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Evaluation of the Swiss National Science Foundation

Annexe V – VIII

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Annexe V

Study C

International comparison of nine research funding agencies

Differences in Basic Research Grant Funding

A Comparison of Nine Research Funding Organisations

Jürgen Janger, Kathrin Hofmann, Nicole Schmidt-Padickakudy

Research assistant: Anna Strauss-Kollin

March 2022
Austrian Institute of Economic Research

Differences in Basic Research Grant Funding

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Commissioned by Swiss Science Council

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Using a systematic comparative approach, this report compares nine research funding organisations involved in basic research grant funding in seven countries: Deutsche Forschungsgesellschaft – DFG (Germany), National Institutes of Health – NIH and National Science Foundation – NSF (USA), National Research Foundation – NRF (Singapore), Dutch Research Council – NWO (Netherlands), Research Council of Norway – RCN, Swiss National Science Foundation – SNSF (Switzerland), UK Research and Innovation – UKRI and Wellcome Trust (UK). Besides overall spending levels, there are considerable differences in the mission and activity focus, reflected in the funding portfolio, for example as regards the share of standard, investigator-initiated bottom-up project funding and the share of thematically oriented, or challenge-driven, funding schemes in overall funding. A more detailed comparison of the main single project funding scheme similarly reveals differences in success rates, lot sizes and project duration, as well as in the types of cost reimbursed and in the peer review procedures.

2022/2/S/WIFO project no: 5121

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1. Introduction

This report aims at a systematic international comparison of nine research funding organisations (RFOs) or agencies in seven countries which are involved in grant-based funding of pure or use-inspired basic research. We want to emphasise that this does not mean that the agencies only fund basic research – while some overwhelmingly fund basic research, others also fund research of a much more applied nature, and even developmental activities or innovation projects in firms. E.g., in 2017, close to 50% of the NIH funding is applied research, by comparison with 13% for the NSF. According to the UK Medical Research Council, two thirds of their funding goes to basic research, one third to applied research. The distinction between basic and applied research is often however fuzzy and some countries do not report statistical data on R&D by type of R&D (whether basic or applied research, or development).[1] Generally, the report focuses on funding for researchers in organisations other than firms, such as universities or research institutes.

The report updates an earlier one commissioned by the German Commission of Experts for Research and Innovation[2]. By contrast with that report, the current one is commissioned by the Swiss Science Council as part of an in-depth look at the Swiss National Science Foundation (SNSF). It broadens the focus to 9 RFOs in seven countries and looks in more detail at mission-oriented or challenge-driven funding, but does not link differences between the RFOs' practices to potential differences in outcomes or impact of the research funded. Note that we also use text and information from the previous report, in case that it is still relevant. The RFOs by country are the following:

Switzerland (Swiss National Science Foundation SNSF), Germany (Deutsche Forschungsgemeinschaft DFG), Netherlands (Dutch Research Council NWO), Norway (Research Council of Norway RCN), Singapore (National Research Foundation NRF), UK (UK Research & Innovation UKRI, Wellcome Trust WT), USA (National Institutes of Health NIH, National Science Foundation NSF). UKRI is the new umbrella organisation for the traditional discipline-specific Research Councils in the UK: AHRC Arts & Humanities RC, BBSRC Biotechnology & Biological Sciences RC, ESRC Economic & Social RC, EPSRC Engineering and Physical Sciences RC, MRC Medical RC, NERC Natural Environment RC, STFC Science and Technology Facilities Council; as well as for Innovate UK and Research England).

The objectives of the report as commissioned are in more detail to provide the following information on the RFOs:

- Their governance structure, incl. decision structures for funding
- Funding portfolio (shares of various funding schemes in total funding disbursed). Within the funding portfolio:

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[1] The OECD (https://stats.oecd.org/glossary/detail.asp?ID=2206, and Frascati Manual (OECD, 2015) provides the following definitions: Pure basic research is research carried out for the advancement of knowledge, without working for long-term economic or social benefits and with no positive efforts being made to apply the results to practical problems or to transfer the results to sectors responsible for its application. Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view. Oriented basic research is research carried out with the expectation that it will produce a broad base of knowledge likely to form the background to the solution of recognised or expected current or future problems or possibilities. Applied research is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective. Experimental development is systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes. For type of R&D in US federal R&D agencies, see https://www.nsf.gov/statistics/2018/nsb20181/tables/tt04-17.

[2] The previous study is freely available here.

    - identifying high risk funding schemes which aim at encouraging highly risky research proposals
    - as well as schemes or agencies that follow funding approaches similar to (D)ARPA in the US[3]
- A more detailed look at the main or standard (single) project funding scheme, in terms of
    - shares of disciplines, grant size, duration, success rates
    - refundable costs and peer review procedures
- Important changes over time and mechanisms for introducing new funding activities, also with regard to trend towards mission orientation

We want to thank the Swiss Science Council for helping to establish contact with the RFOs and our contacts in the RFOs for providing invaluable information and support.

The report is structured as follows: section 2 presents our methodology, section 3 provides an in-depth snapshot of each agency while section 4 provides the comparative analysis. Section 5 concludes.

2. Methodology

Our comparison is based on a characterisation of the agencies based on the same structure across all countries. The relevant characteristics to include mainly come from the previous report (Janger et al., 2019). To be able to compare the different funding portfolios, we use and expand on the classification of the various types of funding schemes developed in the precursor report as well. We first present this classification, before we show the other elements of the characterisation of the RFOs.

2.1 A classification of funding schemes

A prerequisite for characterising the various funding schemes and instruments consists in assigning them to common funding scheme types, to be able to compare the agencies' activities according to comparable types of funding schemes. To the best of our knowledge, no commonly accepted way of classifying funding schemes exists, so that we use an updated version of the one developed in the precursor report[4]. The logic of this classification follows simply the aim and the modalities of the funding scheme (e.g., fostering mobility of researchers, or simply fostering research through individual projects, etc.). The broad types are project funding, structural and thematic priority areas, infrastructure, funding of people, translation, scientific communication, international cooperation and block funding for intra-mural research institutes. This classification is able to cover almost all funding schemes currently run by the funding agencies, with very few exceptions. One drawback of the classification is that a funding scheme can only be assigned to one type, although sometimes funding schemes pursue several goals at the same time or can accommodate different types of proposals, e.g., in the UK the standard grant mechanisms can usually fund both single- and multi-investigator projects, or single- as well as multi-disciplinary projects. Funding schemes are made flexible, e.g., by applying different review criteria or different sets of review panels to, e.g., early career researchers or interdisciplinary research proposals. However, adding a second or even third objective would have become too complex given the scope of the report. The classification hence facilitates a rough illustration of the RFO's funding portfolio but does not work equally well across the RFOs.

[3] https://www.darpa.mil/; see (Tollefson, 2021).

[4] https://www.wifo.ac.at/pubma-datensaetze?detail-view=yes&publikation_id=61664

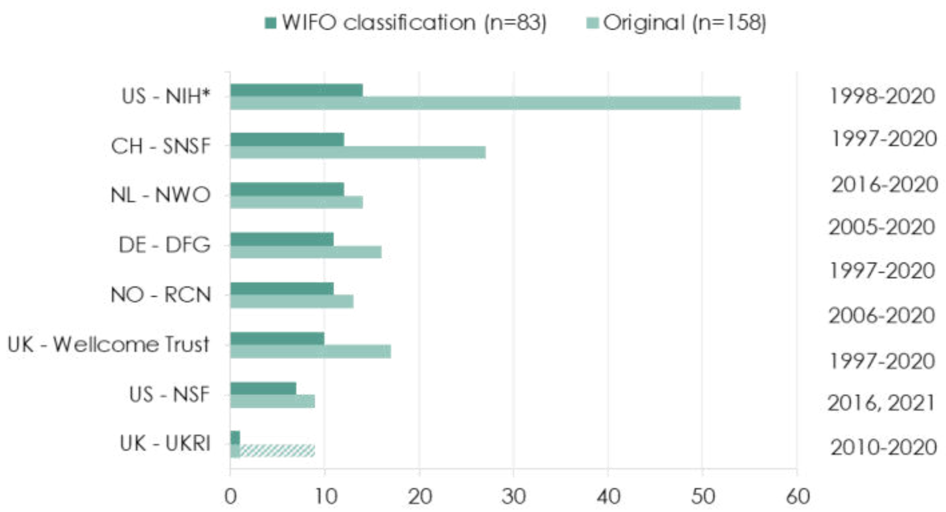
Table 1: **Classification of funding schemes and instruments**

Funding scheme/instrument category	Description
Project funding	
Single project funding (SPF)	The standard funding of single principal investigator-led research projects
SPF early career	Single project funding for early career researchers, where early career refers to all non-tenured researchers and/or first-time applicants
SPF high-risk	Single project funding with a special emphasis on high-risk projects
Networks and multi-project funding	Funding involving collaboration between several researchers/PIs, often located at different institutions, e.g. research clusters or consortium grants
Interdisciplinary research	Funding of research projects requiring interdisciplinary collaboration or approaches
Priority areas	**Larger scale, coordinated funding schemes**
Structural priority area	Funding with a view to strengthen research excellence and international visibility, or critical mass
Thematic priority area	Dedicated funding for research on top-down predefined topics, such as global challenges or emerging fields
Thematic priority area – "ARPA"	Dedicated funding for research on top-down predefined topics, with (quantifiable) specification of research outcomes and active programme management/facilitation by highly qualified and independent programme managers, entailing breakthrough results
Infrastructure	**Funding of equipment outside equipment funded in standard project funding**
Funding of People	
Education & Training	All pre-doctoral funding (incl. PhD-training) of potential researchers with a view to train students for research careers or attract people into research careers, including programmes aimed at non-university students (e.g. interest in science & technology at school)
Career	All post-doctoral funding of researchers with a view to improve career perspectives
Mobility	Funding of international researcher mobility and exchange programmes
Diversification	Funding of researchers with a view to diversify the researcher population according to gender, race, social background etc.
Prizes	Awards for researchers, including distinctions for lifetime achievements but also early career prizes
Translation	**All funding aimed at fostering the use of basic research for further applications**
Applied Research	Funding of applied research within higher education settings
Innovation in firms	Funding for research and innovation projects from firms – bottom up
Innovation in firms - thematic	Thematically oriented funding for research and innovation projects from firms
R&D Collaboration with firms	Collaborative R&D project funding
Commercialisation	Funding commercialisation of research results, including pilot schemes to test feasibility and venture-capital funding for start-ups
R&D Value Chain – Challenge Orientation	Funding of all aspects of research, starting from basic research, to applied research and experimental development as well as commercialisation, aiming at solving problems or addressing missions
Scientific Communication	**Funding of dissemination activities, communicating science to a non-researcher audience**
International Cooperation	**Funding for improving bilateral research cooperation between countries**
Block funding for research institutes	**Some agencies have intra-mural research institutes which they fund (so not project-based, but institutional funding)**

Source: WIFO.

This classification of funding schemes or instruments allows for substantially reducing the complexity of the activities from 403 (158) to 83, to be able to make structured comparisons and build a dataset of funding portfolios. Figure **1** shows this at the level of the RFOs and adds the time series available for funding data.

Figure 1: **Classification of funding schemes or instruments, 2020**



Source: WIFO. Note: * The number shows the sum of funding categories actually used by the study authors (individual funding schemes, not share of funding schemes used in total). The original number of all NIH activity codes is 245 (as of 16/11/21). The category "Other" is not considered here.

An even broader classification would further synthesise these broad types into

- Funding the creation of knowledge (Project, Priority Projects, International Cooperation)
- Funding use/diffusion of research (translation and scientific communication)
- Funding People
- Funding Infrastructure

For characterising the agencies, we will stick however to the less abstract version of Table 1. To assess the individual funding schemes, we use information provided by the agencies, the general information available on the websites of the agencies as well as the detailed guidelines for application, aimed at researchers who want to apply to specific funding schemes.

2.2 Systematic characterisation of the RFOs

We also systematically describe other features of the agencies, which are important characteristics of grant funding which may be relevant for the outcomes of the research funded. We follow this common structure:

Table 2: **Structure of agencies - characterisation with main distinctive features**

Section	What we look out for
1. Organisational mission and governance structure	
Mission focus	Mission focus more narrowly on funding basic/academic research, as well as training and career development, or more broadly also on • funding dissemination of knowledge, use of research results • creating economic and societal impacts • addressing specific problems, challenges or missions
Overarching decision structures	Role of scientific community in • general/strategic decision making and in • individual funding decisions through participation in reviews, i.e., are agencies self-governed by academics or are they governmental agencies, do scientists have a formal say in funding policies decisions or do they just have an advisory role
Allocation of government funding to agency	Who decides on budget of agencies, mechanisms for budget approval; existence of a multi-annual spending framework
2. Characteristics of funding schemes	
Organisation of funding activities	How agencies operate, unit of funding at the operational level
Funding portfolio and data	In a table, • Original name of funding scheme • Classification of schemes according to the structure proposed by study authors • Description of funding scheme • Research topic origin: Proposal topic is investigator-initiated ("bottom-up") or proposed by agency ("top-down") • Subject of funding scheme ("Who gets funded") In graphs, • Share of schemes/disciplines in total funding
Single project funding	Success rates (also by discipline), shares of disciplines, max and average project duration and lot size for one selected, standard project funding scheme
3. Refundable costs and review procedures of single project funding	• For one selected, standard project funding scheme we provide more details on cost reimbursement and peer review: • In particular, if principal investigators' salary can be funded by the grant and if/how indirect costs ("overhead") are being reimbursed • Quality and nature of peer review process (selection of reviewers, organization of review (mail, panel, etc.), criteria for review (weight between different criteria, e.g., track record of applicant vs quality of proposal, potential impact etc.), rights of applicants
4. Important changes over time	• Changes at the level of the agency • Changes in organisational structure • Shifts in budget shares between schemes • Closure of funding schemes, introduction of new funding schemes • Structural changes in allocation of funding (e.g., review procedures, overhead costs, etc.)
5. Information and data sources	List of main sources, contacts at agencies

Source: WIFO.

The following data series are currently available for the agencies (not all the information is present for all the various funding schemes though, see section 1):

- 1997-2020: SNSF (until 2004 at an aggregated level; from 2005 more detailed), RCN, NSF
- 1998-2020: NIH
- 1997-2020: DFG
- 2006-2020: WT (until 2018 at an aggregated level; from 2019 more detailed)
- 2010-2020: UKRI (details for Single Project Funding over time; from 2015 at an aggregated level)
- 2005-2020: NWO
- 2016-2020: RCN

Note that for reasons of international comparability, we use four broad disciplines to present available information on funding by discipline: natural sciences (including biological and agricultural sciences, as well as veterinary medicine), medicine, engineering, and social sciences & humanities. Some agencies are able to provide funding information on a more disaggregated level.

2.3 Limitations

To the best of our knowledge, this report and its precursor version are the first of its kind to look more deeply into (basic) research grant funding from an international comparative perspective, often requiring own desk research rather than being able to use available sources. There are several limitations to bear in mind:

The analysis of funding portfolios can only provide a rough illustration of the RFO's activities, both with a view to the financial dimension of the funding schemes and to the precise nature of what these schemes are actually doing in practice. Given hundreds of individual funding schemes to assess and limited resources, we take the agencies' own description of their schemes from their websites as a starting point and use this as well as the available application documents (information for researchers who want to apply to specific schemes) as a basis for our assessment in terms of funding type and characteristics. But often,

- financial reporting is not linked to the fine-grained level of funding activities, i.e. not all RFOs have financial data down to individual funding schemes as researchers would perceive them when applying for them; in particular, the quantitative characterisation of the funding portfolios of NWO, UKRI, US NSF, RC Norway is limited to more aggregate levels; for the NRF Singapore, we only have qualitative information on funding schemes.
- and some specific funding policy details are sometimes not presented at all on websites; in discussions with our contacts at the RFO's, we have tried to identify some of them and report them in the text, but due to limited resources, there is far more that could be done.

The funding organisations are different in many ways, not just in terms of what they fund, but also in terms how they fund (e.g., with respect to reimbursable costs, funding duration, peer review etc.). In this report, we focused on the standard research grant funding to (single) principal investigators, which is usually present in all research funding organisations and probably most comparable across countries; it is usually also the scheme for which data availability is the best. Many other funding schemes (e.g., related to careers or to thematic priorities) are often more context-specific and would certainly require more effort in terms of understanding differences between them, even if data on them were available more consistently.

Our report should hence be seen as a first step towards a more systematic understanding of basic research grant funding in different countries, providing a rough picture of important differences between agencies and their funding policies. Apart from more information on funding schemes other than individual research grant funding, there are also other characteristics, such as the detailed differences in the way peer review is conducted, which clearly need more work and a higher budget than was available for our study. We are grateful for any comments and help which readers of the report have (Juergen.janger@wifo.ac.at).

The next section presents self-contained sections describing the agencies, which serve as a basis for the comparative analysis in section 4.

3. The research funding organisations in detail

The descriptions of the agencies in section 3 are self-contained, as they were individually sent for validation to the agencies. We want to thank the Swiss Science Council for helping to establish contact with the RFOs and our contacts in the RFOs for providing invaluable information and support.

3.1 Swiss National Science Foundation (SNSF, Switzerland)

3.1.1 Organisational mission and structure

Mission focus

The SNSF targets mainly the investigator-initiated creation of scientific knowledge, with a smaller role for funding focusing on thematic priorities or economic & societal impact, although there are also initiatives focusing on solving important current problems. The following information is taken from the SNSF website:

> The Swiss Confederation has mandated the SNSF to fund research and promote young scientists in Switzerland. The SNSF's strategy and objectives are geared to fulfilling this task and strengthening Swiss research as a whole. The SNSF's strategic goals are derived from the Statutes and the mission statement: The SNSF promotes scientific research in Switzerland. It promotes the international competitiveness and integration of this research as well as its capacity to solve problems. It pays particular attention to the promotion of young researchers. Its ambition is to invest in researchers and their ideas, to promote and disseminate research, to create knowledge that is valuable to society, the economy and politics.

Source: https://www.snf.ch/en/OwOb7mivZ6MYyDXt/page/funding/new-to-the-snsf, http://www.snf.ch/en/theSNSF/profile/strategy/Pages/default.aspx. https://www.snf.ch/media/en/MRzx9NGujO-zMbXSv/snf_leitbild_e.pdf.

Overarching decision structures

The SNSF shows features of academic self-governance, i.e., Swiss academics have a formal say in establishing general principles of the agency's operation.

General/strategic decision making.

> As its highest body, the **Foundation Council** ensures that the SNSF is on mission to fulfil the purpose of the foundation. It supervises the activities of the bodies of the SNSF. Based on a recommendation from the National Research Council, it approves the principles of the SNSF's funding policy and, in particular, the multi-year programme. The Foundation Council is responsible for approving the annual statement and the annual report. It is composed of up to 45 members that include representatives of the federal government, the higher education institutions, the Swiss Academies of Arts & Sciences as well as of other organisations of the Swiss science sector. The **Executive Committee** prepares agenda items of the Foundation Council and it directly supervises the activities of the National Research Council and the Administrative Offices. It elects the members of the Research Council and - together with the president of the Research Council - the Executive Management of the Administrative Offices. The Executive Committee also approves the service level agreement with the Swiss Confederation.

The **Compliance Committee** supports the Executive Committee of the Foundation Council in its supervisory function with regard to the scientific activities of the SNSF. The Compliance Committee reports to the Executive Committee of the Foundation Council and is elected by the latter. It has five members. The person responsible for compliance within the Executive Committee of the Foundation Council assumes the presidency.

Decision structures for funding

The **National Research Council** of the SNSF evaluates several thousand applications each year and makes funding decisions. It is composed of about 100 distinguished researchers, most of whom work at Swiss higher education institutions. The Research Council is supported by 90 evaluation bodies comprising over 700 members. It comprises the following **four divisions**: Humanities and Social Sciences, Mathematics, Natural and Engineering Sciences, Biology and Medicine and Programmes. **Three Specialised Committees** are responsible for cross-divisional matters: International Co-operation, Careers and Interdisciplinary Research. In addition to the **permanent commissions "Gender Equality in Research Funding" and "Research Integrity",** the Research Council can appoint specialised commissions and panels for specific evaluation tasks.

The **Presiding Board** consists of the President of the Research Council and the Presidents of the divisions and specialised committees. It supervises and coordinates the work of the Research Council and drafts science policy recommendations for submission to the Foundation Council. It focuses mainly on funding policy, the elaboration of funding schemes, evaluation methods and the distribution of funds across the individual scientific disciplines.

The **evaluation bodies** evaluate proposals and lay the groundwork for the funding decisions made by the Research Council. The members of these bodies are for the most part researchers working at higher education institutions. A third are women, and a third work at institutes based abroad.

Source: http://www.snf.ch/en/theSNSF/organisation/foundation-council/Pages/default.aspx.

Allocation of government funding to agency (budget appropriation)

The following information was provided by the SNSF:

"With its multi-year programme for the attention of the federal authorities, the SNSF defines for a period of four years strategic priorities, specific instruments and measures with which it plans to achieve its objectives as well as to raise the funding necessary for implementation. The strategic objectives of the SNSF and other strategic documents serve as the framework for financial prioritisation. As part of the multi-year programme 2021-2024[5], the SNSF aims at the following priorities: Enhancing excellence through diversity, strengthening international leadership through cooperation, supporting data infrastructures and services for open science, making research more beneficial to society and evidence-based funding policy.

The multi-year programme is taken into consideration in the ERI message (ERI = Education, Research and Innovation) issued by the Federal Council every four years and is the key basis for the extent of financial resources made available by the Swiss parliament to the SNSF and the other actors for the relevant funding period.

Based on the ERI message, the SNSF iteratively adjusts its content-related prioritisation and detailed financial planning activities. On this basis, the SNSF negotiates its service level agreement

[5] https://www.snf.ch/en/CBGkfq5CP6BAkNu3/page/theSNSF/profile/strategy/action-plan.

with the State Secretariat for Education, Research and Innovation SERI, entrenching the target values of new grants and financing requirements in a binding manner. The distribution of funds among disciplines within the scope of project funding or other bottom-up instruments remains open and is carried out annually."

Allocation of funds within the funding portfolio

The SNSF also provided information on how it allocates funds within its portfolio:

"Each year, about 80% of the SNSFs budget is pre-committed for approved or ongoing projects (prior charges). This means that unless there is considerable budget growth or existing funding lines are discontinued, shifts between funding lines have to be planned several years ahead.

At the beginning of each ERID period, the SNSF defines the overall partitioning between the funding categories (e.g., career funding, project funding, infrastructure funding, etc.) based on its strategic priorities. The SNSF's understanding is that funding projects of all sizes and types at HEIs should be its number one financial priority in order to cover the full range of excellent research. The second priority is career funding. Here, the SNSF's role is subsidiary to the HEIs, and it aims to fund a small number of high-potential early-career researchers.

The partitioning of funds for new projects between specific funding schemes (e.g., Eccellenza, project funding) is flexible and continuously determined throughout each year. The overall quality of proposals, demand and previous and expected success rates are considered before attributing a budget to each call.

Most of the mandates of the Confederation (overhead[6], NRPs, National Centres of Competence in Research (NCCRs), FLARE, bilateral programmes) come with separate budgets, which are specified at the beginning of each ERID period and cannot be modified."

3.1.2 Characteristics of funding schemes

Organisation of funding activities

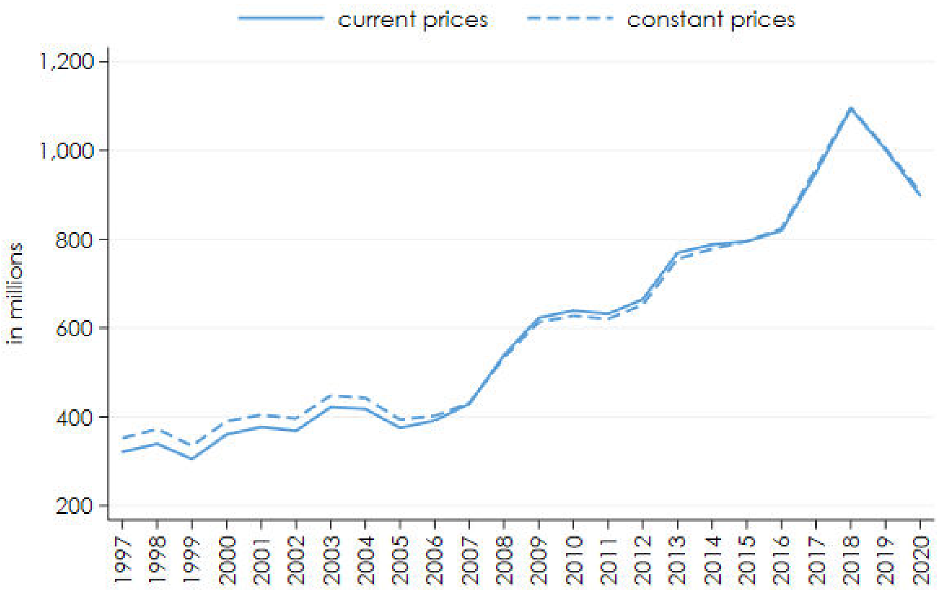
The Swiss National Science Foundation (SNF) allocates money through various non-discipline specific funding schemes (see table below). Budget is nevertheless distributed according to 3 research domains in annual planning, according to the SNSF: Social Sciences & Humanities, STEM and Life Sciences. The repartition is based on estimations based on recent demand, were some indicators like success rates, average yearly spending, etc. are also used. The repartition is (usually) made in terms of budget and not in terms of number of grants. The output of this repartition constitutes the annual funding plan.

Funding portfolio and data

We first present overall funding trends. In constant terms, SNSF funding has about tripled since 1997, although it has declined recently.

[6] Via overhead contributions, the SNSF finances a portion of the indirect research costs incurred by SNSF-funded projects at research institutions. The overhead is devised as an additional incentive for requesting SNSF funds and is aimed at strengthening research at Swiss HEI in the long run. The overhead can be freely used by the research institution in line with the objectives, i.e., in connection with indirect research costs. They amount to a maximum of 15% of the funds provided for projects that are eligible for overhead contributions.

Figure 2: **SNSF awarded funding in current and constant CHF, 1997-2020**



Source: SNSF Data Portal – https://data.snf.ch/key-figures/funding-instruments. SNSF Annual reports; World bank database for GDP deflator (2015=100); WIFO calculation.

Table 3: **Selected characteristics of the funding schemes, 2020**

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 2010-2020	Bottom-up vs. Top-down	Main aim of funding scheme
Total		**100%**			
Project funding		**59%**	**-6.63**		
Single Project Funding (SPF)	Project Funding	43%	-10.08	bottom-up	With its project funding scheme, the Swiss National Science Foundation enables researchers to independently conduct research projects with topics and goals of their own choice. Applicants can apply for funding of research costs and staff salaries, as well as of scientific cooperation, networking and communication; however, they may not apply for their own salaries. The funding period ranges from one to four years, with grants starting at CHF 50,000 (minimum amount). The SNSF recommends that researchers focus on one project and plan it for a four-year period.
SPF early career	Ambizione	6%	2.07	bottom-up	Ambizione grants are aimed at young researchers who wish to conduct, manage and lead an independent project at a Swiss higher education institution. The scheme supports young researchers both from Switzerland and abroad. Scientists holding non-professorial academic positions at higher education institutions are also eligible to submit an application. An Ambizione grant covers the grantee's salary and the funds needed to carry out the project. An Ambizione project grant, however, comprises only project funds. The grants are awarded for a maximum of four years.
SPF high-risk		9%	1.38		
	Spark	1%		bottom-up	The aim of Spark is to fund the rapid testing or development of new scientific approaches, methods, theories, standards, ideas for application, etc. It is designed for projects that show unconventional thinking and introduce a unique approach. The focus is on promising ideas of high originality, with minimal reliance on preliminary data. Taking risks is very welcome, but not a requirement in itself. The focus is on projects or ideas that are unlikely to be funded under other funding schemes.
(Networks and multi-project funding)	Sinergia	8%		bottom-up	Sinergia promotes the interdisciplinary collaboration of two to four research groups that propose breakthrough research.
Priority areas		**12%**	**9.09**		
Structural priority area		8%	7.91		NCCRs are aimed at established researchers in Switzerland who wish to pursue a long-term research project on a theme of strategic importance. The NCCR management teams are based at a higher education institution or at another renowned research institution. NCCRs are backed by one or more home institution. The budget for each series of NCCRs is determined by parliament. In addition to federal funds, NCCRs receive funding from higher education institutions and from third parties.
	NCCR 2010 series	2%		bottom-up	
	NCCR 2014 series	3%		bottom-up	
	NCCR 2020 series	2%		bottom-up	

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 2010-2020	Bottom-up vs. Top-down	Main aim of funding scheme
Thematic priority area		4%	1.18		
	Special Call on Coronaviruses	1%		top-down	Rapid support for research into coronaviruses and their impact.
	r4d (Swiss Programme for Research on Global Issues for Development)	0.7%		top-down	The r4d programme of the SNSF and the SDC is aimed at researchers in Switzerland and in developing and emerging countries who wish to execute a joint research project on global issues. The programme focuses on reducing poverty and protecting public goods in developing countries.
	National Research Programmes (NRPs)	2%		top-down	NRPs embrace research projects that contribute to solving the key problems of today. Federal offices, research institutes, research groups or individual persons propose topics and potential priorities for an NRP to the State Secretariat for Education, Research and Innovation (SERI). The Federal Council makes the final selection of topics, which it then refers on to the SNSF to address within the scope of an NRP.
Infrastructure		**5%**	**0.44**		
	R'Equip	0.7%		bottom-up	R'Equip is aimed at researchers in Switzerland who need top-quality, innovative equipment for their research work. The SNSF awards grants for the acquisition and development of large-scale apparatuses in all areas of science.
	Editions	0.5%		bottom-up	Editions provide access to historical documents and make them available to further research. They cover everything from correspondence between interesting historical figures to legal sources to entire literary oeuvres.
	Research Infrastructure	3%		bottom-up	Centralised infrastructures are becoming increasingly important for research. The SNSF aims to ensure that applicants have access to the infrastructures needed to successfully complete their research projects. However, pursuant to the SNSF Funding Regulations only "the direct costs of the use of infrastructure for conducting the research project" are chargeable to the grant (FR Article 28).
Funding of people		**18%**	**-1.95**		
Education & Training		1%	-1.04		
	MD-PhD fellowships	0.1%		bottom-up	The MD-PhD programme, a joint effort of the Swiss Academy of Medical Sciences (SAMS) and the Swiss National Science Foundation, is designed to enable research-oriented physicians to complete a second course of study at a Swiss University leading to the conferral of a doctorate in the fields of science, public health, clinical research or bioethics.
	Doc.CH	1%		bottom-up	Doc.CH is aimed at promising researchers who wish to write a doctoral thesis on a topic of their own choice in the humanities and social sciences in Switzerland. Part of the doctoral thesis may be conducted at a host institution abroad if a corresponding request giving reasons is submitted.
Career		17%	0.13		

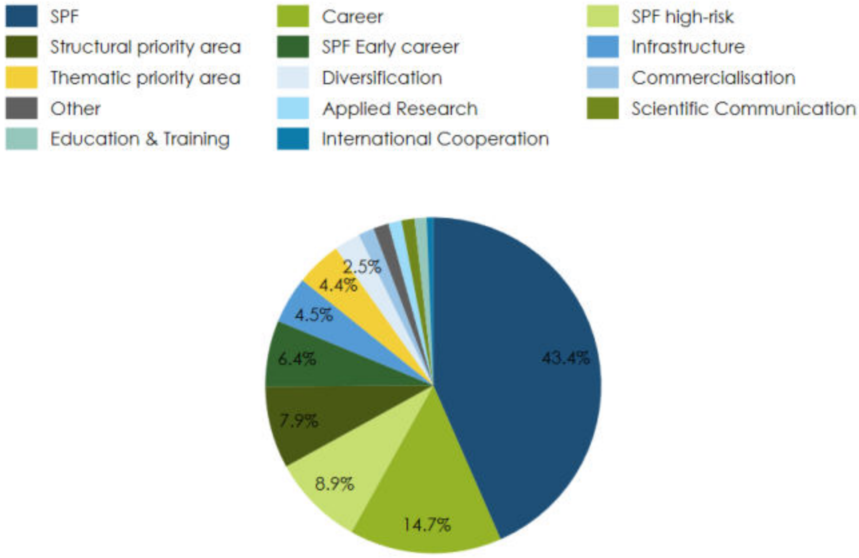
Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 2010-2020	Bottom-up vs. Top-down	Main aim of funding scheme
	SNSF Professorships	2%		bottom-up	The SNSF professorships were replaced by the new SNSF Eccellenza scheme in 2018. SNSF Eccellenza Professorial Fellowships and SNSF Eccellenza Grants are intended for highly qualified young researchers who aspire to a permanent professorship. Eccellenza supports them in achieving their goal as leaders of a generously funded research project with their own team at a Swiss higher education institution.
	Eccellenza	7%		bottom-up	SNSF Eccellenza Professorial Fellowships are aimed at highly qualified researchers who aspire to a permanent professorship. Eccellenza supports them in achieving their goal by allowing them to lead a generously funded research project as an assistant professor with their team at a Swiss higher education institution.
	Practice-to-Science	0.6%		bottom-up	The SNSF awards Practice-to-Science grants to qualified experts with proven practical experience who wish to join a university of applied sciences or a university of teacher education as a professor, and to newly appointed professors at a university of applied sciences or a university of teacher education who wish to strengthen the academic component of their dual scientific-practical skill profile. The time-limited positions offer the opportunity of obtaining higher qualifications and converting to a permanent position.
	Fellowships	5%		bottom-up	Grants for early career researchers
Mobility	International short research visits	N/A	-0.10	bottom-up	This programm was merged into the scheme scientific exchanges in 2017.
Diversification	Marie Heim-Voegtlin grants	N/A	-0.93	bottom-up	This programm was discontinued, its successor is PRIMA.
	PRIMA	3%		bottom-up	PRIMA grants are aimed at excellent women researchers who show a high potential for obtaining a professorship. PRIMA grantees conduct an independent research project with their own team at least at the group leader level within a Swiss research institution.
Translation		**3%**	**-2.63**		
Applied Research	Investigator Initiated Clinical Trials (IICT)	1%	-4.16	bottom-up	The IICT programme is targeted at researchers who wish to conduct an investigator initiated clinical trial. Support will be given to trials that are of value to the patients and address important unmet medical and societal needs but are not in industry focus.
Commercialisation	Bridge - Discovery/Proof of Concept	2%	1.53	bottom-up	BRIDGE consists of two funding schemes: Proof of Concept is aimed at young researchers who want to develop an application or service based on their research results. Discovery is aimed at experienced researchers who want to explore and realise the innovation potential of research results.
Scientific Communication		**1%**	**0.68**		
	Open Access - Article/Chapter/Books	0.6%		bottom-up	The SNSF finances the publication of scientific books that are freely and electronically accessible without restrictions or delays (Gold Open Access).

