

# SBFI NEWS SERI

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Secretariat for Education,  
Research and Innovation SERI



## February 18



Skills competitions

Funding of higher education institutions

High performance computing



Schweizerische Eidgenossenschaft  
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Swiss Confederation

Federal Department of Economic Affairs,  
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**State Secretariat for Education,  
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### Cover photo:

The Confederation has contributed to the funding of the cantonal universities since 1968 and to that of the universities of applied sciences since 1995. Over the years, the legal basis on which these payments are made has changed several times. The Higher Education Act (HEdA), which came into force in two stages (2015 and 2017), has set a fundamental new basis for this funding (see article on page 8 and 9). Photo: a lecture room of the University of Neuchâtel. BPP, Université de Neuchâtel / Guillaume Perret.

## IMPRESSUM

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Dear Reader



A renowned national think tank recently presented its programme for competitive higher education in Switzerland. Some of the points made are very interesting, and are worth discussing in depth.

However, the programme's basic message, which figures prominently in the accompanying press release and thereby risks sticking in the minds of the public, is a disturbing one. According to the think tank, the Swiss higher education sector now costs 70% more than it did in 2000.

This is an unfair simplification of the figures. It suggests that the system has become hugely more expensive while output has remained more or less the same. In actual fact, the product has not only become much wider in scope, it has also changed radically in the last 17 years. Around 50 per cent of 25- to 34-year-olds permanently resident in Switzerland now have a tertiary-level qualification, compared with just 26 per cent in 2000. In other words, the system has expanded massively (as has the country's population).

One of the reasons for this is that many education and training courses have experienced an upgrade, for example in the fields of healthcare, social work and the arts, and are now part of the universities of applied sciences' portfolio. The same is true of teaching qualifications. There has also been an above-average rise in the number of young people studying STEM subjects (science, technology, engineering and mathematics). It is well known that the cost of a degree in these subjects is considerably higher than in the humanities and social sciences.

The decisions to make healthcare, social work and arts courses available at tertiary A level and to aim for more qualifications in STEM subjects enjoyed broad political support. And the additional spending involved was fully intended in an effort to create a more competitive knowledge society.

The basic message sent out by the abovementioned programme though provides ammunition to those who anyway believe that spending on education, research and innovation is too high. This is regrettable as improvements are always desirable. In fact, a certificate of efficiency should be issued to the Swiss higher education system for its achievements in recent years. Indeed, the Swiss education system as a whole deserves one given that its costs as a proportion of GDP are still below the OECD average.

A handwritten signature in black ink, appearing to read 'Mauro Dell'Ambrogio'.

Mauro Dell'Ambrogio  
State Secretary for Education, Research and Innovation



## National and international skills competitions

### «Skills competitions are an ideal platform»

In various professions the best skilled young professionals are crowned each year. The respective professional organisations are in charge of this process in cooperation with the SwissSkills Foundation. While the Swiss delegation caused a sensation at the WorldSkills Competition in Abu Dhabi last year, Switzerland is now gearing up for the national skills competition which will be held in Bern in September. For Josef Widmer, Deputy Director of SERI, holding such competitions is an excellent opportunity to give young people and adults fascinating insights into modern Swiss vocational education and training.



The second centrally organised SwissSkills Competition will take place in Bern in September. The event will provide visitors with insights into modern Swiss vocational education and training. Visitors can watch skilled young professionals doing their work and get a first-hand view of modern occupations. Photo: Swiss Skills Bern 2018

#### Why is it worthwhile holding skills competitions?

*Josef Widmer:* Skills competitions are an ideal platform to show the public the benefits of vocational education and training.



Josef Widmer, Deputy Director of SERI

Switzerland has one of the world's best vocational education and training systems. There is sometimes still a tendency for people with VET qualifications to be underestimated, and people fail to recognise that solid vocational education and training continues to provide an excellent basis for later professional life. Seeing young people compete is the best way to show vocational education and training in a favourable light.

#### At the WorldSkills Competition in Abu Dhabi last year, the Swiss team achieved an outstanding second place. Were you surprised?

To be honest, yes. It was surprising. Our Swiss participants had to push their limits and get out there and perform in order to win so many gold medals and reach second place in the country rankings. It's just like in top-class sport. Top performance is only possible with the right mindset and

attitude. For me, it was particularly impressive this time to see how focused our skilled young professionals were in approaching their tasks and how they didn't let themselves be distracted by the noise, setbacks and difficulties. That was simply phenomenal. And, of course, we also had our fair share of luck in Abu Dhabi.

#### Do international skills competitions say something about the efficacy of a vocational education and training system?

In recent years, international skills competitions have gained tremendously in importance and prestige. Many countries have committed themselves to achieving the best possible national results in order to demonstrate just how good their vocational education and training systems are. Although it has to be pointed out that these are competitions between individuals and not a comparison of sys-

### SwissSkills Bern 2018 – experience more than 135 occupations live

From 12 to 16 September, the best skilled young professionals from the trade, industry and services sectors will meet in Bern for the second centrally organised Swiss Skills Competition.

The SwissSkills 2018 programme features 75 skills competitions and 60 demonstrations, bringing them closer in a unique atmosphere.

The SwissSkills 2018 event is informative and exciting in equal measure. It is the ideal event for anyone wanting to find out more about the diversity of the professional world and career opportunities in a hands-on setting: students, apprentices, vocational trainers, teaching staff, parents, education practitioners, active and retired professionals.



[www.swiss-skills2018.ch](http://www.swiss-skills2018.ch)

tems. Even countries without a strong vocational education and training system can train young individuals to a very high standard.

In Switzerland, we have an excellent vocational education and training system that enjoys broad support. Participants already have a very high standard. They don't need to train for years for the competition. They are so well prepared in many occupations that they have a good chance of winning a medal with just a small amount of additional training. We have a particular advantage when the specific task is not known in advance. That's because Swiss professionals are flexible and have the ability to adapt quickly and find new solutions.

