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Research: a strategic investment in Switzerland

Position paper on research

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Table of content

Research: a strategic investment in Switzerland

Research is a strategic foundation for the long-term security and prosperity of our country. Research generates knowledge, fosters innovation, enables specialist training, strengthens education, and underpins national competitiveness. The findings generated by research permeate the entire economic, cultural, and social fabric of a country. Indeed, far from being an elective expense, research funding represents an essential investment in Switzerland, one that equips our country with the ability to meet the challenges of tomorrow and maintain its leading position as a hub of knowledge, freedom, security, and innovation – for the benefit of all.

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In a global context marked by growing geopolitical tensions and ever-increasing technological interdependencies, strong and reliable support for research is of greater strategic importance than ever, notwithstanding the difficult financial conditions Switzerland is facing.

This position paper outlines seven ways in which research contributes to a democratic society, while also providing selected examples to illustrate the points made. Additional innovations in various disciplines as well as Swiss research breakthroughs are described in the appendix.

An abridged version of this document is available via this link.

1. Investment in research: safeguarding Switzerland's prosperity

Switzerland's wealth stems primarily from human capital. **Investing in education, research, and innovation (ERI) is a strategic necessity for a country with few natural resources.**

Switzerland invests 3.3% of its GDP in the ERI sector, which amounts to nearly 29 billion Swiss francs for the 2025–2028 period. It thus numbers among the countries that invest the highest percentage of their GDP in this sector; the amount is on a par with the UK and Japan, although still far behind Israel (7%) and South Korea (4.9%). Switzerland has also ranked as the world's most innovative country for the past fifteen years and occupies a leading position in several strategic fields.[i]

In today's rapidly changing world, and at a time when many other countries are investing heavily in ERI, it is essential that research funding be viewed as indispensable. This standpoint is also supported by the Draghi report on European competitiveness, published in 2024, which determines that **the sustainable prosperity of a country or a continent in an uncertain geopolitical context is directly contingent on its investment in knowledge, research, and innovation**. Moreover, as Joel Mokyr, co-recipient of the 2025 Nobel Prize in Economics, has demonstrated, **innovation[ii] can only sustainably support growth if it is based on a solid scientific understanding**. Research is therefore not only a driver of innovation. It is also a major strategic priority, similar to energy or security.

2. Cutting-edge research requires substantial governmental investment

To achieve high-quality outcomes, **research requires strong governmental support**. In Switzerland, the public authorities invest in all types of research through financing higher education institutions and research institutions as well as various public funding bodies, including the Swiss National Science Foundation (SNSF) and Innosuisse.

Both basic and applied research projects (see box below) can yield significant returns on investment, albeit at different points in time: applied research tends to deliver more immediate returns, whereas the benefits of basic research are generally realised over a longer period of time. The private sector therefore invests mainly in applied research, making public funding of basic research indispensable: **without public funding, basic research would be structurally underfunded**.

An underinvestment in research would, however, also have serious repercussions on industry and, by extension, the economy, particularly due to the numerous synergies that exist between higher education institutions and various economic partners. This would negatively impact the system supporting all forms of innovation: therefore, **public funding for applied research is also fundamental**.

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Governmental support increases the likelihood that research conducted in Switzerland will lead to groundbreaking innovation. It is precisely this kind of innovation that is most likely to bring major economic advantages to the country or company that develops it.

In short, **public investment in all research is essential: it generates new scientific knowledge while also strengthening the entire economic, industrial, and social fabric of a country**. Given the long-term nature of research, it is critical that public authorities invest on an ongoing basis and not wait until the first effects of underinvestment become apparent. It should also be noted that it would take a very long time to bridge any deficits arising from underinvestment – and that Switzerland would run a real risk of being left behind.

The different types of research
Generally, a distinction is made between two main types of research: basic research and applied research. **Basic research** aims to acquire new knowledge and develop or test new scientific theories, without necessarily anticipating a specific outcome or application. The motivation for this type of research is often the desire to understand. **Applied research** also aims to acquire new knowledge, but with a specific, practical result as the objective. Basic research is a long-term endeavour – spanning years, decades, or even longer – whereas applied research projects are generally completed within a few years. Nevertheless, all research involves a degree of uncertainty, both regarding costs and the time required to achieve a result. And all research can lead to unexpected discoveries that go beyond the initial objectives.