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 2010-2020	Bottom-up vs. Top-down	Main aim of funding scheme
	Scientific Exchanges	0.3%		bottom-up	Scientific Exchanges is aimed at researchers who want to host their own scientific event in Switzerland, invite colleagues from abroad for a research visit to Switzerland, or visit their colleagues in another country.
	Agora	0.4%		bottom-up	The Agora scheme aims to foster dialogue between scientists and society. It encourages researchers to communicate their current research to an audience of lay people. Agora projects have to initiate a dialogue between researchers and the public in which they interact and listen to each other.
International Cooperation		**0.6%**	**-0.23**		
	Bilateral programmes	0.03%		bottom-up	The bilateral programmes of the Swiss Confederation are aimed at promoting and strengthening scientific cooperation between Switzerland and non-European countries that show high or promising research potential.
	SPIRIT	0.6%		bottom-up	The Swiss Programme for International Research by Scientific Investigation Teams promotes team-oriented cross-border research.

Source: https://www.snf.ch/en/A7fep1IPxz1XezVS/page/find-funding-scheme (25/11/21), WIFO calculation. Note: The sum of the shares does not equal 100%, as the EU projects are not taken into account

The funding portfolio is characterised by a large share of project and people (career) funding, which together make up for almost 80%.

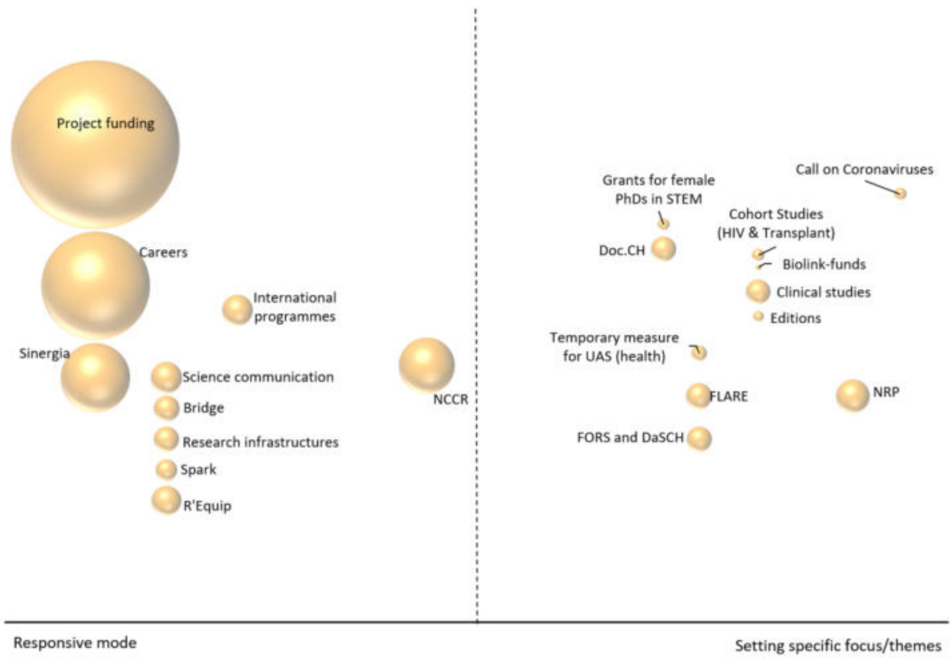
Figure 3: **Total funding awarded by the SNSF by type of funding activity, 2020**



Source: Data provided by SNSF. Note: SPF = Single project funding (SPF). Shares below 2% of total funding are not shown in this chart.

The following visualisation is taken from the SNSF and visualises the financial dimension of the funding activities and their funding mode between "responsive" or bottom-up and setting specific focus and themes.

Figure 4: **Classification of funding schemes according to their funding mode**

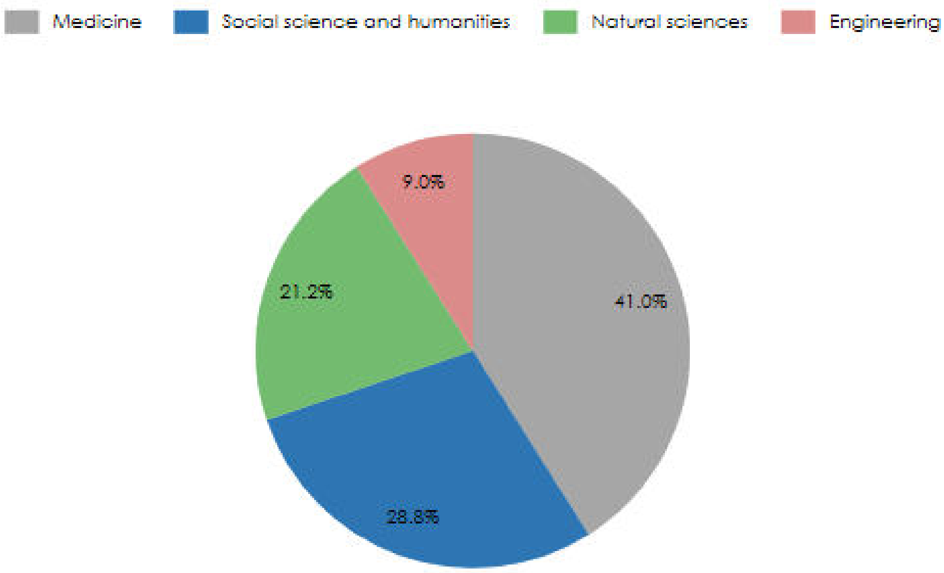


Source: Overall Evaluation of the Role and Function of the Swiss National Science Foundation in the National Education, Research and Innovation System, May 2021. Note: Size of bubble reflects expected new grants in the 2021-24 period.

Single project funding

Figure **5** shows the share of four main disciplines in the project funding scheme of the SNSF. Biological Research and General Biology could also be part of natural sciences, in which cases the share of medicine would only be 23%, and the share of natural sciences 39%.

Figure 5: **Share of disciplines in single project funding, 2020**



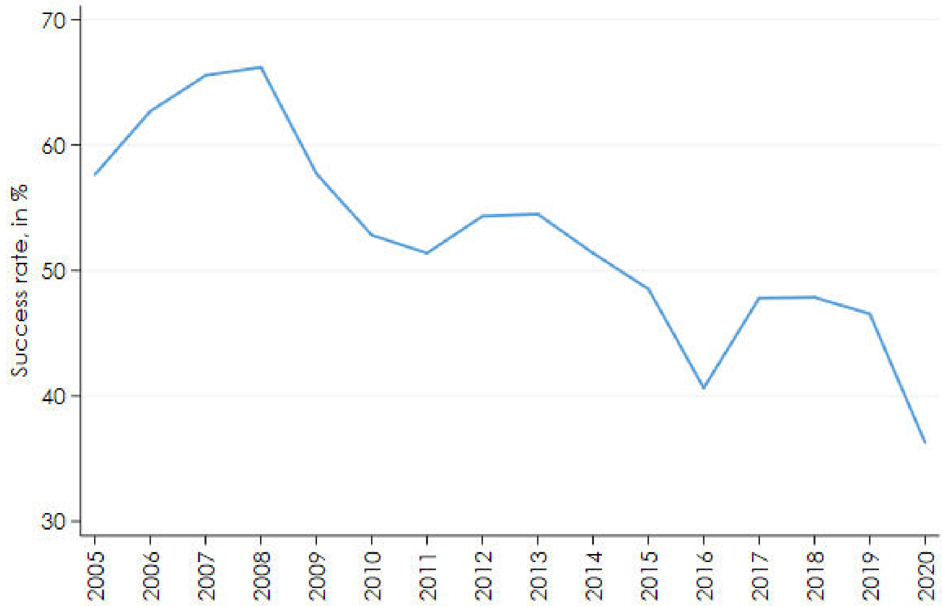
Source: SNSF Data Portal – SNSF Key Figures; WIFO calculation. Note: The division of the disciplines is as follows: Medicine = Basic Biological Research; Basic Medical Sciences; Biology and Medicine; Clinical Medicine; Experimental Medicine; General Biology; Preventive Medicine. Social science and humanities = Art studies, musicology, theatre and film studies, architecture; Economics, law; Ethnology, social and human geography; Linguistics and literature, philosophy; Psychology, educational studies; Sociology, social work, political, sciences, media and communication studies, health; Theology & religious studies, history, classical studies, archaeology, prehistory and early history. Natural sciences = Astronomy, Astrophysics and Space Sciences; Chemistry; Earth Sciences; Environmental Sciences; Mathematics; Mathematics, Natural- and Engineering Sciences; Physics; Social Medicine. Engineering = Engineering Sciences. An alternative classification of the disciplines would mean a shift from Basic Biological Research and General Biology to Natural sciences (share would then be 39.3%) and Social Medicine to Medicine (share would then be 22.9%).

Success rates in the main project funding scheme have come down recently. In autumn 2016, the SNSF raised the maximum duration of projects from three to four years and encouraged researchers to focus as much as possible on maximum two parallel projects. This resulted in fewer projects which on average requested a higher budget than before. In the first three years of the 2017-2020 funding period, a large number of new projects were awarded funding by the SNSF. Most of these projects will run for several years and require a commensurate financial commitment. Because of these carried-over costs, the SNSF had less money at its disposal for new grants in 2020 compared to the previous years. This mainly affected project funding and explains the significant drop in the success rate in 2020.

Note that the success rate shown includes resubmissions, which account for about 25% of proposals in project funding; a request for more time for the grant does not change the grant itself, so is not relevant for the success rate.

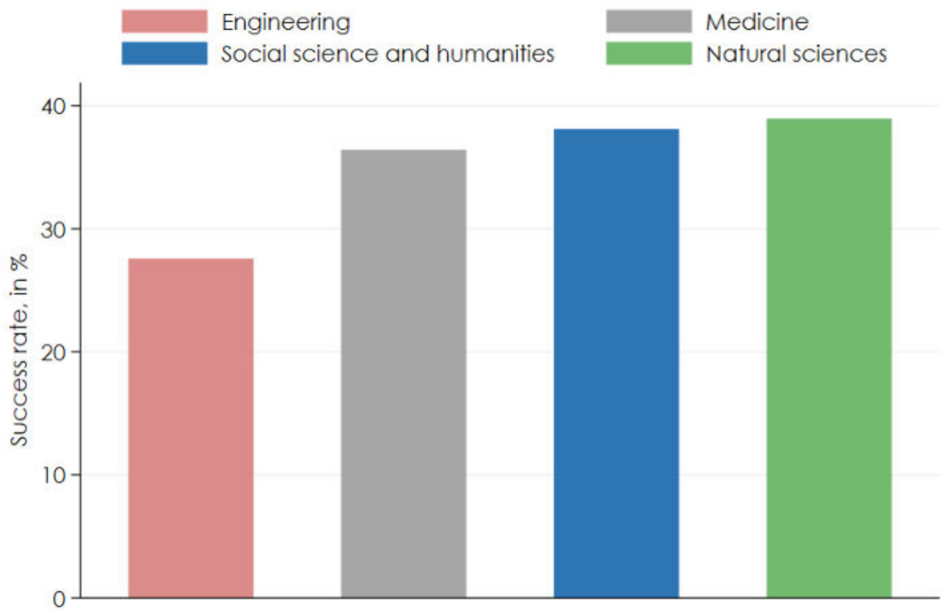
In terms of disciplines, social sciences and humanities have grown at the expense of natural sciences. The success rate is lowest in engineering which also has the lowest share in project funding.

Figure 6: **Success Rate in single project funding, 2005-2020**



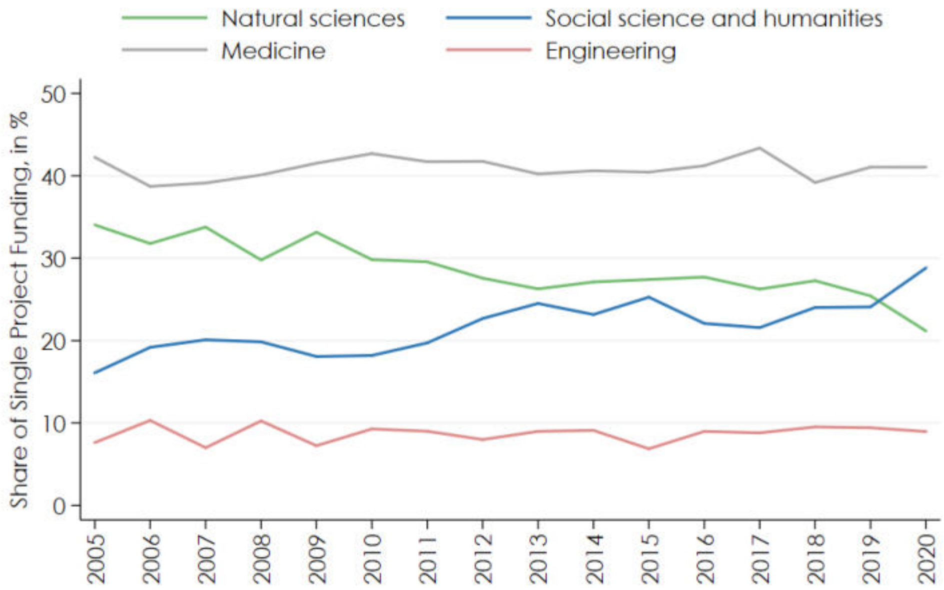
Source: Data provided by SNSF.

Figure 7: **Success Rate in single project funding by discipline, 2020**



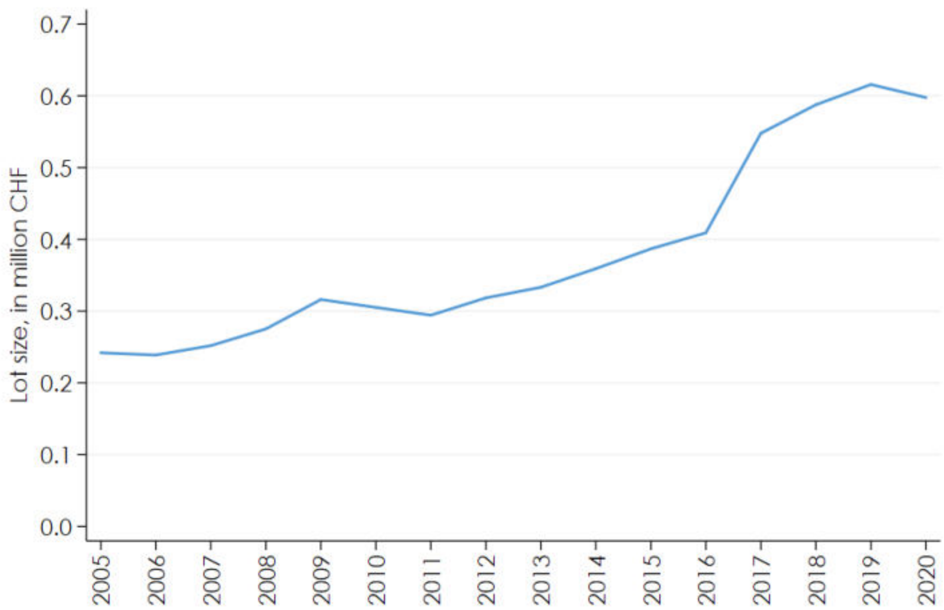
Source: Data provided by SNSF, WIFO calculation. Note: See footnote in Figure 5. The alternative classification of the disciplines would show an average success rate of 30% in medicine and 44% in natural sciences.

Figure 8: **Total awarded funding in single project funding by discipline, 2005-2020**



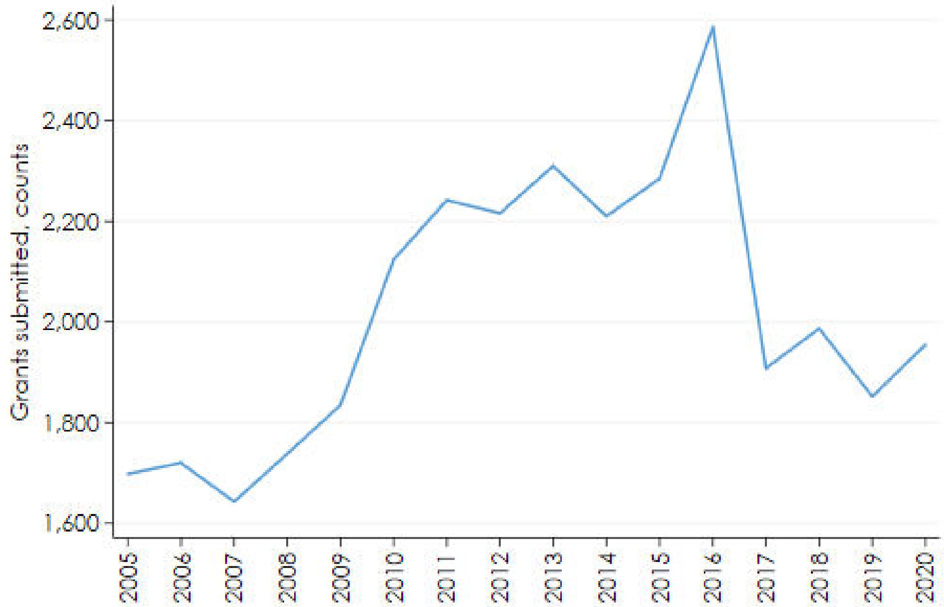
Source: Data provided by SNSF, WIFO calculation. Note: See footnote in Figure 5. The alternative classification of the disciplines would show the following shares: 23% (2005), 21% (2006), 23% (2007), 24% (2008), 19% (2009), 22% (2010), 24% (2011), 21% (2012), 23% (2013), 21% (2014), 22% (2015, 2016, 2017), 19% (2018), 20% (2019), 23% (2020) in medicine and 54% (2005), 49% (2006), 50% (2007), 46% (2008), 55% (2009), 50% (2010), 48% (2011), 49% (2012), 44% (2013), 47% (2014), 46% (2015), 47% (2016), 48% (2017), 47% (2018), 46% (2019), 39% (2020) in natural sciences.

Figure 9: **Lot size of single project funding over time**



Source: Data provided by SNSF, WIFO calculation. Note: Calculation: Funding awarded divided by number of awarded projects.

Figure 10: **Grants submitted in single project funding over time**



Source: Data provided by SNSF; SNSF Data Portal – https://data.snf.ch/key-figures/funding-instruments.

3.1.3 Refundable costs and peer review

- Applicants own salaries only in specific schemes (e.g., Ambizione, PRIMA)
- Wages of scientific/technical staff,
- Material expenses (i.e., Costs for equipment and materials of permanent value, direct costs for the use of infrastructures (including costs for maintenance and care), consumables, field expenses, computing time and data (cloud computing), costs for making research data accessible (open research data),
- Mobility (Travel (incl. accommodation and catering costs), conferences and workshops,
- Third-party expenses (Costs of project partners (not wages), consulting, consortia, outsourcing through subcontracting),
- Costs of scientific (open access) publications,

Source: see article 28 in http://www.snf.ch/SiteCollectionDocuments/allg_reglement_16_e.pdf .

- Indirect cost rate (overheads): 15% (upper limit as set by the ERI Dispatch[1])

The indirect costs are allocated directly to the research institution.

Source: http://www.snf.ch/SiteCollectionDocuments/ueb_overhead_reglement_e.pdf, http://www.snf.ch/en/researchinFocus/newsroom/Pages/news-131126-overhead.aspx, http://www.snf.ch/SiteCollectionDocuments/projektfoerderungsreglement-e.pdf, https://data.snf.ch/stories/overhead-2021-en.html

[1] https://www.sbfi.admin.ch/sbfi/en/home/services/publications/data-base-publications/s-n-2020-2/s-n-2020-2b.html

Table 4: **Overview of review process**

More details can be found in section 3. The following information is taken from the SNSF website:

Internal/External reviewers:	both
Number of reviewers (per proposal):	At least one internal reviewer (member of the Research Council) and at least two external reviewers
International/National reviewers:	both (external reviewers are mostly solicited internationally)
Organisation of Review:	**Two step procedure:** **First Step:** written mail review by external peer reviewers, also reader system[2] or panel[3] (if numerous comparable applications are received within the same discipline). **Second Step:** External reviews are assessed by internal reviewers/referees of the Research Councils. In case of small grants in case of grant renewal, the Research Council may decide to drop external review; referees of Research Council make recommendation on funding to evaluation bodies of Research Council, Presiding Board of Research Council takes final decision. Referees of Research Council are distinguished researchers mostly working at Swiss higher education institutions, elected for four years.
Assessment criteria (incl. weights or relative importance, if available):	**with regard to applicants** • scientific track record and expertise in view of the proposed project • depending on the career funding scheme: Education, previous scientific achievements and competence for the proposed project, if applicable teaching activities, career plan. **with regard to the proposed projects** • scientific quality of the project: scientific relevance, originality and topicality; additionally, broader impact outside science in the case of proposals which self declare to be use-inspired • suitability of methods and feasibility SNSF does not have special review criteria within project funding for first-time applicants, but it has got specific early career project funding scheme such as Ambizione (see below).
Assessment criteria for Ambizione (early career project funding):	**for young investigators**: two stage evaluation procedure internal review (external review upon request by the referee only), invitation to an interview + written mail review by external reviewers *Assessment criteria:* see criteria above + depending on the career funding scheme: education, teaching activities and aptitude for an academic career

Source: https://www.snf.ch/en/ufFZqdPv7wgJ1BkH/page/theSNSF/evaluation-procedures/project-funding, https://www.snf.ch/en/MnwA9gE4ykW1cWzT/page/evaluation-procedures/careers.

3.1.4 Changes over time

Introduction of new funding schemes

According to information provided by the SNSF, currently there is no standard approach for introducing new schemes. New measures and/or instruments have usually been developed in the process of the elaboration of the Multi-Year Programmes (MYP). The researcher survey conducted in 2013 proved to be a good basis for the introduction of new measures in recent years. New instruments are usually discussed in the National Reseach Council, with the higher education institutions and other relevant stakeholders (e.g., actionuni). The statutes of the SNSF define the roles the different bodies have in the elaboration of new instruments. In general, new funding instruments are evaluated some years after their introduction (e.g., Doc.CH, Bridge). Since 2017, the SNSF has launched pilots, e.g., Spark as a response to the results of the researcher

[2] **Reader System:** several external reviewers independently receive several applications (all reviewers receive the same applications), which they then compare and appraise; they compile a ranking of all reviewed applications.

[3] **Panel:** The reviewers meet in person and compile a ranking of all reviewed applications.

survey, Practice-to-Science as a response to the needs of the universities of applied sciences (UASs) and the universities of teacher education (UTEs). Within project funding, the SNSF has launched special calls to address urgent issues (e.g., special call on coronaviruses).

Other changes

- Shifts in budget shares between schemes

Funding of projects and people has decreased as a share of total funding, with structural and thematic priority areas growing in importance.

- Structural changes in allocation of funding (e.g., review procedures, overhead costs, etc.)

Indirect cost reimbursement used to be at 20%, now it is at 15%.

Recent changes can be checked at https://www.snf.ch/en/eBcE6xqoFI2PAqhI/page/funding/regulations-whats-new.

3.1.5 Information and data sources

Contact at SNSF

SNSF Strategy

strategie@snf.ch

Information about structure of fund

https://www.snf.ch/en/OwOb7mivZ6MYyDXt/page/funding/new-to-the-snsf

http://www.snf.ch/en/theSNSF/profile/strategy/Pages/default.aspx

http://www.snf.ch/en/theSNSF/organisation/foundation-council/Pages/default.aspx

Information about application and review procedures

https://www.snf.ch/en/ufFZqdPv7wgJ1BkH/page/theSNSF/evaluation-procedures/project-funding

https://www.snf.ch/en/MnwA9gE4ykW1cWzT/page/evaluation-procedures/careers

Portfolio and data

https://www.snf.ch/en/A7fep1IPxz1XezVS/page/find-funding-scheme

https://www.unibas.ch/dam/jcr:3c21266c-819f-4950-895c-51dd5a68eeac/Self-evaluation_report%20(002).pdf

SNSF Data Portal – SNSF Key Figures

SNSF Annual reports

Janger, J. & Schmidt, N. & Strauss, A. (2019). *International differences in basic research grant funding – a systematic comparison.* WIFO. https://www.wifo.ac.at/publikationen/studien?detail-view=yes&publikation_id=61664

3.2 Deutsche Forschungsgemeinschaft (DFG, German Research Foundation, Germany)

3.2.1 Organisational mission and structure

Mission focus

The DFG focuses primarily on funding the production of scientific knowledge.

The following information was taken from the DFG website:

Best Projects

The main task of the DFG is to select the best projects by researchers at universities and research institutions on a competitive basis and to finance these projects. Individuals or higher education institutions submit proposals in a particular field of curiosity-driven basic research that they themselves select. Interdisciplinary proposals are also considered.

Early career support

The DFG awards the best researchers with funding and, at the same time, gives them the means and freedom necessary for successful research. One of the DFG's key objectives is the advancement of early career researchers. It therefore offers them programmes which provide appropriate support at every phase of their qualification. The DFG is especially committed to the early independence of researchers and supports the recruitment of talented scientists and academics from at home and abroad for German research.

The DFG funds excellent science without regard to extra-scientific factors. Equal treatment of men and women and broad representation of the scientific disciplines in the self-governance of the DFG ensure the diversity and originality required for outstanding research.

Interdisciplinary cooperation

The DFG supports projects from all areas of science and the humanities and especially promotes interdisciplinary cooperation among researchers. DFG funding enables cooperation between researchers from all branches of science as well as the formation of internationally visible priorities at universities and non-university research institutions.

Policy advice

The DFG provides scientific policy advice. As the voice of science in political and social discourse, it counsels and participates in political decision-making processes with scientific expertise. With the deliberations of its Senate commissions and the publication of their findings, the DFG makes recommendations concerning fundamental issues in science and concerning the responsible application of scientific findings in society.

Source: http://www.dfg.de/en/dfg_profile/mission/index.html.

Overarching decision structures

The DFG is the central, independent research-funding organisation in Germany, i.e. representatives of German academic institutions hold a majority of votes in the agency's statutory bodies by academic self-governance.

The legal status of the DFG is that of an association under private law. As such, the DFG can only act through its statutory bodies, in particular through its Executive Board and the General Assembly (http://www.dfg.de/en/dfg_profile/statutory_bodies/index.jsp). Other important bodies are the Senate, the Joint Committee, the Executive Committee, the Head Office and the 49 Review Boards.

The **Executive Board** is responsible for the DFG's regular business. It consists of the President, responsible for internal and external representation and the Secretary General who runs the head office.

Organisational chart: http://www.dfg.de/en/dfg_profile/head_office/structure/organisational_chart/index.jsp?id=0#content.

General/strategic decision making

The **General Assembly** determines the principles of the DFG's work. It is made up of research universities, major research institutions of general importance, academies of sciences and humanities as well as a number of scientific associations.

The **Executive Committee** consists of the President, the Vice Presidents (seven at present) and the President of the Donors' Association, who serves in an advisory capacity. Their main aim is to develop the strategic and conceptual direction of the DFG.

The Senate has 39 members from the scientific and academic communities and is therefore responsible for all important decisions relating to research funding prior to the final funding decision and for all important decisions relating to organising the review, assessment and decision-making processes.

The **Head Office** of the DFG is based in Bonn. It has an office in Berlin plus foreign offices in India, Japan, Latin America, North America and Russia. It supports the work of the bodies and administers the DFG funding programmes.

Decision structures for funding

The **Joint Committee** is responsible for the financial support for research provided by the DFG. It is the DFG's main decision-making body. It bases its final research-policy decisions that relate to the DFG on resolutions passed by the Senate. The Joint Committee is made up of 39 members of the Senate, representatives from the federal government (with a total of 16 votes), 16 representatives from the federal states and 2 representatives from the Donors' Association for the Promotion of Sciences and the Humanities in Germany.

The **Head Office** of the DFG has the following tasks with regard to funding decisions:

- Making sure that all formal requirements have been met and that the submission of the proposal has been correctly carried out.
- Selecting reviewers with the necessary subject-specific qualifications.
- Written notification once the decision is made

The main task of the **review boards** is to provide quality assurance for the review process as part of the preparation for DFG funding decisions. Members of the review boards are elected by researchers for four years in accordance with election regulations to be adopted by the Senate. They are assigned to a subject area according to the focus of their own research work.

Source: https://www.dfg.de/en/dfg_profile/statutory_bodies/index.jsp.

Allocation of government funding to agency

The DFG receives about two thirds of its grants (69%) from the Federal Government and about one third (30%) from the Länder (Germany's regions or states), the total amount of institutional and project funding being calculated according to the "Königsteiner Schlüssel", a formula used in Germany to distribute funds between the federal and the state level as well as between the 16 Länder. The proposal for the funding budget, including the administrative budget, is prepared by the DFG Head Office; the proposal is adopted by the Joint Committee, the DFG's decision-making body consisting of researchers and representatives of the Federal Government and the Länder. The final decision on the DFG's funding and administrative budget rests with the GWK (Gemeinsame Wissenschaftskonferenz or Joint Science Conference), the joint body of science and finance ministers of the Federal Government and the Länder. In the GWK, the Federal Government has 16 votes and the 16 Länder one vote each. In principle, the GWK passes its resolutions with a majority of 29 votes. The Pacts for Research and Innovation III (2016-2020) and IV (2021-2030) result in an annual increase in the DFG budget of three percent over that period. There is hence no real multi-annual spending framework for the DFG, but it can profit from multi-annual higher-level strategies.

Source: Information sent by the DFG.

3.2.2 Characteristics of funding schemes

In this section, we first briefly illustrate how funding activities are organised, before we present the funding portfolio and related data. A more detailed look at single project funding closes the section.

Organisation of funding activities

The DFG allocates money through various funding schemes (see table below) which are in general not discipline-specific (Review Boards and the Head Office are structured by scientific disciplines though). To arrive at a budget across all disciplines, the number of applications and the number of proposals granted in the past is used. According to the DFG, there are tools available to react in the case of discipline-specific under- or over-shooting of requests for funding.

Source: Assessment by study authors/information by agency.

Funding portfolio and data

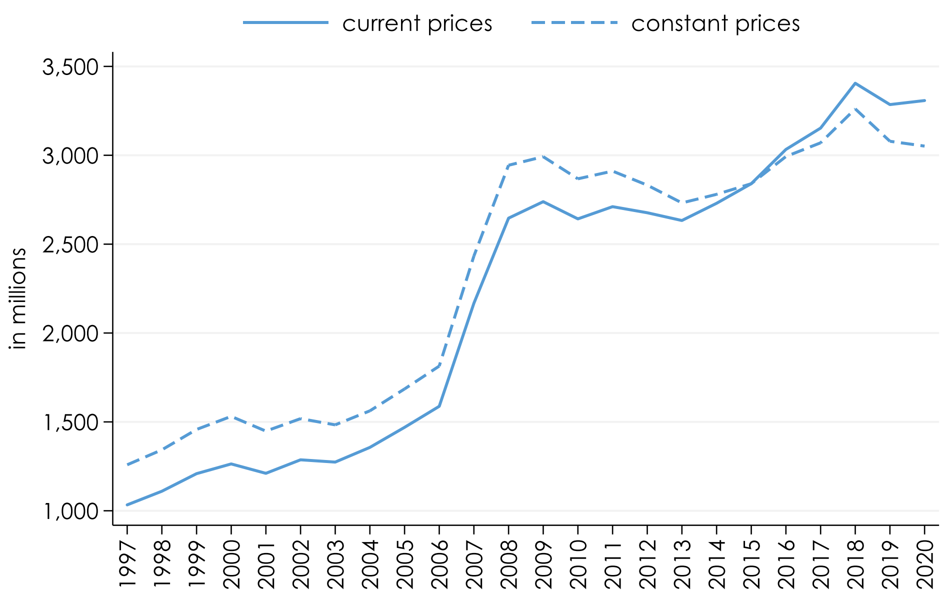
Funding of the creation of knowledge in the broadest sense (single project funding, structural priority areas and networks/multi-project funding) dominate the funding portfolio. In particular structural priority funding is high, due to the Collaborative Research Centres. Moreover, the DFG also administers the Excellence Strategy of the Bund and the Länder (see section 4), but this is not a DFG-programme per se. Thematic focus, in particular with regard to addressing societal challenges, rather than emerging fields, achieves only a small share, just as translational schemes. However, funding translation of basic research proposals is possible in the research grant schemes individual research grants, priority programmes and research units, as a follow-up of basic research (http://www.dfg.de/formulare/54_014/54_014_en.pdf). Moreover, the DFG regularly develops strategic funding initiatives[4] (e.g., on artificial intelligence or with regard to the Covid-19 pandemic). These funding schemes are however not always separately published in terms of their funding shares, thematic funding schemes are hence underestimated in the funding portfolio below. Dedicated high-risk and career-oriented funding schemes achieve only a small share of the total, note however that the support of young researchers can also be an aim of funding schemes classified in other scheme types, such as Collaborative Research Centres, and that the main single project funding scheme specifies review criteria for first-time applicants (see below). Note that the DFG does not show dedicated

[4] For examples see: https://www.dfg.de/service/presse/pressemitteilungen/2019/pressemitteilung_nr_50/index.html, https://www.dfg.de/service/presse/pressemitteilungen/2018/pressemitteilung_nr_06/, https://www.dfg.de/foerderung/info_wissenschaft/2020/info_wissenschaft_20_20/index.html

interdisciplinary funding schemes, however interdisciplinarity is enabled across all funding schemes and a special criterion in the Research Training Groups or the Collaborative Research Centres.