#### What is SERI doing to ensure that young Swiss professionals continue to win medals in the future?

We believe in the importance of promoting skills competitions. That's why we make substantial financial contributions to the SwissSkills Foundation, including in particular the annual contribution of just under CHF 2 million towards the running of the secretariat, which provides a wide range of services and advises professional organisations, for example, on how to plan and execute the competitions. It also ensures that the best young people are optimally prepared to participate in the international competitions. We are also contributing around CHF 9 million to SwissSkills Bern 2018. The idea is to hold this major event every four years. We also provide SwissSkills with additional funding to remunerate experts and to promote the competition in the French- and Italian-speaking parts of Switzerland.

In addition to our financial commitment, we support the skills competitions with ideas and by having staff on site. We want to show all those involved, especially the professional associations and experts, that we greatly value their commitment. We mustn't forget that associations and companies invest significant amounts in the skills competitions. There is a lot of passion and professional pride involved. Ultimately, we promote quality and excellence in training by giving support and advice to the professional associations.

#### The possibility of hosting the WorldSkills Competition in Switzerland is openly discussed. What is SERI's position?

In principle, we would like to host the World Skills Competition in Switzerland. Switzerland plays an important role in WorldSkills International, and should once again offer to host the WorldSkills Competition at some point. When exactly that might happen is not so important. However, we need to be aware that organising such a competition means complying with strict criteria and costs a lot of money. Total costs currently amount to between CHF 80 and 100 million. The private sector needs to raise around CHF 50-60 million of that amount, and the public sector around CHF 30-40 million. Any federal contribution couldn't be drawn from the regular budget on vocational and professional education and training; it would have to be financed separately.


#### In September, the second centralised SwissSkills Competition will take place in Bern. Is it worthwhile holding such a big event?


Yes, it's definitely worth it! We have incorporated the experience gained in 2014 into the planning of SwissSkills Bern 2018. Young people, parents, teachers, companies and anyone interested in vocational training can look forward to an exciting and extremely varied event. Incidentally, the impact of a centrally organised Swiss Skills Competition is even greater than that of the WorldSkills Competition. Far more candidates are involved and more occupations are represented. You're unlikely to see as many occupations demonstrated anywhere in the world as in Bern this September. The WorldSkills Competitions generally only cover occupations that exist in a comparable manner in many countries.

SwissSkills 2018 is a great opportunity for young people, parents and adults to see skilled young professionals from different occupations in action. Many people still have a somewhat outdated image of certain occupations. But there have been huge developments in the world of work: occupations have changed considerably, not only in their name, but also in terms of the skills involved and the requirements.


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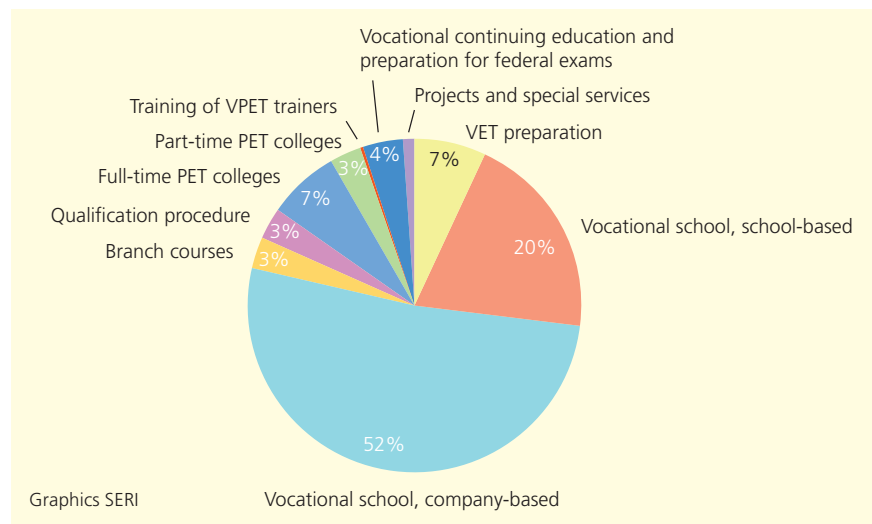
 [www.swiss-skills.ch](http://www.swiss-skills.ch)

## Survey of costs to the cantons of VPET

### Established source of information for VPET funding

Since 2004, SERI and the cantons have conducted an annual survey of costs to the cantons of VPET. This shows in which areas of VPET the cantons spend the available funding. The figures for the 2016 financial year were published at the end of 2017. Overall, the trend has been steady. Cantonal spending is highest in the area of vocational education and training (upper secondary level).

#### Distribution of net costs across individual areas (2016, total for all cantons)



Vocational and professional education and training in Switzerland is funded by the state (Confederation and cantons) and to a large extent by the private sector (professional organisations, companies).

#### Assessment basis for federal subsidies to the cantons

The vast majority of public spending on VPET falls to the cantons, as they are responsible for implementing it. Under Article 59 of the Vocational and Professional Education and Training Act (VPE-TA), the Confederation is required to contribute a quarter of the public spending on VPET (see box on page 6). This is a guideline amount.

The cost accounting drawn up by SERI with the cantonal accountants provides a basis for assessing the amount to be paid by the Confederation to the cantons. It is broadly accepted in the VPET landscape and is a key factor in providing information on how VPET is funded. Since 2008, the majority of federal funding for VPET has been paid out to the cantons in the form of a lump sum (see box on page 7).

Cost accounting provides information on development trends both of overall costs and of costs in individual areas of vocational and professional education and training.

#### Distribution of net costs across individual areas (total for all cantons)

In 2016 the cantons spent CHF 3,465 million on vocational and professional education and training (total state expenditure: CHF 3,565 million). Most of this went to VET schools with net costs of 72%, followed by PET colleges (10%) and preparation for vocational education and training (7%). These areas constitute 89 per cent of all the cantons' entire net VPET costs. Expenditure on VET was around 86 per cent of the cantons' net VPET costs. The remaining 14 per cent was spent on professional education and training and vocational continuing education and training.

#### Development of cantonal costs for vocational and professional education and training since 2004

The percentage distribution across areas has not changed significantly since 2004.

In 2004 the cantons had VPET costs of CHF 2,678 million. By 2016, this figure had risen to CHF 3,465 million. The increase of CHF 787 million is explained by the increased number of apprenticeships, inflation and other factors such as the creation of new occupations and the drive to ensure as many young people as possible obtain a qualification at upper secondary level.

