting stability intervals (adapting the Leiden CWTS centre's method). Stability intervals describe the indicator's sensibility against uncertainties from sampling (2013-2014 disciplinary data).

Disciplinary shares and structures of the MTA research network didn't change much during the analysed period. Physics and space research still has the largest national proportion (~70%) followed by materials science (40%). Most disciplines score 20%-30%, and based on the error bar overlaps there is not much real difference (Figure 6). Specialization index shows a similar (but not identical) picture. This index relates the MTA output structure to the shares of each discipline in the worldwide output (the former represents the structure of basic national research). In this respect the research network is much more concentrated than the international trend (reference value=1) in space research, physics and in the application of multidisciplinary journals. Mathematics, animal and plant science is somewhat less specialized, yet specialization is a permanent trend (Figure 8). Most fields of agricultural science belong to the latter ESI-category.

The above figures (graphs) show that there is a significant difference between the disciplinary distribution of output and citation impact. The so-called mean normalized citation score (MNCS) consistently stays at least around the international average, "the world standard" (MNCS=1). The overlaps of stability intervals also show that despite some subtle alternations there is no great difference among most disciplines (Figure 6,8). The same is true for the excellence index (pp10, expected result 0.1=10%, Figure 7). These two indicators show a highly similar ranking among disciplines (Figure 9). It is important to highlight that those disciplines that are underrepresented with regard to national proportions and specialization gain scores around world average (clinical medicine, psychology, economy, computer science), surpass it (social science!) or have a truly outstanding result (pharmacology). It is important to consider however, that the good results of physics in all dimensions is mostly due to MTA participation in the highly-cited international particle physics research.

The output and impact indicators of Open Access publications show a similar disciplinary structure to publication strategies. The MTA fields that are most active in OA publication take up 20% of the national OA-output. These fields are mostly life sciences (animal and plant science, general biology, microbiology and immunology). With regard to impact, the OA output of physics, biology and clinical medicine ranks solidly over world average (Figure 10).

year is correlated to the disciplinary average (the average number of citations in each discipline's annual output). Reference value (denoting the international average) = 1.

Pp10: The proportion of MTA output belonging to the most cited 10% within a discipline in each year.

Stability interval: The sensibility of the indicator in relation to the uncertainties of sampling.