These two types of research are linked in a dynamic interrelationship. Applied research is frequently based on basic research, and it produces results that in turn feed back into basic research by raising new questions.

3. The ERI sector and higher education institutions make a vital contribution to the economy

The reasons for viewing research funding as an investment rather than an expense also apply to funding higher education institutions (HEIs). Several studies aimed at measuring the economic impact of HEIs reveal a significant multiplier effect: **every franc invested yields at least 3 francs for the economy.**[iii] Moreover, higher education institutions are closely involved in local and national innovation markets, notably through collaborations with the private sector or the creation of spin-offs. Swiss HEIs also enter into numerous collaborations with higher education institutions, institutes, and agencies abroad, a condition that clearly reflects the international nature of research and that is highly relevant for Switzerland as a business location. Horizon Europe, the world's best-funded research programme (95.5 billion euros for the 2021–2027 period), is the second-largest source of funding for Swiss

researchers, following the SNSF. For the 2014–2020 period, Horizon funding for Swiss research amounts to 2.555 billion Swiss francs.[iv] **HEIs therefore make a decisive contribution to the economy.**

Globally, the most prosperous and innovative regions are characterised by strong synergies between HEIs and private industry. Such beneficial relationships are particularly evident in Switzerland, which is distinguished by the richness and quality of its scientific research, its innovative private sector, and, above all, a willingness on the part of both research and industry to collaborate. Through their partnerships with the private sector and their local roots, Swiss HEIs are also instrumental in creating numerous jobs.

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4. Complex challenges call for interdisciplinary research

To understand and resolve societal challenges, **close collaboration between different disciplines** is often necessary. This includes interdisciplinary exchange between the natural sciences and the humanities and social sciences, and it frequently involves collaboration between researchers from different countries. Climate change research is a prime example of the benefits of interdisciplinary work.

The humanities and social sciences – which are predominantly located at universities and state-funded institutions – enable, among other things, critical reflection on the possibilities offered by the natural sciences. They therefore contribute to interpreting scientific findings and technical advances and putting them into perspective. **Moreover, innovation can only become firmly established in society when it is understood and widely supported by the population; the humanities and social sciences play a key role in promoting the dialogue necessary for achieving this broader aim**.

Natural science disciplines also provide valuable tools to the humanities and social sciences, with one example being technologies such as carbon-14 or thermoluminescence dating in archaeology. This interdisciplinary collaboration may also result in disagreement, as the perspectives in different disciplines can lead to different conclusions, as is the case with genetically modified organisms (GMOs). Such differences, however, represent a valuable contribution to both scientific and democratic debate.

5. Research fulfils a democratic mission

Scientific research and science are essential components for building social cohesion. **By promoting rigorous, reasoned discussion and the pursuit of knowledge, they offer a common language in societies that are characterised by a diversity of opinions and beliefs.** The practice of scientific research based on cooperation and mutual respect can therefore be viewed as the embodiment of foundational democratic values. Moreover, a strong scientific culture facilitates informed participation on the part of citizens in public debate, an essential condition for the vitality of social cohesion. Through public research funding, society invests in its own capacity to understand, anticipate, and resolve collective challenges.

Policy-makers require an evidence-based foundation for taking decisions. In this respect, research provides substantial and reliable information that enables well-founded opinion-formation.[v] Such evidence-based policy-making proves particularly valuable in times of crisis such as the COVID-19 pandemic. Findings from science and research can also act as a bulwark against misinformation. In this sense, investing in research means investing in the quality of democratic debate, which also helps to promote trust in institutions.

Scientific outreach and proactive communication are essential for research to meet this objective. For the general public to gain real access to and understanding of scientific findings, much more is needed than simply making research results available – contrary to what was believed in the early 2000s, when the internet became established for a wider public and when the notion of "knowledge societies" became prevalent. It is critical that research results are communicated, explained, and taught through a variety of outreach and communicative activities.