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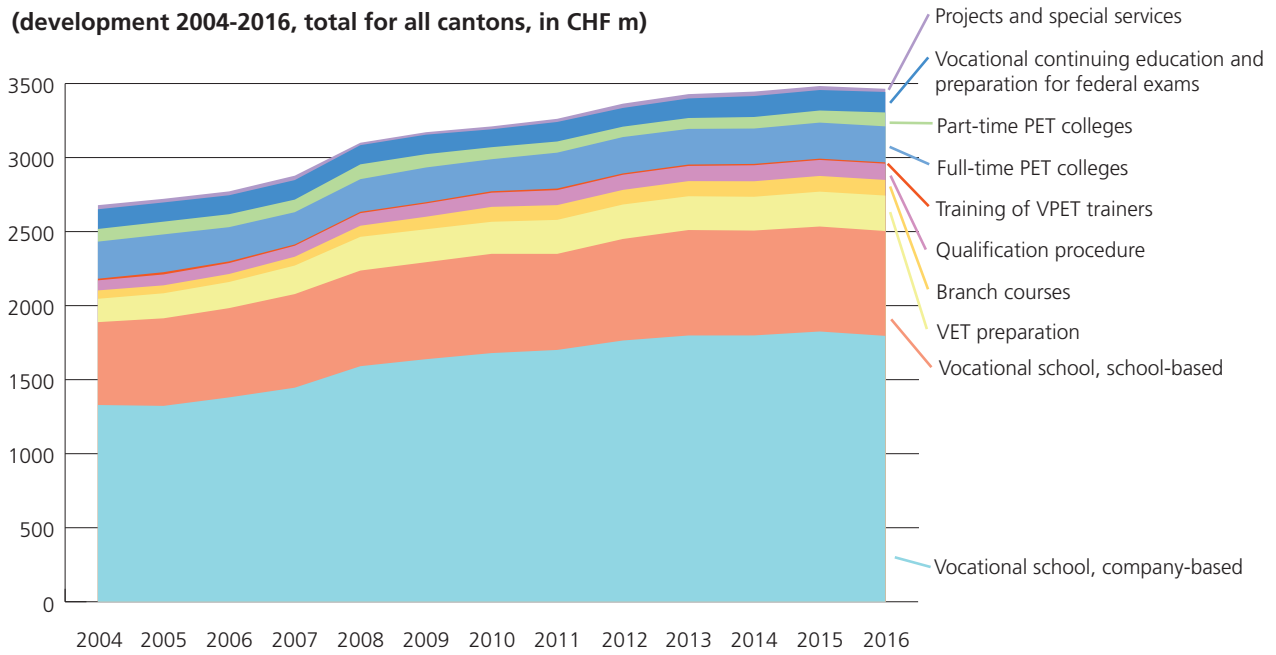
Survey of costs to the cantons of VPET  
[www.sbfi.admin.ch/kostenerhebungbb](http://www.sbfi.admin.ch/kostenerhebungbb)

#### Distribution of lump-sum payments among the cantons

The federal lump-sum payments to the cantons are distributed according to the number of learners (apprentices) in vocational education and training (Art. 53 para. 1 Vocational and Professional Education and Training Act and Art. 62 Vocational and Professional Education and Training Ordinance). The total available amount is divided proportionately between the costs of school-based VET and the costs of dual-track VET. These calculations are made on the basis of the averages of the last four years, both of cost shares and of numbers of learners.



**Distribution of net costs across individual areas  
(development 2004-2016, total for all cantons, in CHF m)**



**Federal funding of vocational and professional education and training**

In 2016 federal expenditure on vocational and professional education and training amounted to CHF 860 million.

Under the Vocational and Professional Education and Training Act (VPETA), the Confederation spent this as follows:

- Lump-sum funding to the cantons (Art. 53 VPETA). This is not bound to specific offerings or investments, so the cantons can use the funds as they see fit;
- Funding of projects to develop vocational and professional education and training subsidies for third parties for specific activities that serve the public interest (Art. 54 and 55 Art. VPETA). Under VPETA, up to ten per cent of federal funding can be allocated to such projects and activities;
- Conducting federal professional examinations and study programmes at professional education institutions (Art 56 VPETA);
- Contributions to persons who have completed preparatory courses leading to the federal PET and advanced federal PET diploma exams (Art. 56a VPETA). These payments will be made for the first time in 2018 and are therefore not contained in the results for the 2016 financial year shown here.

The Confederation also funds:

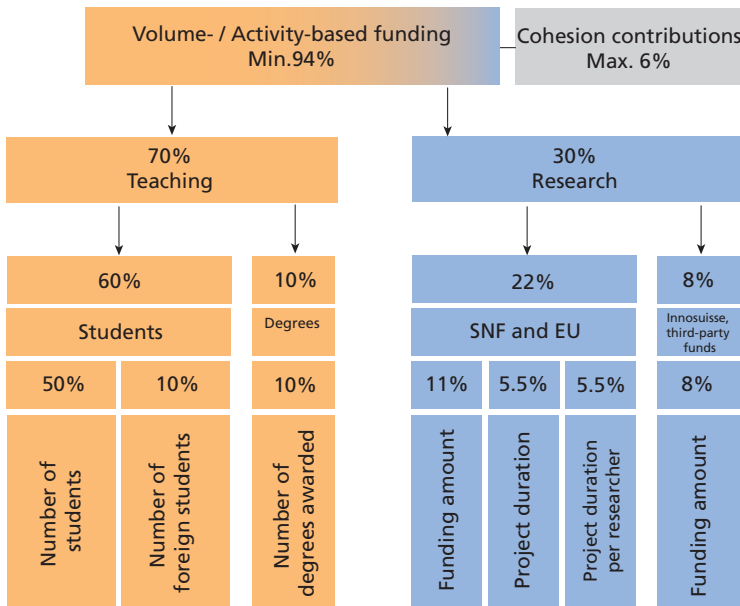
- activities to develop vocational and professional education and training, including research (Art. 4 VPETA);
- the Swiss Federal Institute for Vocational Education and Training (SFIVET).