Figure 6

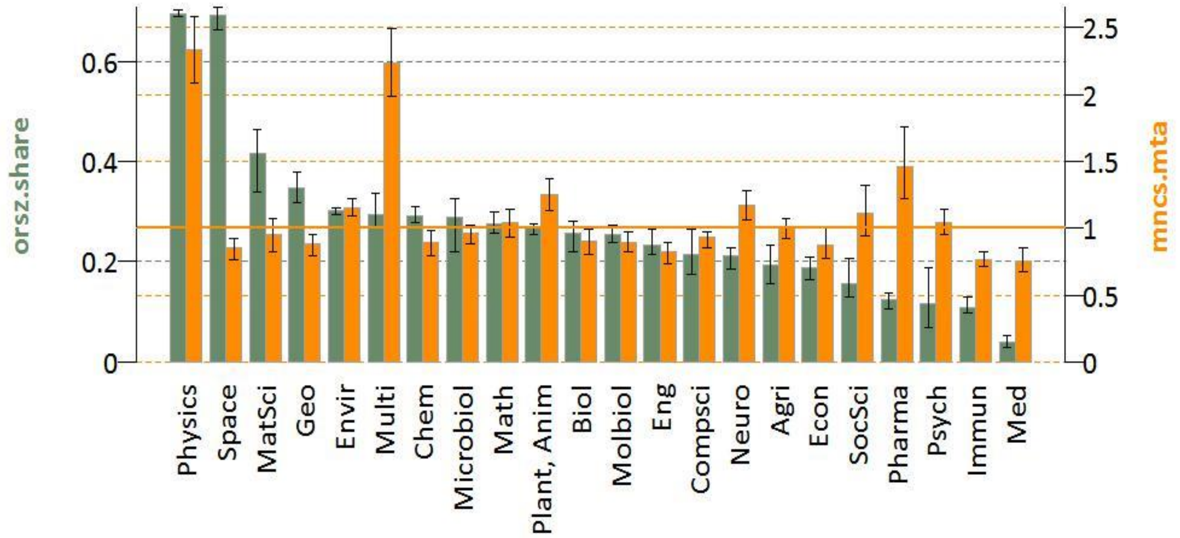


Figure 7

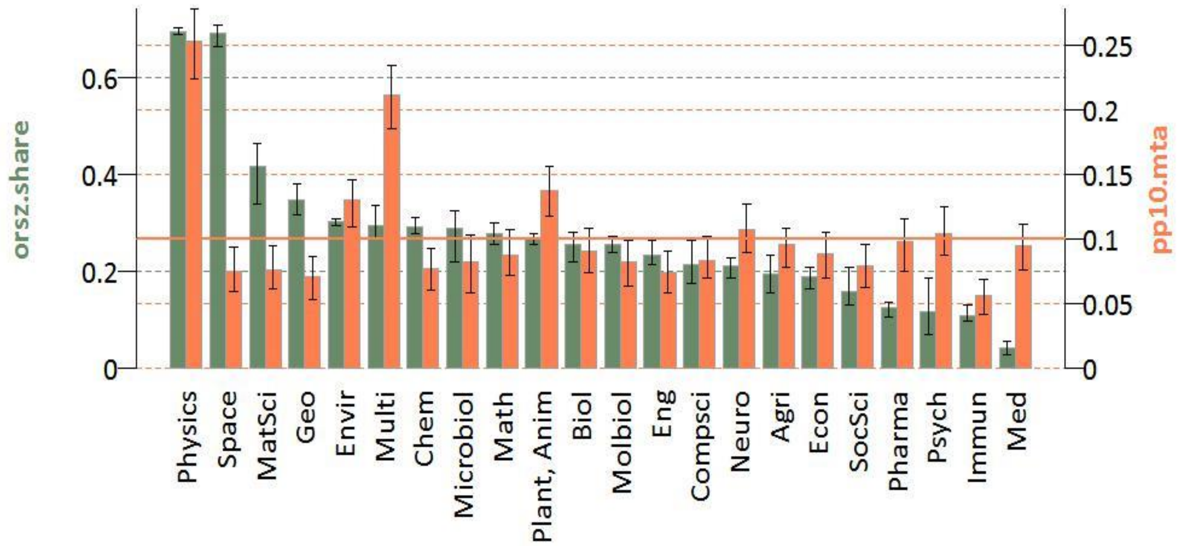


Figure 8

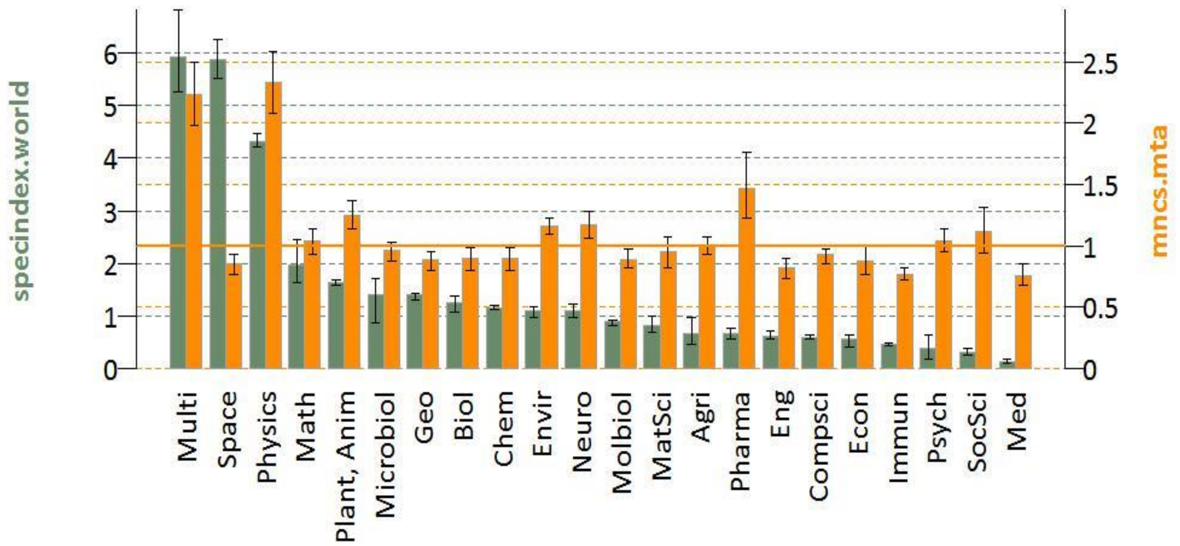


Figure 9

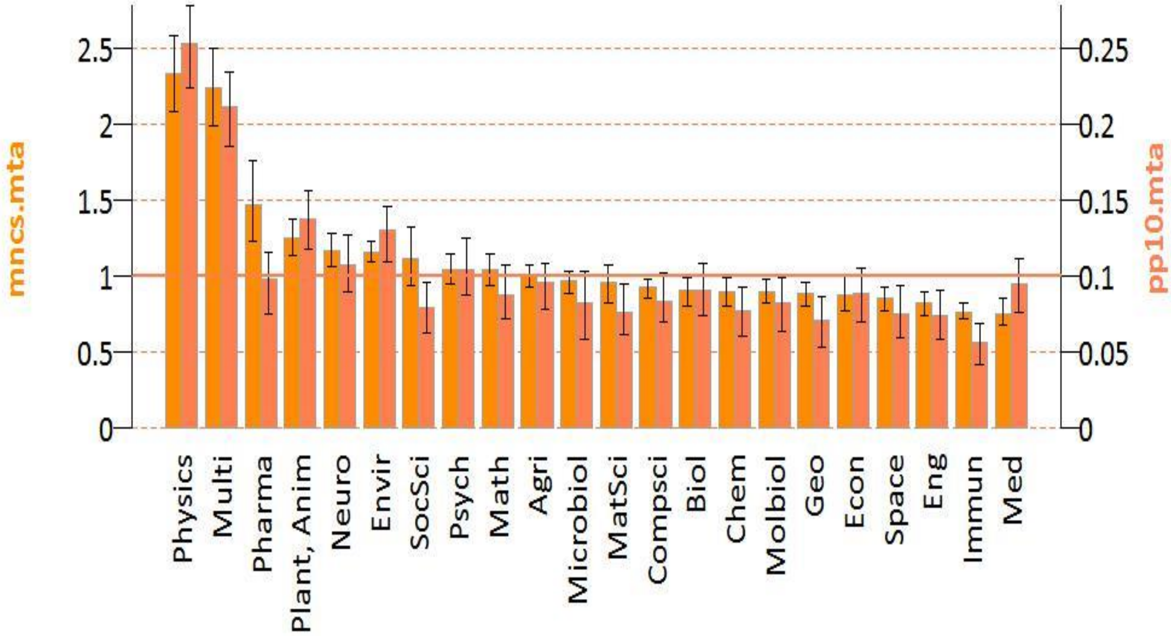
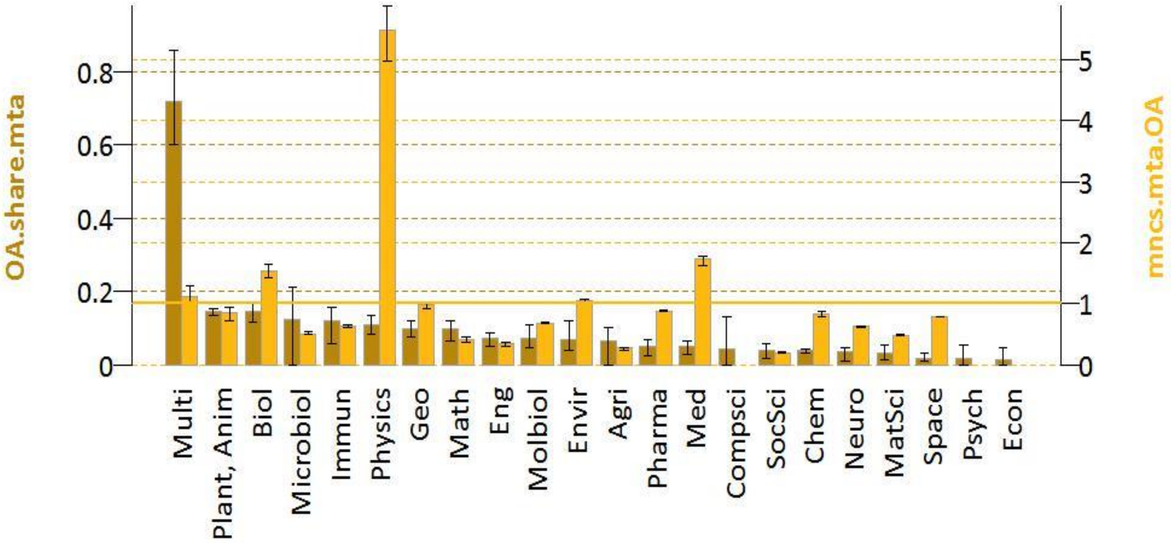


Figure 10



The National and International Network of the MTA

The research network's position and success in the international R&D system can be represented through the MTA's scientific co-operation system. Applying MTMT publication data, one can draw the research network's relation network with the national higher education system (FOI). According to the figure representing the 2014-2015 period, the MTA research network has a leading role in national research networking (Figure 13). With an outstanding number of partner institutions and high co-operation intensity, the MTA is the most significant re-

The indicator of national scientific collaboration: interinstitutional co-authorship

The analysis of the MTA's co-operation network is based on MTMT data.

search partner on a national level (Figure 11). As for network structure, partners are mostly the Hungarian universities (Figure 12): the research universities (ELTE, BME, SE, SZTE, DE, PTE) and other larger universities (PE, BCE, SZIE, etc.). Co-operation intensity is relatively similar with these institutions, but ELTE stands out with a higher intensity. The structure chart of the research universities show that the MTA is their most significant partner (yet again, intensity is the highest with ELTE).

International research co-operation data is found in the Web of Science database. According to it, the MTA collaboration still focuses on the "central countries" (Figure 14). Without much change over the years, the USA and Germany are the most important MTA partners followed by France and England (once more it is important to mention the MTA participation in the large international author consortiums in particle physics). With regard to co-operation frequency (within Europe), the above countries are followed by Russia, Hungary's closest western neighbours and the countries of South-Western Europe. The next group consists of Northern European countries, Hungary's eastern neighbours and the countries of Southern Europe. It can also be seen, that regarding co-operation with less dominant MTA partner countries, MTA has the largest share on a national level, thus it has an essential role in the co-operation with non-central countries. The same can be observed on the world map (Figure 16): the MTA has a high share in the co-operation with non-European and developing countries. On a worldwide level, it is important to highlight that according to "frequency ranking" China appears in the second category – along with Russia – as an important research partner. With regard to Open Access, co-operation shows a relatively steady picture (Figure 15): on average 20% percent of the partner country co-operation output belongs to the Open Access category.

