



SLOVAK ACADEMY OF SCIENCES

**Analysis of funding
and scientific output
of SAS**

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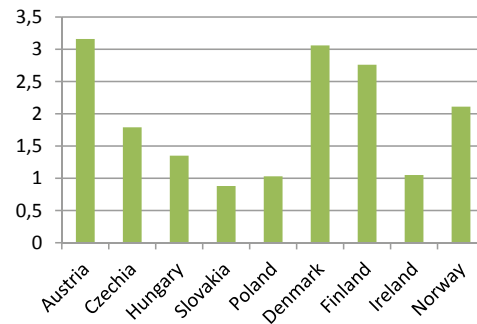
I. Research and development (R&D) in Slovakia and in other selected countries

We compared the state of science and research between Slovakia and the so-called V4+ countries, which are close geographically, as well as between Slovakia and countries of similar populations, namely the Scandinavian countries and Ireland.

In studies making similar comparisons, one common theme has been the chronically low level of R&D funding in Slovakia. In 2017, spending on R&D amounted to 0.88 % of GDP, which places us in 22nd place among the 28 member states of the EU, where the average is 2.07 % of GDP. All other V4+ countries are ahead of us in this regard, and the high level of support for R&D in the Scandinavian countries has been well-documented for some time (Graph 1).

Graph 1

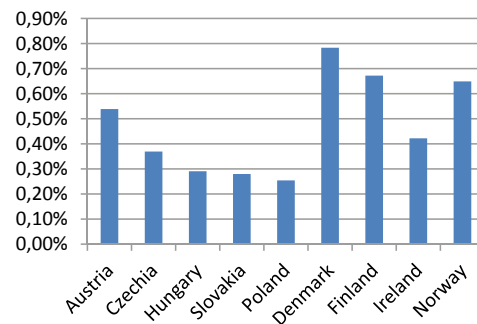
Spending on R&D (% of GDP) in 2017



Interestingly, the proportion of researchers within the population is lower in the V4 countries than in the other countries examined, which may indicate that young people in particular have less interest in science careers, or that these countries suffer greater brain drain (Graph 2).¹

Graph 2

Proportion of researchers within the population

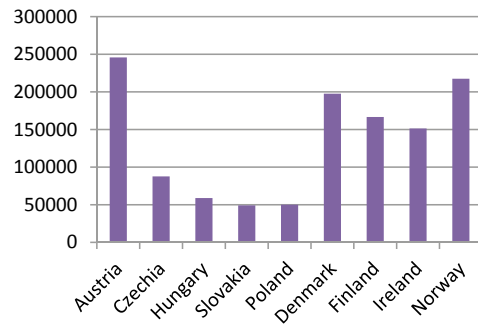


¹ Proportion of researchers (FTE) within the entire population of the country.

If funding for R&D is recalculated as the amount spent per scientist (in full-time equivalent; FTE), the resulting trend is similar to that in the previous graphs. Czechia shows the greatest result of all V4 countries, while Austria and the Scandinavian countries spend three to five times more per scientist than Slovakia (Graph 3).

Graph 3

Spending per scientist [€]

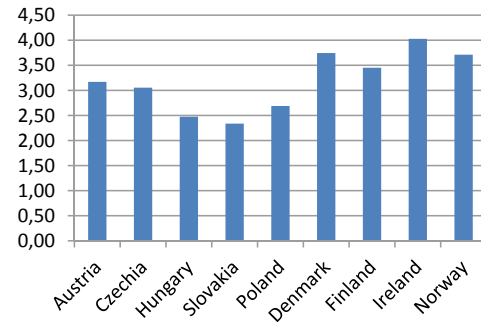


In terms of the number of Web of Science publications per researcher over 10 years, Slovakia falls only slightly behind the other countries (Graph 4). However, Slovakia falls far behind in terms of the number of citations (Graph 5).