## Federal funding of cantonal higher education institutions

# Basic contributions now distributed according to new model

The Confederation makes basic contributions from the approved budget for higher education to the ten cantonal universities and seven universities of applied sciences to meet their operating costs. In 2017 these contributions were made for the first time on the basis of new Higher Education Act. A total of CHF 1.2 billion was awarded.

### Basic contributions: funding framework for universities



the performance of all others of the same type. Besides performance, the institutions' overheads – or their size – are also a factor in determining how much federal funding they receive in the form of basic contributions.

The basic contributions largely go towards meeting the operating costs of the cantonal universities and universities of applied sciences. They are not earmarked for a specific purpose; the institutions can use them as they see fit.

### Cantonal universities: 30% research weighting

The federal basic contributions to the cantonal universities in 2017 amounted to CHF 664 million. Once cohesion contributions (see box) have been deducted, these contributions are divided between teaching (70%) and research (30%):

- Universities receive volume-based funding for teaching in proportion to the number of students and the number of degrees taken.
- For the allocation of activity-based funding for research, Swiss National Science Foundation projects and EU projects (European Research Framework

The Confederation has contributed to the funding of the cantonal universities since 1968 and to that of the universities of applied sciences since 1995. Over the years, the legal basis on which these payments are made has changed several times. The Higher Education Act (HEdA), which came into force in two stages (2015 and 2017), has set a fundamental new basis for this funding.

the Federal Council in the four-year ERI dispatches, which are then approved by Parliament.

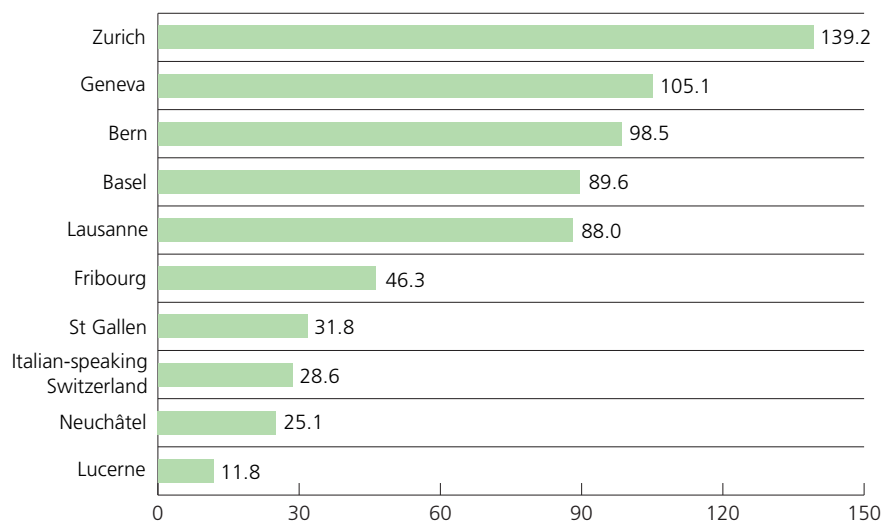
Performance-based measurement criteria are applied to calculate how the basic contributions are distributed. The performance of a higher education institution is compared on a competitive basis with

### Taking account of different profiles

The HEdA provides for three types of funding: basic contributions, contributions to cover construction and the use of buildings, and project contributions. Most federal funding is awarded in the form of basic contributions.

Two separate funding frameworks have been established for basic contributions to the cantonal universities and the universities of applied sciences. This ensures that the two types of higher education institution are not in competition with each other and so takes account of their different profiles. The funding frameworks for basic contributions are requested by

### Federal basic contributions the cantonal universities in 2017 (in CHF m)





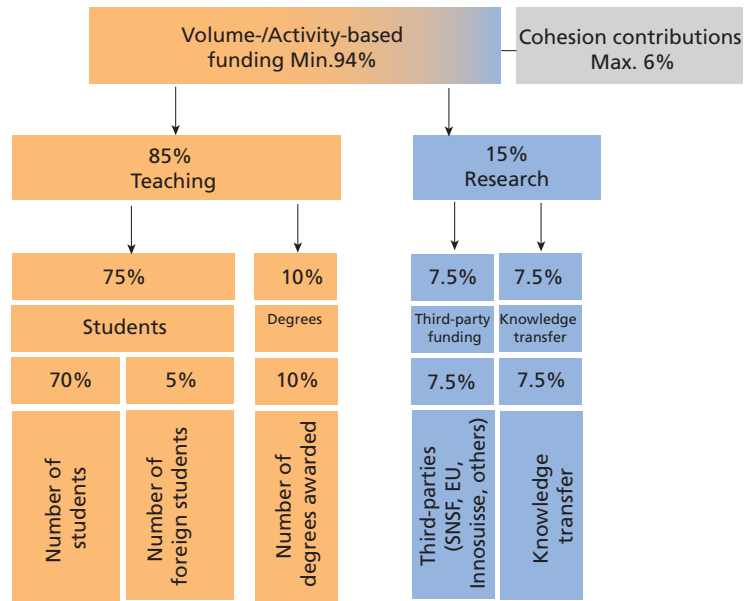
Programmes) are taken into account – the level of funding and number of project months, and the type of research activity. The amount of third-party funding (Commission for Technology and Innovation CTI – Innosuisse since 2018 – and other public or private third parties) is also a factor.

**Universities of applied sciences: 85% teaching weighting**

The basic contributions to the universities of applied sciences amounted to CHF 536.3 million in 2017. Once cohesion contributions (see box) have been deducted, these contributions are divided between teaching (85%) and research (15%):

- Universities of applied sciences receive volume-based funding for teaching in proportion to the number of students and the number of degrees taken.
- For the allocation of activity-based funding for research, two factors are taken equally into account: the research funds the UASs receive from the SNSF, from EU Framework Programmes, from the CTI (Innosuisse as of 2018) and other public and private third-party funding on the one hand, and knowledge transfer (staff involved in both teaching and applied research and development) on the other.