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6. Research and education foster critical thinking and the development of talent

The education system also has a crucial role to play in this regard: compulsory schools and higher education institutions teach science, scientific methods, and critical thinking. In doing so, they underpin the democratic mission of research. Indeed, **the ability to distinguish opinion from fact, hypothesis from scientific result, and cause from effect, is an essential prerequisite for informed debate and, by extension, a healthy democracy**. This ability is even more valuable and necessary in a world characterised by growing societal polarisation and a proliferation of "fake news", further fuelled by artificial intelligence.

The reciprocal relationship between research and teaching is of particular importance at higher education institutions: research findings are incorporated into teaching, and the experience and knowledge gained in the classroom flow back into research. This inherent interrelationship forms the very foundation of knowledge and its dissemination at HEIs.

Research settings also involve the training of highly qualified specialists across all disciplines, whether during a person's studies or in professional development programmes. By encouraging interdisciplinary exchange, higher education institutions equip students with the capacity to understand major contemporary issues, including artificial intelligence or climate change. A high-quality education system also helps to attract outstanding talent from abroad, which in turn ensures cutting-edge research.

Research brings benefits to the education system as a whole, including vocational training programmes. In educational sciences or subject-specific pedagogy, for example, research promotes the development of better teaching tools and scientifically grounded educational media for all levels of education. Education research also enables the study of learning conditions and equal opportunity across all levels of education, which helps to improve teaching practices and, ultimately, to strengthen the entire education system.

7. Academic freedom: a fundamental requirement for independent research

Academic freedom is essential for the proper conduct of research. This principle is a basic prerequisite for ensuring that scientific research remains free from political or economic influence. There are numerous examples of research having been manipulated and exploited for economic ends, including the detrimental health effects of tobacco and global warming. Academic freedom is also one of the best indicators for gauging the state of lived democracy in a country. In Switzerland, it is enshrined in the Federal Constitution.

Academic freedom is a foundational principle at universities and research institutions. By their very nature, and due to their academic mission, such institutions are ideally placed to explore entirely new fields of knowledge, as certain kinds of research can only be carried out at universities and research institutions. This also applies to research that is less frequently undertaken in the private sector, as it is too time-consuming and has uncertain outcomes. In

principle, this guarantees such research a certain degree of independence from economic interests. However, useful commercial applications and impacts on everyday life can also stem from this type of research. For instance, without Einstein's special and general theories of relativity, satellite navigation devices would be unusable, as they would provide completely inaccurate data.

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[i] https://www.sbfi.admin.ch/dam/en/sd-web/WNWVe84YUIhL/faktenblatt_bfi_kennzahlen_2021_de.pdf; https://www.oecd.org/en/data/indicators/gross-domestic-spending-on-r-d.html; https://www.sbfi.admin.ch/en/eri-policy-2025-2028; https://www.wipo.int/web-publications/global-innovation-index-2025/assets/89507/global-innovation-index-2025-en.pdf (all links last accessed on 12 May 2026). Investment in R&D expressed as a percentage of GDP corresponds to the year 2023. Figures may vary slightly depending on the calculation method.

[ii] Apart from this instance, "innovation" is to be understood in the position paper in its broader sense, and not limited to the natural sciences and technology.

[iii] Further details can be found in the respective studies. It should be noted that the methodology sometimes varies between studies. Studies conducted in various European countries arrive at similar results, as does Innosuisse: one franc invested in a company generates, after three years, more than four francs of added value. Participating companies significantly increase their revenue (21%) and number of jobs (18%) after five years, compared with similar companies that receive no funding (https://innosuisse-impact.github.io/impact/en/ (last accessed 1 June 2026)).

[iv] https://scienceindustries.ch/_file/37878/20250514-studie-horizon-europe-d.pdf ; https://www.netzwerk-future.ch/data/Horizon%20Europe_FR.pdf; https://www.sbfi.admin.ch/dam/en/sd-web/oyMgTnynnlkM/f-i-bericht-2022_d%20.pdf (all links last accessed on 1 June 2026). Switzerland's non-participation (or partial participation) in European programmes in recent years has had tangible negative repercussions, and it is above all young researchers and businesses – particularly those heavily reliant on research – that have suffered the most from the negative effects.