Co-operation Intensity:
The strength of the connection between two institutions can be described through the number of collaborative articles normalized by institution size (output amount). This is called Salton Index, and it ranges from 0 (no collaboration) to 1 (all publications are collaborations).

The indicator of international scientific collaboration: international co-authorship

Co-operation Frequency:
the number of collaborative articles with the partner country (and its proportion within co-authored publications)

Figure 11 (Co-operation intensity, Number of co-operating institutions)

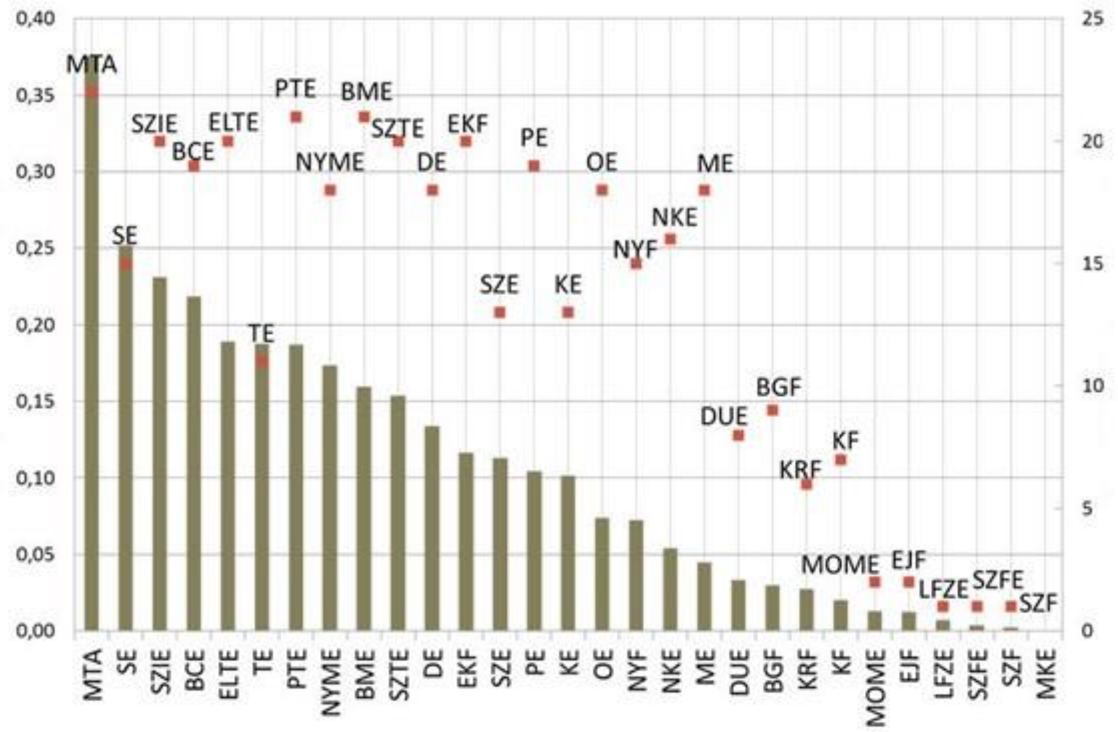


Figure 12 (Co-operation Intensity)