**Basic contributions: funding framework for universities of applied sciences**



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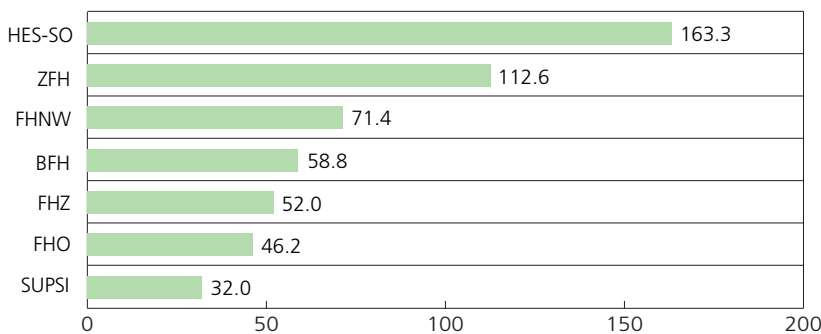
**Cohesion fund**

Under Article 74 HEdA, higher education institutions whose basic contributions fall by more than five per cent as a result of the changes made to the funding calculation methods may receive additional support in the first few years following commencement of the Act. The additional funds are awarded digressively and cease no later than eight years after the Act comes into force, i.e. at the end of 2024.

**Assessment basis**

The basic contributions are allocated among the higher education institutions according to a formula which takes account of the amount of teaching and research performed. Measurement indicators are employed to calculate their performance. The distribution model takes account of the measurement criteria set out in Article 51 paragraphs 2–4 HEdA (number of students, number of foreign students, number of degrees awarded, research performance, acquisition of third-party funding). Following hearings with the Swiss Conference of Higher Education Institutions, at the end of 2016 the Federal Council issued the necessary implementing provisions in the Ordinance to the HEdA.

**Federal basic contributions to the universities of applied sciences in 2017 (in CHF m)**



HES-SO: University of Applied Sciences Western Switzerland; ZFH: Zurich University of Applied Sciences; FHNW: University of Applied Sciences Northwestern Switzerland; BFH: Bern University of Applied Sciences; FHZ: Lucerne University of Applied Sciences and Arts; FHO: University of Applied Sciences of Eastern Switzerland; SUPSI: University of Applied Sciences and Arts of Southern Switzerland. Source: SERI

## Clinical research

# Improving the quality of drug trials with existing instruments

**In December 2017 the Federal Council approved a report on establishing reliable bases for decisions on drug therapies (Verlässliche Entscheidungsgrundlagen für die Arzneimitteltherapien), which explains how important legal bases have been created in this field in recent years. The federal government has also introduced many well-coordinated measures to promote research in this area. There is now a need to raise the quality and transparency of results, rather than increase the number of trials.**

Postulate 14.4007 presented by the National Council Social Security and Health Committee required the Federal Council to produce a report identifying ways of improving the state of research into major medicines whose patent protection has expired. The report was also to propose how clinically relevant, industry-independent trials can be financed,

and if and how the pharmaceutical industry can be involved in cofunding such studies. Moreover, it should show how gaps in clinical research can be filled, and in particular how to improve the readability and accessibility of research data and how to better record the side-effects of drugs whose patent protection has expired.

### Development of statutory bases

The statutory bases relevant to clinical research – at federal level, the Human Research Act and the Therapeutic Products Act – have been enacted or revised following consultation with specialists and in view of international developments. This means that the conditions for clinical studies in Switzerland have been markedly

### The four phases of a drugs trial

A drugs trial is a clinical study conducted on people with the aim of systematically investigating the effectiveness, tolerability, safety and other features of a drug (pharmacodynamics), or how it is absorbed, distributed or eliminated by the body (pharmacokinetics). Drugs trials – like clinical trials in general – occur in four main phases. Clinical trials to develop and obtain authorisation for new drugs are conducted in Phases I to III. The trials particularly mentioned in the postulate, trials on drugs whose patent protection has expired, fall under Phase IV.

Phase	Problems and objectives	Sample size
I	A new substance is tested for the first time on humans to observe its pharmacokinetic and dynamic characteristics, tolerability and safety. It may be tested on a small group of healthy persons or, in the case of known toxic substances (e.g. chemotherapy drugs), on patients.	Small (<50)
II	The investigational product is administered to small groups of patients to test its efficacy and determine appropriate dosages. The potential side effects of the drug are also observed.	Medium (50-100)
III	This phase is the actual test of the efficacy and safety of the investigational product on a large number of patients, which determines whether or not it will be authorised. Usually at least two independent clinical studies are required, each of which provides separate proof of the statistical significance of efficacy. The efficacy of the investigational product is compared with the efficacy of standard therapy (i.e. how the disease is currently treated) or, if there is no standard treatment, with the efficacy of a placebo. Whereas it must always be shown that the new treatment is superior to the placebo, it may be sufficient to demonstrate a comparable effect to standard treatment. Further investigations may also be carried out during Phase III to profile the effects of the drug more precisely.	Large (100-1000)
IV	Existing approved drugs continue to be tested. The aim is to investigate the therapeutic use of an approved drug in its broad application and to identify rare, undesirable effects as well as the frequency of certain side effects.  This phase allows researchers to test dose recommendations or to obtain information on the therapeutic benefits and efficacy of the drug in everyday use or on specific patient groups (children, elderly people or patients suffering from several illnesses at the same time). The main benefits of Phase IV are that rare side effects can be detected and clearly described, and interactions with other drugs can be identified.	Very large (> 3000)

improved. The ongoing evaluation of the Human Research Act will establish whether any further action is required. The final report is due to be published at the end of 2019.

#### Improving the situation longterm

One of the proposals in the postulate is that pharmaceutical companies could compulsorily contribute a percentage of their turnover to help fund clinical trials. The Federal Council feels that is not a constructive solution, in view of experience of similar funding models in other countries and considering the incompatibility of the solution with the key principles of the Swiss funding system, in particular bottom-up funding, competition and the promotion of excellence.

National and international expert opinions confirm the report's findings that the situation regarding clinical trials must be improved sustainably. In other words, clinical studies need to address more clinically relevant issues and respect the highest methodological standards.

In light of this, the Swiss National Science Foundation (SNSF) has further developed its funding instruments, yet still on the basis of established funding principles.