We first show data on overall funding levels: The funding awarded by the DFG more than tripled since 1997, there has been a particularly steep increase between the years 2006-2008 due to the introduction of the German excellence initiative, the predecessor of the German excellence strategy (2018).

Figure 11: **DFG funding awarded in current and constant EUR, 1997-2020**



Source: Data was provided by the DFG; DFG Annual reports; World bank database for GDP deflator (2015=100), WIFO calculation.

In the next table, we present the DFG's funding portfolio along with a general description of the funding activities. Within funding schemes such as single project funding, there are further subdivisions, e.g., for long-term research projects up to 12 years. No separate data are available for them (see http://www.dfg.de/foerderung/programme/einzelfoerderung/sachbeihilfe/formulare_merkblaetter/index.jsp).

Table 5: **Selected characteristics of the funding schemes, 2020**

Funding according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Changes of share in percentage points 1997-2020	Changes of share in percentage points 2010-2020	Bottom-up vs. Top-down	Main aim of funding scheme
Total	**Total**	**100%**				
Project Funding		**39%**	**-4.3**	**2.11**		
Single Project Funding (SPF)		32%	-7.42	1.73		
	Sachbeihilfen (Research Grants)	32%			bottom-up	Research grants enable individuals who have completed their academic training to conduct at any time research projects with clearly defined topics and durations, regardless of the subject.
	Weitere Einzelförderung (Further individual support)	0.1%			N/A	Including publication grants, equipment maintenance, scientific networks, workshops for Early Career Investigators and project academies.
SPF early career	Walter Benjamin-Programm	0.1%	0.09	0.09	bottom-up	The Walter Benjamin Programme enables researchers in the postdoctoral training phase to independently conduct their own research project at a location of their choice.
SPF high-risk	Reinhart Koselleck-Projekte (Reinhart Koselleck-Projects)	0.4%	0.37	0.15	bottom-up	This programme enables outstanding researchers with a proven scientific track record to pursue exceptionally innovative, higher-risk projects.
Networks and multi-project funding		6%	1.41	-0.53		
	Forschungsgruppen (Research Units)	6%			bottom-up	A Research Unit is made up of a team of researchers working together on a research project which, in terms of thematic focus, duration and finances, extends beyond the funding options available under the Individual Grants Programme or Priority Programme.
	Internationale wissenschaftliche Kontakte (International scientific contacts)	1%			bottom-up	In principle, researchers at a German institution (both in Germany and abroad) can submit funding proposals with researchers in any country at any time, in any subject area and with no limitation as to the specific topic.
Priority areas		**41%**	**0.27**	**-4.62**		
Structural priority area	Total	34%	7.08	-4.36		
	Sonderforschungsbereiche (Collaborative Research Centres)	24%			bottom-up	Collaborative Research Centres are long-term university-based research institutions, established for up to 12 years, in which researchers work together within a multidisciplinary research programme.

Funding according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Changes of share in percentage points 1997-2020	Changes of share in percentage points 2010-2020	Bottom-up vs. Top-down	Main aim of funding scheme
	Forschungszentren (DFG Research Centres)	0%			top-down	The primary objective of this programme is to establish a limited number of internationally visible and competitive research centres at German universities.
	Exzellenzstrategie des Bundes und der Länder (Excellence Strategy)	10%			bottom-up	The aim of the Excellence Strategy is to strengthen Germany's position as an outstanding place for research in the long term and further improve its international competitiveness. This is not a DFG programme per se, the DFG only administers this initiative by the German Bund and Länder.
Thematic priority area	Schwerpunktprogramme (Priority Programmes)	7%	-6.81	-0.26	top-down	As a rule, Priority Programmes receive funding for a period of six years. If researchers are interested in collaborating on a Priority Programme, the DFG will invite them to submit the corresponding applications for research grants by a certain deadline. Note that this figure underestimates the share of thematic funding initiatives, as diverse thematic calls are not always separately flagged in the funding data.
Infrastructure	**Infrastrukturförderung (Research Infrastructure)**	**8%**	**3.04**	**0.26**	**N/A**	Includes funding opportunities for technical equipment and information systems.
Funding of People		**12%**	**1.08**	**0.33**		
Education & Training	Graduiertenkollegs (Research Training Groups)	7%	0.67	1.29	N/A	Research Training Groups are established by universities to promote young researchers. They are funded by the DFG for a period of up to nine years. Their key emphasis is on the qualification of doctoral researchers within the framework of a focused research programme and a structured training strategy. Research Training Groups with an interdisciplinary approach are warmly welcomed.
Career	Total	4&	2.36	0.33		
	Emmy Noether-Programm	3%			N/A	The Emmy Noether Programme gives exceptionally qualified early career researchers the chance to qualify for the post of professor at a university by leading an independent junior research group for a period of six years. The programme is open to postdocs and junior professors with temporary contracts who are at an early stage in their research careers.

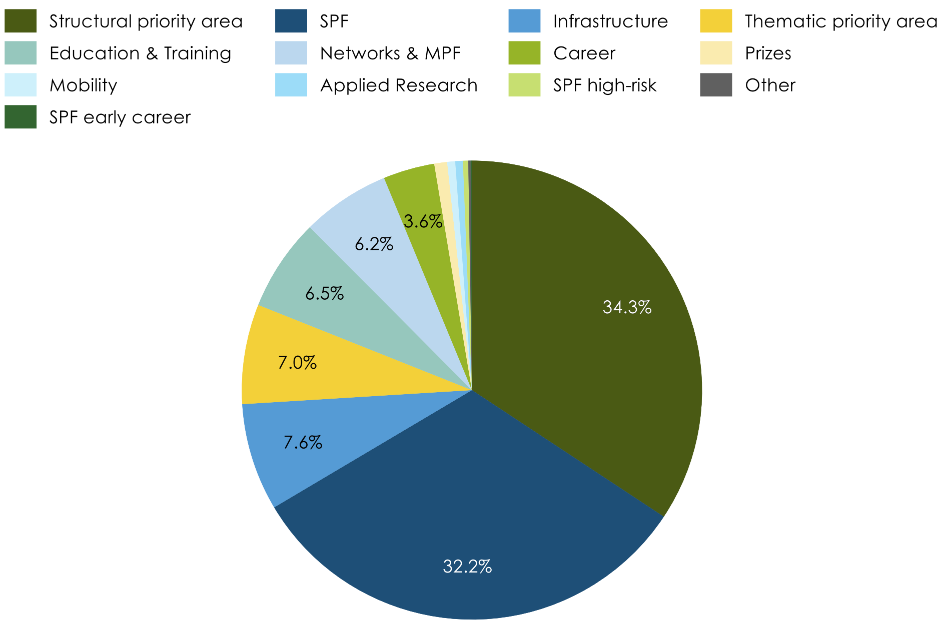
Funding according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Changes of share in percentage points		Bottom-up vs. Top-down	Main aim of funding scheme
			1997-2020	2010-2020		
	Heisenberg-Programm	1%			bottom-up	If you already meet all the requirements for appointment to a permanent professorship, you can apply to the Heisenberg Programme. While you prepare for a future senior academic role, the DFG provides funding to enable you to carry on with high-quality research at the institution of your choice and continue building your academic reputation.
Prizes	Preise (Prizes)	1%	-2.52	0.09	N/A	Prizes awarded by the DFG recognise researchers for outstanding research achievements under various aspects, as well as international research cooperation and science communication. Individuals cannot usually nominate themselves for a prize, but must instead be nominated by others. The decisive criterion is the quality of the researchers' work. Recipients are free to use the prize money for their research in any way they choose.
Mobility	Forschungsstipendien * (Research Fellowships)	1%	0.56	-0.03	N/A	Research Fellowships are intended to help early career researchers to conduct a defined project at a location of their choice in a country other than Germany and to use it as an opportunity to familiarise themselves with new research methods or to bring a large project to a conclusion.
Translation		1%	0.54	0.54		
Applied Research	Klinische Studien (Clinical Trials)	1%	0.54	0.54	bottom-up	The Clinical Trials Programme enables individuals who have completed their academic training to conduct at any time patient-oriented clinical research within a temporary project. The programme provides funding for interventional clinical studies, including feasibility studies (phase II) and interventional trials (phase III). The programme also funds observational trials, provided that the study investigates a highly relevant research question that cannot demonstrably be answered using an interventional design.
Scientific Communication		**N/A**				There is no separate funding scheme for scientific communication, but in many funding schemes there are modules for scientific communication which researchers can ask for – it is hence integrated into many DFG funding schemes.

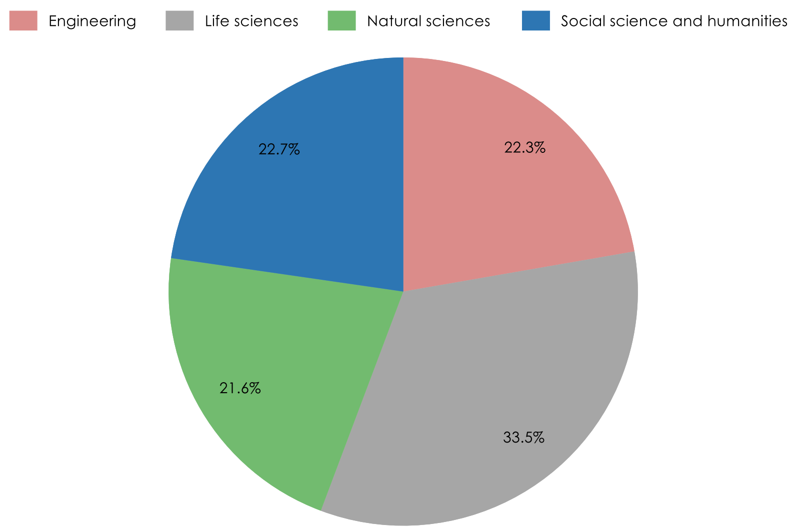
Funding according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Changes of share in percentage points		Bottom-up vs. Top-down	Main aim of funding scheme
			1997-2020	2010-2020		
International Cooperation		**N/A**				There is no separate funding scheme for internal cooperation, but in all funding schemes the integration of international researchers is possible – international cooperation is hence integrated into all the DFG funding schemes.

Source: Data was provided by the DFG; DFG annual reports; https://www.dfg.de/en/research_funding/programmes/index.html; WIFO calculation. *Note: Since 2020, Research Fellowships have gradually been merged into the "Walter Benjamin Programme", which can be attributed to both career and mobility support.

Figure 12 presents the funding portfolio in terms of shares of broad type of funding activity (section 2.1) as well as the share of disciplines (bottom panel). Structural priorities (Collaborative Research Centres and Excellence Strategy) and single project funding make up together more than two thirds of the DFG's funding in 2020. Life sciences achieve the highest share in overall funding, followed by social sciences & humanities medicine, engineering and natural sciences.

Figure 12: **Total funding awarded by the DFG by type of funding activity (top panel) and share of disciplines in total funding (bottom panel), 2020**



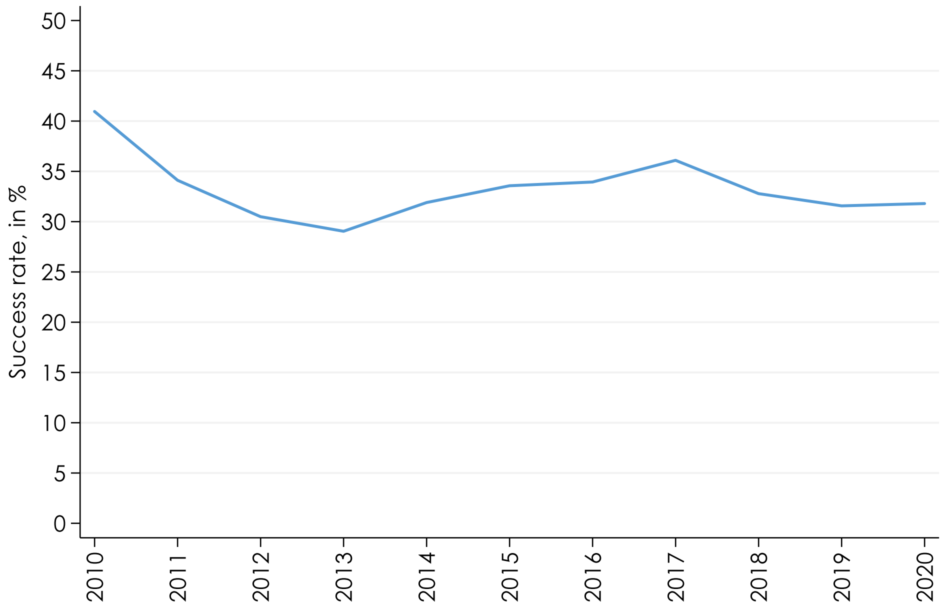


Source: Data was provided by the DFG; DFG annual reports, https://www.dfg.de/dfg_profil/zahlen_fakten/statistik/fachbezogene_statistiken/index.htm; WIFO calculation. Note: Thematic priorities, scientific communication and international cooperation are underestimated (see table above). The Excellence Strategy is not a DFG-funding scheme, but only administered by it. SPF = Single project funding (SPF), Networks & MPF = Networks and multi-project funding; The discipline Life Sciences consists of Medicine, Biology, Agriculture, Forestry and Veterinary Medicine. The Natural Science category includes chemistry, physics, mathematics, and earth science. Shares below 1% of total funding are not shown in the chart.

Single project funding

Here we show data on success rates and the shares of disciplines over time. Other data such as max project duration are shown only in section 3. The success rate in single project funding fluctuated between more than 40% in 2010 and just below 30% in 2013 but has since then recovered to above 30%. The funding rate for renewal applications is significantly higher than for new applications: In 2017, e.g., 63% of renewal proposals and 36% of new proposals were approved.

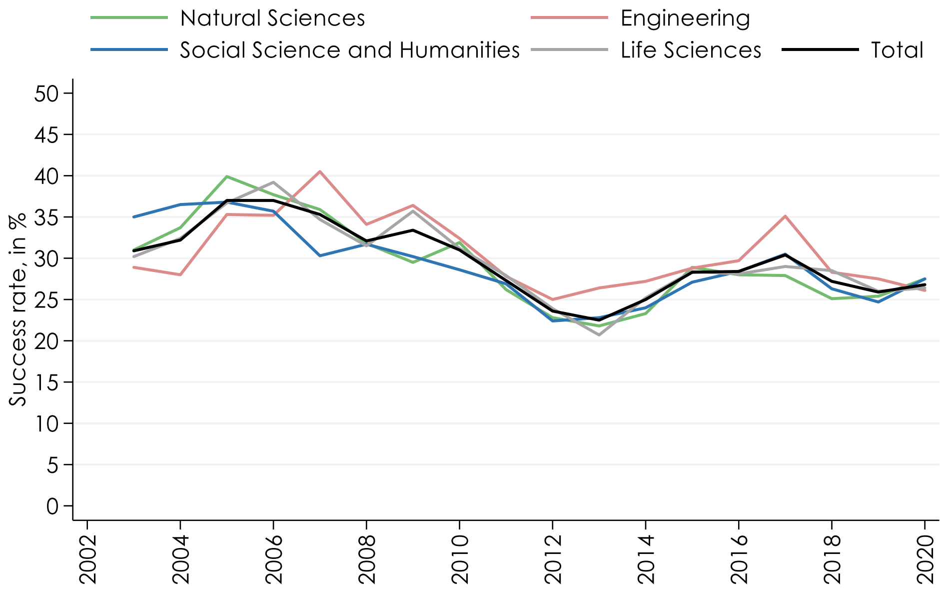
Figure 13: **Success rate in single project funding, 2010-2020**



Source: Data was provided by the DFG.

The success rate of proposals in different disciplines usually follows quite a narrow corridor, with differences amounting to 10 percentage points only seen rarely. An overview of the development of funding rates in the (somewhat broader) individual funding areas, broken down by scientific discipline, can be found in the DFG Annual Reports and http://www.dfg.de/en/dfg_profile/facts_figures/index.html.

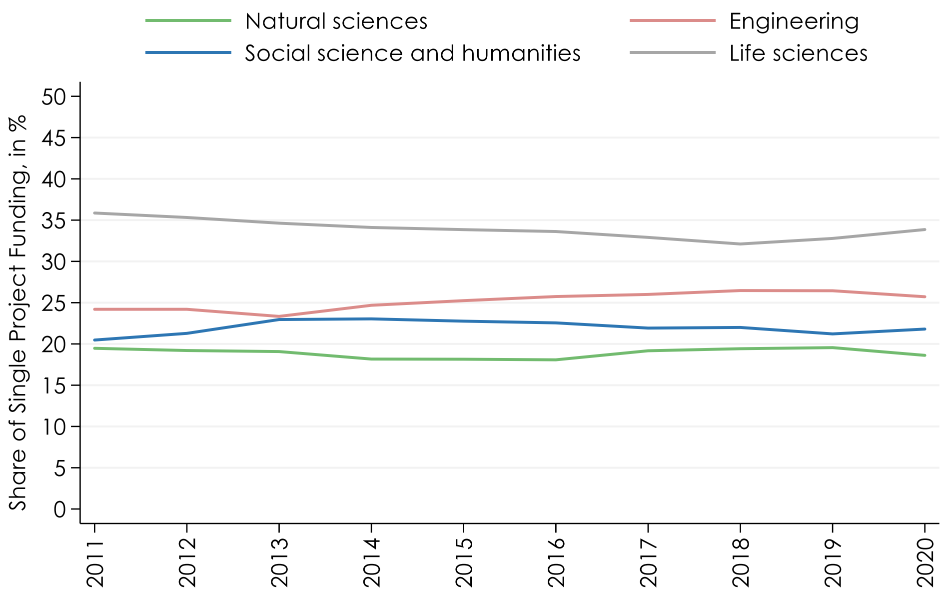
Figure 14: **DFG Success Rates in single project funding by scientific discipline, 2003-2020**



Source: DFG Annual reports; https://www.dfg.de/dfg_profil/zahlen_fakten/statistik/bearbeitungsdauer/index.html; WIFO calculation.

The share of disciplines in total funding has kept quite stable over the years.

Figure 15: **Single project funding "Sachbeihilfen" by discipline, 2011-2020**



Source: DFG annual reports; WIFO calculation

3.2.3 Refundable costs and review procedures of single project funding

This section describes refundable costs peer review procedures of the main single project funding scheme.

The following costs will be refunded:

- Wages of scientific/ technical staff
- Material expenses (i.e. Costs for equipment and materials of permanent value, direct costs for the use of infrastructures (including costs for maintenance and care), consumables, field expenses, computing time and data (cloud computing), costs for making research data accessible (open research data).
- Mobility (Travel (incl. accommodation and catering costs), conferences and workshops.
- Third-party expenses (Costs of project partners (not wages), consulting, consortia, outsourcing through subcontracting)
- Costs of scientific (open access) publications.
- Administrative costs

Salaries of the principal investigator cannot be refunded (except for career and mobility programmes, Research Fellowships, Heisenberg-Programme or "Eigene Stelle" (a specific module of the Research Grants, called "Temporary Positions for Principal Investigators", which provides a post-doc salary for non-tenured principal investigators, so that they can fund their own position). Moreover, again as a module ("Replacement") in the Research Grants scheme, researchers can apply for funds to buy them out of their teaching and administrative duties, i.e. for funds for a qualified person to replace them for a period of max. 12 months, up to the salary of the applicant. The need has to be justified though and the research institution hosting the researcher needs to agree.

- Indirect cost rate (*Programmpauschale*, overheads): 22%

The indirect costs remain with the research institution, not with the researcher and can be used freely by the research institution, e.g. also strategically to fund new research.

Source: http://www.dfg.de/formulare/1_19/1_19_de.pdf, http://www.dfg.de/formulare/2_023/2_023_de.pdf.

Table 6: **Overview of review process for individual research grants ("Sachbeihilfen")**

The following information is taken from the DFG website:

Internal/External reviewers:	External reviewers
Number of reviewers (per proposal):	As a rule, two independent reviews are obtained for each proposal. For the 'coordinated' process, the proposals are reviewed by panels
International/National reviewers:	both
Organisation of Review:	**1st stage** mail review by external peer reviewers; **2nd stage** Review board (external researchers nominated for four years; elected by scientists and academics) examines the reviews, gives funding recommendation to Joint Committee which decides (also based on interdisciplinary comparison)
Assessment criteria (incl. weights or relative importance, if available):	General assessment criteria: • scientific quality of the project (originality and anticipated contribution to knowledge) • Objectives and work programme (feasibility – clear working hypotheses, suitability of method and appropriateness of schedule) • *applicants' qualifications* (soundness of the preliminary work, the quality of publications) • Work and research environment (at the institution where the project is to be carried out) No weights given.

	There are special criteria for first-time applicants, where potential and the quality of the proposal matter more than the track record (past publications): • for coordinated programmes: • quality and added value of cooperation • programme-specific criteria

Source: https://www.dfg.de/en/research_funding/individual_grants_programmes/arriving_decision/index.html; https://www.dfg.de/en/research_funding/faq/faq_review_process/index.html

3.2.4 Important changes over time

Introduction of new funding schemes

The most important novelty in the funding portfolio was the introduction of the "Exzellenzinitiative" since 2005, to bolster German universities' international standing. As German universities are financed by the Länder (the regions), the federal level can only use federal-level instruments such as the DFG to incentivise structural reforms among universities.

Based on information received from the DFG, "there is no standard approach for the developing of new funding schemes. All funding schemes reflect the different needs and requirements of the scientific communities (all kind of disciplines). Therefore, the development of … funding schemes is science driven and does not follow a standardized approach. The DFG conducts on a regular bases assessments and studies concerning the quality and implementation of its funding schemes (See also the PFI-Monitoring Survey, 2020)."

See „Background on the Funding Portfolio": https://www.dfg.de/en/research_funding/principles_dfg_funding/funding_portfolio/index.html

Other changes

- Overall change in funding policies

The DFG has recently restructured its funding opportunities.[11] "The guiding objectives were to

  - simplify the transitions between funding instruments
  - make the overall funding portfolio clearer and more flexible
  - stipulate as few individual project specifications as possible, e.g. with regard to funding volume, number of participating researchers and discipline
  - assign the DFG's strategic funding objectives and the instruments suitable for achieving them a systematic place in the funding portfolio"

- Shifts in budget shares between schemes

The funding portfolio of the DFG has evolved considerably over the past 20 years, seeing an increase of the share of structural priority funding (not least due to the introduction of the "excellence initiative", although this is not a DFG initiative per se. Infrastructure funding has also increased, followed by people's funding, whereas the shares of project funding and thematic priority areas have slightly decreased since 1997, by contrast (note however the underestimation of thematic funding as described above and the increase of project funding since 2010).

- Structural changes in allocation of funding (e.g. review procedures, overhead costs, etc.)
  - Introduction of indirect cost rate "Programmpauschale" (Flat-rate programme allowance) - Gradual introduction from 2008, increase from 20% to 22% from 2016 onwards.

[11] See https://www.dfg.de/en/research_funding/principles_dfg_funding/funding_portfolio/index.html

- Limitation of number of publications to be included with research proposal to the 10 most important publications
- Since 2011: Conversion to "money instead of position": Instead of a detailed specification of which researchers are going to be involved in the project, money will now be granted for job categories, which the recipients will then manage themselves.

3.2.5 Information and data sources

Contact at DFG

postmaster@dfg.de

Information about structure of fund

http://www.dfg.de/en/dfg_profile/mission/index.html.

http://www.dfg.de/en/dfg_profile/head_office/structure/organisational_chart/index.jsp?id=0#content.

https://www.dfg.de/en/dfg_profile/statutory_bodies/index.jsp

Information about application and review procedures

https://www.dfg.de/en/research_funding/individual_grants_programmes/arriving_decision/index.html;

https://www.dfg.de/en/research_funding/faq/faq_review_process/index.html

Portfolio & data

https://www.dfg.de/en/research_funding/programmes/index.html

https://www.dfg.de/dfg_profil/zahlen_fakten/statistik/fachbezogene_statistiken/index.html#anker117929490.

https://www.dfg.de/dfg_profil/zahlen_fakten/statistik/bearbeitungsdauer/index.html

Annual Reports

Janger, J. & Schmidt, N. & Strauss, A. (2019). International differences in basic research grant funding – a systematic comparison. WIFO. https://www.wifo.ac.at/publikationen/studien?detail-view=yes&publikation_id=61664

3.3 National Institutes of Health (NIH, USA)

3.3.1 Organisational mission and structure

Mission focus

NIH focuses broadly on knowledge creation as well as on economic and societal impacts. The following information is taken from the NIH website:

NIH's mission is to seek fundamental knowledge about the nature and behaviour of living systems and the application of that knowledge to enhance health, lengthen life, and reduce illness and disability.

The goals of the agency are:

- to foster fundamental creative discoveries, innovative research strategies, and their applications as a basis for ultimately protecting and improving health;
- to develop, maintain, and renew scientific human and physical resources that will ensure the Nation's capability to prevent disease;
- to expand the knowledge base in medical and associated sciences in order to enhance the Nation's economic well-being and ensure a continued high return on the public investment in research; and
- to exemplify and promote the highest level of scientific integrity, public accountability, and social responsibility in the conduct of science.

Source: https://www.nih.gov/about-nih/what-we-do/mission-goals.

Sampat (2012) provides a detailed account of the NIH's mission and the relationship between a focus on basic science and on finding cures for diseases, which can lead to tensions.

Overarching decision structures

NIH operates as a governmental agency with external scientists taking on an advisory role, but without a formal say in the agency's decision-making.

The National Institutes of Health (NIH), a part of the U.S. Department of Health and Human Services, is the nation's medical research agency. It is made up of 27 different components called **Institutes and Centers, coordinated by a central Office of the NIH Director**. Each has its own specific research agenda, often focusing on particular diseases or body systems. All but three of these components receive their funding directly from Congress, and administrate their own budgets. Each NIH Institute and Center has its own director to lead the pursuit of the research mission specific to the Institute. NIH leadership plays an active role in shaping the agency's research planning, activities, and outlook.

Organisational Chart: https://oma.od.nih.gov/IC_Organization_Chart/OD%20Organizational%20Chart.pdf.

General/strategic decision making

The **NIH Director**, with a unique and critical perspective on the entire agency, is responsible for providing leadership to the Institutes and for constantly identifying needs and opportunities, especially for efforts that involve multiple Institutes. The NIH Director is assisted by NIH Deputy Directors including the Principal Deputy Director, who shares in the overall direction of the agency's activities.

The **Office of the Director (OD)** is the central office, responsible for setting policy for NIH and for planning, managing, and coordinating the programs and activities of all the NIH components. The OD comprises several offices that provide expert advice to the NIH Director and his leadership team (more information on the website). There is also an Office for Intramural and an Office for Extramural Research. In general, NIH is quite an apolitical agency, with only the Director and the Director of the National Institute for Cancer Research politically appointed.

Decision structures for funding

Each NIH administering Institute and Center (IC) has its own research agenda, driven by its focus on specific diseases, conditions, body systems, public health needs, scientific opportunities or other strategic goals. To meet this agenda, ICs set priorities for research funding, taking into consideration their five-year strategic plan, their existing research portfolio, extant and emerging public health needs, plans of other ICs, and other factors. ICs typically split their extramural research budgets by institute-initiated projects (such as those conducted by cooperative groups, networks, or centers or those conducted in response to an RFA) and investigator-initiated projects, which are largely made up of R01 grants that are submitted in response to NIH's 'parent announcement.' Some IC's spend the majority of the extramural funds on institute-initiated projects, while others spend the majority on investigator-initiated projects.

National Advisory Councils and Boards (NACs) perform the second level of peer review for research grant applications and offer advice and recommendations on policy and program development, program implementation, evaluation, and other matters of significance to the mission and goals of the respective Institutes or Centers, as well as providing oversight on research conducted by each Institute's or Center's intramural program.

Source: https://www.nih.gov/about-nih/who-we-are/organization, https://www.nih.gov/about-nih/who-we-are/nih-leadership, https://report.nih.gov/sites/report/files/docs/NIH%20Institute%20and%20Center%20Funding%20Priorities_DSAR_July%202019.pdf https://ofacp.od.nih.gov/about_us/overview.asp

Allocation of government funding to agency (budget appropriation)

All but three of NIH's ICs receive their funding directly from the Congress and administrate their own budgets. NIH prepares a yearly request for funds to the Congress. In addition, members of Congress can push for additional funding. NIH was also a beneficiary of the 2009 ARRA, the fiscal stimulus programme in the wake of the financial crisis, an unusual countercyclical increase of university/basic research funding (Stephan, 2012). Congress votes more easily for medicine than physical or engineering sciences (Stephan, 2012). (Sampat, 2012) provides a detailed account of the funding allocation process, including the relationship between the agency, Congress, and interest groups, as well as the way health considerations enter the budget appropriation process next to science considerations (referring to the focus of NIH on both scientific understanding of the working of the human diseases and treating specific diseases).

Budget increases usually in lockstep across the 27 institutes (Sampat, 2012), with some exceptions, e.g. the NIAID National Institute of Allergic and Infectious Diseases got disproportionate increases as a result of AIDS.

3.3.2 Characteristics of funding schemes

Organisation of funding activities

NIH funding activities can be characterised as working through the decentralized 27 institutes (with coordination by the NIH Office); funding activities are discipline-specific, of course, and rely on common instruments such as research project grants, centres and contracts (see next section).

NIH uses activity codes to differentiate the wide variety of research-related programs it supports. NIH Institutes and Centers (ICs) may vary in the way they use activity codes; not all ICs accept applications for all types of grant programs or they apply specialized eligibility criteria. Besides, not all of the activity codes may be in use by NIH every year. At NIH it is possible to submit applications both unsolicited (through "Parent Announcements" – i.e. researchers define the research questions bottom-up) and solicited (through specific funding opportunities (FOA) of the activity codes – i.e. researchers respond to research questions asked by NIH).

Source https://grants.nih.gov/grants/funding/funding_program.htm.

There is however also a Common Fund: The Office of the Director consists of several offices, one of which is the Division of Program Coordination, Planning, and Strategic Initiatives (DPCPSI). Its Office of Strategic Coordination manages the Common Fund, which provides funding activities among others similar, but not identical to an ARPA-style (see section 2.1) funding effort, as focusing on new foundational research rather than accomplishing use-driven objectives.

Source: NIH (2012): Report of the Director National Institutes of Health, Fiscal Year 2012 & 2013, https://report.nih.gov/biennialreport1213/NIH_OD_Biennial_report_2012-2013_508complete.pdf ; https://commonfund.nih.gov/ ; https://commonfund.nih.gov/sites/default/files/CommonFundCongressionalJustificationFY2021.pdf

NIH provides several types of grant support. The following groupings represent the main types of grant funding:

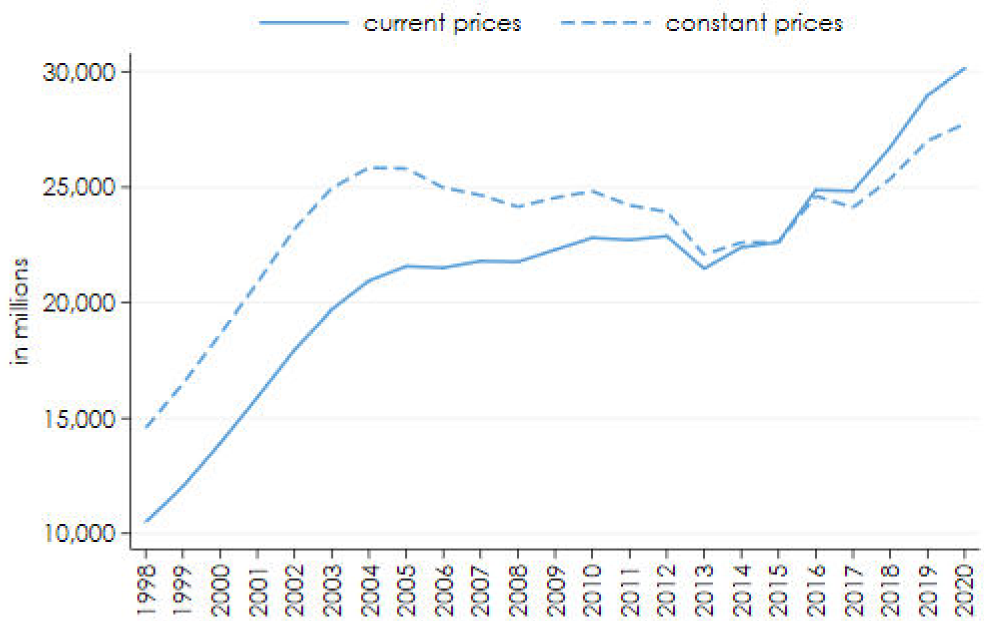
- Research Grants (R series)
- Small Business Grants (R): These small business programs support research and development by small businesses of innovative technologies that have the potential to succeed commercially or provide significant societal benefits.
- Career Development Awards (K series) & Research Training and Fellowships (T&F series) provide institutional research training opportunities (including international) to trainees at the undergraduate, graduate, and postdoctoral levels.
- https://grants.nih.gov/training/nrsa.htm (T & F series) provide individual research training opportunities (including international) to trainees at the undergraduate, graduate, and postdoctoral levels.
- Program Project/Center Grants (P series) support large, multi-project efforts that generally include a diverse array of research activities. NIH Institutes and Centers issue funding opportunity announcements to indicate their interest in funding this type of program.
- Resource Grants (various series)
- Trans-NIH Programs support broad-reaching programs that are trans-NIH in nature (e.g. programs of the NIH Common Fund).

Source: Type of Grant Programs, https://grants.nih.gov/grants/funding/funding_program.htm; Small Business Research, https://seed.nih.gov/.

Funding portfolio and data

We first present data on total funding over time, which has more than doubled in constant terms, with steep increases from 1998 to 2004, a relatively flat period from 2004 to 2017 and steep increases thereafter. The table below shows the individual funding schemes (grant mechanisms).

Figure 16: **NIH total funding awarded in current and constant USD, 1998-2020**



Source: NIH Table #103: NIH Research Grants – Total Number of Awards and Total Funding by Grant Mechanism and Activity Code, NIH Funding Facts (until 2017); World bank database for GDP deflator (2015=100); WIFO calculation.