As **indicators of top-level science**, we evaluated the number of ERC grants gained, placement within the Nature Index ranking, and the number of top publications. Regarding ERC grants, Austria and the Scandinavian countries were, once again, top of the ladder, while Hungary led the V4

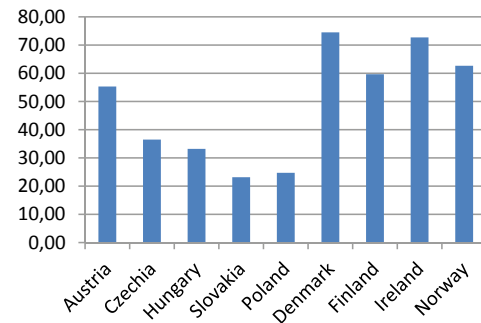
Graph 4

Web of Science publications per researcher over 10 years



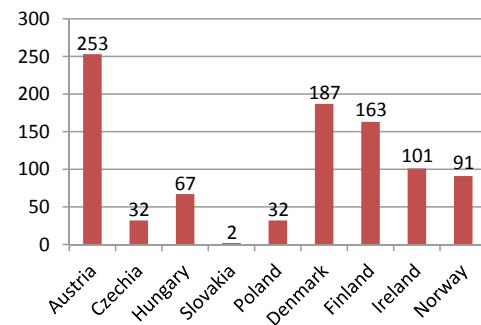
Graph 5

Web of Science citations per researcher over 10 years



Graph 6

ERC grants gained



countries. Slovakia has gained only two ERC grants (Graph 6).

Another possible indicator of top-level research is the number of publications in Nature Index journals². The fractional count (FC) indicator takes into account the percentage of authors from a certain country or organisation, as well as the total number of countries (organisations) represented among the authors of the article. Using this indicator, Slovakia can still be found on the bottom rung; among the V4 countries, Poland won the best placement (Graph 7). The situation is similar if we look at the “Top papers” category in the “Essential Science Indicators”³ on Web of Science, where Slovakia has 349 publications, while Czechia has 1501 and Denmark 4303 (Graph 8).

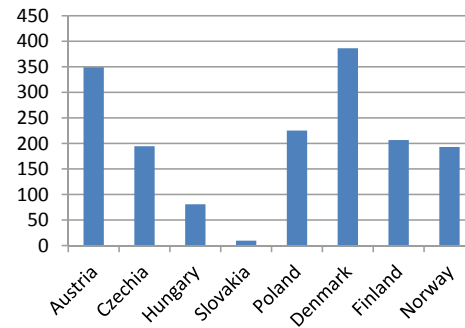
Taken together, it is clear that Slovakia is falling behind in all indicators, especially those that identify excellent science. This situation correlates with low funding for R&D in the country.

² Group of 82 high-quality journals selected by the panel of independent excellent scientists

³ Sum of the „Hot Papers” and „Highly Cited Papers”, i. e. sum of publications from previous 2 years which have acquired high number of citations in current 2-month timespan, and publications ranked amongst top 1 % of publications within last 10 years. Duplicities are excluded, i. e. if publication is ranked amongst Hot Papers as well as amongst Highly Cited Papers, it is counted just once.

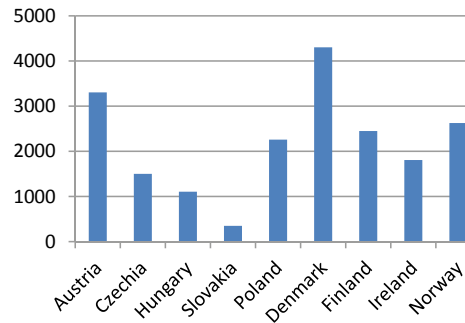
Graph 7

Publications in Nature Index journals



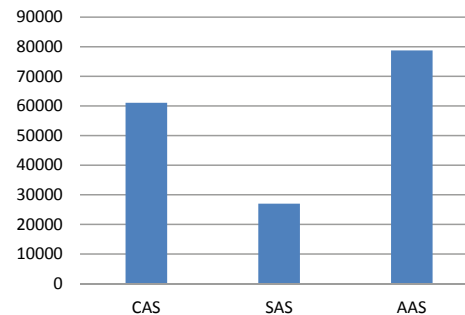
Graph 8

Web of Science top publications



Graph 9

Funding per employee [€]



II. SAS compared with the Academies of Sciences in the surrounding countries

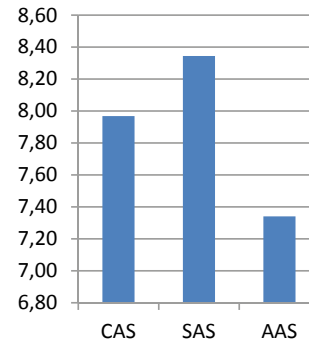
We compared SAS with the Academies of Sciences in the V4+ countries, that is the Czech Academy of Sciences (CAS), the Hungarian Academy of Sciences (HAS), the Polish Academy of Sciences (PAS), and the Austrian Academy of Sciences (AAS).