In 2015 it set up a special programme for funding industry-independent clinical studies in which only projects meeting the highest quality standards receive funding. Experience from the first two rounds of funding show that there is currently enough money available in this programme. The evaluation of the programme in 2021 will show whether further incentives or specific funding instruments are required for academic clinical research.

#### Measures must be given time to take effect

The aim is therefore not to increase the number of clinical trials conducted, but to improve their quality. The federal government has a number of well-coordinated measures to ensure this. SERI and the Federal Office of Public Health fund research infrastructures such as the Swiss Clinical Trial Organisation for funding clinical research in general and the specialised Swiss Group for Clinical Cancer Research. Further measures include project funding by the SNSF and its open access and open data policy (access to research data), the promotion of young researchers in clinical research and the federal master plan to promote biomedical research and technology.

The majority of these measures have been implemented in recent years and will only begin to bear fruit in the next few years. The federal government will follow developments closely and adapt the instruments within the scope of its authority as appropriate.

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## ERI | Photo of the month



In 1958 Urs Hochstrasser was the first science counsellor to be employed in the federal diplomatic service, in Washington D.C., USA, and in Ottawa, Canada. He had previously obtained a doctorate in numerical mathematics at the ETH Zurich. He was probably one of the first ETH doctoral students to use a computer to do calculations for a dissertation. Before taking up his post as a science counsellor, Hochstrasser had been a professor in Washington und Kansas. Back in Switzerland, in 1961 he was appointed delegate to the Federal Council in matters relating to nuclear energy. At the same time he lectured at the ETH Zurich and from 1968 was honorary professor at the University of Bern. In 1969 he became head of the new section for science and research at the Federal Department of Home Affairs, which later became the Federal Office for Education and Science. In this position, Hochstrasser was responsible for formulating and implementing a coherent and comprehensive federal science policy up to 1989.

#### Further information:

Swiss Historical Dictionary  
🌐 [www.hls-dhs-dss.ch/textes/d/D24735.php](http://www.hls-dhs-dss.ch/textes/d/D24735.php)



## Scientific publications from Switzerland

# Switzerland's strong performance by international standards

An evaluation of the scientific publications published in Switzerland between 2006 and 2015 shows that Swiss research activities remain very efficient and strongly networked by international standards. The report "A bibliometric analysis of scientific research in Switzerland", which is published by SERI every two years, monitors scientific research in Switzerland. For the first time in the current issue, studies have also been conducted by region.

At present, Switzerland produces 1.1% of the world's publications and is ranked 19th among all countries (2011-2015). This is a very good result given that it is not easy to keep this global share, which has been put to the test by the rise of emerging countries. However, Switzerland's good performance is even more visible when analysing publications per inhabitant or researcher: Switzerland ranks first in the world in terms of publications per million inhabitants (4,286 publications) and second in terms of publications per 1,000 researchers (965 publications).

### Swiss research with an international impact

Also in terms of reception by other researchers (the impact of Swiss publications measured by the number of times researchers cite these publications), Switzerland's performance is excellent, ranking third, just behind the United States and the United Kingdom.

Some publications receive more citations than others and are therefore considered more important in judging a country's performance. Switzerland produces 1.5% of the 10% of the most cited publications worldwide (Top 10%), which is a higher proportion than its 1.1% share of worldwide publications. This shows the very high global recognition enjoyed by Switzerland's researchers. If one counts the number of Top 10% publications per million inhabitants and per 1,000 researchers, Switzerland ranks first in both cases, with 560 and 172 publications respectively.

### Internationally successful research collaborations

Swiss researchers publish a great deal with their foreign colleagues, as shown by the high proportion of publications produced in international cooperation (84%); they first collaborate with researchers from

World ranking of Switzerland, 2011-2015 (Score)	
World share of scientific publications	19th (1,1%)
Publications per million inhabitants	1st (4286)
Publications per 1,000 researchers	2nd (965)
Impact	3rd (118)
World share of Top 10% publications	13th (1,5%)
Top 10% publications per million inhabitants	1st (560)
Top 10% publications per 1,000 researchers	1st (172)
International partnerships	84%

the United States (16.2%), then with researchers from the countries bordering Switzerland, i.e. Italy (10.9%), Germany (7.2%) and France (6.0%).

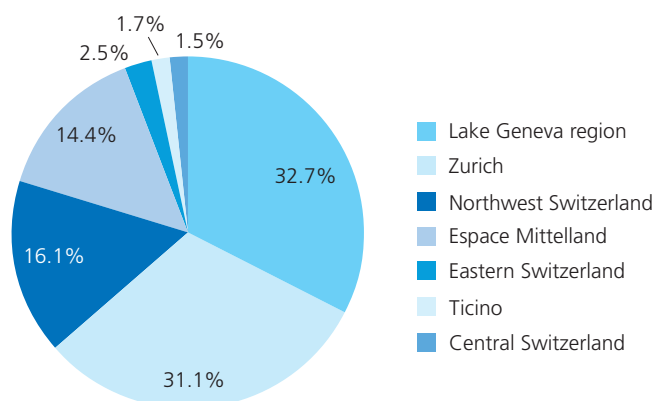
### Lake Geneva region and Zurich strong in scientific publications

Of the seven regions into which the 26 Swiss cantons are grouped for the purposes of the report, the Lake Geneva and Zurich regions are the most active in terms of scientific publications. Together, they produce 64% of Switzerland's total publications (Fig. 1). This is not surprising given that these two regions are home to seven higher education institutions, three research institutes in the ETH Domain, several private laboratories and international organisations. The regions North-

west Switzerland and Espace Mittelland produce 30% and the three remaining regions (Eastern Switzerland, Ticino and Central Switzerland) generate nearly 6%.

The profiles of the two regions are similar and are representative of the profile of Switzerland as a whole. In fact, they contain the fields that are currently making Swiss research famous, namely Life Sciences; Physics, Chemistry and Earth Sciences; and Clinical Medicine. These three fields account for a little more than two-thirds of the publications produced not only in these two regions, but in the whole of Switzerland (Fig. 2). However, some specific regional features are evident in the different research profiles and institution profiles.