Table 7: **Selected characteristics of the funding schemes, 2020**

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 1998-2020	2010-2020	Bottom-up vs. Top-down	Main aim of funding scheme
Total		**100%**				
Project funding		**69%**	**2.63**	**3.19**		
Single Project Funding (SPF)		51%	-0.72	1.82		
	R01	47%			bottom-up/top-down	To support a discrete, specified, circumscribed project to be performed by the named investigator(s) in an area representing his or her specific interest and competencies.
	R21	3%			bottom-up/top-down	To encourage the development of new research activities in categorical program areas. (Support generally is restricted in level of support and in time.)
	RF1	1%			N/A	To support a discrete, specific, circumscribed project to be performed by the named investigator(s) in an area representing specific interest and competencies based on the mission of the agency, using standard peer review criteria. This is the multi-year funded equivalent of the R01 but can be used also for multi-year funding of other research project grants such as R03, R21 as appropriate.
SPF early career	DP2	0.5%	0.48	-0.10	bottom-up	To support highly innovative research projects by new investigators in all areas of biomedical and behavioral research.
SPF high-risk		4%	3.10	3.37		
	DP1	0.4%			bottom-up	To support individuals who have the potential to make extraordinary contributions to medical research. The NIH Director's Pioneer Award is not renewable.
	DP5	0.09%			bottom-up	To support the independent research project of a recent doctoral degree recipient. This research grant program will encourage exceptionally creative scientists to bypass the typical post-doc research training period in order to move rapidly to research independence. It will encourage institutions to develop independent career tracks for recent graduates in order to demonstrate the benefits of early transition to independence both in terms of career productivity for the candidate and research capability for the institution.
	R35	3%			N/A	To provide long term support to an experienced investigator with an outstanding record of research productivity. This support is intended to encourage investigators to embark on long-term projects of unusual potential.
Networks and multi-project funding		13%	-0.24	-1.91		
	P01	2%			N/A	For the support of a broadly based, multidisciplinary, often long-term research program which has a specific major objective or a basic theme. A program project generally involves the organized efforts of relatively large groups, members of which are conducting research projects designed to elucidate the

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 1998-2020	2010-2020	Bottom-up vs. Top-down	Main aim of funding scheme
						various aspects or components of this objective. Each research project is usually under the leadership of an established investigator. The grant can provide support for certain basic resources used by these groups in the program, including clinical components, the sharing of which facilitates the total research effort. A program project is directed toward a range of problems having a central research focus, in contrast to the usually narrower thrust of the traditional research project. Each project supported through this mechanism should contribute or be directly related to the common theme of the total research effort. These scientifically meritorious projects should demonstrate an essential element of unity and interdependence, i.e., a system of research activities and projects directed toward a well-defined research program goal.
	U01	6%			N/A	To support a discrete, specified, circumscribed project to be performed by the named investigator(s) in an area representing his or her specific interest and competencies.
	U19	2%			N/A	To support a research program of multiple projects directed toward a specific major objective, basic theme or program goal, requiring a broadly based, multidisciplinary and often long-term approach. A cooperative agreement research program generally involves the organized efforts of large groups, members of which are conducting research projects designed to elucidate the various aspects of a specific objective. Substantial Federal programmatic staff involvement is intended to assist investigators during performance of the research activities, as defined in the terms and conditions of award. The investigators have primary authorities and responsibilities to define research objectives and approaches, and to plan, conduct, analyze, and publish results, interpretations and conclusions of their studies. Each research project is usually under the leadership of an established investigator in an area representing his/her special interest and competencies. Each project supported through this mechanism should contribute to or be directly related to the common theme of the total research effort. The award can provide support for certain basic shared resources, including clinical components, which facilitate the total research effort. These scientifically meritorious projects should demonstrate an essential element of unity and interdependence.
	UM1	3%			N/A	To support cooperative agreements involving large-scale research activities with complicated structures that cannot be appropriately categorized into an available single component activity code, e.g. clinical networks, research programs or consortium. The components represent a variety of supporting functions and are not independent of each component. Substantial federal programmatic staff involvement is intended to assist investigators during performance of the research activities, as defined in the terms and conditions of the award. The performance period may extend up to seven years but only

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 1998-2020	2010-2020	Bottom-up vs. Top-down	Main aim of funding scheme
						through the established deviation request process. ICs desiring to use this activity code for programs greater than 5 years must receive OPERA prior approval through the deviation request process.
Interdisciplinary research	T90	0.02%	0.02	0.01	N/A	To support comprehensive interdisciplinary research training programs at the undergraduate, predoctoral and/or postdoctoral levels, by capitalizing on the infrastructure of existing multidisciplinary and interdisciplinary research programs.
Infrastructure		**5%**	**2.02**	**1.43**		
	P30	3%			N/A	To support shared resources and facilities for categorical research by a number of investigators from different disciplines who provide a multidisciplinary approach to a joint research effort or from the same discipline who focus on a common research problem. The core grant is integrated with the center's component projects or program projects, though funded independently from them. This support, by providing more accessible resources, is expected to assure a greater productivity than from the separate projects and program projects.
	R24	0.4%			N/A	To support research projects that will enhance the capability of resources to serve biomedical research.
	U24	2%			N/A	To support research projects contributing to improvement of the capability of resources to serve biomedical research.
Funding of people		**6%**	**-0.17**	**-0.49**		
Education & Training		2%				
	T32	2%			N/A	To enable institutions to make National Research Service Awards to individuals selected by them for predoctoral and postdoctoral research training in specified shortage areas.
	T34	0.08%			N/A	To enhance the undergraduate research training of individuals from groups underrepresented in biomedical, behavioral, clinical and social sciences through Institutional National Research Service Award Training Grants, in preparation for research doctorate degree programs.
	T35	0.02%			N/A	To provide individuals with research training during off-quarters or summer periods to encourage research careers and/or research in areas of national need.
	TL1	0.10%			N/A	To support research training experiences for pre-doctoral trainees who are interested in pursuing research careers in multi-disciplinary clinical and translational science. The training award is administratively linked to another project or projects. A TL1 award may only be disaggregated from a U54 application and organizations may not apply for a TL1, Linked Training Award. The TL1 is used in lieu of the T32 for those programs that offer linked awards.
Career		3%	0.83	-0.05		

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 1998-2020	2010-2020	Bottom-up vs. Top-down	Main aim of funding scheme
	F30	0.1%			N/A	Individual fellowships for predoctoral training which leads to the combined M.D./Ph.D. degrees.
	F31	0.2%			N/A	To provide predoctoral individuals with supervised research training in specified health and health-related areas leading toward the research degree (e.g., Ph.D.).
	F32	0.2%			N/A	To provide postdoctoral research training to individuals to broaden their scientific background and extend their potential for research in specified health-related areas.
	F33	0.0002%			N/A	To provide opportunities for experienced scientists to make major changes in the direction of research careers, to broaden scientific background, to acquire new research capabilities, to enlarge command of an allied research field, or to take time from regular professional responsibilities for the purpose of increasing capabilities to engage in health-related research.
	K00	0.03%			N/A	To support the second phase of a Pre-Doctoral to Post-Doctoral Transition award program that provides 3-4 years of career support. Note: The K00 Post-doctoral Transition Award is anticipated to only be used in conjunction with the F99 Pre-Doctoral Award.
	K01	0.5%			N/A	For support of a scientist, committed to research, in need of both advanced research training and additional experience.
	K02	0.01%			N/A	For support of a scientist, committed to research, in need of additional experience.
	K07	0.03%			N/A	To create and encourage a stimulating approach to disease curricula that will attract high quality students, foster academic career development of promising young teacher-investigators, develop and implement excellent multidisciplinary curricula through interchange of ideas and enable the grantee institution to strengthen its existing teaching program.
	K08	0.6%			N/A	To provide the opportunity for promising medical scientists with demonstrated aptitude to develop into independent investigators, or for faculty members to pursue research aspects of categorical areas applicable to the awarding unit, and aid in filling the academic faculty gap in these shortage areas within health profession's institutions of the country.
	K12	0.3%			N/A	For support to a newly trained clinician appointed by an institution for development of independent research skills and experience in a fundamental science within the framework of an interdisciplinary research and development program.
	K18	0.003%			N/A	Provides either full-time or part-time support for experienced scientists who wish to broaden their scientific capabilities or to make changes in their research careers by acquiring new research skills or knowledge. Career enhancement experiences supported by this award should usually last no more than one year.

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 1998-2020	2010-2020	Bottom-up vs. Top-down	Main aim of funding scheme
	K22	0.06%			N/A	To provide support to outstanding newly trained basic or clinical investigators to develop their independent research skills through a two phase program; an initial period involving and intramural appointment at the NIH and a final period of support at an extramural institution. The award is intended to facilitate the establishment of a record of independent research by the investigator in order to sustain or promote a successful research career.
	K23	0.7%			N/A	To provide support for the career development of investigators who have made a commitment to focus their research endeavors on patient-oriented research. This mechanism provides support for a 3 year minimum up to 5 year period of supervised study and research for clinically trained professionals who have the potential to develop into productive, clinical investigators.
	K24	0.1%			N/A	To provide support for the clinicians to allow them protected time to devote to patient-oriented research and to act as mentors for beginning clinical investigators.
	K25	0.03%			N/A	To engender and foster such activities by supporting the career development of investigators with quantitative scientific and engineering backgrounds outside of biology or medicine who have made a commitment to focus their research endeavors on behavioral and biomedical research (basic or clinical). This mechanism is aimed at research-oriented scientists with experience at the level of junior faculty (e.g., early to mid-levels of assistant professor or research assistant professor ranks). This award provides support for a period of mentored study and research for professionals with such backgrounds who have the potential to integrate their expertise with biomedicine and develop into productive investigators. Examples of quantitative scientific and technical backgrounds outside of biology or medicine considered appropriate for this award include, but are not limited to: mathematics, statistics, computer science, informatics, physics, chemistry, and engineering.
	K43	0.02%			N/A	For support of a Low- or Middle-Income Country scientist, committed to research at a Low- or Middle-Income Country institution, in need of career development and additional mentored research experience.
	K76	0.03%			N/A	To advance the development of physician-scientists prepared to take an active role in addressing both present and future challenges of a global biomedical research enterprise as relevant to their field of expertise.
	K99	0.2%			N/A	To support the initial phase of a Career/Research Transition award program that provides 1-2 years of mentored support for highly motivated, advanced postdoctoral research scientists.
	KL2	0.2%			N/A	To support newly trained clinicians appointed by an institution for activities related to the development of a successful clinical and translational research career. The award is administratively linked to another project or projects. A KL2 award may

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 1998-2020	2010-2020	Bottom-up vs. Top-down	Main aim of funding scheme
						only be disaggregated from a U54 application and organizations may not apply for a KL2, Mentored Career Development Award. The KL2 is used in lieu of the K12 for those programs that offer linked awards.
Diversification	TL4	0.03%	0.03	0.03	N/A	To enhance the undergraduate research training of individuals from groups underrepresented in biomedical, behavioral, clinical and social sciences through Institutional National Research Service Award Training Grants, in preparation for research doctorate degree programs. This is the linked equivalent of the T34.
Translation		**11%**	**1.68**	**-2.97**		
Applied Research		4%	1.90	-0.90		
	P20	1%			N/A	To support planning for new programs, expansion or modification of existing resources, and feasibility studies to explore various approaches to the development of interdisciplinary programs that offer potential solutions to problems of special significance to the mission of the NIH. These exploratory studies may lead to specialized or comprehensive centers.
	U10	0.5%			N/A	To support clinical evaluation of various methods of therapy and/or prevention in specific disease areas. These represent cooperative programs between sponsoring institutions and participating principal investigators, and are usually conducted under established protocols.
	UG1	1%			N/A	To support single project applications conducting clinical evaluation of various methods of therapy and/or prevention (in specific disease areas). Substantial federal programmatic staff involvement is intended to assist investigators during performance of the research activities, as defined in the terms and conditions of the award. NOTE: The UG1 is the single-component companion to the U10 which is used for multi-project applications only.
	UL1	1%			N/A	To support clinical and translational research. The UL1 administratively linked to another project or projects. AUL1 award may only be disaggregated from a U54 application and organizations may not apply for a UL1, Linked Specialized Center Cooperative Agreement. The UL 1 activity code is used in lieu of the U54 for those programs that offer linked awards.
R&D Collaboration with firms		4%	1.17	0.82		
	R41	0.2%			N/A	To support cooperative R&D projects between small business concerns and research institutions, limited in time and amount, to establish the technical merit and feasibility of ideas that have potential for commercialization. Awards are made to small business concerns only.
	R42	0.3%			N/A	To support in - depth development of cooperative R&D projects between small business concerns and research institutions, limited in time and amount, whose

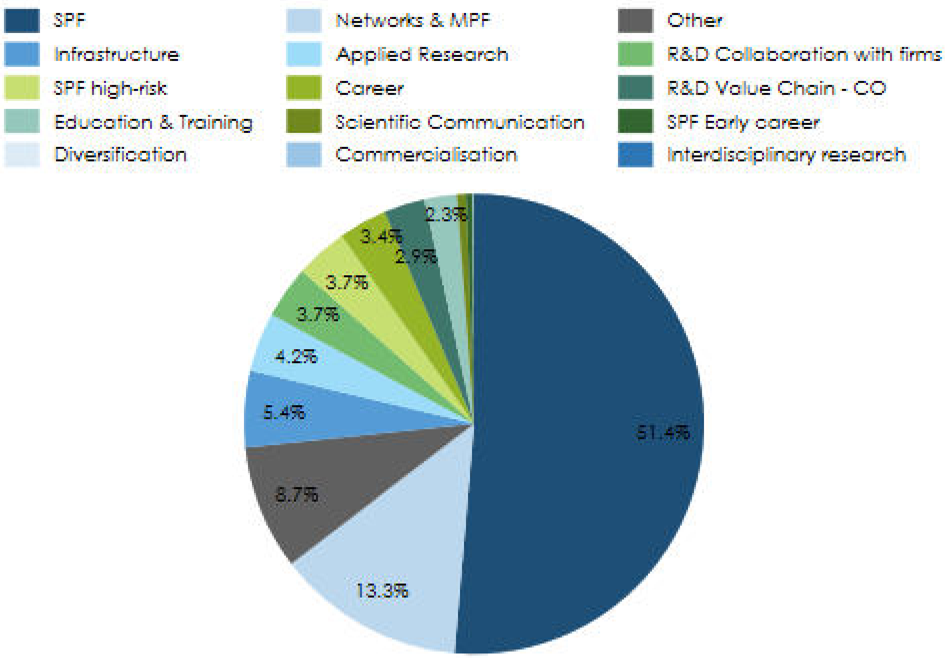
Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 1998-2020	2010-2020	Bottom-up vs. Top-down	Main aim of funding scheme
						feasibility has been established in Phase I and that have potential for commercialization. Awards are made to small business concerns only.
	R43	0.5%			N/A	To support projects, limited in time and amount, to establish the technical merit and feasibility of R&D ideas which may ultimately lead to a commercial product(s) or service(s).
	R44	3%			N/A	To support in - depth development of R&D ideas whose feasibility has been established in Phase I and which are likely to result in commercial products or services. SBIR Phase II are considered “Fast-Track” and do not require National Council Review.
	U43	0.002%			N/A	To support projects, limited in time and amount, to establish the technical merit and feasibility of R&D ideas that may ultimately lead to commercial products or services.
	U44	0.06%			N/A	To support in-depth development of R&D ideas whose feasibility has been established in Phase I and that are likely to result in commercial products or services.
	UT2	0.02%			N/A	To support in-depth development of cooperative research and development projects between small business concerns and research institutions, limited in time and amount, whose feasibility has been established in Phase I and that have potential for commercialization.
Commercialisation	SB1	0.02%	0.02	0.02	N/A	To support follow-on awards to small businesses for technology development, testing, evaluation, and commercialization assistance for SBIR or STTR Phase II technologies or for awards to small businesses to support the progress of research, research and development, and commercialization conducted under the SBIR or STTR programs to Phase III.
R&D Value Chain - Challenge Orientation		3%	-1.41	-2.90		
	P50	1%			N/A	To support any part of the full range of research and development from very basic to clinical; may involve ancillary supportive activities such as protracted patient care necessary to the primary research or R&D effort. The spectrum of activities comprises a multidisciplinary attack on a specific disease entity or biomedical problem area. These grants differ from program project grants in that they are usually developed in response to an announcement of the programmatic needs of an Institute or Division and subsequently receive continuous attention from its staff. Centers may also serve as regional or national resources for special research purposes.
	U54	2%			N/A	To support any part of the full range of research and development from very basic to clinical; may involve ancillary supportive activities such as protracted patient care necessary to the primary research or R&D effort. The spectrum of

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 1998-2020	2010-2020	Bottom-up vs. Top-down	Main aim of funding scheme
						activities comprises a multidisciplinary attack on a specific disease entity or biomedical problem area. These differ from program project in that they are usually developed in response to an announcement of the programmatic needs of an Institute or Division and subsequently receive continuous attention from its staff. Centers may also serve as regional or national resources for special research purposes, with funding component staff helping to identify appropriate priority needs.
Scientific Communication	**R25**	**0.6%**	**0.14**	**-0.04**	**N/A**	**For support to develop and/or implement a program as it relates to a category in one or more of the areas of education, information, training, technical assistance, coordination, or evaluation.**

Source: https://grants.nih.gov/grants/funding/ac_search_results.htm (1/12/21); WIFO calculation. Note: The sum of the shares does not equal 100%, as not all activity codes were taken into account due to their small percentage share.

The NIH has a high share of project related funding, with single and multi-project/networked funding accounting for almost two thirds of funding. The remaining third is characterised by a broad funding portfolio, including career, infrastructure and translational funding. There is no thematic funding per se, which however has to be seen in the light of the NIH being a discipline-specific funding agency so that all of NIH's funding could be seen as thematically oriented.

Figure 17: **Total funding awarded by the NIH by type of funding activity, 2020**

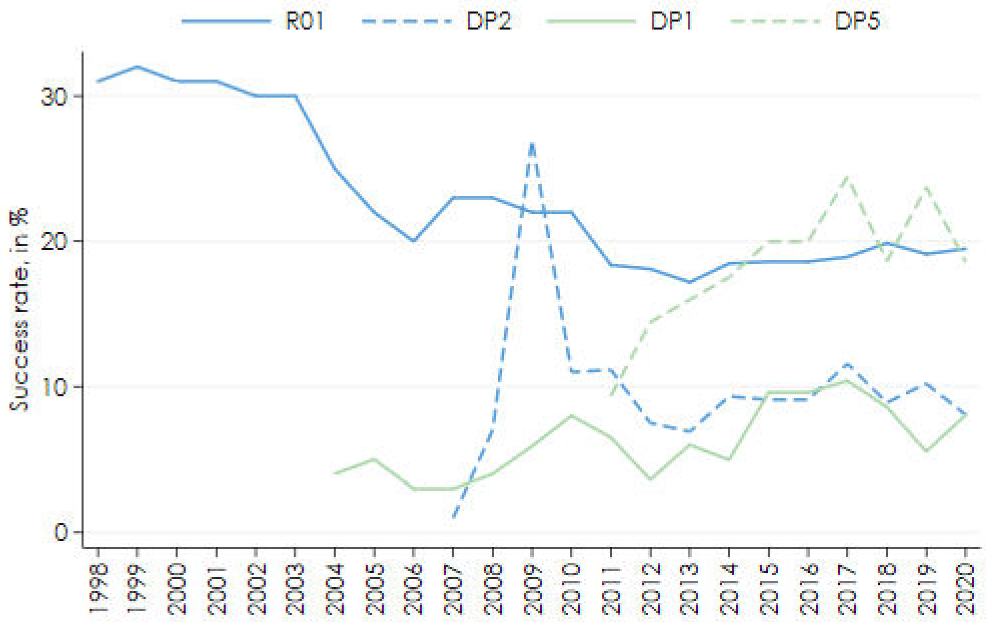


Source: Data was provided by the NIH, WIFO calculation. Note: SPF = Single project funding (SPF), Networks & MPF = Networks and multi-project funding; R&D Value Chain – CO = R&D Value Chain – Challenge Orientation. The category „Other" includes those activity codes that were not taken into account due to their small percentage share. Shares below 2% of total funding are not shown in the chart

Single project funding

For single project funding, we only provide success rates over time; a split by discipline is not applicable in the case of the NIH; further information is provided in section 3. High-risk and early career funding schemes show low success rates of about 10%.

Figure 18: **Success rate in single project funding (R01), SPF high-risk (DP1 and DP5) and SPF Early career (DP2), 1998-2020**



Source: NIH Table #206: Research Project Grants (RPGs) – Competing Applications, Awards, Success Rate and Total Funding by Competing Status (Type), NIH Funding Facts (until 2017). Note: SPF = Single Project Funding.

3.3.3 Refundable costs and peer review

The following costs will be refunded:

- Wage(s) of the applicant(s)/principal investigator,
- Wages of scientific/technical staff,
- Material expenses (i.e. Costs for equipment and materials of permanent value, direct costs for the use of infrastructures (including costs for maintenance and care), consumables, field expenses, computing time and data (cloud computing), costs for making research data accessible (open research data),
- Mobility (Travel (incl. accommodation and catering costs), conferences and workshops,
- Third-party expenses (Costs of project partners (not wages), consulting, consortia, outsourcing through subcontracting),
- Costs of scientific (open access) publications,
- Administrative/indirect costs (e.g. depreciation; maintenance; library costs; interest on debt; general administrative expenses; departmental administrative expenses; sponsored projects administration; and student administration expenses, from Stephan, 2012)

- Indirect cost rate (overheads): in principle, 100% of indirect costs are reimbursed - Research institutions in the US can have their full indirect costs reimbursed for all federal research grants: in 2010. the indirect cost rate (the indirect costs relative to the direct costs) amounted to 29.8-69% of the direct cost of research (Sale - Sale, 2010). Universities calculate the indirect costs they ask for themselves, subject to an audit by the agency and to guidelines by the OMB (Office of Management and Budget), it is not determined by the agencies. This is a time-consuming process which is updated every three years (Stephan, 2012).

Source: https://oamp.od.nih.gov/division-of-financial-advisory-services/indirect-cost-branch/indirect-cost-submission/indirect-cost-definition-and-example, https://grants.nih.gov/grants/policy/nihgps/html5/section_7/7_cost_consideration.htm?tocpath=7%20Cost%20Consideration%7C_____0.

Table 8: **Overview of review process**

The following information is taken from the NIH website. It shows the general review process, standard criteria and considerations. If individual funding schemes may have additional criteria and consideration it is mentioned in the individual Funding Opportunity Announcements (FOAs).

Internal/External reviewers:	external/internal reviewers by Scientific Review Group (SRG) and National Advisory Council/Board (NAC) of the potential awarding Institute/Center (IC)
Number of reviewers (per review panel):	20-30
International/National reviewers:	national
Organisation of Review:	panel review by SRG and NAC of the potential awarding IC **1st level of the review process (initial peer review):** A SRG (or study section) is led by SRO (Scientific Review Officer, an NIH extramural staff scientist) who selects the individual peer reviewers (study sections are composed of pre-selected members serving multiyear terms, to which the SRO may add additional reviewers). Individual reviewers prepare written grant reviews and discuss the scientific and technical merit of the applications under review in the SRG meeting. Federal officials may participate if they have pertinent responsibilities, NIH staff by decision of the SRO. Note SRGs: no more than ¼ of the members of any SRG may be federal employees. **2nd level of the review process:** Advisory Council/Board of the potential awarding Institute/Center as reviewer (scientists from the extramural research community and public representatives – NIH maintains over 150 charted advisory committees, authorized by the Public Health Service Act). Members are chosen by the respective IC and are approved by the Department of Health and Human Services. For certain committees, members are appointed by the President of the United States). Council members have access to applications and summary statements pending funding for that IC in that council round. NIH program staff also provide a grant funding plan to the AC/B, and applications by investigators who already receive more than USD 1 million in funding are subject to a Special Council Review. The Advisory Council/Board also considers the Institute/Center's goals and needs and advises the Institute/Center director concerning funding decisions. The Institute/Center director makes final funding decisions based on staff and Advisory Council/Board advice.
Assessment criteria (incl. weights or relative importance. if available):	**Scored Review Criteria** (scored individually and considered in overall impact score) (see details below for Research Project Grant (R01)): • Significance Does the project address an important problem or a critical barrier to progress in the field? Is there a strong scientific premise for the project? If the aims of the project are achieved, how will scientific knowledge, technical capability, and/or clinical practice be improved? How will successful completion of the aims change the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field? • Investigator(s): Is the PD/PI well suited to the project? Does the PD/PI have the appropriated experience and training? If Early Stage Investigators or those in the early stages of independent careers, do they have appropriate experience and training? If established, have they demonstrated an ongoing record of accomplishments that have advanced their field(s)? If the project is collaborative or multi-PD/PI, do the investigators have complementary and integrated expertise; are their leadership approach, governance and organizational structure appropriate for the project? Is the effort committed sufficient to perform the proposed research? Innovation

	Does the application challenge and seek to shift current research or clinical practice paradigms by utilizing novel theoretical concepts, approaches or methodologies, instrumentation, or interventions? Are the concepts, approaches or methodologies, instrumentation, or interventions novel to one field of research or novel in a broad sense? Is a refinement, improvement, or new application of theoretical concepts, approaches or methodologies, instrumentation, or interventions proposed? • Approach Are the overall strategy, methodology, and analyses well-reasoned and appropriate to accomplish the specific aims of the project? Have the investigators presented strategies to ensure a robust and unbiased approach, as appropriate for the work proposed? Are potential problems, alternative strategies, and benchmarks for success presented? If the project is in the early stages of development, will the strategy establish feasibility, and will particularly risky aspects be managed? If the project involves human subjects and/or NIH-defined clinical research, are the plans to address 1) the protection of human subjects from research risks, and 2) the inclusion (or exclusion) of individuals on the basis of sex/gender, race, and ethnicity, as well as the inclusion (exclusion) of children, justified in terms of the scientific goals and research strategy proposed? • Environment Will the scientific environment in which the work will be done contribute to the probability of success? Are the institutional support, equipment and other physical resources available to the investigators adequate for the project proposed? Will the project benefit from unique features of the scientific environment, subject populations, or collaborative arrangements? **Additional Review Criteria** (not scored individually, but considered in overall impact score): • Protections for Human Subjects • Inclusion of Women. Minorities & Children • Vertebrate Animals • Biohazards • Resubmission • Renewal • Revision **Additional Review Considerations** (not scored individually and not considered in overall score): • Applications from Foreign Organisations • Selected Agent Research • Resource Sharing Plans • Budget and Period of Support • Additional Comments to the Applicant
Specific criteria for early-career investigators (first-time applicants):	Yes, see **Scored** and **Additional Review Criteria** and **Additional Review Considerations** above, with the following exceptions: • Investigator(s) Is the PD/PI well suited to the project? Does the PD/PI have the appropriated experience and training? If Early Stage Investigators or those in the early stages of independent careers, do they have appropriate experience and training? If established, have they demonstrated an ongoing record of accomplishments that have advanced their field(s)? If the project is collaborative or multi-PD/PI, do the investigators have complementary and integrated expertise; are their leadership approach, governance and organizational structure appropriate for the project? Is the effort committed sufficient to perform the proposed research? Not applicable are following Additional Review Criteria: • Resubmission • Renewal • Revision and following Additional Review Consideration: • Applications from Foreign Organisations

Source: Peer review - https://grants.nih.gov/grants/peer-review.htm#Initial, Review criteria, https://grants.nih.gov/grants/peerreview22713webv2.pdf, https://grants.nih.gov/grants/peer/guidelines_general/Review_Criteria_at_a_glance.pdf, https://grants.nih.gov/grants/peer/critiques/rpg.htm, https://grants.nih.gov/grants/policy/review_templates.htm. https://grants.nih.gov/grants/guide/rfa-files/RFA-RM-21-016.html

Additional information

According to Stephan, 2012, p. 131, "the NIH review process puts considerable weight on past accomplishments, which are enumerated on a standardized NIH biosketch form. Results from the previous grant (if there was one) also play an important role in evaluation. The presence of demonstrated expertise and strong preliminary data play an especially key role in the review process. "No crystal, no grant". A major reason that universities provide start-up funds is to permit the newly hired faculty member time to continue the process of collecting preliminary data for an NIH proposal. The "lineage" of the scientist is often noted, in terms of where the scientist trained and in whose lab the scientist did his or her postdoc work. Researchers must also demonstrate that they have adequate space at their university in which to conduct the research." According to a preliminary analysis of the new NIH scoring system, criteria most highly correlated with the overall impact score are approach and significance, lowest were investigator and environment (Berg, 2010). The analysis was however only done for the National Institute for the General Medical Sciences, so that the results should be interpreted with care.

Source: https://ofacp.od.nih.gov/about_us/overview.asp.

3.3.4 Changes over time

Introduction of new funding schemes

In principle, introducing new activities is a mixture of top-down (government-driven) & bottom-up processes by the NIH centers which have some autonomy in deciding on what to use their funds for. The NIH responds to White House or Administration priorities, but programme/center directors can launch new initiatives themselves as well, when they spot new trends, e.g.

More specifically, the Common Fund was enacted into law by Congress through the 2006 NIH Reform Act to support cross-cutting, trans-NIH programs that require participation by two or more NIH ICs or would otherwise benefit from strategic planning and coordination. The requirements for the Common Fund encourage collaboration across the ICs while providing NIH with flexibility to determine priorities for Common Fund support. To date, the Common Fund has been used to support a series of short-term, exceptionally high-impact, trans-NIH programs, including the High-Risk, High-Reward Research program, which supports several awards to test new ways of fostering innovation and also was authorized through the Reform Act.

It is not the same as the planned ARPA-H (ARPA-Health) however, according to (Collins et al., 2021), as it focuses on new areas of foundational research rather than accomplishing use-driven objectives.

Otherwise, all funding initiatives since 1992 are being kept track of on this website: https://grants.nih.gov/funding/searchguide/index.html. They show that NIH frequently responds to emerging scientific and health challenges, such as AIDS in Africa or most recently the opioid crisis.

Source: https://www.nih.gov/arpa-h.

Other changes

- Shifts in budget shares between schemes

Over time, no big shifts occurred, with project funding and infrastructure increasing somewhat at the expense of translational and career activities.

3.3.5 Information and data sources

Contact at NIH

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NIH Deputy Director for Extramural Research

Michael.lauer@nih.gov

Information about structure of fund

https://www.nih.gov/about-nih/what-we-do/mission-goals

https://oma.od.nih.gov/IC_Organization_Chart/OD%20Organizational%20Chart.pdf

https://www.nih.gov/about-nih/who-we-are/organization

https://www.nih.gov/about-nih/who-we-are/nih-leadership

https://report.nih.gov/sites/re-port/files/docs/NIH%20Institute%20and%20Center%20Funding%20Priorities_DSAR_July%202019.pdf

https://ofacp.od.nih.gov/about_us/overview.asp

Information about application and review procedures

https://grants.nih.gov/grants/funding/funding_program.htm

https://report.nih.gov/biennialreport1213/NIH_OD_Biennial_report_2012-2013_508complete.pdf

https://grants.nih.gov/grants/funding/funding_program.htm

https://www.nimh.nih.gov/funding/sbir/index.shtml

https://grants.nih.gov/grants/peer-review.htm#Initial

https://grants.nih.gov/grants/peerreview22713webv2.pdf,

https://grants.nih.gov/grants/peer/guidelines_general/Review_Criteria_at_a_glance.pdf

https://grants.nih.gov/grants/peer/critiques/rpg.htm

https://grants.nih.gov/grants/policy/review_templates.htm

https://grants.nih.gov/grants/guide/rfa-files/RFA-RM-21-016.html

NIH (2012): Report of the Director National Institutes of Health, Fiscal Year 2012 & 2013

Portfolio & data

https://grants.nih.gov/grants/funding/ac_search_results.htm

NIH Table #103: NIH Research Grants – Total Number of Awards and Total Funding by Grant Mechanism and Activity Code

NIH Table #206: Research Project Grants (RPGs) – Competing Applications, Awards, Success Rate and Total Funding by Competing Status (Type)

NIH Funding Facts (until 2017)

Janger, J. & Schmidt, N. & Strauss, A. (2019). *International differences in basic research grant funding – a systematic comparison.* WIFO. https://www.wifo.ac.at/publikationen/studien?detail-view=yes&publikation_id=61664

3.4 National Research Foundation (NRF, Singapore)

3.4.1 Organisational mission and structure

The NRF focuses more broadly on funding scientific and applied research and on its potential impact or utilisation, as well as being involved in national coordination of thematic research and innovation strategies.

Mission focus

The following information was taken from the NRF's website:

NRF's vision is to develop Singapore as a vibrant science & technology hub, with R&D contributing significantly to a knowledge-intensive, innovative and entrepreneurial economy.

The NRF sets the national direction for R&D by:

- Developing policies, plans and strategies for research, innovation and enterprise;
- Funding initiatives that strengthen research and scientific capabilities, and achieve economic and national impact;
- Building up R&D capabilities and capacities through nurturing people and attracting foreign researchers and scientists; and
- Coordinating the research agenda of different agencies to transform Singapore into a knowledge-intensive, innovative and entrepreneurial economy.

The NRF is also the secretariat to the Research, Innovation and Enterprise Council (RIEC), chaired by the Prime Minister, Mr Lee Hsien Loong. Deputy Prime Minister and Coordinating Minister for Economic Policies Mr Heng Swee Keat is the Chairman of the NRF Board.

Source: https://www.nrf.gov.sg/about-nrf/national-research-foundation-singapore.

Overarching decision structures

The Research, Innovation and Enterprise (RIE) ecosystem in Singapore comprises various ministries, R&D funding bodies and R&D performers. At the top is the Research, Innovation and Enterprise Council (RIEC), chaired by the Prime Minister, which oversees the long-term strategy to transform Singapore into a knowledge-based society, with strong capabilities in research and technology. The RIEC is supported by the National Research Foundation (NRF) Board, which is responsible for the formulation of 5-year plans and policies to grow Singapore's research capability, support economic growth and meet Singapore's future national challenges.