CAS has 9057 employees, including 5452 researchers, while SAS has 2990 employees with 1670 researchers and AAS has 1359 employees with 927 researchers (all counts as FTE). The annual budget of SAS hovers around 80 million EUR, while that of AAS is over 107 million EUR and the CAS budget is about 553 million EUR. As a result, SAS has fallen far behind in terms of available funding per employee. Specifically, **SAS has an annual budget of 27,000 EUR per employee, while CAS has 61,000 EUR and AAS has 79,000 EUR** (Graph 9).

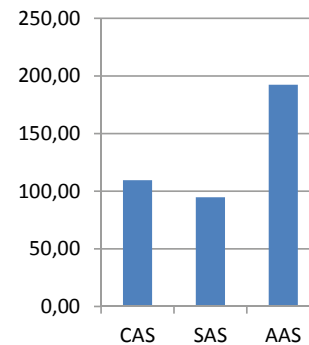
This reflects on the employees' salaries: the average monthly wage of SAS employees is 1150 EUR (1300 EUR for researchers), while that of CAS employees is 1550 EUR (2000 EUR for researchers)⁴.

After correcting for the number of researchers (FTE), SAS produces the most publications in Web of Science; in terms of the number of citations and top

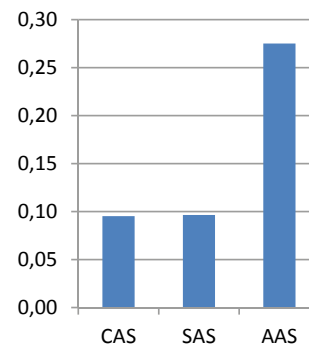
publications, it is comparable with CAS, but both fall far behind AAS (Graphs 10–12).⁵



Graph 10
Web of Science publications per researcher over 10 years



Graph 11
Web of Science citations per researcher over 10 years



Graph 12
Web of Science top publications over 10 years

⁴ Information unavailable for the other academies.

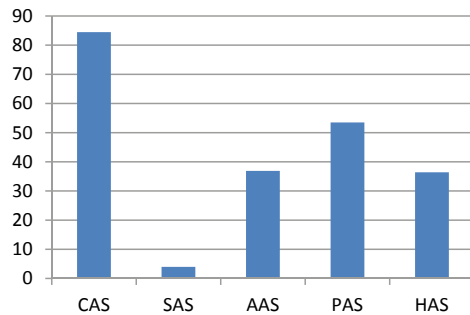
⁵ HAS and PAS do not publish data for calculation.

Because SAS has a similar publication record, but a lower budget, it follows that the price of each publication is lower for SAS (ca. 43,000 EUR), than for CAS (98,000 EUR) and AAS (110,000 EUR).

However, SAS has produced very few publications in the top Nature Index journals, falling behind the other academies (Graph 13). The number of ERC grants gained is also several times lower (Graph 14).

Graph 13

Publications in the Nature Index



Graph 14

ERC grants gained

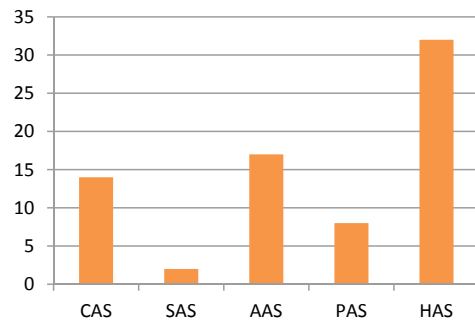


Table 1 shows the placement of the Academies of Sciences in the worldwide and Europe-wide Nature Index ranking in 2017/2018.

Table 1

Position in the Nature index

	Nature Index (global)	Nature Index (Europe)
CAS	169	47
SAS	1320	481
AAS	369	124
PAS	267	83
HAS	372	126



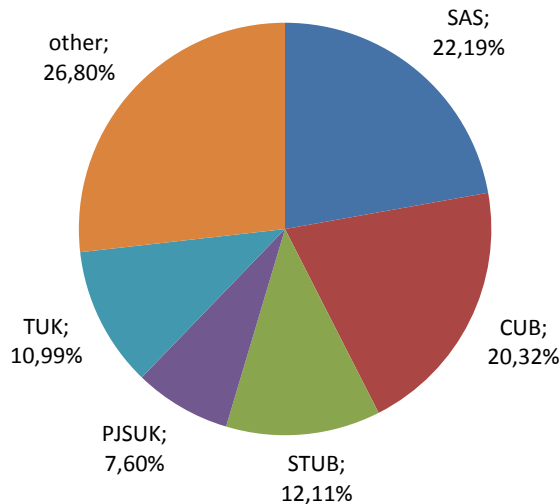
III. SAS in Slovakia

Within Slovakia, SAS was evaluated against the four leading research universities: Comenius University Bratislava (CUB), the Slovak Technical University Bratislava (STUB), Pavol Jozef Šafárik University Košice (PJSUK), and the Technical University in Košice (TUK).