Figure 1: Breakdown of Swiss publications by region, 2011-2015



Source: Clarivate Analytics (SCIE/SSCI/A&HCI), graphic by SERI © SERI 2018

**Figure 2: Publication profiles by field of research, 2011–2015**



Source: Clarivate Analytics (SCIE/SSCI/A&HCI), graphic by SERI © SERI 2018

**Regional institutional profiles**

The Zurich region publishes more than the Swiss average in the field of Agriculture Biology & Environmental Sciences (14% versus 11%), largely due to a strong presence of research institutes. The Lake Geneva region produces more than the Zurich region in the field of Clinical Medicine with a share of 24% versus 19%, and publishes an above-average share of publications in the field of Physical, Chemical & Earth Sciences (26% versus 23%).

output (Fig. 3), followed by the research institutes sector (11.5%), while in the Lake Geneva region, the higher education sector is the most productive (74.1%), followed by the international organisations sector (e.g.: CERN, OMS, United Nations, etc.: 15.8% of publications).

**Contact**

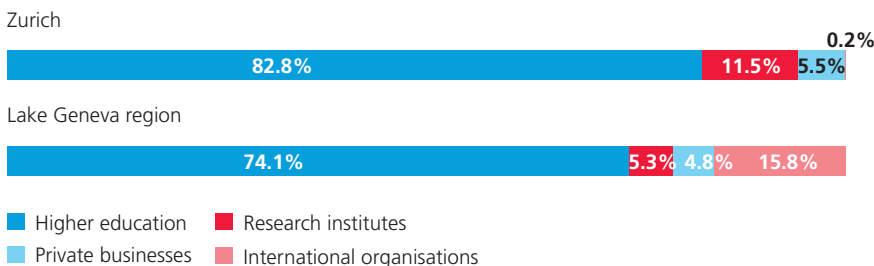
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**Further information**

*Report on publications in Switzerland:* Continuing its work on the biometric analyses carried out in recent years, SERI has published a new report entitled “Scientific publications in Switzerland, 2006-2015; A bibliometric analysis of scientific research in Switzerland”. This report looks closely at the performance of Swiss research based on the scientific publications of researchers established in Switzerland. It compares Switzerland with other countries and describes the development of its performance. In addition, it provides an analysis by Swiss region in order to obtain a more differentiated profile of Switzerland’s scientific production.

 [www.sbfi.admin.ch/pub\\_fi](http://www.sbfi.admin.ch/pub_fi)

**Figure 3: Publications by institutional sector, 2011-2015**

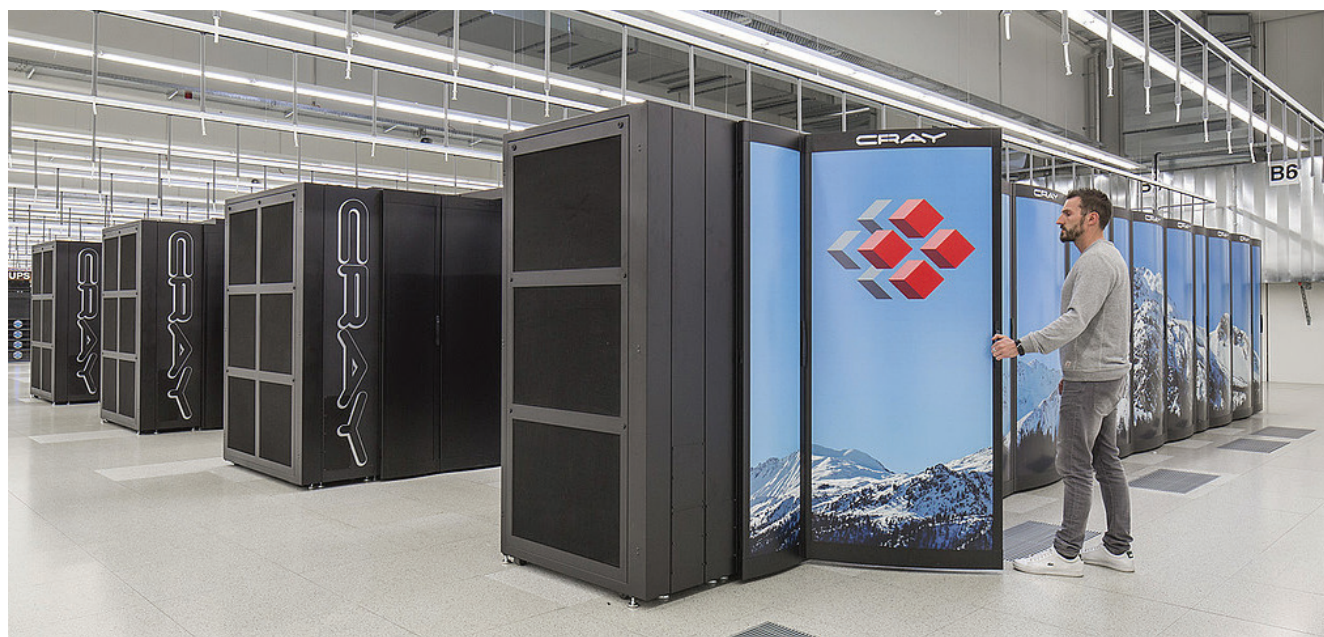


Source: Clarivate Analytics (SCIE/SSCI/A&HCI), graphic by SERI © SERI 2018

## Europe invests in supercomputers

# Switzerland among the best in high performance computing

High performance computing (HPC) is crucial in calculating, modelling and simulating complex systems and for processing ever greater amounts of data. The European Commission therefore wants Europe to become a global player in this area, and presented a project plan to this effect in January of this year. Switzerland is able to participate in the project preparations as an associated member in the European Framework Programme for Research and Innovation and as a cosignatory of the EuroHPC declaration. Piz Daint, the most powerful supercomputer in Europe, is located on Swiss soil, at the Centro Svizzero di Calcolo Scientifico in Lugano.



The 'Piz Daint' super computer at the CSCS in Lugano is currently considered to be the most powerful supercomputer in Europe. Photo: CSCS

High performance computers are very important instruments to overcome challenges faced by science and by society. This might be the early recognition and treatment of disease, decoding the way the human brain works, predicting climate change or preventing and mitigating largescale natural disasters.