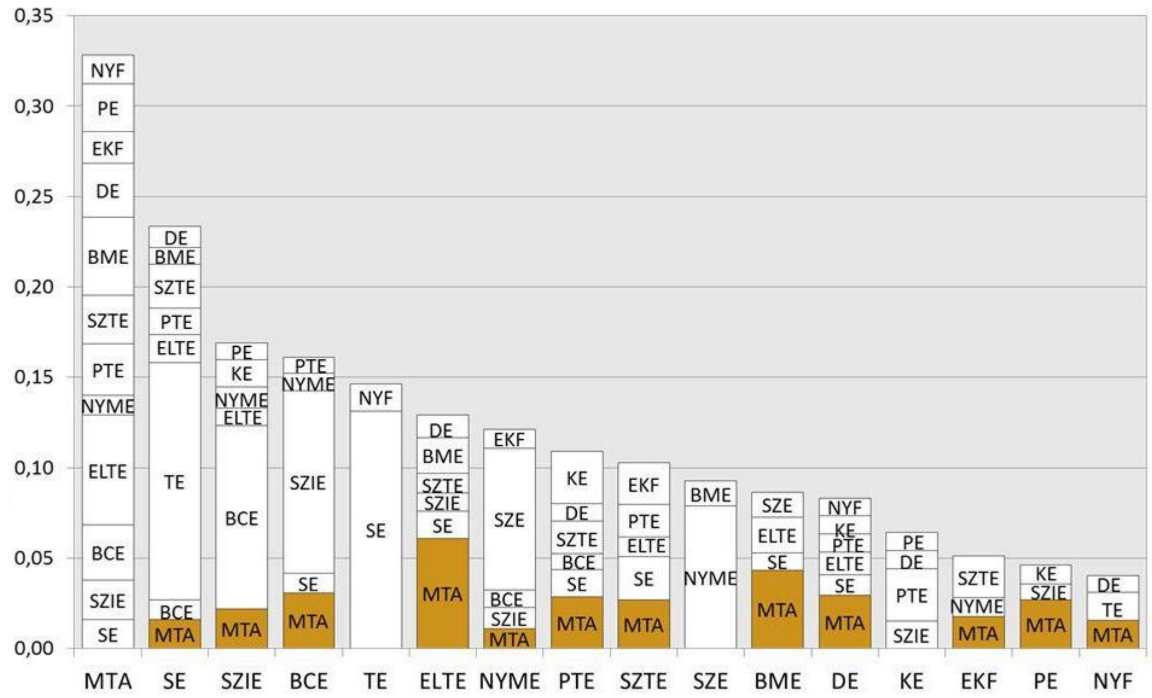


Figure 13

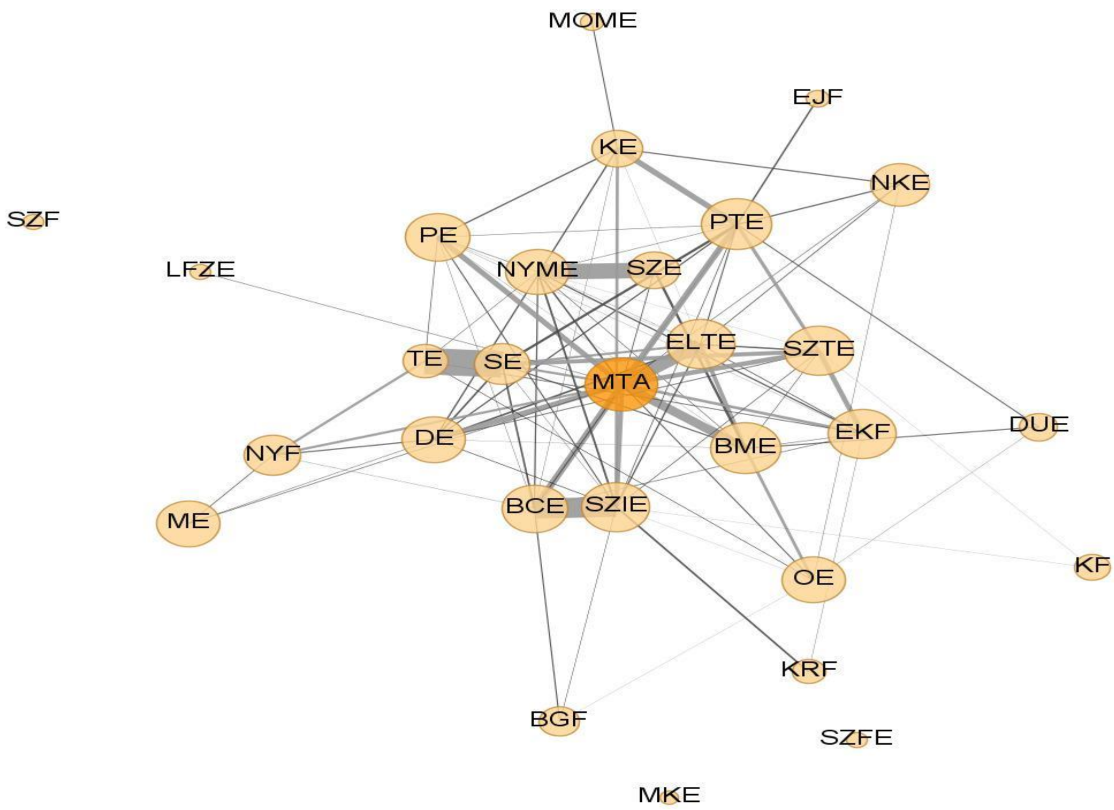