[v] Through replicability and reproducibility standards as well as the peer review system, scientific studies and experiments are designed to deliver results that are as reliable as possible.

From research to innovation to practical application: a few examples

Research produces many tangible results, including innovations that are useful and beneficial to society. The examples below highlight a few such developments, while also demonstrating how many aspects of daily life stem from scientific advances whose applications were not always anticipated from the outset. Whenever relevant, Switzerland's involvement is mentioned to emphasise the importance of scientific collaboration as well as the leading role Switzerland plays in international research. A final set of examples focuses on research and innovation in Switzerland.

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Linguistics

Computational linguistics and the social sciences: Basic research in computational linguistics in the 2010s led to the development of tools for identifying the author of a text, despite variations in style across different contexts and registers. Through the emergence of large language models (LLMs), this research enabled the development of systems to help detect texts written by artificial intelligence. These tools are proving particularly useful in recognising and combating misinformation as well as scientific fraud. Several research projects in computational linguistics and automatic language analysis are currently being carried out in Switzerland, with one project investigating the extent to which GPT-3 was able to generate convincing disinformation campaigns on social media.

Physics

Entangled photons and quantum information science: Quantum entanglement, which was experimentally confirmed in the early 1980s, describes a phenomenon whereby two particles that have interacted remain in a state in which their properties correlate – even if they are physically separated by light years. Thus, if one particle changes, the other particle simultaneously mirrors the exact change. This property can be used to encode complex information, and it was in the early 1990s that the idea emerged to develop new quantum cryptography methods based on quantum entanglement. These methods are now revolutionising information processing and communication, and Switzerland is currently a global leader in quantum cryptography research. For instance, a Swiss project supported by the SNSF has developed a mathematical method for facilitating communication between quantum computers, even across great distances. The 2022 Nobel Prize in Physics was awarded for experiments in quantum entanglement that enabled these innovations.

Chemistry

Catalysts for green hydrogen: The production of green hydrogen relies on water electrolysis, an extremely costly process, as it requires the use of precious metals (platinum, iridium) to fabricate high-performance catalysts. Between 2015 and the early 2020s, chemists developed catalysts based on abundant metals such as iron, nickel, and cobalt by building on basic electrochemical and surface chemistry research into the basic mechanisms of water electrolysis. Several leading Swiss institutions were involved in engineering these next-generation catalysts that enable the more cost-effective production of green hydrogen, an essential resource for realising the energy transition.

Biology

CRISPR-Cas9: Basic research carried out on bacteria in the 1980s and 1990s led to the identification of specific repetitive sequences in the DNA of certain bacterial species. In turn, the gradual realisation that these sequences constitute an adaptive immune memory, which equips bacteria with the ability to recognise and destroy viral DNA, led to the discovery of the Cas9 enzyme and to the development of the CRISPR-Cas9 method. This enzyme enables the targeted modification of a cell's genome. From 2013 onwards, the technology has paved

the way for the development of groundbreaking and relatively inexpensive treatments for numerous genetic diseases. CRISPR-Cas9 has also been used to create plants that are resistant to disease or invasive organisms. Several research projects based on CRISPR-Cas9 are currently being conducted in Switzerland, a world leader in the field.

mRNA vaccines: COVID-19 vaccines were developed in record time – in less than one year – whereas it usually takes between five and ten years to develop an effective drug. This was made possible by decades of research dating back to the discovery of messenger RNA in 1961. At that time, researchers realised that mRNA acts as an intermediary between DNA and proteins. The idea of using messenger RNA to produce therapeutic proteins was tested in the 1980s and 1990s, but it was not until the 2000s, and particularly the 2010s, that the results proved conclusive. This foundation is what enabled the rapid development of COVID-19 vaccines. Now, recent studies have delivered promising results for the use of mRNA vaccines in cancer treatments. HAYA Therapeutics, a Swiss start-up, is currently developing a similar therapeutic approach that targets long non-coding RNA. The aim is to create effective therapies for common, rare, and even chronic diseases, and to promote healthy ageing.