### Lagging behind

Europe's competitiveness in science and industry depends to a large extent on access to the world's best high performance computers and data infrastructure, so that it can keep pace with the growing demands and complexity of the problems society faces. Europe is currently unable to meet the high demand for computing capacity. Moreover, in recent years it has lost some of its capability to build its own supercomputers.

There is also a need to catch up on the technical level; Europe relies on US and Asian suppliers for some major compo-

nents. The continent's fragmented super-computer landscape is also problematic. Compared to China, the US or Japan, in Europe there is too little investment in this area and what there is is largely uncoordinated. The industrial use of HPC technology is also comparatively limited.

### The entire valueadded chain

In a bid to stem these trends the European Commission plans to invest around EUR 1 billion in HPC. Half of this funding will come from Horizon 2020 (European Framework Programme for Research and Innovation) and from the Connecting Europe Facility Funds. The remaining EUR 500 million will be provided directly by the EU member states

The project plan presented by the European Commission in January proposes setting up a joint procurement framework to purchase and run two supercomputers as a first step.

Parallel to this, HPC technologies and expertise in Europe will be promoted along the whole valueadded chain, for example basic research into energyefficient microprocessors. Finally, the aim is to encourage a competitive HPC system for the whole of Europe (ecosystem), so that by 2023 two competitive supercomputers of the next "exascale" generation and based on European technology will be available.

Since Switzerland is associated to Horizon 2020, SERI signed the European Declaration on High-Performance Computing (EuroHPC) in October 2017 at the request of the ETH Board. This allows Switzerland to contribute to the project preparations. The EuroHPC Declaration is a nonbinding declaration of intent to cooperate on planning high performance computers and data infrastructure at European level. It is not yet clear whether and in which way Switzerland will also be involved in procuring the planned computers.



### Currently Europe's most powerful computer

Thanks to the cooperation with the EU, Switzerland hopes to preserve and extend its position in the field of high performance computing. The Centro Svizzero di Calcolo Scientifico (CSCS) in Lugano, part of the ETH Zurich, is Switzerland's centre of HPC. The CSCS' supercomputers are available for research projects and mandates of national interest, such as Meteo Schweiz's weather forecasts. From 2013 to 2016, the Piz Daint computer was one of the most powerful computers in the world, and following a hardware upgrade in 2017, is now actually the most powerful computer in Europe.

Furthermore, Switzerland is one of the five leading members of the ten-year-old European partnership PRACE (Partnership for Advanced Computing in Europe). Swiss researchers at CSCS can benefit greatly from this partnership, as it gives them access to a number of European supercomputers.

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#### Further information:

CSCS in Lugano:  
🌐 [www.cscs.ch](http://www.cscs.ch)

European Commission information:  
🌐 <https://ec.europa.eu/digital-single-market/en/eurohpc-joint-undertaking>

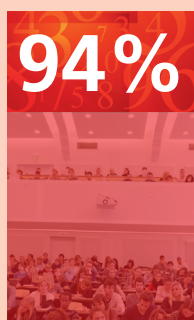
Information on PRACE:  
🌐 [www.prace-ri.eu](http://www.prace-ri.eu)

### Ranking of the world's most powerful supercomputers

Rank	Name	Country	Performance (Linpack/Rmax [PFlop/s])	Power usage (MW)	Efficiency (GFlops/Watt)	No. of processor cores	Processor manufacturer
1	Sunway TaihuLight	China	93.01	15.37	6.051	10 649 600	Sunway
2	Tianhe-2 (MilkyWay-2)	China	33.86	17.81	1.902	3 120 000	Intel
3	Piz Daint	Switzerland	19.59	2.27	8.622	361 760	Intel
4	Gyokou	Japan	19.14	1.35	14.173	19 860 000	Intel
5	Titan	USA	17.59	8.21	2.143	560 640	AMD
6	Sequoia	USA	17.17	7.89	2.177	1 572 864	IBM
7	Trinity	USA	14.14	3.84	3.678	979 968	Intel
8	Cori	USA	14.01	3.94	3.558	622 336	Intel
9	Oakforest-PACS	Japan	13.55	2.72	4.986	556 104	Intel
10	K computer	Japan	10.51	12.66	0.830	705 024	Fujitsu

Source: Compiled by SERI

### Figure of the month



By 2015, 94% of Swiss citizens had completed upper secondary education by the age of 25. This is shown by a recently published longitudinal analysis by the Swiss Federal Statistical Office (FSO). The figure is close to the political target of 95%. For the total of young adults, the figure is 90.9%. There are major differences depending on gender, migration status, type of commune, language region and canton. Completion of upper secondary education is regarded as a key factor for sustainable and

successful integration into the country's economy and society. It provides access to the labour market and to tertiary education.

#### Further information (not available in English):

🌐 [www.bfs.admin.ch/bfs/de/home/aktuell/medienmitteilungen.assetdetail.4282276.html](http://www.bfs.admin.ch/bfs/de/home/aktuell/medienmitteilungen.assetdetail.4282276.html)

## ERI updates


### Organisational changes within SERI

SERI has undergone a number of organisational changes as of 1 January:

- The National Research and Innovation division and the International Cooperation in Research and Innovation division have been merged to form a single division, Research and Innovation. The former head of International Cooperation in Research and Innovation, Bruno Moor, will retire at the end of 2018. Until then he will act as the State Secretary's delegate for international research organisations. Gregor Häflicher is head of the new Research and Innovation division.
- The Upper Secondary Education and Professional Education and Training divisions have been merged to form the Vocational, Professional and Continuing Education division. The head of the new division is Rémy Hübschi.
- In the international field, tasks have now been harmonised throughout SERI between the specialist divisions and the International Relations division.

These changes have allowed the executive board to further simplify and streamline SERI's organisation. This has also made it possible to further reduce the number of points of contact.

#### Further information:

 [www.sbfi.admin.ch/sbfi/de/home/das-sbfi/organigramm-sbfi.html](http://www.sbfi.admin.ch/sbfi/de/home/das-sbfi/organigramm-sbfi.html)

### SERI divisions and partners