Figure 14

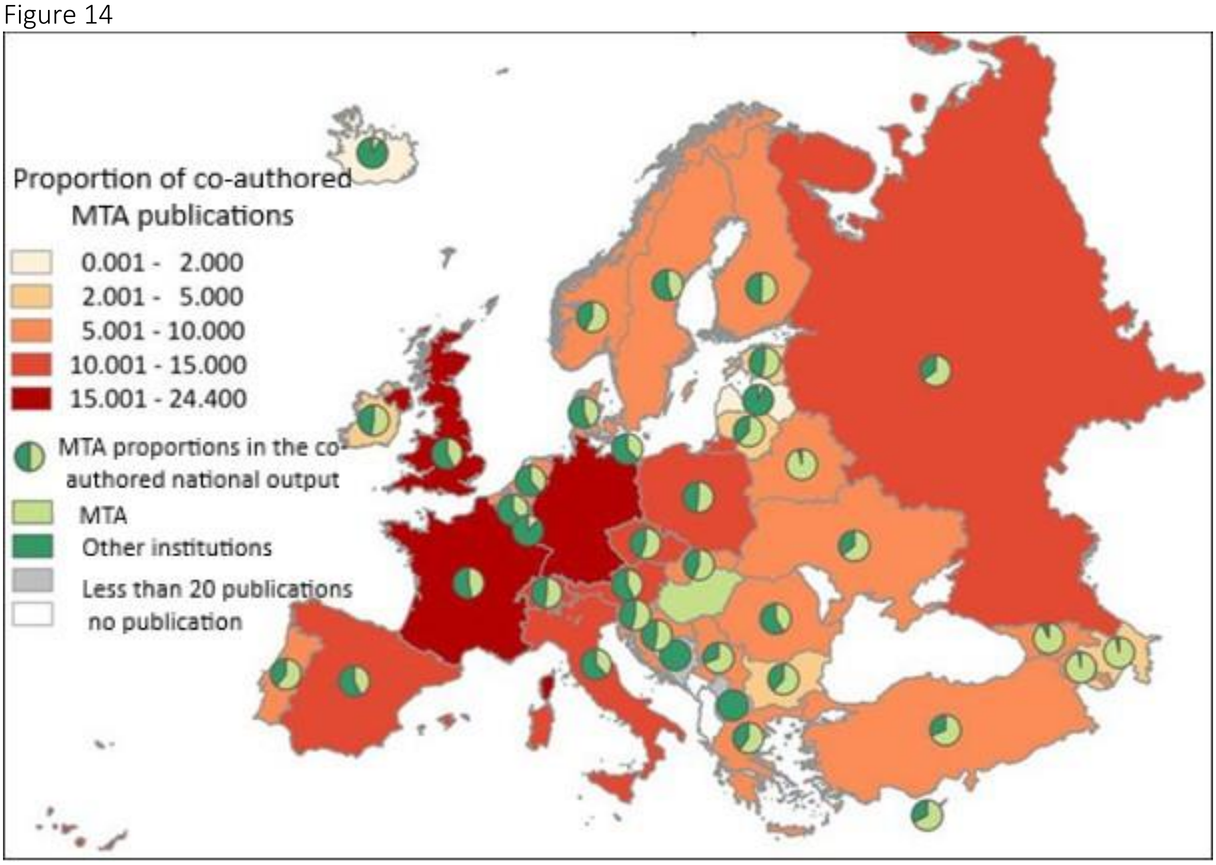


Figure 15