SAS employs 1670 researchers, CUB 2439, STUB 1292, PJSUK 777, and TUK 886 (FTE). In 2017, SAS produced 22.19 % of all Slovak Web of Science publications. Together with CUB and STUB, these three institutions produced more than 50 % of all Slovak Web of Science publications (Graph 15).

Graph 15

Contribution of each research institution to Slovak Web of Science publications



After correcting for the number of researchers (FTE), SAS dominated in all scientometric indicators examined:

number of Web of Science publications and citations, **indicators of top-level science** (number of top publications per researcher over 10 years, FC indicator, and placement in the Nature Index ranking) (Graphs 16–19; Table 2).

Table 2

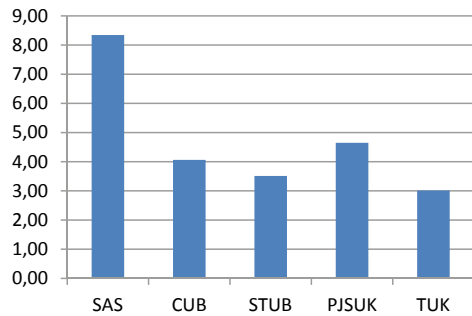
Position in the Nature index

	Nature Index (global)	Nature Index (Europe)	Nature Index (Slovakia)
SAS	1320	481	1
CUB	1671	615	2
STUB	2259	804	3
PJSUK	2525	906	4
TUK	3613	1334	6

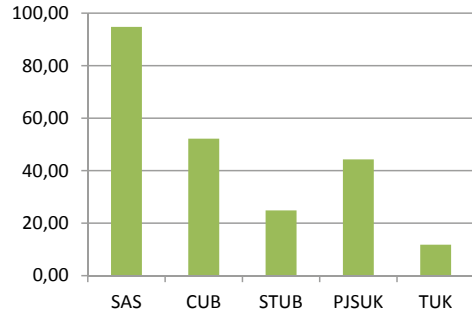
Note: A total of 4694 organisations were evaluated in the worldwide Nature Index ranking.

Graph 16

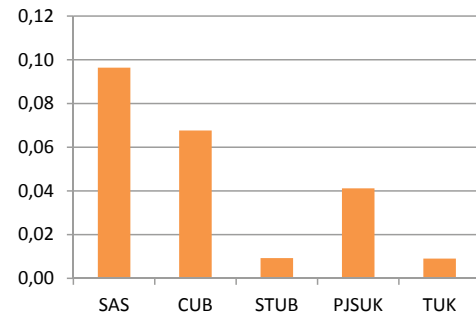
Web of Science publications per researcher over 10 years

**Graph 17**

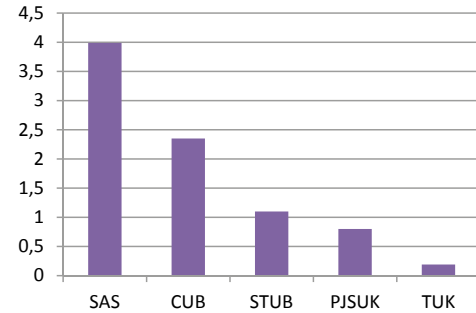
Web of Science citations per researcher over 10 years

**Graph 18**

Web of Science top publications

**Graph 19**

Publications in the Nature index



Data sources

- Eurostat
- Web of Science
- Nature Index
- ERC website
- Annual reports of the organisations

Summary

SAS maintains a leading position within Slovak science in terms of both quantitative and qualitative parameters, as well as in indicators of top-level science. However, it only has around half the funding per employee compared to CAS (around a third compared to AAS), SAS dominates in terms of publications and is an equal player in terms of citations.

However, SAS falls behind equivalent organisations in the surrounding countries in terms of indicators of top-level science (ERC grants, Nature Index). Similar situation is in comparison of Slovakia with neighboring countries, while in comparison with Scandinavian countries, the difference is even more stark. This state of affairs is the result of long-term neglect of R&D on the part of lawmakers and of a poorly-informed public. For this reason, the position of SAS within society and the conditions for carrying out research must be improved, and all parties involved must show greater commitment.