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Educational sciences/cognitive psychology

Motivation theories: Research into human motivation led to the development of Self-Determination Theory (SDT) by Edward L. Deci and Richard Ryan in the 1980s, and to the development of Expectancy Theory by Jacquelynne Eccles and Allan Wigfield in the 1990s. These theories are based on concepts such as autonomy, competence, and social relations, and they describe how motivation stemming from internal factors (pleasure, satisfaction) is more effective than purely extrinsic motivation. In recent years, research on motivation in digital and hybrid learning environments has shown that learner engagement depends largely on the pedagogical design of tools, particularly in contexts of technology- and AI-assisted learning, which alter the forms of feedback, control, and perseverance. These findings are now informing the development of new pedagogical approaches and digital learning tools, also in Switzerland, where several higher education institutions are conducting research into educational technologies, personalised learning settings, and artificial intelligence in education.

Selected innovations at Swiss universities

A model for simulating landslides: Landslides, avalanches, and other geological events are common in alpine environments. In addition to predicting such events, it is highly advantageous to simulate them accurately in advance so that the relevant authorities and local populations are informed about what to expect and can prepare accordingly. Swiss researchers have developed a new, highly accurate model that is superior to previous tools. The new model is able to simulate not only the affected terrain and landslides in three dimensions, but also the behaviour of a rock mass when it encounters an obstacle and the trajectories of flying debris, snow, and other materials. The new model has already been used for some ten sites in Switzerland, the first time in Brienz, Graubünden, in 2023, where it generated very accurate predictions of a rockfall. It was most recently used in Blatten, prior to the devastating landslide that occurred on 28 May 2025, where the simulations were even more accurate. Due to the information generated by the tool, the original evacuation zone in Blatten was expanded.

Solar heat to reduce CO_2 emissions: Industry accounts for around a third of all global energy consumption, most of which stems from heat production. The Swiss start-up Solaxer is developing an innovative solution based on solar thermal energy to produce heat without the use of fossil fuels. The principle involves using mirrors or lenses to concentrate solar radiation in order to heat a liquid circulating in a receiver tube to high temperatures. At present, conventional coatings on receiver tubes degrade rapidly under the effect of heat and air, which reduces efficiency and increases costs. The Solaxer solution envisages an innovative, more durable coating to render installations more sustainable, efficient, and cost-effective. The patented technology is now being tested and rolled out on a larger scale; the aim is to reduce the reliance of industry—including pharmaceutical, textile, and beverage manufacturers—on fossil fuels. Solaxer has received funding from Innosuisse and the Swiss National Science Foundation.

Filter for removing PFAS from drinking water: Per- and polyfluoroalkyl substances (PFAS) have been widely used since the 1970s, as their hydrophobic, lipophobic, and stain-resistant properties make them highly interesting in the manufacture of plastics, non-stick cookware, fire-fighting foams, numerous electronic devices, medical materials, and other products. Often called “forever chemicals”, PFAS are virtually non-biodegradable and accumulate in the environment and in living organisms, including plants. They are widely believed to endanger environmental and human health, as several PFAS types have been linked to cancer and immune diseases. Removing the harmful substances from the environment poses a major societal and environmental challenge; in one approach, Swiss researchers are developing a filter made of cellulose fibres and various absorbents to remove PFAS from drinking water.

Early detection of breast cancer: Breast cancer is the most common form of cancer in women, affecting one in eight women. In Switzerland, around 6,800 new cases are detected each year, and nearly 1,400 breast-cancer deaths per annum are recorded. Detecting this cancer as early as possible is a public health priority. Currently, mammograms are the most common screening method, but the procedure has major drawbacks, including its imperfect specificity and sensibility, and the fact that there is a risk of X-ray-induced DNA damage. In addition, many women experience the examination as unpleasant, with some considering the procedure to be unacceptable. The Swiss start-up Xemperia is collaborating with clinical partners to develop an innovative blood-based detection method for identifying multiple cancer-induced alterations in blood leukocytes that form in response to a tumour. Bio-based nanosensors using DNA origami nanotechnology enable the detection of very low concentrations of biomarkers. The blood test has the potential to revolutionise breast cancer screening: it would allow for more frequent check-ups, eliminate exposure to radiation, boost

accuracy, and increase patient comfort. It would also enable a more personalised treatment, provide better follow-up results, and detect relapses at an earlier stage.

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