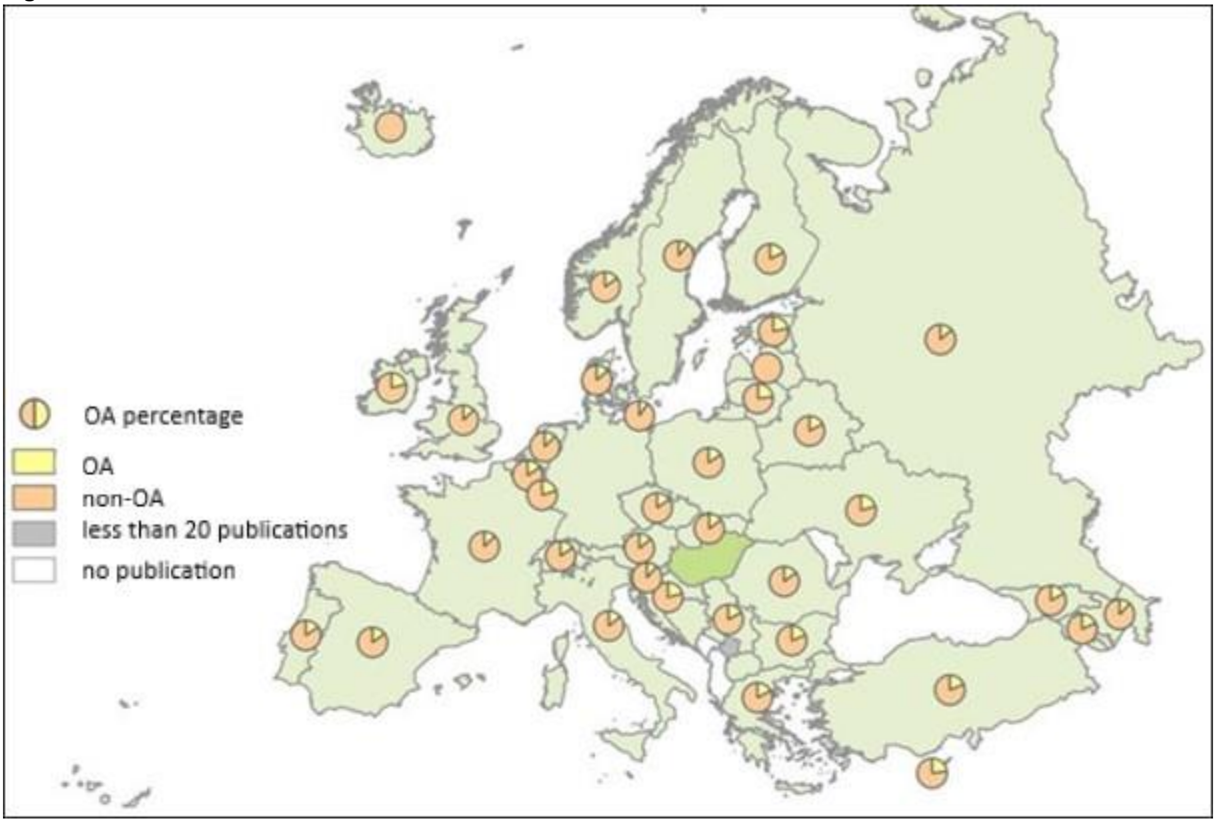
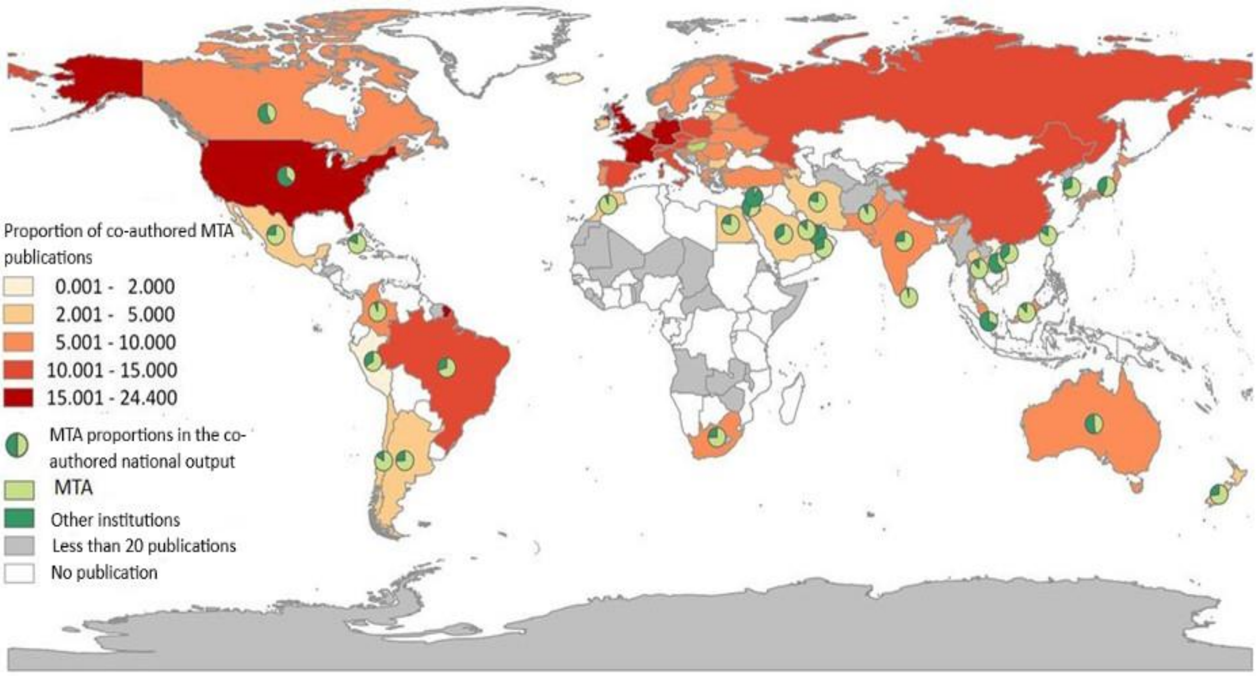