Figure 19: **Research, Innovation and Enterprise (RIE) Ecosystem**

Source: https://www.nrf.gov.sg/about-nrf/rie-ecosystem.

The NRF supports the **Research Innovation and Enterprise Council (RIEC**). The RIEC is chaired by the Prime Minister of Singapore, who appoints members to two-year terms. The RIEC comprises Cabinet Ministers and distinguished local and foreign members from the business, science and technology communities.

Set up in 2006, the RIEC provides strategic direction for national R&D. It has two main goals:

- Advise the Singapore Cabinet on national research and innovation policies and strategies to drive the transformation of Singapore into a knowledge-based society, with strong capabilities in R&D; and
- Lead the national drive to promote research, innovation and enterprise by encouraging new initiatives in knowledge creation in science and technology, and to catalyse new areas of long term economic growth.

This high-level council underscores the political commitment to and importance placed on the national R&D agenda.

The RIEC is supported by the **National Research Foundation (NRF) Board**, comprising top government officials and industry representatives, which is responsible for the formulation of Its 5-year plans and policies to grow Singapore's research capability, support economic growth and meet Singapore's future national challenges.

The Scientific Advisory Board (SAB) is a multi-disciplinary international board with expertise in broad areas of technology. SAB convenes annually in Singapore to advise on NRF's policies and programmes. SAB members are appointed by the Chairman of the NRF Board.

The SAB's role is to:

- Highlight critical issues and emerging global trends in basic and investigator-led research where Singapore could fill a gap or meet a need;
- Identify, with the NRF, new areas of research where Singapore can reap the benefits of cutting edge science and build the foundation for enterprise and industry growth;
- Review and advise on the proposals and plans prepared by the NRF; and
- Assist and advise the NRF on the management of R&D, including the allocation of funding and the assessment of research outcomes.

Source: https://www.nrf.gov.sg/about-nrf/governance, https://www.nrf.gov.sg/about-nrf/rie-ecosystem.

Decision structures for funding & allocation of government funds to agency

The following information was provided by the agency:

> The RIE budget is drawn from the Singapore Government and distributed across various ministries and R&D funding bodies, of which NRF is one of them.

3.4.2 Characteristics of funding schemes

Organisation of funding activities

Singapore's public investment in research and innovation comes in 5-year cycles (known as funding tranche). Currently, they are in the Research, Innovation and Enterprise (RIE) 2025 tranche (from 2021 to 2025). The RIE2025 efforts are organized along four strategic domains, supported by three cross-cutting horizontals.

Strategic domains:

- Manufacturing, Trade and Connectivity
- Human Health and Potential
- Urban Solutions and Sustainability
- Smart Nation and Digital Economy

Cross-cutting horizontals:

- Academic Research
- Research Manpower
- Innovation and Enterprise

Source: Information sent by NRF; https://www.nrf.gov.sg/rie2025-plan.

In addition, NRF uses specific funding schemes (see table below) which may be used in the strategic domains or for one of the cross-cutting horizontals.

Funding portfolio and data

For the NRF, no funding data is available. We hence simply list the schemes which can be found on NRF's website (Table **9**) in order to both provide an illustration of the activities and a rough idea about the financial magnitudes involved.

Table 9: **Programme overview**

Scheme according to study scheme classification	**Programme**	**Bottom-up vs. Top-down**	**Main aim of funding scheme**
Thematic priority area	AI Singapore	top-down	AI Singapore is a national programme in Artificial Intelligence (AI) to catalyse, synergise and boost Singapore's AI capabilities to power our future, digital economy.
Thematic priority area	National Cybersecurity R&D Programme	top-down	The National Cybersecurity R&D Programme (NCR) seeks to develop R&D expertise and capabilities in cybersecurity for Singapore. It aims to improve the trustworthiness of cyber infrastructures with an emphasis on security, reliability, resiliency and usability.
Thematic priority area	Marine Science R&D Programme	top-down	The national Marine Science Research and Development (R&D) Programme (MSRDP) will integrate R&D in tropical marine science and promote active engagement of industry in the drive towards environmental and marine sustainability. It seeks to advance marine science research in Singapore by leveraging Singapore's location in a region with rich marine biodiversity, to develop nationally relevant R&D and to build capabilities that would address the strategic needs of Singapore in the future. Three research themes and one enabling technology theme for MSRDP were identified through discussions with academics, government agencies, stakeholders and industry players. These are: • Marine Ecosystems and Biodiversity • Environment Impact and Monitoring • Coastal Ecological Engineering • Marine Technology and Platforms
Thematic priority area	Synthetic Biology R&D Programme	top-down	The national Synthetic Biology R&D Programme will advance Singapore's synthetic biology research agenda and expertise, as part of efforts to promote a bio-based economy built on deep science capabilities. The programme will integrate and ensure holistic development of synthetic biology capabilities in Singapore, including the translation of research outcomes for clinical and industrial use. Under the programme, NRF will fund research projects under three research thrusts which seek to: Establish a proprietary national strain for commercialisation. Develop a Synthetic Cannabinoid Biology Programme to deliver life-saving therapeutics derived from the cannabis plant in a sustainable manner. Deliver industry relevant projects, in particular the production of rare fatty acids, which have important applications in the pharmaceutical industry.
International Cooperation	International Collaborations		
R&D Collaboration with firms	Technology Consortia	N/A	Over time, individual pockets of research expertise and capabilities have developed, with emerging technology areas among the awarded projects. NRF worked with Institutes of Higher Learning (IHLs) to set up technology consortia, which build on these individual research projects to integrate research outcomes around a technology area.
R&D Collaboration with firms	Corporate Laboratories in Universities	N/A	NRF encourages public-private R&D partnerships between universities and companies through the establishment of corporate laboratories in their universities.

Scheme according to study scheme classification	Programme	Bottom-up vs. Top-down	Main aim of funding scheme
Structural priority area	Campus for Research Excellence and Technological Enterprise (CREATE)	N/A	An international collaboratory, the Campus for Research Excellence and Technological Enterprise (CREATE) houses research centres set up by top universities. Its modern laboratory design has also won CREATE a Laboratory of the Year award. At CREATE, researchers from diverse disciplines and backgrounds work closely together to perform cutting-edge research in strategic areas of interest, for translation into practical applications that can lead to positive economic and societal outcomes for Singapore.
Structural priority area	Research Centres of Excellence	N/A	The National Research Foundation (NRF) and the Ministry of Education (MOE) established the Research Centres of Excellence (RCE) in 2007 to spur research excellence in the local universities. This programme saw the set-up of five research centres within the National University of Singapore (NUS) and the Nanyang Technological University (NTU). RCEs carry out world-class investigator-led research aligned with the long-term strategic interests of Singapore
Infrastructure	National Research Infrastructure	N/A	Singapore requires a wide range of research infrastructure to underpin its development of Research & Development (R&D) capabilities. To coordinate and maximise value from our research infrastructure investments, the National Research Foundation (NRF) introduced the National Research Infrastructure (NRI) framework in April 2015 to guide the development of selected research facilities that are to be operated as a national resource, open to all researchers in Singapore.
Structural priority area	Medium-Sized Centre	N/A	The Medium-Sized Centre funding scheme seeks to consolidate research activities across departments, faculties and universities to create a critical mass of leading researchers in strategic research areas for Singapore.
Commercialisation	I&E Fellowship Programme (IFP)	N/A	The National Research Foundation (NRF) and Enterprise Singapore (ESG) will be jointly administering the Innovation & Enterprise Fellowship Programme (IFP) which aims to grow the pool of deep-tech talent in Singapore that can support the commercialisation of deep-tech research and bring nascent technologies to market. Researchers, Scientists, Engineers (RSEs) or working professionals with technical or business development background can apply to enrol in 9-18 month training programmes, where one would be able to develop commercialisation skills through formal training and on-the-job training with national I&E platforms, accelerators or their portfolio startups.
Mission/Challenge-Orientation	Competitive Research Programme[12]	Bottom-up	The National Research Foundation Competitive Research Programme funding scheme seeks to foster the formation of multi-disciplinary teams to conduct cutting-edge research projects that are of relevance to Singapore and the society. The Competitive Research Programme funds use-inspired basic research projects that are selected through a merit review process based on scientific excellence. The theme of the proposed research project must be motivated by an important need or problem to be solved. Past projects have made discoveries of potential significant impact to industry and society.

[12] See: https://www.nrf.gov.sg/funding-grants/competitive-research-programme

Scheme according to study scheme classification	Programme	Bottom-up vs. Top-down	Main aim of funding scheme
Single project funding (SPF)	NRF Fellowship[13]	Bottom-up	The Singapore NRF Fellowship provides opportunities for early career researchers to carry out independent research in Singapore, over a five-year period. It is open to all areas of science and technology and outstanding young scientists and researchers of all nationalities are welcome to apply.

Source: https://www.nrf.gov.sg/programmes.

[13] See https://www.nrf.gov.sg/funding-grants/competitive-research-programme

Single project funding

In principle, there is a standard grant, bottom-up programme, the Academic Research Tier 2 funding scheme, which is however administered by the Ministry of Education which distributes the funds they have received from the NRF for this funding scheme.

3.4.3 Important changes over time

Introduction of new funding schemes

According to information provided by the NRF, "in the planning process for the next 5-year RIE plan, a stocktake and capability mapping are conducted on the outcomes from … existing investments, to identify areas [in] which … capabilities [were built for] delivering high quality research output, establishing peaks of excellence, and translation of research outcomes to deployment. Consultation with stakeholders, such as key government agencies, local research performers and industry players, and the NRF Scientific Advisory Board (SAB), is usually carried out to identify … strategic national needs, innovation and enterprise capabilities, as well as new and emerging challenges and opportunities, so as to identify gaps and decide which capabilities Singapore should build locally through a build-vs-buy analysis. These will help [NRF] to develop new funding schemes to address any needs that have not been addressed by … existing schemes.

3.4.4 Information and data sources

Contact at NRF

communications@nrf.gov.sg

Information about structure of fund

https://www.nrf.gov.sg/about-nrf/national-research-foundation-singapore

https://www.nrf.gov.sg/about-nrf/rie-ecosystem

https://www.nrf.gov.sg/about-nrf/governance,

https://www.nrf.gov.sg/funding-grants/nrf-fellowship

Portfolio & data

https://www.nrf.gov.sg/programmes

3.5 National Science Foundation (NSF, USA)

3.5.1 Organisational mission and structure

Mission focus

Similar to the NIH, NSF also focuses broadly on knowledge creation as well as the impact of the knowledge created on the economy and society. NSF also emphasises support for school-level education to create interest for studying science. The following information is taken from the NSF website:

NSF is the only federal agency whose mission includes support for all fields of fundamental science and engineering, except for medical sciences.

- The mission of NSF is to promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defence.
- NSF's vision is A Nation that is the global leader in research and innovation
- NSF supports research and workforce development programs that help drive future economic growth and enhance our Nation's security and global competitiveness.
- NSF invests in basic research that sets the stage for transformative breakthroughs and leads to new ways of thinking about scientific, economic, and sociotechnical challenges facing the Nation and the world.
- NSF funds advanced instrumentation and facilities, Arctic and Antarctic research and operations, cooperative research between universities and industry, and U.S. participation in international scientific efforts

Source: FY2020 Performance and Financial Highlights - https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf21003&org=NSF , see also https://www.nsf.gov/about/ and https://www.nsf.gov/about/who.jsp.

Table 10: **NSF goal structure**

Strategic Goal		Strategic Objective
1	Expand knowledge in science, engineering, and learning.	**1.1 | Knowledge** Advance knowledge through investments in ideas, people, and infrastructure.
		1.2 | Practice Advance the practice of research.
2	Advance the capability of the Nation to meet current and future challenges.	**2.1 | Societal Impacts** Support research and promote partnerships to accelerate innovation and to provide new capabilities to meet pressing societal needs.
		2.2 | STEM Workforce Foster the growth of a more capable and diverse research workforce and advance the scientific and innovation skills of the Nation.
3	Enhance NSF's performance of its mission.	**3.1 | Human Capital** Attract, retain, and empower a talented and diverse workforce.
		3.2 | Processes and Operations Continually improve agency operations.

Source: NSF FY2020 Performance and Financial Highlights, p. 3.

Overarching decision structures

The following information was provided by the NSF:

NSF is a federal / governmental agency where external scientists *who participate in the NSF merit review process* provide expert advice but do not determine who gets funded. External scientists however work at at the NSF, e.g. on loan from their research institutions, among others as directors for PhD / scientist programmes. On a temporary position, they bring front-line research expertise to the NSF. It is divided into the following seven directorates that support science and engineering research and education: Biological Sciences, Computer and Information Science and Engineering, Education and Human Resources, Engineering, Geosciences, Mathematical and Physical Sciences and Social, Behavioral and Economic Sciences. Each is headed by an assistant director, who go through a competitive application process. Within NSF's Office of the Director, the Office of Integrative Activities also supports research and researchers. Other sections of NSF are devoted to financial management, award processing and monitoring, legal affairs, outreach and other functions.

Organisational Chart: https://www.nsf.gov/staff/organizational_chart.pdf.

General/strategic decision making

The **Office of the Director (OD)** houses the Foundation's top leadership, and oversees all Foundation activities from the development of policy priorities to the establishment of administrative and management guidelines, including long-range planning. The positions of Director and Deputy Director are appointed by the President and confirmed by the U.S. Senate. NSF's statutory authority establishes a six-year term for the Director.

Each federal agency has an **Office of Inspector General (OIG)** that provides independent oversight of the agency's programs and operations. The office is responsible for promoting efficiency and effectiveness in agency programs and for preventing and detecting fraud, waste, and abuse. By statute, the NSF OIG is independent from the agency, with the IG reporting directly to the National Science Board and the Congress. OIG consults NSF in developing their plans and obtain agency feedback on reports before they are issued. Semi-annually, the OIG submits a summary report of its activities to the Congress, National Science Board, and NSF.

The **National Science Board (NSB)** is made up of 25 Members appointed by the President. The NSF Director is an ex officio Member. Members serve six-year terms. With the exception of the NSF Director, one-third of the Board is appointed every two years. NSB Members are drawn from industry and universities, and represent a variety of science and engineering disciplines and geographic areas. The NSB is apolitical and has two important roles. First, it establishes the policies of NSF within the framework of applicable national policies set forth by the President and the Congress. In this capacity, the Board identifies issues that are critical to NSF's future, approves NSF's strategic budget directions and the annual budget submission to the Office of Management and Budget, and approves new major programs and awards. The NSB also sets NSF's merit review criteria (see below, peer review). The second role of the Board is to serve as an independent body of advisors to both the President and the Congress on policy matters related to science and engineering and education in science and engineering. In addition to major reports, the NSB also publishes occasional policy papers or statements on issues of importance to U.S. science and engineering.

Source: https://www.nsf.gov/staff/orglist.jsp ; https://www.nsf.gov/nsb/about/index.jsp.

Decision structures for funding

Decision structures for funding proposals are quite simple, in that the NSF lacks a second stage discussion among outside external reviewers to decide on funding, as the NSF Program Officer recommends to the Division Director whether the proposal should be declined or recommended for award based on the first-stage review results: external peer review is advisory, the decision-making authority lies in NSF.

Funding and budget implementation at the aggregate agency level is done by the **Budget Division**, located within the Office of Budget, Finance and Award Management (BFA), which is responsible for the development, analysis, and execution of the Foundation's annual budget to the Office of Management and Budget and the Congress. This responsibility encompasses budget formulation and development, implementation and management of appropriate budget operations and control processes through development of operating plans and special analyses, assisting the development of long-range plans for the Foundation, and assisting the Chief Financial Officer (CFO) and Deputy CFO in the resource management of the Foundation.

The mission of the **Division of Acquisition and Cooperative Support (DACS)** is to provide comprehensive acquisition and cooperative agreement award leadership. DACS is responsible for solicitation, negotiation, award and administration of NSF contracts and of complex cooperative agreements for NSF's research facilities, and major centers' programs such as Science Technology Centers (STC's) and Engineering Research Centers (ERC's). DACS is also responsible for overseeing NSF procurement systems, contracts policy, processes and guidance.

The **Division of Grants and Agreements (DGA)** is responsible for the award of NSF grants and agreements recommended for support by NSF program offices. From pre-award through closeout, DGA conducts a variety of business, financial, and award administrative reviews to ensure compliance with award terms and conditions, NSF policies and procedures, and Federal rules and regulations.

Source: https://www.nsf.gov/bfa/.

Allocation of government funding to agency

The NSF is funded primarily through six Congressional appropriations to which it submits an annual budget request. Research & Related Activities (R&RA), Education & Human Resources (EHR) and Major Research Equipment & Facilities Construction (MREFC) fund the agency's programmatic activities and account for 95 percent of NSF's total appropriations. The Agency Operations & Award Management (AOAM) appropriation provides funds to administer and manage those programmatic activities. Separate appropriations are provided to support the activities of the Office of Inspector General (OIG) and National Science Board (NSB).

Source: FY2020 Performance and Financial Highlights - https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf21003&org=NSF

3.5.2 Characteristics of funding schemes

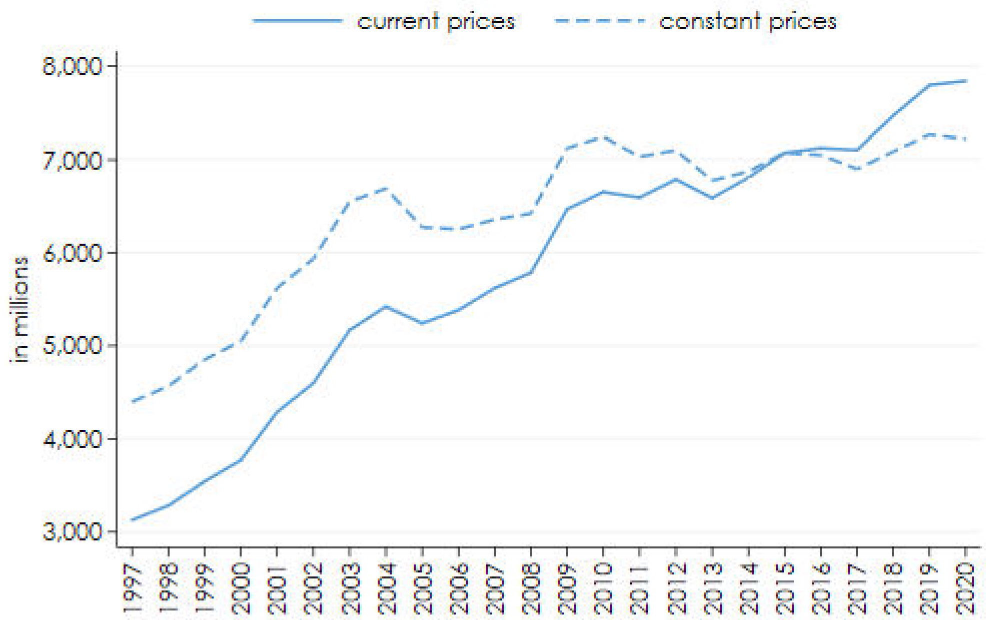
Organisation of funding activities

The NSF allocates money through common funding schemes (see table below) for seven discipline-specific directorates (research areas); time-series data are only available at a higher aggregation level however.

Funding portfolio and data

We start with the total funding awarded by the NSF, which has increased considerably in constant terms between 1997 and 2004, but since remained relatively flat.

Figure 20: **NSF total funding awarded in current and constant USD, 1997-2020**



Source: NSF Budget Requests – NSF Summary Table; World bank database for GDP deflator (2015=100); WIFO calculation. Note: Total funding is the sum of Research & Related Activities, Education & Human Resources and Major Research Equipment & Facilities Construction.

Next, we present the funding activities for which data are available over time but add more detail in the text following the table.

Table 11: **Selected characteristics of the funding schemes, 2020**

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 1997-2020	2010-2020	Bottom-up vs. Top-down	Main aim of funding scheme
Total		**100%**				
Project funding		**45%**	**-15.26**	**-4.10**		
Single Project Funding (SPF)	Research	42%	-9.99	-3.38	bottom-up	The "Research" Category involves different kinds of single-project funding, among them standard research grants, but also more specific mechanisms such as RAPID (see list below). Funding within the R&RA Appropriation invests in early-stage research as well as development of a future-focused science and engineering workforce that can support the private sector and accelerate progress in basic science and engineering research. NSF is the only federal agency dedicated to funding basic research across all areas of non-biomedical science and engineering. [Link, p. RRA-1]
Interdisciplinary research	Centers	3%	-5.28	-0.72	N/A	NSF supports a variety of centers programs that contribute to the Foundation's mission and vision. Centers exploit opportunities in science, engineering, and technology in which the complexity of the research program or the resources needed to solve the problem require the advantages of scope, scale, duration, equipment, facilities, and students. Centers are a principle means by which NSF fosters interdisciplinary research. [Link, p. NSF-Wide Investments-57]
Infrastructure		**24%**	**8.72**	**-3.38**		The Nation's science and engineering activities rely on instrumentation that is geographically and technically accessible, cost effective, and managed well. To meet the infrastructure needs of the entire community, NSF is dedicated to supporting activities that ensure that instrumentation and infrastructure can be designed, developed, acquired, or constructed across the Nation, through programs with focused oversight and investments. [Link, p. Overview-9]
	Infrastructure	22%			N/A	
	Major Research Equipment & Facilities Construction	2%			N/A	
Funding of people		**21%**	**18.00**	**0.25**		
Education & Training		13%	12.76	-4.71		

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 1997-2020	2010-2020	Bottom-up vs. Top-down	Main aim of funding scheme
	Education & Human Resources	10%			N/A	The mission of EHR is to achieve excellence in U.S. science, technology, engineering and mathematics (STEM) education at all levels and in all settings (both formal and informal) in order to support the development of a diverse and well-prepared workforce of scientists, technicians, engineers, mathematicians and educators and a well-informed citizenry that have access to the ideas and tools of science and engineering. The purpose of these activities is to enhance the quality of life of all citizens and the health, prosperity, welfare and security of the nation. [Link]
	Education	2%			N/A	NSF is investing in education research across all levels of learning — from preK-12 through graduate education and beyond — which then informs education and training programs to better develop skill sets in cutting-edge technologies, promote highly collaborative team science, and foster greater diversity in the workforce. [Link, p. Overview-2]
Career	Career	5%	1.91	1.63	bottom-up/top-down	The CAREER program offers NSF's most prestigious awards in support of early-career faculty and is designed to provide stable support at a sufficient level and duration to enable awardees to develop careers not only as outstanding researchers but also as educators demonstrating commitment to teaching, learning, and dissemination of knowledge. [Link, p. NSF-Wide Investments-70]
Diversification	Programs to Broaden Participation	3%	3.33	3.33	N/A	NSF has taken a variety of approaches to broaden participation across its many programs. While broadening participation is included in the NSF review criteria, some program announcements and solicitations go beyond the standard criteria. They range from encouraging language to specific requirements. Investments range from capacity building, research centers, partnerships, and alliances to the use of co-funding or supplements to existing awards in the core research programs. [Link, p. Summary Tables-15]
Translation		**3%**	**-0.07**	**0.60**		
R&D Collaboration with firms	SBIR/STTR	3%			bottom-up	The Small Business Innovation Research (SBIR) / Small Business Technology Transfer (STTR) programs provide early stage, high-tech small businesses with grants for proof-of-concept / feasibility research that could potentially be followed by grants for cutting-edge, high-quality scientific research and development to de-risk their technologies. [Link]

Source: Data provided by the NSF; https://www.nsf.gov/about/budget/; WIFO calculation. Note: The sum of the shares does not equal 100%, as not all expenditures can be classified according to the study scheme classification.

Standard research grants dominate within NSF's funding portfolio (Figure 21); single project funding should be interpreted with care, as many different grant mechanisms (see box below, e.g., RAPID, EAGER, etc.) are summarised within this category (for indications of the size, see percentages in box below). At any time, scientists and engineers are also welcome to send in **unsolicited proposals** for research and education projects, in any existing or emerging field (see https://www.nsf.gov/about/how.jsp). NSF shows a large role for infrastructure spending, as well as for education & training. Career and translational schemes play a much smaller role by comparison. Note however that all research proposals to NSF are also reviewed according to potential impact (see section 2.7.3.), so that a translational perspective is built into the standard research grants. Funding by discipline shows that close to half of all funds go to natural sciences, followed by engineering, interdisciplinary research and social sciences and humanities. Note that the NSF is only one of the main US grant-based research funding organisations and that medicine is funded by NIH, so that the funding portfolio in terms of disciplines needs to be assessed together with the NIH (see section 3).

The following information on more detailed grant mechanisms is taken from the NSF website.

At NSF proposals may be submitted in response to the various funding opportunities that are announced on the NSF website. These funding opportunities fall into three categories -- program descriptions, program announcements and program solicitations -- and are the mechanisms NSF uses to generate funding requests (for a full list of funding schemes, see: https://www.nsf.gov/funding/azindex.jsp).

In addition to standard research proposals, there are other types of proposals that may be submitted to NSF[14]:

- **Rapid Response Research (RAPID) Proposal:** RAPID is a type of proposal used when there is a severe urgency with regard to availability of, or access to, data, facilities or specialized equipment, including quick-response research on natural or anthropogenic disasters and similar unanticipated events (2019: 0.1% of Obligations).
- **Early-concept Grants for Exploratory Research (EAGER) Proposal:** EAGER is a type of proposal used to support exploratory work in its early stages on untested, but potentially transformative, research ideas or approaches. This work may be considered especially "high risk-high payoff" in the sense that it, for example, involves radically different approaches, applies new expertise, or engages novel disciplinary or interdisciplinary perspectives (2019: 0.8% of Obligations).
- **Research Advanced by Interdisciplinary Science and Engineering (RAISE) Proposal:** RAISE is a type of proposal that may be used to support bold, interdisciplinary projects whose scientific advances lie in great part outside the scope of a single program or discipline, such that substantial funding support from more than one program or discipline is necessary; whose lines of research promise transformational advances; whose prospective discoveries reside at the interfaces of disciplinary boundaries that may not be recognized through traditional review or co-review.

[14] For more detailed information, see https://www.nsf.gov/pubs/policydocs/pappg18_1/pappg_2.jsp#IIE6, Chapter E. Types of proposals.

- **Grant Opportunities for Academic Liaison with Industry (GOALI) Proposal:** GOALI is a type of proposal that seeks to stimulate collaboration between academic research institutions and industry. Under this proposal type, academic scientists and engineers request funding either in conjunction with a regular proposal submitted to a standing NSF program or as a supplemental funding request to an existing NSF-funded award. GOALI is not a separate program.
- **Ideas Lab Proposal:** "Ideas Lab" is a type of proposal to support the development and implementation of creative and innovative project ideas that have the potential to transform research paradigms and/or solve intractable problems. An Ideas Lab may be run independently, or in parallel, with the issuance of an NSF funding opportunity on the same topic. These project ideas typically will be high-risk/high-impact, as they represent new and unproven ideas, approaches and/or technologies. This mechanism was developed collaboratively within NSF, modeled on the "sandpit" workshops that are a key component of the United Kingdom Research Council's "IDEAs Factory" program.
- **Facilitation Awards for Scientists and Engineers with Disabilities (FASED):** to reduce or remove barriers to participation in research and training by persons with physical disabilities by providing special equipment and assistance under awards made by NSF; and to encourage persons with disabilities to pursue careers in science and engineering by stimulating the development and demonstration of special equipment that facilitates their work performance.
- **Conference Proposals:** NSF supports conferences in special areas of science and engineering that bring experts together to discuss recent research or education findings or to expose other researchers or students to new research and education techniques. NSF encourages the convening in the US of major international conferences.
- **Equipment Proposals:** A proposal for specialized equipment may be submitted by an organization for: individual investigators; groups of investigators within the same department; several departments; organization(s) participating in a collaborative or joint arrangement; any components of an organization; or a region.
- **Travel proposal:** A proposal for travel support, either domestic and/or international, for participation in scientific and engineering meetings are handled by the NSF organizational unit with program responsibility for the area of interest.
- **Center proposal:** NSF provides support for a variety of individual Centers and Centers programs that contribute to the Foundation's vision as outlined in the NSF Strategic Plan.
- **Research Infrastructure Proposal:** As an integral part of its responsibility for strengthening the science and engineering capacity of the country, NSF provides support for the design, construction, operation and upgrade of research infrastructure including instrumentation, mid-scale projects and major facilities.

The NSF funding data does not show the thematic focus of its funding schemes, as it is aggregated at a very broad level, e.g., research vs. careers. However, the NSF follows a number of thematic priorities which present in an exemplary way from the budget requests 2016 and 2019:

Foundation-wide programs and priorities of NSF bring together researchers from all fields of science and engineering. Some of these interdisciplinary investments are listed below[15].

The following information is taken from the NSF website:

[15] For more Foundation-wide programs and priorities, see NSF's Budget and Performance Site: https://www.nsf.gov/about/budget/.

- **Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS)** aims to understand, design, and model the interconnected food, energy, and water system through an interdisciplinary research effort that incorporates all areas of science and engineering and addresses the natural, social, and human-built factors involved (2018: 0.4% of total funding).
- **NSF Innovation Corps (I-CorpsTM)** improves NSF-funded researchers' access to resources that can assist in bridging the gap between discoveries and technologies, helping to transfer knowledge to downstream technological applications and use at scale (2020: 0.5% of total funding).
- **Secure and Trustworthy Cyberspace (SaTC)** investment aims to build the knowledge base in cybersecurity that enables discovery, learning, and innovation, and leads to a more secure and trustworthy cyberspace (2020: 1.7% of total funding).
- **Understanding the Brain (UtB)** encompasses ongoing cognitive science and neuroscience research and NSF's contributions to the ongoing Brain Research through Advancing Innovation and Neurotechnologies (BRAIN) Initiative. The goal of UtB is to enable scientific understanding of the full complexity of the brain, in action and in context (2020: 2.11% of total funding) (2018: 2.1% of total funding).
- **Clean Energy Technology** investments support research and education in alternative energy for electricity (solar, wind, wave, geothermal) and fuels (chemical and biofuels) (2020: 3.7% of total funding).
- **Cyber-enabled Materials, Manufacturing, and Smart Systems (CEMMSS)** aims to integrate a number of science and engineering activities across the Foundation – breakthrough materials, advanced manufacturing, robotics, and cyber-physical systems. It will address pressing technological challenges facing the Nation and promote U.S. manufacturing competitiveness (2016: 3.8% of total funding).
- **Cyberinfrastructure Framework for 21st Century Science, Engineering, and Education (CIF21)** accelerates and transforms the process of scientific discovery and innovation by providing advanced cyberinfrastructure and new capabilities in computational and data-enabled science and engineering (2015: 2.2% of total funding).
- **NSF Research Traineeship (NRT)** aims to identify priority research themes that both align with NSF priority research activities and have strong potential in areas of national need where innovative practices in graduate education can be developed (2020: 0.6% of total funding).
- **Research at the Interface of Biological, Mathematical, and Physical Sciences (BioMaPS)** involves the Directorates for Biological Sciences, Mathematical and Physical Sciences, and Engineering, and it seeks to advance discovery at the intersections of these established disciplines.
- **Science, Engineering, and Education for Sustainability (SEES)** aims to increase understanding of the integrated system of supply chains, society, the natural world, and alterations humans bring to Earth, in order to create a sustainable world (2015: 2.2% of total funding).

Source: FY 2019 Budget Request to Congress, https://www.nsf.gov/about/budget/fy2019/pdf/fy2019budget.pdf; FY 2016 Budget Request to Congress, https://www.nsf.gov/about/budget/fy2016/pdf/fy2016budget.pdf.

NSF also has a "**Big Ideas**" initiative[16], with currently 3 being pursued mainly through the RAISE grants: Growing Convergence Research, Understanding the Rules of Life, and Quantum Leap, and another 7 announced. Altogether, in 2019 it was planned to invest $30 Mio per idea (at

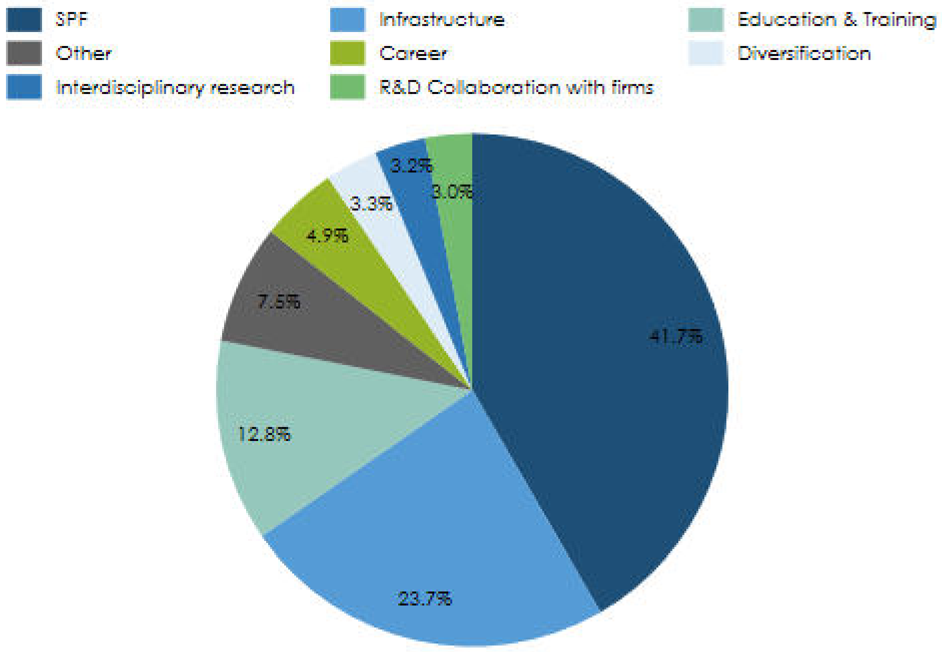
[16] https://www.nsf.gov/news/special_reports/big_ideas/

0.38% of total funding, for 10 Big Ideas hence about 3.8% of funding). The Big Ideas initiative works through the common grant mechanisms, but if relevant, once received proposals will be managed by a cross-disciplinary team of NSF Program Directors; convergence research is central to the Big Ideas, with multiple areas of expertise, multiple partners, cross-disciplinary and multi-disciplinary research activities.