Figure 16

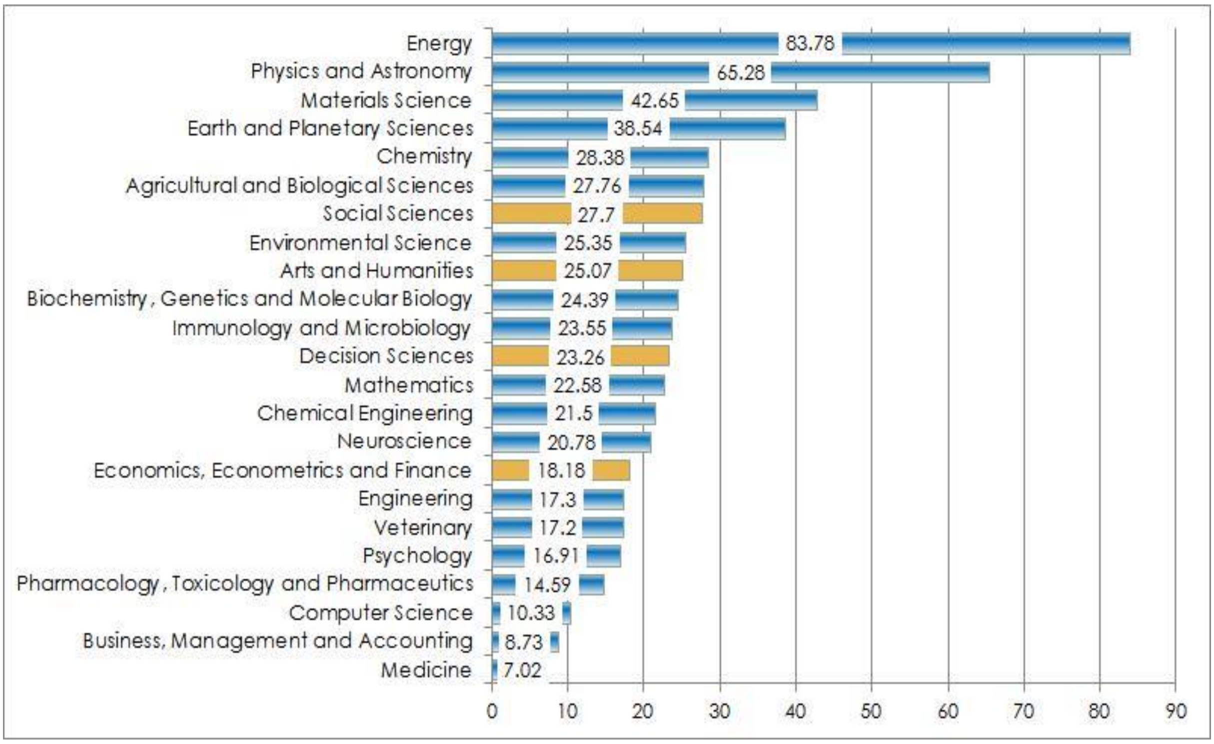


Appendix

The distribution of IF values in the MTA output through the ESI-categorization

Discipline	average	scatter	median	min	max
AGRICULTURAL SCIENCES	1.53	1.00	1.29	0.05	3.99
BIOLOGY & BIOCHEMISTRY	4.22	3.83	3.34	0.59	32.07
CHEMISTRY	3.26	3.53	2.64	0.30	46.57
CLINICAL MEDICINE	4.15	3.22	3.47	0.67	13.28
COMPUTER SCIENCE	1.57	1.07	1.00	0.53	4.55
ECONOMICS & BUSINESS	1.50	1.21	1.10	0.10	3.78
ENGINEERING	1.45	0.73	1.22	0.04	4.53
ENVIRONMENT/ECOLOGY	2.37	0.98	2.32	0.56	4.59
GEOSCIENCES	2.32	1.61	2.19	0.33	7.89
IMMUNOLOGY	3.93	1.75	3.04	1.79	6.75
MATERIALS SCIENCE	3.82	6.05	2.66	0.49	36.50
MATHEMATICS	0.77	0.39	0.66	0.23	2.36
MICROBIOLOGY	2.51	1.57	2.39	0.78	9.19
MOLECULAR BIOLOGY & GENETICS	6.79	7.98	3.38	1.48	32.24
MULTIDISCIPLINARY	10.28	12.10	5.58	0.46	41.46
NEUROSCIENCE & BEHAVIOR	5.19	4.69	4.28	0.22	31.43
PHARMACOLOGY & TOXICOLOGY	3.12	1.42	2.98	0.77	6.69
PHYSICS	3.63	2.08	3.30	0.44	20.15
PLANT & ANIMAL SCIENCE	2.18	1.77	1.65	0.19	9.34
PSYCHIATRY/PSYCHOLOGY	2.57	0.68	2.56	1.35	3.40
SOCIAL SCIENCES, GENERAL	1.05	0.88	0.71	0.06	3.73
SPACE SCIENCE	4.77	2.16	4.38	0.71	17.64

Relative MTA output for 2015 through SCOPUS journals (MTA proportions within the national output).



The indicators of output, impact and co-operation

Indicator	Definition	Reference value
Publication	Publications in WoS (ESI-) journals	
Output indicators		
orsz.share	MTA shares in the national output, 2015 (*100%)	
specindex.world	The weight of the discipline (within the MTA output) compared to its international weight, 2015	international weight = 1
~.min/~.max	Minimum and maximum values for the 3-year period	
Impact indicators		
mncs	Mean normalized citation index	international value = 1
pp10	The proportion of publications belonging to the most cited 10% in each discipline (*100%)	international value = 0.1
~.min/~.max	The liminal values of indicator stability in a 2-year time window	
Scope of indicators		
mta	publications produced by the MTA research network	
orsz	national publications	
OA	Gold Open Access publications	
Co-operation Indicators		
Intensity	The number of two institutions' collaborative publications corrected by all their co-authored output.	

Abbreviations

Disciplines (the WoS ESI 22-category system)

Abbreviation	Discipline
Agri	Agricultural Sciences
Biol	Biology and Biochemistry
Chem	Chemistry
Med	Clinical Medicine
Compsci	Computer Science
Econ	Economics and Business
Eng	Engineering
Envir	Environment/Ecology
Geo	Geosciences
Immun	Immunology
MatSci	Materials Science
Math	Mathematics
Microbiol	Microbiology
Molbiol	Molecular Biology & Genetics
Multi	Multidisciplinary
Neuro	Neuroscience & Behavior
Pharma	Pharmacology
Physics	Physics
Plant, Anim	Plant & Animal Science
Psych	Psychiatry/Psychology
SocSci	Social Sciences
Space	Space Science

Mentioned Universities

FOI	higher ed institutions
Corvinus University of Budapest	BCE
Budapest University of Technology and Economics	BME
University of Debrecen	DE
Eötvös Loránd University	ELTE
University of Pannonia	PE
University of Pécs	PTE
Semmelweis University	SE
University of Szeged	SZTE
Szent István University	SZIE