For the $5.7 billion of obligations for R&D in FY2015, 87.7% was for basic research and 12.3% for applied research.

Source: Table 4-17, https://www.nsf.gov/statistics/2018/nsb20181/report/sections/research-and-development-u-s-trends-and-international-comparisons/recent-trends-in-federal-support-for-u-s-r-d.

Figure 21: **Total funding awarded by the NSF by type of funding activity, 2020**

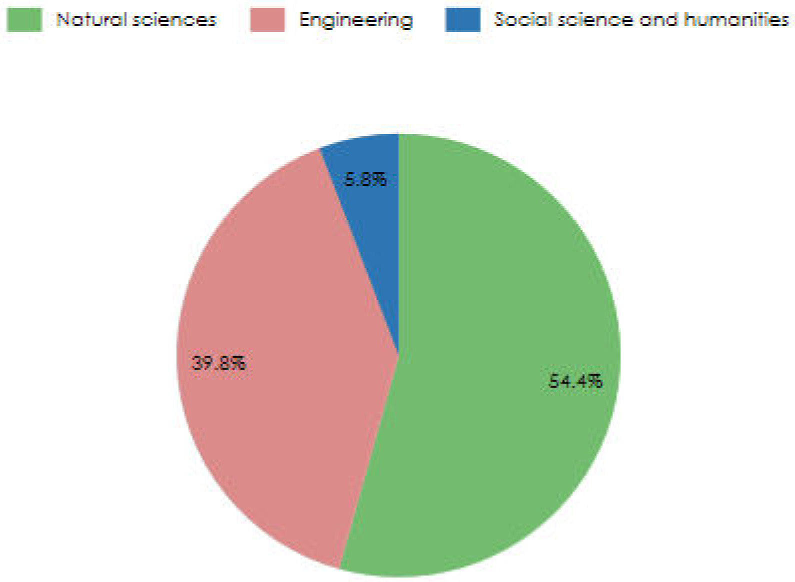


Source: Data provided by the NSF; WIFO calculation. Note: SPF = Single project funding (SPF). Category "Other" forms funding schemes that cannot be classified according to WIFO allocation and can include data due to statistical differences.

Single project funding

Figure **22** shows the shares of disciplines in the project research funding schemes of the NSF. As in the US, medicine is funded by the NIH, the funding scope of the NSF is smaller.

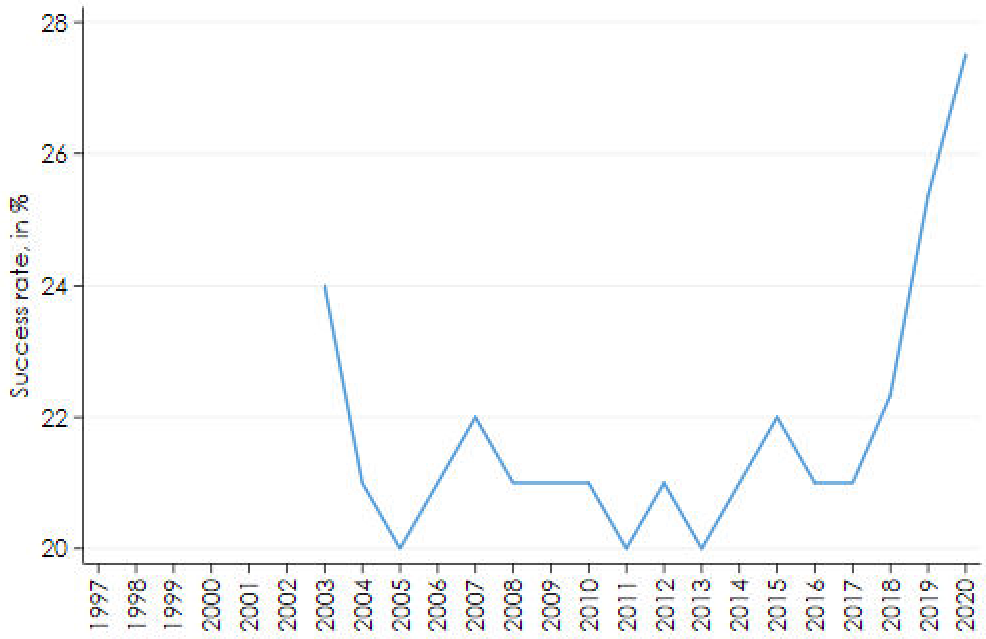
Figure 22: **Shares of disciplines in single project funding, 2020**



Source: Data provided by the NSF; WIFO calculation. Note: NSF consists of several directorates, which have been assigned to disciplines as follows: Natural Sciences (Biological Sciences, Geosciences, Mathematical and Physical Sciences, Office of Polar Programs), Engineering (Computer and Information Science and Technology, Engineering), Social Sciences and Humanities (Social, Behavioral, and Economic Sciences).

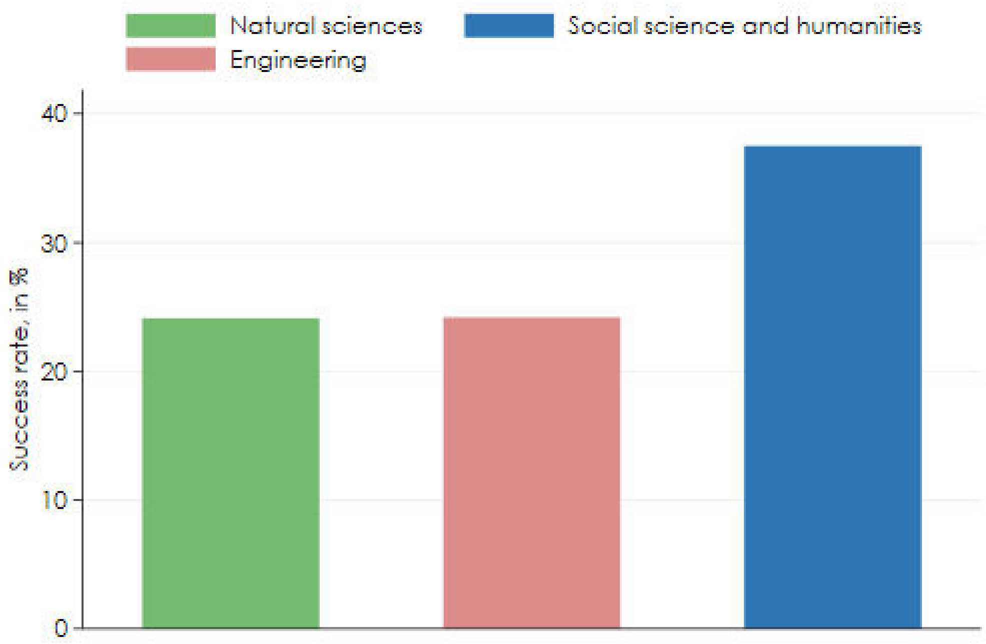
For the standard research grants, we present success rates over time, between disciplines in the year 2020 and the share of three disciplines in this funding. Success rates increased considerably since 2017. According to information provided by the NSF, a key factor in this change was adjustments to NSF proposal submission guidelines, including a shift from submission deadlines to open submission in many programs. The adjustments aimed to encourage submission of fully developed proposals when ready rather than submission to meet a deadline.

Figure 23: **Success rate in single project funding, 2003-2020**



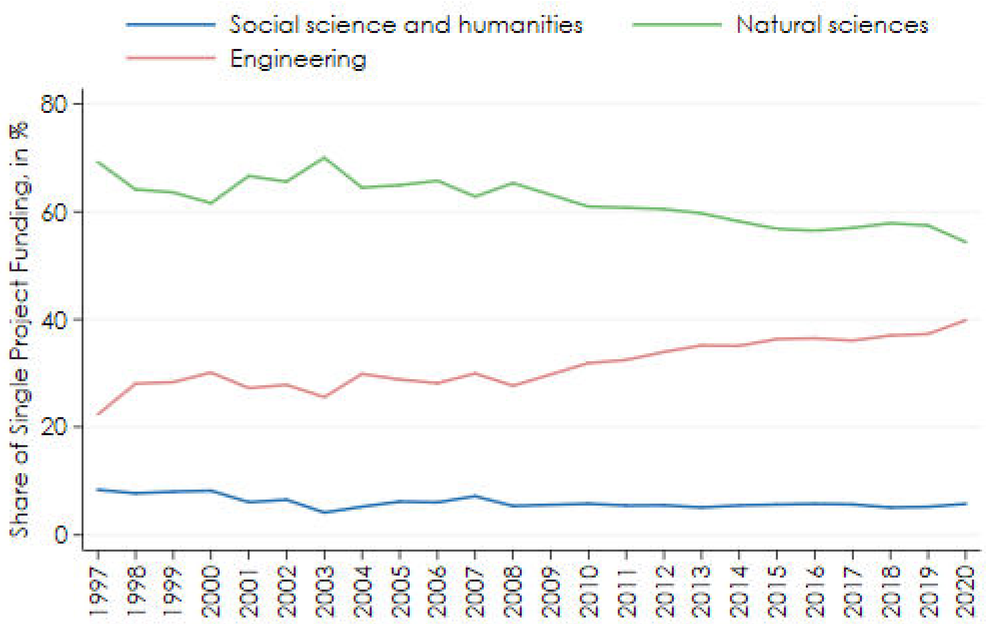
Source: https://www.nsf.gov/about/budget/index.jsp – NSF Funding Profile (Statistics for Research Grant Awards).

Figure 24: **Success Rate in single project funding by discipline, 2020**



Source: Data provided by the NSF; WIFO calculation. Note: NSF consists of several directorates, which have been assigned to disciplines as follows: Natural Sciences (Biological Sciences, Geosciences, Mathematical and Physical Sciences, Office of Polar Programs), Engineering (Computer and Information Science and Technology, Engineering), Social Sciences and Humanities (Social, Behavioral, and Economic Sciences). The success rates are the average of the individual directorates.

Figure 25: **Total awarded funding in single project funding by discipline, 1997-2020**



Source: NSF Budget Request. Note: Social science and humanities = NSF SBE; Natural sciences = NSF BIO, NSF GEO, NSF MPS, NSF OPP, NSF USARC; Engineering = NSF CISE, NSF ENG.

3.5.3 Refundable costs and peer review

The NSF Office of Budget Finance and Award Management provides the applicability of U.S. Federal cost principles to NSF cost reimbursement grants https://www.nsf.gov/pubs/manuals/gpm05_131/gpm6.jsp. The NSF reimburses costs of PIs, along with the cost of postdocs and graduate students. US university faculty salaries are typically calculated as 9-month salaries, allowing the faculty member to raise summer salary support through grants or other means. In principle, NSF allows a PI/co-PI to charge up to two months summer salary to a grant. Grants also typically provide support for a postdoc and/or a graduate research assistant. Among other cost categories reimbursed are e.g., equipment, materials and supplies, travel costs, third party or consultant costs if motivated specifically, publication, documentation and dissemination costs.

Indirect cost rate (overheads): in principle, 100% of indirect costs are reimbursed - Research institutions in the US can have their full indirect costs reimbursed for all federal research grants: in 2010. The indirect cost rate (the indirect costs relative to the direct costs) amounted to 29.8-69% of the direct cost of research (Sale - Sale, 2010). Universities calculate the indirect costs they ask for themselves as a basis for negotiation with the so-called “cognizant federal agency”, i.e. the federal agency that provides the largest share of federal research grant funding to the research institution in question. The “cognizant federal agency” negotiates on behalf of all federal science funding agencies. The largest agency is rarely the NSF, rather the NIH’s parent agency, Department of Health and Human Services. This is a time-consuming process which is updated every three years (Stephan, 2012).

Table 12: **Overview of review process**

The following information is taken from the NSF website.

Internal/External reviewers:	both
Number of reviewers (per proposal):	at least one internal reviewer and three external reviewers
International/National reviewers:	mostly national
Organisation of Review:	**1st stage:** either ad hoc (mail), panel review or combination of both organised by NSF Program Officer who selects external peer reviewers; **2nd stage:** After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the Division Director whether the proposal should be declined or recommended for award. The Division Director's concurrence is required to finalize an award recommendation. Applicants will get the information coming from the reviews, except the names of the reviewers, but won't get information about internal NSF deliberations about the proposal.
Assessment criteria (incl. weights or relative importance, if available):	**Merit review criteria:** • Intellectual Merit (encompasses the potential to advance knowledge) • Broader Impacts (encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes) The following elements should be considered in the review for both criteria: What is the potential for the proposed activity to: • Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and • Benefit society or advance desired societal outcomes (Broader Impacts)? • To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts? • Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success? • How well qualified is the individual, team, or organization to conduct the proposed activities? • Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities? • The NSF Program Officer may in addition examine other factors, e.g. different approaches to significant research and education questions; potential (with perhaps high risk) for transformational advances in a field; capacity building in a new and promising research area; or achievement of special program objectives and portfolio balance.
Special characteristics for early stage researchers (first-time applicants):	There is no formal policy on this, but the programme officer may take this into consideration in thinking about portfolio balance.

Source: https://www.nsf.gov/bfa/dias/policy/merit_review/, https://www.nsf.gov/pubs/policydocs/pappg20_1/pappg_3.jsp" \l "IIIA.

The following presents a visualisation of the peer review process from the NSF.

Figure 26: **Visualisation of the NSF peer review process**

Source: https://www.nsf.gov/bfa/dias/policy/merit_review/.

Additional information

According to Stephan, 2012, p. 132f., "NSF peer review follows a slightly different process [to NIH]. Investigators submit proposals to programs, which are generally organized around fields of study. Programs vary as to whether they use mail reviews exclusively or panel reviews supplemented by mail reviews to evaluate proposals. Reviewers rank proposals on a five-point scale that goes from Excellent to Poor….

Unlike the case of NIH, program officers have considerable discretion in making funding decisions, especially with regard to proposals that fall between a "clearly fund" and a "clearly do not fund." There is not a tradition of continuing a grant at NSF, as there is at NIH, although researchers can and do submit proposals for follow-on research. NSF has the appearance of putting less emphasis on reputation than does NIH and limits the number of publications the researcher can list to a maximum of ten….

[The success rate] also depends on NSF policies with regard to size of award and length of award. In an effort to "increase productivity by minimizing the time PIs spent writing multiple proposals and managing administrative tasks" NSF tried to extend the length of the average grant and increase the size of the grant. Between 2000 and 2005 the average size of an award increased by 41%; the average length of an award stayed approximately the same, at almost exactly three years. Success rates plummeted as more proposals chased fewer grants."

Source: Stephan, 2012, p. 132f.

3.5.4 Changes over time

Introduction of new funding schemes

In principle, as in the NIH, introducing new activities is a mixture of top-down (government-driven) & bottom-up processes by the NSF directorates which have some autonomy in deciding on what to use their funds for. The NSF responds to White House or Administration priorities, but directors can launch new initiatives themselves as well, when they spot new trends, e.g., the introduction of various activities, such as the NSF Big Ideas, or EAGER, as well as cross-cutting thematic activities, has been described in section 3.5.2.

Other changes

- Shifts in budget shares between schemes

Over time, project funding has decreased significantly in terms of its share in total funding, at the benefit of funding for education and training and infrastructure.

3.5.5 Information and data sources

Contact at NSF

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aemig@nsf.gov

Information about structure of fund

https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf21003&org=NSF

https://www.nsf.gov/about/

https://www.nsf.gov/about/who.jsp

NSF FY2020 Performance and Financial Highlights

https://www.nsf.gov/staff/organizational_chart.pdf

https://www.nsf.gov/staff/orglist.jsp

https://www.nsf.gov/nsb/about/index.jsp

https://www.nsf.gov/bfa/

https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf21003&org=NSF

Information about application and review procedures

https://www.nsf.gov/bfa/dias/policy/merit_review/

https://www.nsf.gov/pubs/policydocs/pappg20_1/pappg_3.jsp#IIIA

https://www.nsf.gov/bfa/dias/policy/merit_review/

Portfolio & data

https://www.nsf.gov/about/budget/

NSF Budget Requests – NSF Summary Table

NSF Budget Requests – NSF Funding Profile

Janger, J. & Schmidt, N. & Strauss, A. (2019). *International differences in basic research grant funding – a systematic comparison.* WIFO. https://www.wifo.ac.at/publikationen/studien?detail-view=yes&publikation_id=61664

3.6 Netherlands Organisation for Scientific Research (NWO)

3.6.1 Organisational mission and structure

Mission focus

NWO focuses more broadly on funding scientific research and on its potential impact or utilisation, as well as being involved in national coordination of thematic research strategies (e.g., within the Dutch "Top Sectors" sectoral prioritisation policy). Similar to RCN Norway or NIH, NWO also has inhouse-research institutes. The following information was taken from the NWO website:

- Ambition 1: Nexus role (NWO will ensure increased coordination in Dutch science so that a national research strategy can be developed, including a regularly updated Dutch National Research Agenda. In this, thematic and curiosity-driven research will be kept in balance.)
- Ambition 2: People (Good research requires good researchers. NWO will ensure that researchers in the Netherlands can continue to develop in all phases of their career)
- Ambition 3: Research (Fundamental research forms the basis for excellence and innovation. Consequently, curiosity-driven and fundamental research will remain an important focus for NWO with programmes for high-risk pioneering research.)
- Ambition 4: Infrastructure (Research infrastructure plays an important role in all areas of science. In this regard, not just the 'hard' equipment and ICT-facilities are important, but also the technical support and a professional environment where brainpower is concentrated and people meet.)
- Ambition 5: Knowledge sharing (Besides having a scientific impact, research should also generate societal impact that contributes to the solving of societal issues. NWO wants to facilitate knowledge sharing by increasing the collaboration with users. In doing so, NWO will further build upon the experience of various NWO units. During the next strategy period, public-private and public-public partnership in research will remain possible.

Source: https://www.nwo.nl/en/about-nwo/mission+and+vision; https://www.nwo.nl/en/about-nwo/strategy.

Overarching decision structures

NWO works as an independent governmental agency rather than an academic self-governance body, i.e. academic organisations are not mandatorily represented in the decision-making bodies. As an example the executive board is appointed by the Ministry in charge rather than being elected by a body which consists of members of academic institutions. It has both intra-mural research centres and provides extra-mural funding to researchers.

Organisational chart: https://www.nwo-i.nl/wp-content/uploads/2019/10/ENG_Organogram-NWO-and-NWO-I.png

General/strategic decision making

As an independent directive body (founded in 1950) with the authority to distribute public resources, NWO falls under the responsibility of the Ministry of Education, Culture and Science. The tasks and responsibilities are established in the NWO Act.

The Executive Board is the most senior administrative body within NWO. Its members are a President, a Chief Financial Officer and the four chairs of the NWO Domains. The NWO Executive Board is supported by an Executive Board Office.

The president and members of the Executive Board are appointed by the Minister of Education, Culture and Science. The president and the Chief Financial Officer are appointed for a period of five years. The other members, who are at the same time Chair of a NWO domain, are appointed for a period of three years. The president and the members may be reappointed once.

As the authorising officer, the Executive Board determines the budget of NWO. This includes the separate budgets for the four domains, NWO-I, the temporary taskforces, the operations department and the Executive Board Office. The Authorisation Procedure NWO states which persons within the organisation are authorised to make which financial decisions.

The Executive Board decides which persons are authorised to exercise certain responsibilities on their behalf. The authorisation procedure states who has financial mandate/authorisation, what the various mandates/authorisations involve and which conditions apply.

The Executive board carries final responsibility for the entire, umbrella organisation. The Supervisory board advise the Executive Board of NWO, on request or at its own initiative and has an Audit committee that advises on the budget, annual financial statements and annual report. The Advisory board can advise the executive board, on request or at its own initiative, on societal and scientific developments that are relevant to NWO. Under NWO come domain boards, research institutes and temporary taskforces. Important to NWO are the quality, carefulness and transparency of the assessment process and the management of projects. NWO has settled some important governance issues in a number of regulations. The NWO domains organise the programmes and the research funding. There are four of them, Science, Applied and Engineering Sciences, Social Sciences and Humanities and Medical sciences as well as a cross domain initiative Science for Global Development.

Source: https://www.nwo.nl/en/governance; https://www.nwo.nl/en/authorisation-procedure-nwo

Organisation of funding decisions

NWO (the Executive Board or Domain Board) appoints a selection committee or jury for each funding instrument, usually senior researchers and experts from industry and civil society, experienced in assessing research. Its task is to compare and assess the research proposals. The committee or jury has access to all the research proposals as well as the referees' reports and applicants' rebuttals. An interview or site visit can also form part of the assessment procedure. Based on this information, the selection committee issues a funding advice to the NWO Board that takes the funding decision.

Firstly, the Board assesses whether the selection committee worked according to the procedure and selection criteria described in the call for proposals. Board members have access to all relevant information such as research proposals, referees' reports, applicants' rebuttals, the description of the assessment procedure, the composition of the committee, and the assessment of the conflict of interest code. The Board then takes a funding decision. Usually the Board adopts the selection committee's advice. It may, however, deviate from this if it states its reasons for doing so.

Source: https://www.nwo.nl/en/about-nwo/organisation/governance, https://www.nwo.nl/en/funding/funding+process+explained. https://www.nwo.nl/en/nwo-executive-board

Allocation of government funding to agency

An important part of NWO's duties is performed by providing funding to academic researchers. The financial means for this are for the most part drawn from the budget of the Ministry of Education, Culture and Science.

3.6.2 Characteristics of funding schemes

Organisation of funding activities

Some funding schemes are domain-specific, such as Open Competition and the Talent Scheme, while NWA/KIC and infrastructure are non-discipline specific cross-cutting funding schemes. Within these cross-cutting schemes, discipline-specific/thematic calls for research proposals may be launched. NWO is trying to harmonise the current funding instruments as much as possible to facilitate collaboration, so that researchers, irrespective of the research domain, will be subject to the same conditions as much as possible. Part of the budget is "labelled", but another part can be spent freely according to the Executive Board or domain boards. As an example, the Executive Board determines how much funding is provided in the Open Competition, but how it is spent is determined by the domain boards. The following information was taken from the NWO website:

NWO provides a limited palette of funding instruments with a clear number of modules. These modules can be combined in accordance with the objectives of the programme or call concerned. This approach will provide the flexibility needed to meet the needs of the various disciplines.

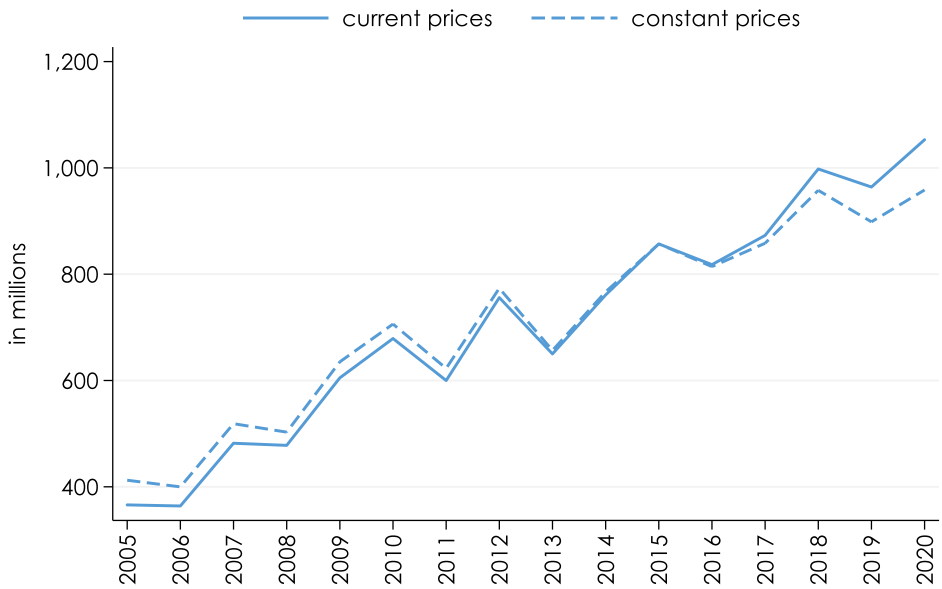
1. **Open Competition** (Curiosity-driven research)
2. **Talent Programme (**Curiosity-driven, responsive-mode research aimed at research talent)
3. **Knowledge and Innovation Covenant (KIC) (**Projects or programmes in partnership with external public and/or private parties)
4. **Dutch Research Agenda (**Facilitate science making a contribution to economic and societal challenges)
5. **Research Infrastructure (**Realising large-scale infrastructure)

Source: https://www.nwo.nl/en/about-nwo/funding+lines.

Funding portfolio and data

We first show data on overall funding levels: The funding awarded by the NWO almost tripled since 2005.

Figure 27: **NWO awarded funding in current and constant EUR, 2005-2020**



Source: Data was provided by the NWO; NWO annual reports; World bank database for GDP deflator (2015=100), WIFO calculation.

Table 13: **Selected characteristics of the funding schemes, 2020**

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Bottom-up vs. Top-down	Main aim of funding scheme
Total	**Total**	**100%**		
Project Funding	**Total**	**13%**		
Single project funding (SPF)	Total	8%		
	Open Competition Domain AES (Applied and Engineering Sciences, Open Technology Program)	2 %	bottom-up	The Open Technology Programme is open to excellent research aimed at the possible implementation of the results. The programme offers companies and other organisations an easily accessible way of becoming involved in scientific research that leads to usable knowledge.
	Open Competition Domain science (OC M)	3%	bottom-up	This funding instrument is open for research proposals with a question in or overlapping the fields of earth sciences, astronomy, chemistry, computer science, life sciences, physics and mathematics. Proposals can be monodisciplinary, multidisciplinary or interdisciplinary in nature. In the NWO Open Competition Domain Science - M, researchers can apply individually or in collaboration for curiosity-driven, high-quality research within the research fields of NWO Domain Science (NWO-domein Exacte en Natuurwetenschappen (ENW).
	Open Competition Domain SSH	3%	bottom-up	The aim of the Open Competition – SSH is to facilitate excellent, non-programmed, curiosity-driven research that primarily addresses a social sciences or humanities research question and research problem.
SPF high-risk	Total	0.2%		
	Open competition Domain science (OC XS)	0.1%	bottom-up	This funding instrument is open for research proposals with a question in or overlapping the fields of earth sciences, astronomy, chemistry, computer science, life sciences, physics and mathematics. Proposals can be monodisciplinary, multidisciplinary or interdisciplinary in nature. The NWO Domain Science has established the XS category within the Open Competition with the aim of encouraging curiosity and new ideas in research as part of promising, high-risk projects.
	Open competition Domain AES (Open mind)	0.02%	bottom-up	This also aims at high-risk projects: Every year, the NWO domain of Applied and Engineering Sciences (AES) holds a competition for the development of an innovative and creative "out-of-the-box" idea that contributes to solving a societal challenge: Open Mind https://www.emconsult.nl/en/grant-programs/nwo-programs/nwo-open-mind/
Networks and multi-project funding	Total	5%		

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Bottom-up vs. Top-down	Main aim of funding scheme
	Open Competition Domain science (OC XL)	3%	bottom-up	This funding instrument is open for research proposals with a question in or overlapping the fields of earth sciences, astronomy, chemistry, computer science, life sciences, physics and mathematics. Proposals can be monodisciplinary, multidisciplinary or interdisciplinary in nature. In the NWO Open Competition Domain Science - XL, consortia of researchers can apply for curiosity-driven,fundamental research in the research fields of the NWO Domain Science (NWO-domein Exacte en Natuurwetenschappen (ENW)).Through cooperation consortia create added valuecompared to separate smaller projects, such as ENW -M grants.
	Knowledge and Innovation Covenant (KIC) - Partnerships	1%	top-down	Within this KIC instrument, a limited number of demand-driven partnerships are developed each year that focus on the knowledge or development issue of a private or public partner. Researchers can participate in a thematical Partnership (through Demand-driven Partnerships for Partners), or can initiate a Partnership with a consortium (through Demand-driven Partnerships for Consortia). Demand-driven Partnership for Partners: through this desk, a public or private partner can submit an initiative to NWO, including co-financing. After selection by NWO, the partner will work out a thematic call for project proposals in co-creation with NWO. Demand-driven Partnership for Consortia: via an open call, a public-private consortium formulates an initiative, including co-funding, that an applicant submits to NWO on behalf of a consortium. After selection by NWO, the consortium will develop the initiative into a coherent public-private project proposal.
Priority areas	**Total**	**18%**		
Thematic priority area	Total	18%		
	Dutch Research Agenda (NWA) - Research along Routes by Consortia (NWA-ORC)	13%	top-down	This science-encompassing funding round is aimed at making interdisciplinary research and innovation possible, so that societal and scientific breakthroughs come within reach. A main characteristic of this programme is that participants must be part of a consortium.
	Knowledge and Innovation Covenant (KIC) - Mission-driven calls	5%	top-down	The main line MISSION has two PPP-working forms with different co-funding conditions: a working form knowledge with 10% co-funding and a working form innovation with 30% co-funding. In both forms a minimum private co-funding of 10% is required. For each mission-driven programme, NWO can use a mix of these two working forms is possible, in alignment with the KIA's.
	Dutch Research Agenda (NWA) - Thematic Programming (NWA)	0.4%	top-down	The Dutch Research Agenda focuses on challenging issues that match the strength of Dutch science, the grand societal challenges of our time, and economic opportunities that arise. Specific thematic programming on societally urgent themes is in line with this.
Infrastructure	**Infrastructure**	**13%**	**bottom-up**	**Research institutions can apply bottom-up for funding of research infrastructure, but there is a national road-map which has been established top-down and determines eligible infrastructure.**
Funding of People	**Total**	**18%**		

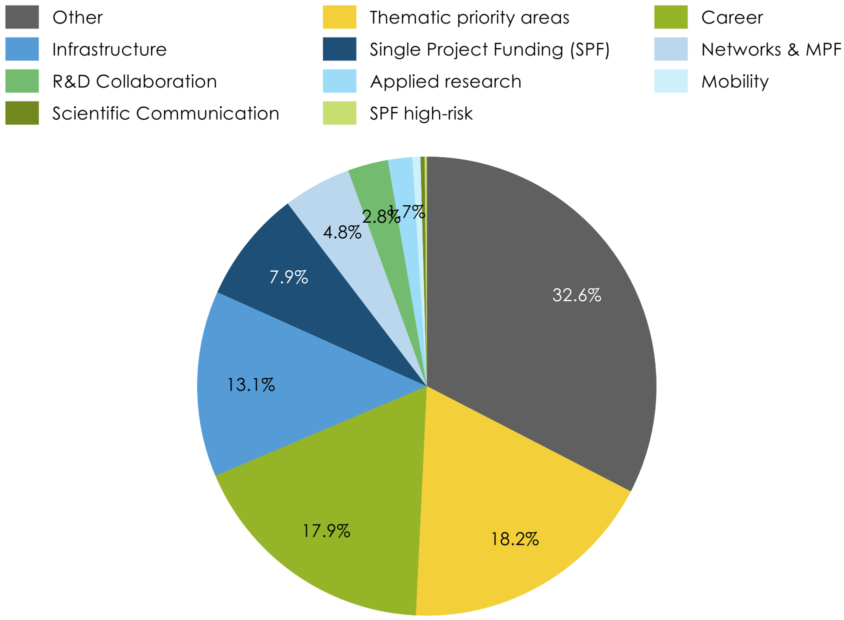
Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Bottom-up vs. Top-down	Main aim of funding scheme
Career		18%		
	Talent Programme - Veni	4%	bottom-up	Veni provides researchers who have recently gained their PhD the chance to develop their ideas further for a period of three years.
	Talent Programme - Vidi	6%	bottom-up	Vidi is aimed at researchers who have already conducted several years of research following their PhD. In this, they have demonstrated their ability to generate innovative ideas and to successfully and independently develop these. They may develop their own innovative line of research and appoint one or two researches for this themselves.
	Talent Programme - Vici	5%	bottom-up	Vici is aimed at senior researchers who have successfully demonstrated their ability to develop their own innovative line of research. They have also guided young researchers in this. Researchers who receive a Vici grant may form their own research group, often in advance of a tenured professorship. The line of research becomes structurally embedded in the research facility.
	Talent Programme - Other talent instruments	3%	bottom-up	The Other instruments include multiple smaller instruments focused on researchers and teachers.
Mobility	Talent Programme - Rubicon	1%	bottom-up	Rubicon is part of the NWO Talent Programme, aimed at retaining talented already postdoctoral researchers for science. It allows recently graduated scientists to gain experience at a foreign top institute.
Translation	**Total**	**5%**		
Applied Research	Knowledge and Innovation Covenant (KIC) - Practice-oriented instruments	2%	bottom-up	Funding for practice-oriented instruments in the Knowledge and Innovation Covenant (KIC) 2020-2023 allows practice-oriented researchers to build up innovation networks and collaborate with regional partners and SMEs.
R&D Collaboration with firms	Knowledge and Innovation Covenant (KIC) - Strategic collaborations (Long-Term Programmes)	3%	top-down	NWO offers the opportunity for strong public-private consortia to apply for funding for a ten-year programme. The NWO contribution to the KIC focuses on the mission-driven top sectors and innovation policy of the national government. In main line 3, proposals can be submitted that focus on topics from the KIAs of this policy. In a Long-Term Programme, activities can take place at scientific parties and other parties in the knowledge chain.
Scientific Communication	**Dutch Research Agenda (NWA) - Science Communication and Outreach (NWA)**	**0.3%**	**bottom-up**	**Science communication & outreach has two communication goals: funding communication and public communication. Funding communication concerns the NWA program towards researchers, scientists, stakeholders and civil society organizations. This communication supports the three funding programs of the NWA when it comes to program information, information about the various funding instruments and result communication. This communication generally takes place via the communication channels of NWO.** **The second goal is to make science accessible to a wide audience. Both for those who are already interested in science and a large target group with a latent interest in science. We translated the second goal into a public campaign, events and collaboration with (media) partners.**

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Bottom-up vs. Top-down	Main aim of funding scheme
Other	**Total**	**33%**		
	Dutch Research Agenda (NWA) - Innovation and Networks (NWA)	0.5%	top-down	The NWA supports 25 routes. These routes form self-organising networks that address and investigate important scientific, social and economic issues in society.
	Other	32%		

Source: Data was provided by the NWO; NWO annual reports; https://www.nwo.nl/en/researchprogrammes/knowledge-and-innovation-covenant; https://www.nwo.nl/en/researchprogrammes/dutch-research-agenda-nwa; https://www.nwo.nl/en/funding-lines; WIFO calculation. Note: Category "Other" forms funding schemes that cannot be classified according to WIFO allocation and can include data due to statistical differences.

In the Netherlands, standard single project funding (open competition) is not the most important funding category, career-oriented, translational, infrastructure and thematic schemes are more important. The focus of the agency as defined in its mission statement can also be seen at the level of its funding portfolio, with a higher emphasis on translational and thematic priorities. No data on the discipline mix are available for total funding.

Figure 28: **Total funding awarded by NWO by type of funding activity, 2020**

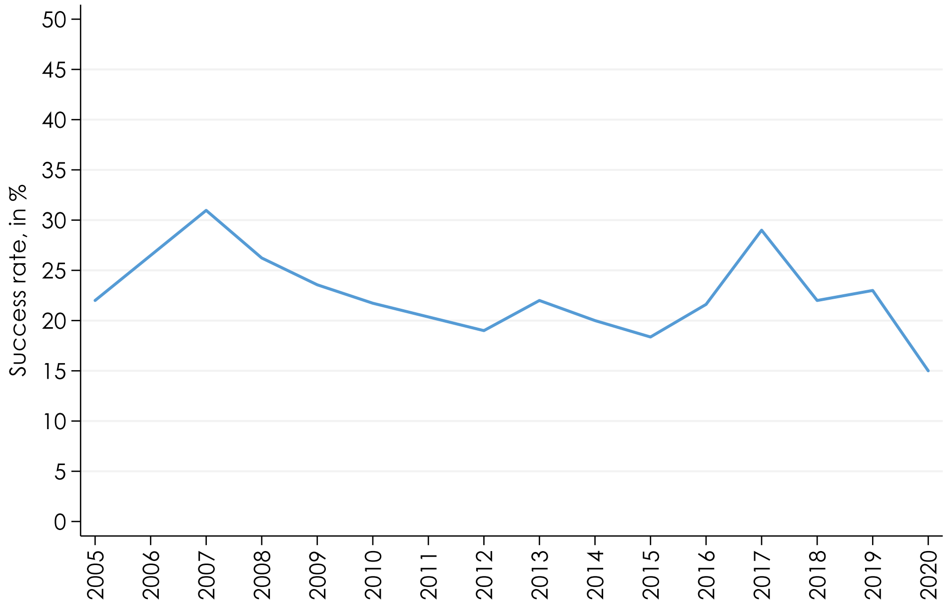


Source: Data was provided by NWO and by data on these websites; https://www.nwo.nl/en/researchprogrammes/knowledge-and-innovation-covenant; https://www.nwo.nl/en/researchprogrammes/dutch-research-agenda-nwa; WIFO calculation. Note: Category "Other" forms funding schemes that cannot be classified according to WIFO allocation and can include data due to statistical differences. Shares below 2% of total funding are not shown in the chart.

Single project funding

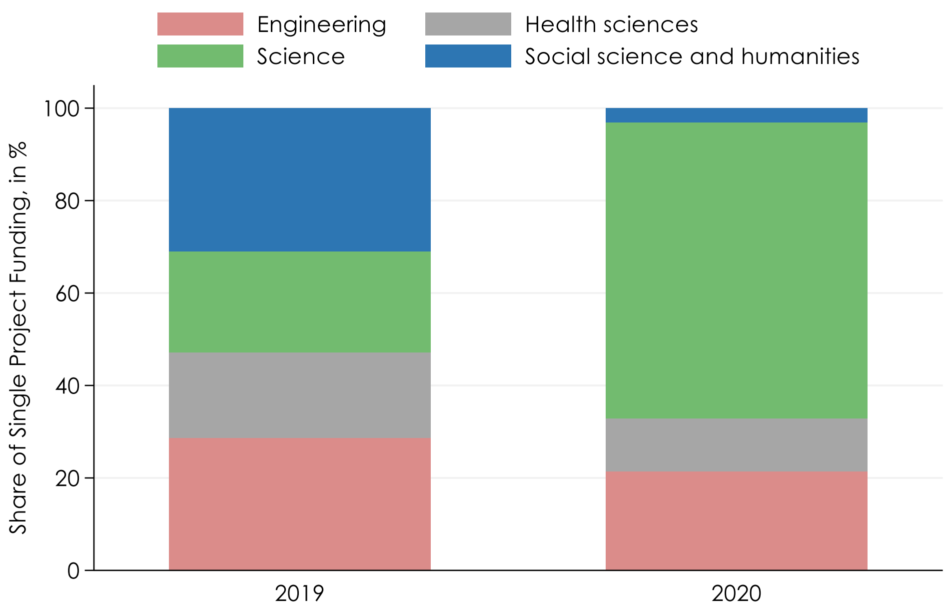
Here we present data on success rates over time and the share of disciplines in SPF (open competition). Further data on project duration or lot size are presented in section 3. The success rate is currently at a low of 15%, by comparison with close to 30% in 2017. The shares of disciplines show strong variations between the years because the open competition "XL" scheme in the science domain is run once every two years; moreover, due to COVID-19, projects granted in the social sciences and humanities in 2020 have been postponed to 2021.

Figure 29: **Success rate in single project funding, 2005-2020**



Source: Data was provided by NWO.

Figure 30: **Single project funding by discipline, ´2019-2020**



Source: Data was provided by NWO. Note: The big swing between the disciplines "Science" and "Social science and humanities" can be explained by the fact, that the Science Open Competition XL is run once every two years and is therefore included in the 2020 data but not in the 2019 data. Also the projects granted in 2020 in SSH have been postponed to 2021 due to Covid.

3.6.3 Refundable costs and review procedures of single project funding

This section illustrates cost reimbursements and peer review procedures based on the open competition "M" scheme in the domain science.

- Wages of scientific/ technical staff
- Material expenses (i.e. Project-related goods/services; Travel and accommodation costs for the personal positions applied for; implementation costs).
- Internationalisation (incl. Travel and accommodation costs; travel and accommodation costs for foreign guest researchers; costs for organizing international workshops/symposia/scientific meetings)
- Money follows Cooperation (provides the possibility of realising a part of the project at a publicly funded knowledge institution outside of the Netherlands.)

Source: https://www.nwo.nl/sites/nwo/files/media-files/Budget%2Bmodules%2Bexplained.pdf

For the single project funding open competition "M" of the NWO domain science, funding can be requested for 1 or 2 PhD students or postdocs and/or budget for equipment. Additionally, budget can be requested for scientific and non-scientific staff (student assistants, analysts or technicians). In the NWO Talent program and the rubicon budget, it can be requested to fund the PI – principal investigator. In some funding schemes of NWO it is allowed to apply for reimbursement of management costs, or replacement personnel. 'Overhead' costs, such as standard office or laboratory equipment, general computer equipment, and maintenance and insurance costs, are generally not covered by NWO, with the exception of a 5.000€ bench fee for PhD-students or post-docs.

The size of the personnel costs to be funded can be looked up in the salary tables of the Universities of the Netherlands (Dutch acronym: UNL). The salary tables have been agreed upon in the 'Agreement for Funding Scientific Research' and are based on the collective labour agreement (Dutch acronym: CAO) of the Dutch universities.

Source: https://www.nwo.nl/en/funding/funding+process+explained/salary+tables,

Table 14: **Overview of review process of open competition Domain Science "M"**

The following information is taken from the NWO website:

Internal/External reviewers:	External and internal
Number of reviewers (per proposal):	min. 2
International/National reviewers:	Mostly international reviewers
Organisation of Review:	**1st stage:** mail review by external reviewers, organised by NWO staff (who may pre-select in case of too many applications); applicants may respond to the referees' assessments; **2nd stage:** a selection committee or jury (composed of mostly senior researchers, or non-academic experts) issues a funding recommendation to the NWO Board which takes the final funding decision; applicants can lodge an objection within six weeks, which will be addressed by an independent Appeals and Objections Committee.
Assessment criteria (incl. weights or relative importance, if available):	Assessment criteria: **Criterion 1: Scientific quality of the proposal (What/Who)** This includes: • the clarity of the proposal, question posed and the objectives; • scientifically innovative and/or ground-breaking elements of research proposal/investment; • the scientific approach: (challenge in) the approach and the feasibility of this; • the effectiveness in terms of methodology proposed.

	• appropriate expertise of the researchers involved and (access to) the equipment needed. • in the case of a proposal with an investment: the need for the investment must be made clear. **Criterion 2: Scientific and/or societal impact (Why)** This includes: • the importance of potential research results in the short and long term in the own discipline; • knowledge utilisation: possible use and relevance of the knowledge generated in other scientific disciplines and/or society (economic, technical, social or cultural, for example via outreach). The criteria will be weighted as follows in the assessment: Scientific quality of the proposal is 70% of the final score, the scientific and/or societal impact 30%.

Source: https://www.nwo.nl/en/funding/funding+process+explained; https://www.nwo.nl/en/calls/open-competition-domain-science-m

3.6.4 Important changes over time

Introduction of new funding schemes

According to information provided by NWO, every four years NWO develops a new Strategic Plan. The implementation of the Strategic Plan can lead to changes to, or the introduction of new instruments. A change in governmental policy can also lead to changes in the programmes that are assigned by government. For example the Dutch Research Agenda. Moreover, typically after completing a call of a funding scheme there is a (small) evaluation. A larger evaluation takes places every couple of years. Sometimes new schemes, or changes to current schemes are piloted in one or two domains.

Regarding mission-oriented approaches, when NWO developed their current strategy they took notice of the Commission's policy (the Lamy report for example) which was under developed at the time, and NWO features its own mission-oriented, thematic programmes (see below).

Other changes

- Changes in organisational structure: NWO has implemented a new organisational structure, the aim being to have a more efficient structure by way of clustering the current science divisions and foundations into the four domains mentioned above.

Source: https://www.nwo.nl/en/news-and-events/news/2015/contours-new-nwo-announced.html

- Shifts in budget shares between schemes

Due to the lack of detailed funding data, shifts in budget shares between schemes are not available. According to information provided by NWO, under the current strategy - which runs from 2019-2022 - NWO has two large programmes which focus on specific themes: the Knowledge and Innovation Covenant (KIC) and the Dutch Research Agenda:

- Within the main line MISSION of the Knowledge and Innovation Covenant (KIC) 2020-2023, a limited number of large thematic calls with a volume of between 5 and 15 million euros are developed each year. Within these mission-driven programmes researchers submit proposals for collaborative projects, with a budget of 750,000 to 4 million euros per proposal.
- Also within the Dutch Research Agenda thematic calls - Thematic Programming (NWA) - are developed.

3.6.5 Information and data sources

Contact at NWO

Joyce Kuipers

Senior Policy Officer

j.kuipers@nwo.nl

Information about structure of fund

https://www.nwo.nl/en/about-nwo/mission+and+vision,

https://www.nwo.nl/en/about-nwo/strategy.

https://www.nwo-i.nl/wp-content/uploads/2019/10/ENG_Organogram-NWO-and-NWO-I.png

https://www.nwo.nl/en/authorisation-procedure-nwo

https://www.nwo.nl/en/governance

https://www.nwo.nl/en/about-nwo/organisation/governance

https://www.nwo.nl/en/funding/funding+process+explained

https://www.nwo.nl/en/nwo-executive-board

Information about application and review procedures

https://www.nwo.nl/sites/nwo/files/media-files/Budget%2Bmodules%2Bexplained.pdf

https://www.nwo.nl/en/funding/funding+process+explained/salary+tables,

https://www.nwo.nl/en/funding/funding+process+explained,

https://www.nwo.nl/en/calls/open-competition-domain-science-m

https://www.nwo.nl/en/news-and-events/news/2015/contours-new-nwo-announced.html

Portfolio and data

https://www.nwo.nl/en/about-nwo/funding+lines.

https://www.nwo.nl/en/researchprogrammes/knowledge-and-innovation-covenant

https://www.nwo.nl/en/researchprogrammes/dutch-research-agenda-nwa

https://www.nwo.nl/en/funding-lines.

Annual reports

Janger, J. & Schmidt, N. & Strauss, A. (2019). International differences in basic research grant funding – a systematic comparison. WIFO. https://www.wifo.ac.at/publikationen/studien?detail-view=yes&publikation_id=61664

3.7 The Research Council of Norway (RCN, Norway)

3.7.1 Organisational mission and structure

Mission focus

The RCN focuses more broadly on funding scientific and applied research and on its potential impact or utilisation, as well as being involved in national coordination of thematic research and innovation strategies. It integrates basic research funding and applied research funding in firms. The following information is taken from the RCN's website:

> The Research Council works to promote research and innovation of high quality and relevance and to generate knowledge in priority areas to enable Norway to deal with key challenges to society and the business sector.
>
> Our purpose is to facilitate research that promotes innovation and sustainability.

Source: https://www.forskningsradet.no/en/about-the-research-council/what-we-do/.

Overarching decision structures

General/strategic decision making

> The **Executive Board** of the Research Council of Norway distributes funding for research and serves as the chief advisory body for research policy issues. The Executive Board has 11 members and is responsible for overseeing the Research Council's activities and providing advice on research policy.
>
> The **Research Council** is a key stakeholder in the Norwegian research and innovation system. The members of the Executive Board have broad insight into research, innovation, the business sector and other societal issues, and represent the various geographic regions of Norway.

The **International Advisory Board** is an independent standing committee of international experts, appointed by the Chief Executive of the Research Council of Norway to provide advice on research and innovation policy.

Source: https://www.forskningsradet.no/en/about-the-research-council/what-we-do/the-executive-board/; https://www.forskningsradet.no/en/about-the-research-council/what-we-do/the-research-council-international-advisory-board/

Decision structures for funding

RCN has 15 portfolio boards and one steering committee. Each of them is responsible for making investments within one or more of its budgetary purposes. They are also responsible for monitoring investments in their respective portfolio area, but the investment decisions are made by other portfolio boards.

The portfolio board is also charged with promoting internationalisation, among other things through the EU Framework Programme for Research and Innovation.

The Portfolio Board also advises the CEO on overall holistic follow-up of the portfolios and the professional activities within their area of responsibility and manages the budget funds as they are made available by the Research Council's board. The main purpose of the management is to achieve regular and predictable calls and optimal project portfolios in order to achieve the goals in the portfolio board's area of responsibility.

The portfolio boards normally have 10–12 members, each appointed by the Executive Board for a period of four years. Before appointing the members, RCN asks external actors to nominate candidates and the invitation to nominate is published on RCN's website. The candidates are chosen from the nominated candidates and from people with specific competencies that we have approached. This recommendation is then presented to the Board, which appoints the portfolio boards. The Research Council has portfolio boards for:

- Democracy, administration and renewal
- Energy, transport and low emissions
- Global development and international relations
- Oceans
- Health
- Humanities and social sciences
- Industry and services
- Climate and polar research
- Land-based food, the environment and bioresources
- Life sciences
- Enabling technologies
- Natural sciences and technology
- Petroleum
- Education and competence
- Welfare, culture and society
- Sami (steering committee)

Source: https://www.forskningsradet.no/en/about-the-research-council/what-we-do/Portfolio-boards/; https://www.forskningsradet.no/en/apply-for-funding/who-can-apply-for-funding/research-organisations/Researcher-Project/adminstrative-procedures/.

Allocation of government funding to agency (budget appropriation)

According to information provided by RCN, it invests in research and innovation on behalf of the Norwegian government. It is the RCN's task to ensure that this funding goes to the best research and innovation projects. Funding decisions are taken by the portfolio boards, which are comprised of nearly 200 independent board members from across all sectors (see above).

3.7.2 Characteristics of funding schemes

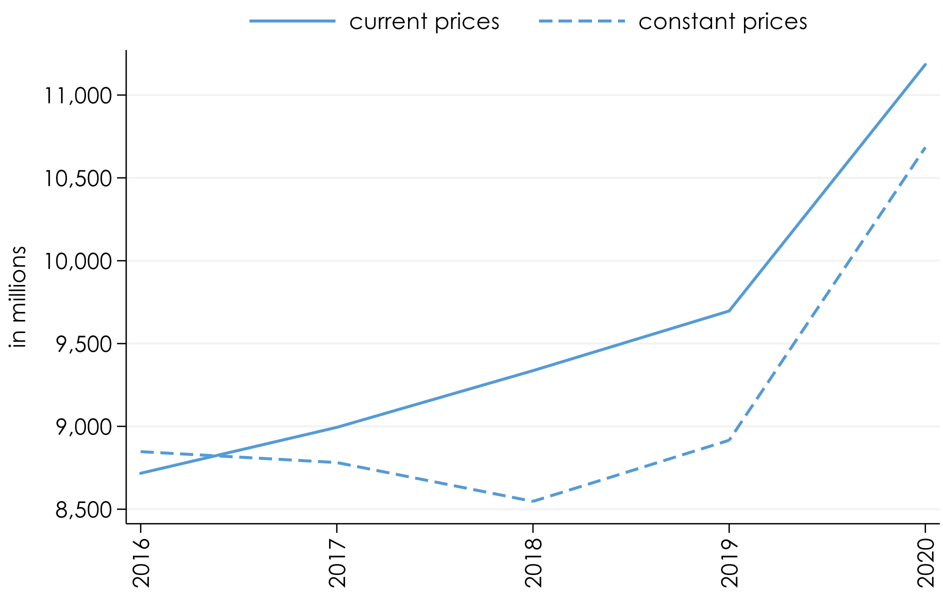
Organisation of funding activities

RCN uses calls within funding schemes, such as the "Researcher Projects". These calls are relevant for several thematic areas as well, so that there is a cross-cutting or matrix approach to funding, standard research proposals/application types can be used for a variety of initiatives, with the portfolio boards aiming at coherent funding portfolios for their boards.

Funding portfolio and data

Total funding data is available for the time period 2016-2020, in which there has been a considerable increase.

Figure 31: **RCN funding awarded in current and constant NOK, 2016-2020**



Source: The Research Council in numbers - tables and figures (https://www.forskningsradet.no/en/statistics-and-evaluations/statistics-and-evaluations/the--research-councils-statistics/); World bank database for GDP deflator (2015=100); WIFO calculation.

Next, we turn to individual funding schemes and the funding portfolio (table below). Please note that PhD and postdoc funding is integrated into the presented research funding schemes so that the numbers on the activities career, education & training are underestimated/not present. Moreover, due to recent reorganisation and restructuring at the RCN, there is no guarantee that we have interpreted the data from the website and the funding schemes accurately. The data should hence be interpreted very cautiously.

Table 15: **Selected characteristics of the funding schemes, 2020**

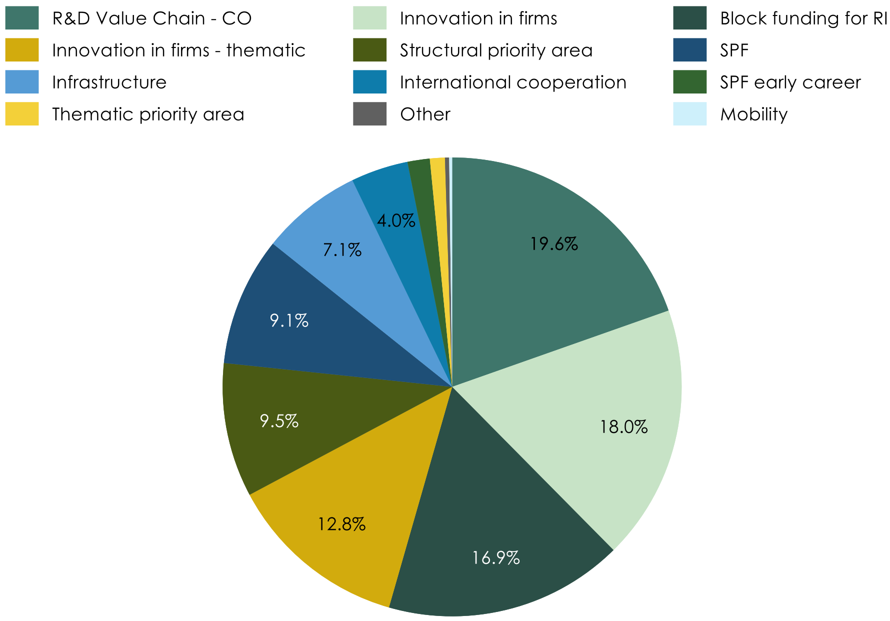
Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 2016-2020	Bottom-up vs. Top-down	Main aim of funding scheme
Total	**Total**	**100%**			
Project Funding	**Total**	**11%**	**-1.03**		
Single project funding (SPF)	Total	9%	-0.85		
	Fri prosjektstøtte (Free project support)	7%		bottom-up	Open arena - researcher projects. To promote renewal and development in research across all disciplines and thematic areas.
	Andre frittstående prosjekter (Other freestanding projects)	2%		bottom-up	Other independent projects
SPF early career	Fri prosjektstøtte (Free project support)	2%	-0.18	bottom-up	Open arena - researcher projects. To promote renewal and development in research across all disciplines and thematic areas.
Priority areas	**Total**	**11%**	**-1.35**		
Structural priority area	Total	9%	-0.54		
	Strategisk institusjonsstøtte (Strategic institutional support)	2%		N/A	Support for Establishment of strategic programmes at the institutions
	SFF/SFI/FME (SFF/SFI/FME)	7%		top-down	Centres of Excellence/Centres for Research-based Innovation/Centres for Environment-friendly Energy Research. Targeted, long-term investment to strengthen and further develop outstanding and creative research and innovation groups, or to build up research groups in areas of key strategic importance
Thematic priority area	Grunnforskningsprogrammer (Basic research programmes)	1%	-0.80	top-down	Thematic basic research program
Infrastructure	**Total**	**7%**	**0.65**		
Infrastructure	**Total**	**7%**	**0.65**		
	Andre infrastrukturtiltak (Other infrastructure tasks)	0.08%			Other infrastructure measures. To promote and strengthen infrastructure that leads to innovative research and development.
	Vitenskapelig utstyr, databaser, samlinger (Scientific equipment, databases, collections)	7%		N/A	Infrastructure. To promote and strengthen infrastructure that leads to innovative research and development.
Funding of People	**Total**	**0.2%**	**-0.02**		
Mobility	Fri prosjektstøtte (Free project support)	0.2%	-0.02	bottom-up	Open arena - researcher projects. To promote renewal and development in research across all disciplines and thematic areas.
Translation	**Total**	**50%**	**1.42**		

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 2016-2020	Bottom-up vs. Top-down	Main aim of funding scheme
Innovation in firms	Brukerstyrte innovasjonsprogrammer (User-driven innovation programmes)	18%	1.84	bottom-up	User-driven innovation programs for firms
Commercialisation		N/A			
R&D Value Chain - Challenge Orientation	Store programmer (Major programmes)	20%	0.04	top-down	Thematic programs (basic-applied-innovation)
Innovation in firms - thematic	Handlingsrettede programmer (Action-oriented programmes)	13%	-0.46	top-down	Thematic programs (applied research)
International Cooperation	**Total**	**4%**	**-1.63**		
	Internasjonale nettverkstiltak (International networking activities)	3%		bottom-up	Support for the Establishment and Management of National and International Networks
	Internasjonal prosjektstøtte (International project support)	1%		bottom-up	Support for intenational projects
Block funding for research institutes	**Basisbevilgninger (Basic grants)**	**17%**	**2.25**	**N/A**	**Core funding; This activity is not for universities, but for the so-called institute- sector. The purpose of the state basic funding of research institutes is to ensure a strong institute sector that can offer business and the public sector relevant expertise and research services of high international quality**
Other	**Total**	**0.3%**	**-0.28**		
	Nasjonale stimuleringstiltak,møteplass (National incentive schemes, meeting places)	0.3%		N/A	National stimulus measures; conferences and dialogues
	Virksomhetskostnader (Corporate costs)	0.01%		N/A	

Source: Information was provided by the NRF; The Research Council in numbers - tables and figures (https://www.forskningsradet.no/en/statistics-and-evaluations/statistics-and-evaluations/the--research-councils-statistics/); https://www.forskningsradet.no/en/apply-for-funding/funding-from-the-research-council/application-types/; https://www.forskningsradet.no/en/call-for-proposals/; https://www.forskningsradet.no/en/apply-for-funding/funding-from-the-research-council/. Note: The budget of the programme "Fri prosjektstøtte" was allocated proportionally to the different study scheme classification, based on the shares and allocation of the current calls of the programme. Since there is no English table with the financial data, it was translated with deepl (https://www.deepl.com/translator). Due to recent reorganisation and restructuring at the RCN, there is moreover no guarantee that we have interpreted the data from the website and the funding schemes accurately. The data should hence be interpreted very cautiously.

The different nature of RCN as integrating basic research as well as innovation funding can be seen in its funding portfolio, with funding innovation in firms playing an important role, as well as the funding of inhouse research institutes.

Figure 32: **Total funding awarded by the RCN by type of funding activity, 2020**

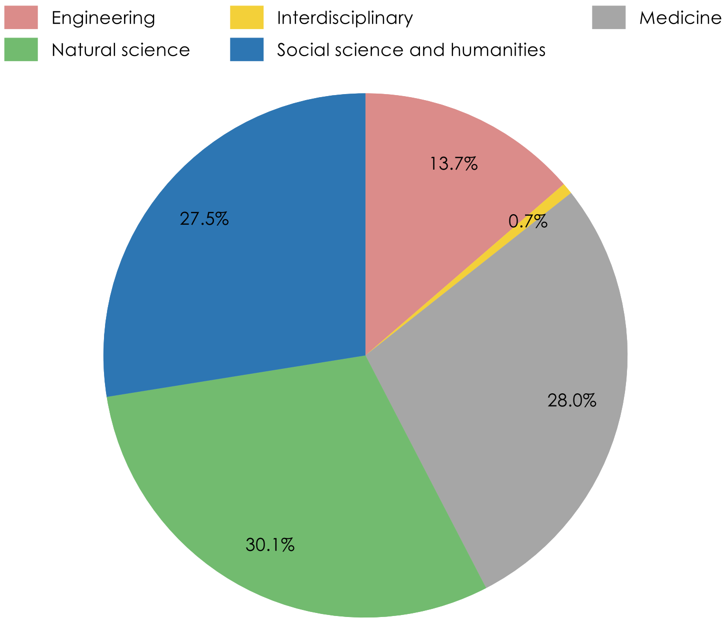


Source: The Research Council in numbers - tables and figures (https://www.forskningsradet.no/en/statistics-and-evaluations/statistics-and-evaluations/the--research-councils-statistics/); https://www.forskningsradet.no/en/apply-for-funding/funding-from-the-research-council/application-types/; https://www.forskningsradet.no/en/call-for-proposals/. Note: The budget of the programme "Fri prosjektstøtte" was allocated proportionally to the different study scheme classification, based on the shares and allocation of the current calls of the programme; Category "Other" forms funding schemes that cannot be classified according to WIFO allocation. Values that are not displayed are <2%. Due to recent reorganisation and restructuring at the RCN, there is no guarantee that we have interpreted the data from the website and the funding schemes accurately. The data should hence be interpreted very cautiously.

Single project funding

Figure **33** shows the shares of some broad disciplines in the single project funding scheme of the RCN, with a relatively high share of social sciences and humanities.

Figure 33: **Share of disciplines in single project funding, 2020**



Source: https://prosjektbanken.forskningsradet.no/en/explore/statistics?Kilde=FORISS&distribution=Fag&chart=bar&calcType=funding&Sprak=no&sortBy=date&sortOrder=desc&resultCount=30&offset=0&Soknad=Forskerprosjekt&Ar=2020.
Note: Engineering= Teknologi (Technology); Interdisciplinary=Annet; Medicine= Medisin og helsefag (Medicine and Health Sciences) & Landbruks- og fiskerifag; (Agriculture and fisheries) Natural science= Matematikk og naturvitenskap (Mathematics and Natural Sciences); Social science and humanities: Humaniora (Humanities) & Samfunnsvitenskap (Social Science). Since there is no English table with the financial data, it was translated with deepl (https://www.deepl.com/translator).

There are no success rates over time, for 2020 the information provided was 11%.

3.7.3 Refundable costs and review procedures of single project funding

The following information was taken directly from the website of the RCN:

All applications for project support from the Research Council must contain a complete budget. The budget includes a cost plan detailing all the expected project costs and a funding plan showing how these costs will be covered under the project. The budget is to be specified by calendar year.

The call for proposals will specify the kinds of costs that can be funded.

For the current call for the researcher project for scientific renewal, for example, it is:

- Payroll and indirect expenses related to researcher time (including research fellowship positions) at the research organisations participating in the project. For doctoral and post-doctoral research fellowships, this funding is limited to maximum three person-years.
- Equipment. This encompasses operating and depreciation costs for scientific equipment and research infrastructure necessary for the execution of the project.
- Operating expenses, which comprise costs for other activities that are necessary to carry out R&D efforts under the project. Procurements from subcontractors that exceed NOK 100,000 must be specified.

If the project includes doctoral and post-doctoral research fellowships and there are concrete plans in place for research stays abroad for the fellowship holders, the costs of such stays may be included in the grant application.

Source: https://www.forskningsradet.no/en/apply-for-funding/Budget/what-to-enter-in-the-project-budget/; https://www.forskningsradet.no/en/call-for-proposals/2022/researcher-project-scientific-renewal/.

The RCN pays indirect costs according to full economic costs calculated by the TDI model. "Research Council funding for researcher time is awarded as a lump-sum allocation to the organisation responsible for employing the researcher. This funding is to help to cover salary, social security costs, indirect costs and general operating costs (including supervision of research fellows)" For a reference salary indicated by RCN on its website, 70% of full economic costs are paid, but the salary calculation base is fixed, so that higher salaries lead to lower shares of economic costs reimbursed.

Source: For universities, see here https://www.forskningsradet.no/en/apply-for-funding/Budget/what-to-enter-in-the-project-budget/foring-av-personalkostnader-og-indirekte-kostnader-i-uh-sektoren/ and https://www.forskningsradet.no/en/apply-for-funding/Budget/what-to-enter-in-the-project-budget/rates-for-researcher-time-in-the-university-and-university-college-sector/ .

Table 16: **Overview of review process**

The following information is taken from the RCN's website.

Internal/External reviewers:	Proposals seeking funding in excess of NOK 500 000 will be assessed by external referees. Other proposals will be assessed internally within the Research Council..
Number of reviewers (per proposal):	4-7 panel reviewers, 2 written reviews beforehand
International/National reviewers:	International
Organisation of Review:	The external referees assign marks for each of the three assessment criteria and may be asked to rank the individual applications in relation to one another. Applications that are assessed in relation to the assessment criterion will receive a separate mark for this. The Research Council's scientific advisors will draw up a recommended ranking of the submitted grant proposals. Recommendations are based on the referee assessments, and may incorporate an assessment of relevance and an overall assessment of all the applications submitted in response to the call. The final decision regarding the approval or rejection of grant proposals is normally taken by one of the Research Council's portfolio boards. The portfolio boards review the recommendation and take the final decision regarding funding allocations. The portfolio boards are responsible for ensuring that the funded proposals as a whole will lead to optimal achievement of the board's objectives. All applicants receive the grounds for the funding decision via "My RCN Web. After application processing has been concluded, applicants will receive the referee panel's assessment. A list of all referees used to review grant applications will be published on our website.
Assessment criteria (incl. weights or relative importance, if available):	In 2019 the Research Council introduced new assessment criteria for overall assessment of grant proposals: Excellence, Impact and Implementation. The three criteria have been defined and adapted to accommodate the Research Council's various application types. The criteria are structured in the same way for all application types. **Excellence** • The extent to which the proposed work is ambitious, novel, and goes beyond the state-of-the-art; • The quality of the proposed R&D activities. **Impact** • Potential outcomes and impacts of the proposed research and innovation; • Communication and exploitation. **Implementation** • The quality of the project manager and project group; • The quality of the project organisation and management.

	In addition, grant applications for some calls will be assessed for their relevance to the call for proposals. Assessment of the relevance criterion is normally carried out by the Research Council's internal scientific advisors. **Relevance** • The relevance of the grant applications is assessed in relation to the requirements and priorities stipulated in the call for proposals.
Special characteristics for early stage researchers (first-time applicants):	NA

Source: https://www.forskningsradet.no/en/processing-grant-applications/processing-applications/processing-of-grant-applications/.

3.7.4 Important changes over time

Introduction of new funding schemes

According to information provided by RCN, there are various approaches. For instance, the Research Council carries out tasks commissioned by the 15 governmental ministries which can use the RCN for their purposes. The Research Council`s activities are also an important part of the Government's long-term plan for research and higher education. This plan again is the result of different initiatives, initiated by international and national actors. The EU Missions are an important part of the RCN's work to engage with Horizon Europe and examine synergies with RCN's own funding schemes and policies. Missions have become central for future planning in Norway.

Other changes

Due to a lack of longer-term data at a more detailed level, shifts in the budget shares of activities cannot be documented.

3.7.5 Information and data sources

Contact at RCN

post@forskningsradet.no

Information about structure of fund

https://www.forskningsradet.no/en/about-the-research-council/what-we-do/

https://www.forskningsradet.no/en/about-the-research-council/what-we-do/the-executive-board/

https://www.forskningsradet.no/en/about-the-research-council/what-we-do/the-research-council-international-advisory-board/

https://www.forskningsradet.no/en/about-the-research-council/what-we-do/Portfolio-boards/

https://www.forskningsradet.no/en/apply-for-funding/who-can-apply-for-funding/research-organisations/Researcher-Project/adminstrative-procedures/

Information about application and review procedures

https://www.forskningsradet.no/en/apply-for-funding/Budget/what-to-enter-in-the-project-budget/

https://www.forskningsradet.no/en/call-for-proposals/2022/researcher-project-scientific-renewal/

https://www.forskningsradet.no/en/apply-for-funding/Budget/what-to-enter-in-the-project-budget/foring-av-personalkostnader-og-indirekte-kostnader-i-uh-sektoren/

https://www.forskningsradet.no/en/apply-for-funding/Budget/what-to-enter-in-the-project-budget/rates-for-researcher-time-in-the-university-and-university-college-sector/

https://www.forskningsradet.no/en/processing-grant-applications/processing-applications/processing-of-grant-applications/

Portfolio & data

The Research Council in numbers - tables and figures (https://www.forskningsradet.no/en/statistics-and-evaluations/statistics-and-evaluations/the--research-councils-statistics/)

https://www.forskningsradet.no/en/apply-for-funding/funding-from-the-research-council/application-types/; https://www.forskningsradet.no/en/call-for-proposals/

https://www.forskningsradet.no/en/apply-for-funding/funding-from-the-research-council/.

https://prosjektbanken.forskningsradet.no/en/explore/statistics?Kilde=FORISS&distribution=Fag&chart=bar&calcType=funding&Sprak=no&sortBy=date&sortOrder=desc&resultCount=30&offset=0&Soknad=Forskerprosjekt&Ar=2020.

3.8 UK Research and Innovation (UKRI, United Kingdom)

In April 2018, the UK underwent major change with respect to its funding of research and innovation, with the hitherto 7 discipline-focused research councils being regrouped under a common umbrella organisation, UK Research and Innovation (UKRI), together with Research England and Innovate UK – the UK's innovation agency. In the following, we present features of mostly the umbrella organisation and partly the 7 research councils, providing separate information when there are differences in funding practices and consolidated information when all councils share the same practices, as e.g. in using full economic costing for reimbursing funds. Funding data does not include Innovate UK or Research England as the project was focused on single project research grant funding. Innovate UK provides funding to businesses and Research England provides quality-related block-grant research funding, awarded directly to universities.

3.8.1 Organisational mission and structure

Mission focus

UKRI and the individual research councils follow a broad focus on both funding the creation of knowledge as well as its use, strongly emphasising economic and societal impact. Creation of knowledge is not limited to basic research, but as in the case for most Research Councils they also fund strategic and applied research. Innovate UK also funds research in business, but we look mainly at the former traditional research funding Research Councils within UKRI for this study. The following information is taken from the UKRI website; the mission of the individual Research Councils can be found in the annex to this section on UKRI.

> UKRI's mission is to convene, catalyse and invest in close collaboration with others to build a thriving, inclusive research and innovation system that connects discovery to prosperity and public good.
>
> UKRI brings together nine organisations with great depth and breadth of expertise, allowing it to connect research communities, institutions, businesses and wider society, in the UK and around the world. This combination enables it to work across the whole research and innovation system, informed by our networks and expertise. As the UK's largest public funder of research and innovation it is UKRI's responsibility to ensure the health of the system as a whole, now and in the future. As a steward of this system, it will work together with many other organisations. These include its close partners at the heart of the research and innovation system such as higher education institutions and institutes, innovative businesses, investors, not-for-profit organisations and policy makers, and a wider set of partners such as those in the education system and civil society. UKRI will fulfil its stewardship role through the ways in which we catalyse, convene, incentivise, invest in and conduct research and innovation.

Source: https://www.ukri.org/about-us/strategic-prospectus/vision-mission-and-values/.

Overarching decision structures

General/strategic decision making

UKRI is a non-departmental government body, rather than as academic self-governance, i.e. academic researchers have an advisory role rather than a formal say in Council-level decision making. The individual Research Councils have no separate legal entity. The following information is taken from the UKRI website:

UKRI's main governance bodies are the UK Research and Innovation Board and the Executive Committee which provides strategy advice to the Board and is the day-to-day coordinating body for UKRI executive activity.

The **UK Research and Innovation Board (UKRI Board)** is UKRI's primary governing body. It has general oversight of UKRI's activities and is responsible for achieving UKRI's strategic objective and vision.

The board is made up of UKRI's Chair, Chief Executive and Chief Finance Officer, as well as between 9 and 12 independent members drawn from higher education, industry and commerce, policy, and charities and other non-governmental organisations. Board members are appointed by the Secretary of State for Business Energy and Industrial Strategy. Members initially serve for three to five years. The board is required to give updates and advice to the Secretary of State, including an annual report and strategic priorities.

The board is supported by the Audit, Risk, Assurance and Performance Committee, the Nominations and Remuneration Committee and a Board Investment Committee that provides independent scrutiny of major business cases that exceed UKRI's delegations.

The **Executive Committee** provides strategic advice to the UKRI Board and is the day-to-day coordinating body for UKRI activity.

It provides leadership across the councils and ensures collaboration on strategy and operational matters. The committee is chaired by the Chief Executive and includes the Executive Chairs of the nine UKRI councils.

UKRI has a number of non-executive committees, which are responsible for advising and guiding the UKRI Board and Executive Committee. Each of the nine councils also has its own Council, which sets the objectives and direction of that council.

The **Audit, Risk, Assurance and Performance Committee** supports the overall operational performance and offers assurances on governance, risk management, the control environment and the integrity of financial statements. It reports directly to the board.

The **Nominations and Remuneration Committee** determines the composition and effectiveness of the Councils, and the remuneration of the Executive Chairs, CEO, Chief Finance Officer and other senior managers.

People, Finance and Operations Committee provides leadership for, and overseeing, collective areas of operational strategy and policy, chaired by the Chief Finance Officer.

Strategy Committee provides expertise and advice on the development of and implementation of UKRI's research strategy, chaired by the Strategy Director.

The **Health and Safety Management Committee** is the senior governance forum for health and safety within UKRI and is a sub-committee of the Executive Committee.

Source: https://www.ukri.org/about-us/our-structure/ukri-board/.

Decision structures for funding

The following information was provided by UKRI:

The formalization of the Haldane principle (page 10 and 60 in https://www.ukri.org/files/about/ukri-framework-document-2018-pdf/) means that decisions on individual research proposals are best taken following an evaluation of the quality and likely impact of the proposals by researchers themselves through peer review. The Higher Education Research Act defines more precisely how this principle operates within UKRI. Strategic, long term decision making requires input from both subject matter experts and central government, this includes investment in large capital infrastructure and research treaties. The Haldane principle does not apply to the government's funding of innovation and the activities of Innovate UK. The UK government formally rescinds any influence on individual funding decisions of projects. The individual Research Councils still take most of the funding decisions, based on their peer review process (see section 4.5.3).

The Secretary of State takes decisions about overall strategic priorities (for example on major programmes such as the Industrial Strategy Challenge Fund) and overall budgets on advice from UKRI, approves the overall strategy and corporate plan for UKRI, and takes specific spending decisions if those are above delegated limits or have significant policy implications.

Allocation of government funds to agency

The central UKRI strategy team, with support from across UKRI including the Research Councils are responsible for making a case for the combined UKRI budget to elected ministers through the Comprehensive Spending Review process in the UK. They are also responsible for providing advice to those ministers about the allocation of that budget to the nine councils of UKRI.

3.8.2 Characteristics of funding schemes

Organisation of funding activities

The Research Councils provide discipline-specific funding through funding schemes which invite both investigator-initiated projects ("responsive mode") and managed or programmed funding, i.e., the Councils also invite proposals for their own strategic research questions. Most of the Research Councils feature a couple of core mechanisms, among them a general research grants scheme, i.e., the standard single-project funding, as well as early career grant funding schemes, career development and postgraduate funding schemes; more translation- and thematic challenge-oriented schemes also feature in the portfolio of most Councils. UKRI also delivers strategic mission-orientated programmes that are developed by the UK Government to address a Government priority or need in Research and Innovation, these are developed in collaboration with UKRI, other delivery partners and other stakeholders and UKRI receives funding from the UK Government to support these (https://www.ukri.org/our-work/our-main-funds/). UKRI also promotes all funding schemes and calls externally on its website: https://www.ukri.org/funding/funding-opportunities/. Note that the standard project funding research grants scheme is usually quite flexible, in that it accommodates both responsive (bottom-up) and managed (top-down) calls for proposals, single- and multi-project proposals, R&D collaboration with businesses (and hence both basic and applied research proposals, single- as well as interdisciplinary research (as long as the problem addressed loosely falls within the remit of one of the Councils, e.g. a biological research question in the case of the Biotechnology and Biological Research Council (BBSRC)). Some Councils also provide funding for strategic institutes (such as the BBSRC). Thematic focus changes with the various calls influenced by current scientific needs and problems. Accordingly, the tables below need to be interpreted bearing in mind within-scheme flexibility of addressing other goals.

Table 17: **Qualitative overview table of funding portfolios, 2020**

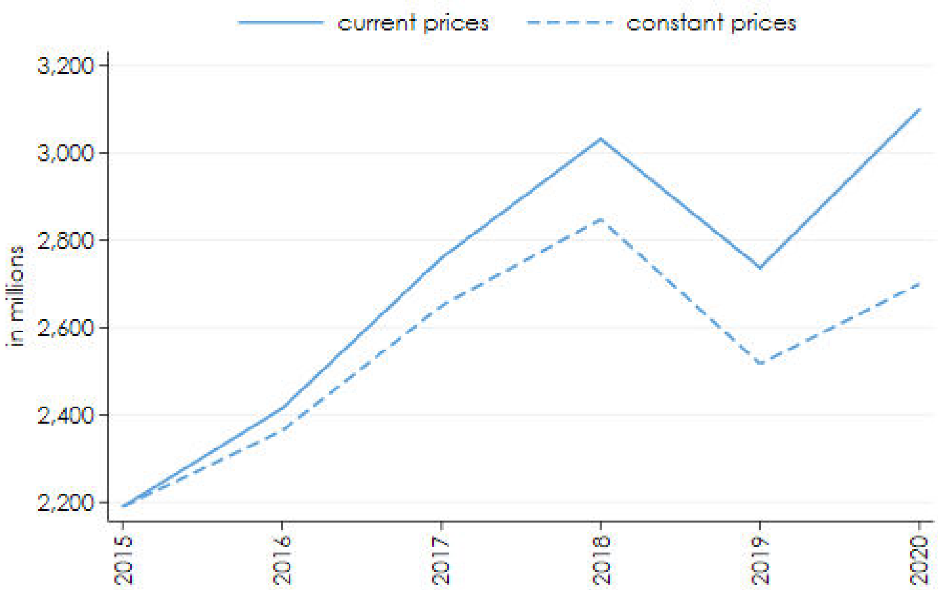
Category of award according to UKRI	AHRC	BBSRC	EPSRC	ESRC	MRC	NERC	STFC	UKRI
Fellowships	x	x	x	x	x	x	x	x
Impact/Innovation/KE	x	x	x	x	x	x	x	x
Networking/Partnering	x	x	x	x	x	x	x	x
PE	x		x	x	x	x	x	x
Research Project	x	x	x	x	x	x	x	x
Strategic Equipment		x	x	x	x	x	x	x
Training	x	x	x	x	x	x	x	x

Source: Information provided by UKRI. Note: PE = Public Engagement, KE = Knowledge Exchange. This table was provided by UKRI based on preliminary information and needs to be interpreted with caution.

Funding portfolio and data

UKRI total funding data over time is available from 2015, indicating a rise in funding of about 20% (Figure 34). This data does not include funding such as block grants, studentships or quality related funding from Research England. The subsequent graphs and charts are based on one funding scheme, an analysis of single-project / responsive mode, standard grant data provided by the Research Councils grants teams from 2014 – 2020. This includes funding disbursed (except for the Economic and Social Research Council -ESRC) and success rates. This is only a subset of all UKRI competitively awarded grants.

Figure 34: **UKRI awarded funding in current and constant GBP, 2015-2020**



Source: Data on total funding from UKRI Tableau Public https://public.tableau.com/app/profile/uk.research.and.innovation.ukri./viz/CompetitiveFundingDecisions2015-16to2019-20/UKRICompetitiveFunding, World bank database for GDP deflator (2015=100), WIFO calculation.

Table 18 shows the total funding across each of the research councils from the UKRI website (https://public.tableau.com/app/profile/uk.research.and.innovation.ukri./viz/UKRICompetitiveFundingDecisions2020-21/CompetitiveFundingDecisions) and the calculated share of the single-project funding data as a percentage of the total funding and a the change in percentage from 2015-2020.

Table 18: **Selected characteristics of the standard research grant, 2020**

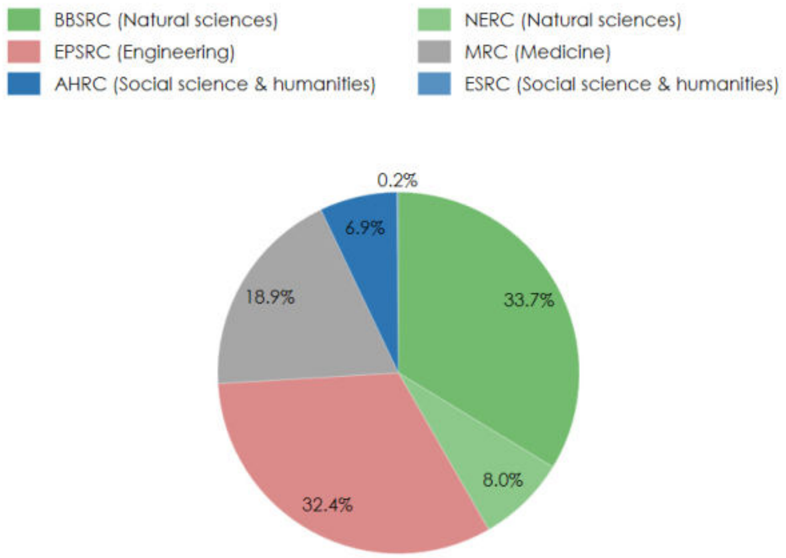
RFOs	Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 2015-2020	Bottom-up vs. Top-down
BBSRC	Single Project Funding (SPF)	BBSRC standard research grant	56%	-7.99	bottom-up
AHRC	Single Project Funding (SPF)	Research Grants Standard	30%	-23.70	bottom-up
MRC	Single Project Funding (SPF)	Research Boards Standard grants	25%	0.81	bottom-up
NERC	Single Project Funding (SPF)	Standard grants	23%	-1.49	bottom-up
EPSRC	Single Project Funding (SPF)	Standard research grant	18%	-8.19	bottom-up

Source: Information and data on single project funding provided by UKRI, data on total funding from UKRI Tableau Public https://public.tableau.com/app/profile/uk.research.and.innovation.ukri./viz/UKRICompetitiveFundingDecisions2020-21/CompetitiveFundingDecisions. Note: ESRC provided mean and median funding so it is not included. No data for STFC and ESRC. The standard research grant in the UK can also accommodate research collaborations, so more than one principal investigator.

Single project funding

Figure 35 shows the percentage shares of funding distributed to successful projects against the budget available for the various Research Councils Standard Grant scheme. As the Research Councils are discipline specific and for the purposes of this study to allow comparison of funding agencies this figure shows a rough split of the scientific disciplines in single project funding, but this needs to be interpreted with caution, as e.g., the EPSRC does not only fund engineering but also physical sciences and BBSRC does not neatly fit into the natural sciences but all aspects of the biosciences. The disciplines have been chosen like this to be consistent with the other agencies.

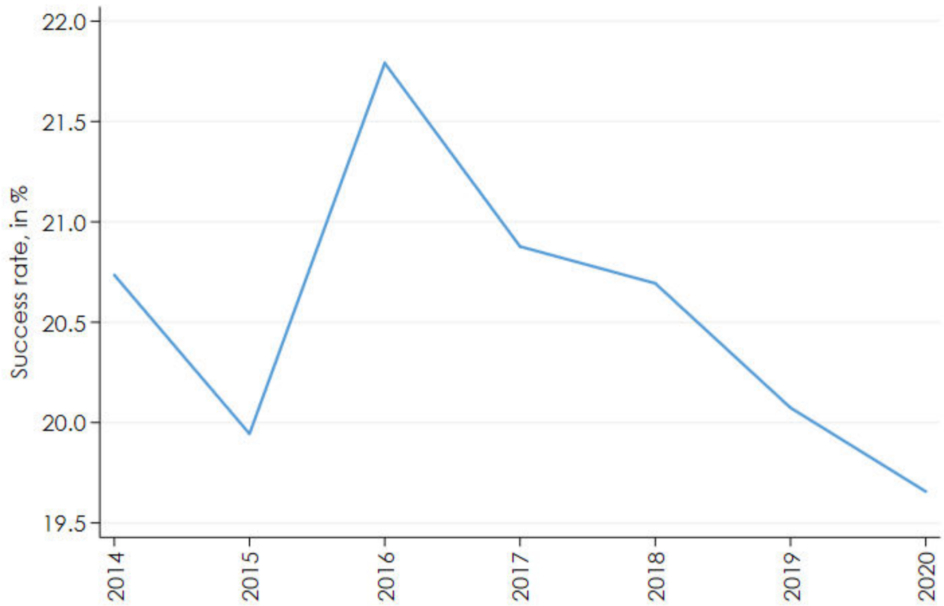
Figure 35: **Shares of disciplines – Research Councils – in single project funding, 2020**



Source: Responsive mode – standard grant data provided by UKRI. Note: Natural science consists of the councils BBSRC and NERC. Engineering corresponds to the council EPSRC (which includes physical sciences), Medicine to the council MRC. Social science and humanities consists of the councils AHRC and ESRC. Social science and humanities is underestimated in this graph as only average values for ESRC disbursed funding has been provided. The average shares are 21% for natural sciences and 4% (caution – underestimated!) for social science and humanities. The standard research grant in the UK can also accommodate research collaborations, so more than one principal investigator.

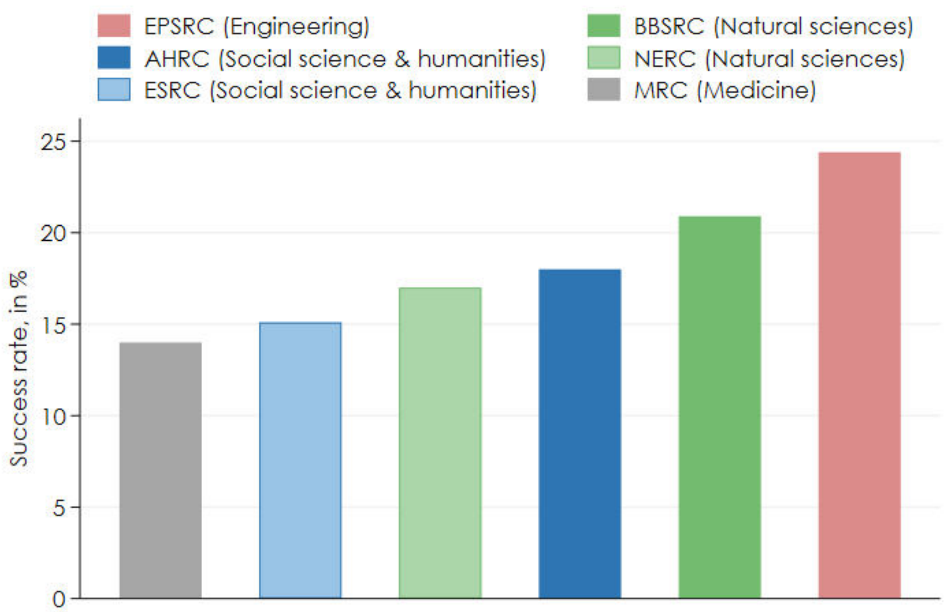
Success rates are calculated as averages of number of grants submitted and number of projects awarded for individual councils; they have shown a variable trend since 2014, with the average across the UKRI Research Councils for 2020 being 19.7%. The success rate is highest for EPSRC at 24.4% for 2020.

Figure 36: **Success Rate in the standard research grant across all Research Councils, 2014-2020**



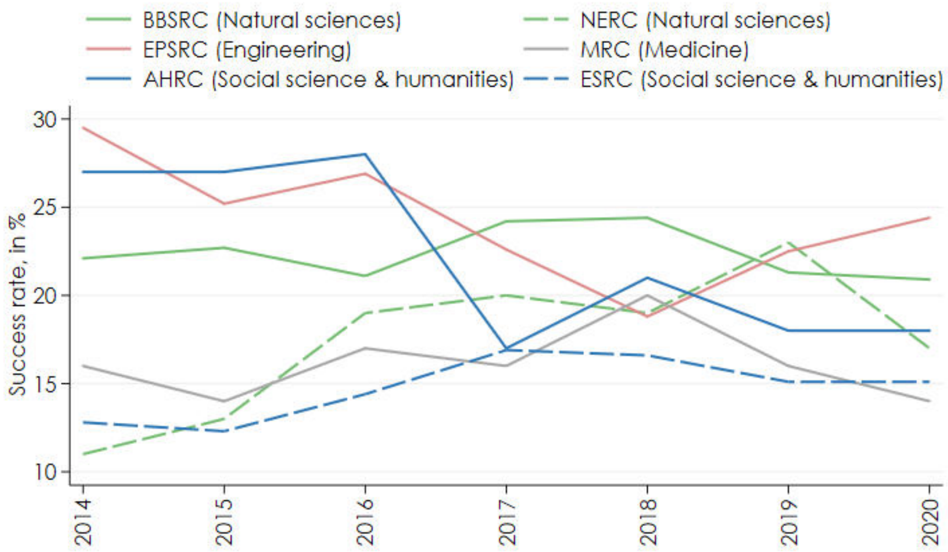
Source: Responsive mode – standard grant data provided by UKRI, WIFO calculation based on all submissions. Note: An average value was calculated from the available councils who support single-project, bottom-up 'Standard grants': AHRC, BBSRC, EPSRC, ESRC, MRC and NERC. The standard research grant in the UK can also accommodate research collaborations, so more than one principal investigator.

Figure 37: **Success Rate in single project funding by discipline, 2020**



Source: Responsive mode – standard grant data provided by UKRI. Note: Natural science consists of the councils BBSRC and NERC for this study – although BBSRC funds world-class biosciences and so is not only natural sciences in remit. Engineering corresponds to the council EPSRC (which includes physical sciences), Medicine to the council MRC. Social science and humanities consists of the councils AHRC and ESRC. The average success rates are 20% for natural sciences and 16% for social science and humanities.

Figure 38: **Success Rate in single project funding by discipline, 2010-2020**



Source: Data provided by UKRI. Note: Natural science consists of the councils BBSRC and NERC (although BBSRC funds world-class biosciences and so is not only natural sciences in remit). Engineering corresponds to the council EPSRC (which includes physical sciences), Medicine to the council MRC. Social science and humanities consists of the councils AHRC and ESRC. The average success rates for natural sciences are 20% (2020), 22% (2019), 23% (2018, 2017), 21% (2016), 20% (2015), 19% (2014) and 16% (2020), 17% (2019), 19% (2018), 17% (2017), 20% (2016), 18% (2015), 18% (2014) for social science and humanities.

3.8.3 Refundable costs and peer review

The UK government's support for university research relies on a 'dual support system'. This refers to the two main mechanisms of research funding for universities. One part of dual support is the grant funding which is awarded to specific projects or programmes (detailed below). The other part is a block grant, known as Quality-related Research (QR) funding, awarded directly to universities, on the basis of quality, volume and relative cost of research in different subject areas. QR funding constitutes the majority of funding for research in UK universities, providing stability and flexibility - universities are able to decide for themselves how best to use the funding to support research and research infrastructure in line with their own needs and priorities.

To assess the quality of research for funding purposes, Research England and the other UK funding bodies run a periodic assessment exercise, the Research Excellence Framework (REF), which takes place every six or seven years. The most recent exercise took place this year (2021). Results are due in spring 2022, and these will inform funding from 2022-23 onwards.

The distribution of QR to individual universities is informed by the volume of research (based on numbers of research-active staff as reported to the REF), and the quality of research as assessed by the REF. The formula for calculating QR also includes different weightings for different subjects, reflecting, for example, that laboratory-based research is more expensive than library-based research.

For grant funding cost reimbursement is generally treated in the same way across the various Research Councils: UKRI funding works on the basis of Full Economic Costing (FEC). Research Organisations should indicate in their grant proposals the full economic cost of a project. UKRI will then pay a fixed percentage of 80% of this sum unless stated otherwise, which includes a contribution of the cost of academic staff time, and the Research Organisations facilities, estates & indirect costs. Research organisations, in accepting an FEC grant, undertake to provide the remaining 20% from their own resources. Exceptions to this rule are Studentships and externally contracted social surveys and some equipment which will be paid at 100% of the FEC.

See https://www.ukri.org/wp-content/uploads/2021/08/UKRI-170821-FullEconomicCostingGrantTermsConditionsGuidance-Aug2021.pdf – Costings Information (pages 15-19).

For Innovate UK there is different guidance for the eligible costs for non-academic organisations - found https://www.ukri.org/councils/innovate-uk/guidance-for-applicants/costs-we-fund.

The following costs will be refunded:

- Wages of scientific/ technical staff, including wages of tenured principal investigators
- Material expenses (i.e., Costs for equipment and materials of permanent value, direct costs for the use of infrastructures (including costs for maintenance and care), consumables, field expenses, computing time and data (cloud computing), costs for making research data accessible (open research data).
- Mobility (Travel (incl. accommodation and catering costs), conferences and workshops.)
- Costs of scientific (open access) publications. (MRC does not fund this in standard research grant)
- Administrative costs

Review Process

There is a UKRI Peer Review Framework which describes how peer review is used in assessing proposals and making funding decisions. The framework also outlines what information is routinely published relating to proposals and awards, and the approach taken by the councils in responding to requests for information about the assessment process. The framework is designed for use by Applicants and Research Organisations, Board/Panel members and external reviewers, members of the public and Research Council staff. In the following, we show however only the peer review process of EPSRC, for a standard grant. The peer review process of other Councils is similar, e.g. the MRC also features a two stage procedure with external peer review in the first and triage (prioritisation) of applications in the second through panels, in preparation of the funding meeting; criteria are also similar, while of course reflecting disciplinary differences (importance; scientific potential (research quality; research environment and people – how suitable is the applicant work environment; impact; ethics); appropriateness of resources requested).

Table 19: **Overview of review process for full research proposal for standard grant at EPSRC**

The following information is taken from the EPSRC website:

Internal/External reviewers:	External reviewers
Number of reviewers (per proposal):	Minimum 4 will be approached, minimum 3 needed in practice
International/National reviewers:	both
Organisation of Review:	**1st stage:** EPSRC Portfolio Manager organises mail review by external reviewers (possibly members of EPSRC Peer Review College, which consists of 5,500 independent experts, aiming at a balanced composition in terms of gender, region, etc.), **2nd stage:** panel review by panel review members – different to first stage reviewers, but also taken from Peer Review College if possible (prioritisation among projects reviewed in first stage, then recommendation for funding decision.; assessment of relative quality based on research quality and then on importance (see below)
Assessment criteria (incl. weights or relative importance, if available):	**Primary major criterion: Quality** 1. The novelty, relationship to the context, and timeliness; 2. The ambition, adventure, and transformative aspects identified;

	3. The appropriateness of the proposed methodology. **Secondary major criterion: Importance** – how the research… 1. Contributes to, or helps maintain the health of other disciplines contributes to addressing key UK societal challenges and/or contributes to future UK economic success and development of emerging industry(s); 2. Meets national needs by establishing/maintaining a unique world leading activity; 3. Complements other UK research funded in the area, including any relationship to the EPSRC portfolio **Secondary criterion: Impact** - particularly: 1. How complete and realistic are the impacts identified for this work; 2. The effectiveness of the activities identified to help realise these impacts, including the resources requested for this purpose; 3. The relevance and appropriateness of any beneficiaries or collaborators **Secondary criterion: Applicant** - particularly 1. Appropriateness of the track record of the applicant(s); 2. Balance of skills of the project team, including academic partners **Secondary criterion: Resources and Management** – assessment of: 1. effectiveness of the proposed planning and management and of whether the requested resources are appropriate and have been fully justified; 2. the viability of the arrangements described to access equipment needed for this project, and particularly on any university or third party contribution
Assessment criteria for early stage researchers (first-time applicants)	There are no specific criteria for early stage researchers in the standard grant, but EPSRC has a dedicated new investigator award.

Source: https://epsrc.ukri.org/funding/assessmentprocess/review/formsandguidancenotes/standardgrants/.

See also:

How we make decisions – UKRI

UKRI-310321-Principles-of-Assessment-and-Decision-Making-V2.pdf

3.8.4 Changes over time

Introduction of new funding schemes

According to information provided by UKRI, the Strategic (Mission oriented) Programmes are developed by UK Government to address a Government priority or need in R&I. They will normally be developed in consultation with UKRI, other delivery partners and UK R&I stakeholder groups.

Individual UKRI Councils will develop their own top-down directed programmes and opportunities in response to their strategic needs. Each Council has its own governance structure, advisory groups and processes for developing strategic programmes. This will be informed by their current strategy and delivery plans and typically draw in expert advice from the relevant R&I communities.

Other changes

The increasing importance of the impact of the research funded has been very prominent in the UK: "UK Research and Innovation exists to fund the researchers who generate the knowledge that society needs, and the innovators who can turn this knowledge into public benefit."

Source: https://epsrc.ukri.org/files/funding/change-to-pathways-to-impact-epsrc-external-briefing/.

More specifically, UKRI aims at the following reforms according to information provided by it:

Reducing Unnecessary Bureaucracy

UKRI is implementing a set of major changes to how it interacts with applicants – innovators and researchers. The changes build on work already underway across UKRI to streamline and simplify its processes and the lessons learnt during UKRI's rapid response to the coronavirus pandemic.

UKRI's plans include the following specific proposals:

Selection process

- reviewing, with a view to simplifying, the criteria for organisations to be eligible to apply to UKRI for funding
- streamlining the 200+ research and innovation grant schemes run by UKRI, for example moving to single institutional impact acceleration accounts for all future funding rounds and maximising the standardisation of terms and conditions
- changing to a streamlined, two-stage application process for standard grant rounds. Applicants will provide only the information necessary to make a funding decision up front, with information necessary to make an award only required for successful proposals
- replacing multiple, varied approaches to providing CV and track record information with a single format based on the Royal Society's résumé for researchers
- implementing a brand new, fully digital, user-designed, applicant-focused and streamlined grants application system with the first pilot to run this month
- ensuring there is a single information document for a funding call rather than multiple documents to consult.

Assurance and capturing outcomes

- harmonising reporting requirements across UKRI and where possible with other funders
- reducing the number of questions for mandatory reporting for the Researchfish 2020 submission period and actively reviewing our approach to outcomes monitoring with a view to ensuring it is fit for purpose and minimally demanding on our awardees, for example via use of ORCID/integration with other datasets
- identifying opportunities to enhance our risk-based funding assurance approach to align better to the organisation and project type, to reduce the burden of independent audits and where possible assure the organisation's funding, rather than individual projects
- reviewing end of award reporting, for example, the use of and process for final expenditure statements.

Broader systems and activities

- working with external advisers to provide additional, independent challenge and to calculate the total costs of bureaucracy
- stopping multiple asks for data or information that already exists elsewhere, for example in ORCID, CrossRef, DataCite and Companies House
- reviewing the approach to and use of transparent approach to costings (TRAC), with a focus on the research aspects of TRAC to identify and implement improvements to ensure we accurately capture the true costs of research and innovation and act in a sustainable and informed manner. UKRI will work closely with the Office for Students on this to ensure coherence with evidence gathering for the review of TRAC(T), while allowing the two reviews to progress in tandem.

UKRI will work closely with key stakeholders to design, deliver and evaluate the impact of the proposed changes. The aim is to ensure that they result in true systemic reductions in bureaucracy rather than simply moving the burden to another part of the system and without compromising UKRI's ability to invest in quality ideas, researchers and innovators.

More information can be found: https://www.ukri.org/apply-for-funding/how-were-improving-your-funding-experience and https://www.ukri.org/wp-content/uploads/2020/09/UKRI-100920-Reducing-Bureaucracy-Information-Pack.pdf.

Moreover, a new funding agency is planned, called ARIA, supposed to mimic the ARPA-style agencies in the US (ARPA, ARPA-E).

Source: https://www.gov.uk/government/publications/advanced-research-and-invention-agency-aria-statement-of-policy-intent/advanced-research-and-invention-agency-aria-policy-statement.

3.8.5 Information and data sources

Contact at UKRI

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Information about structure of UKRI

https://www.ukri.org/about-us/strategic-prospectus/vision-mission-and-values/

https://www.ukri.org/about-us/our-structure/ukri-board/

Information about application, review procedures and policies

https://epsrc.ukri.org/funding/assessmentprocess/review/formsandguidancenotes/standardgrants/

https://www.ukri.org/about-us/policies-standards-and-data/good-research-resource-hub/

https://www.ukri.org/apply-for-funding/before-you-apply/preparing-to-make-a-funding-application/if-your-research-spans-different-disciplines/

How we make decisions – UKRI

UKRI-310321-Principles-of-Assessment-and-Decision-Making-V2.pdf

Portfolio and data

UKRI Tableau Public for information on total funding

Single-project standard grant – responsive mode data has been provided by UKRI

3.8.6 Annex

Table 20: **Missions of the seven research councils, Research England and Innovative UK**

Council	Mission statement
Arts & Humanities Research Council (AHRC)	The Arts and Humanities Research Council aims to: • Promote and support the production of world-class research in the arts and humanities. • Promote and support world-class postgraduate training designed to equip graduates for research or other professional careers. • Strengthen the impact of arts and humanities research by encouraging researchers to disseminate and transfer knowledge to other contexts where it can make a difference. • Raise the profile of arts and humanities research and to be an effective advocate for its social, cultural and economic significance. Source: https://ahrc.ukri.org/about/policies/codeofpractice/ourmission/.

Council	Mission statement
Biotechnology & Biological Sciences Research Council (BBSRC)	The BBSRC's mission is: • To promote and support, by any means, high-quality basic, strategic and applied research and related postgraduate training relating to the understanding and exploitation of biological systems. • To advance knowledge and technology (including the promotion and support of the exploitation of research outcomes), and provide trained scientists and engineers, which meet the needs of users and beneficiaries (including the agriculture, bioprocessing, chemical, food, healthcare, pharmaceutical and other biotechnological related industries), thereby contributing to the economic competitiveness of the United Kingdom and the quality of life. In relation to the Council's activities, and as the Council may see fit, to: • generate public awareness • communicate research outcomes • encourage public engagement and dialogue • disseminate knowledge. Source: https://bbsrc.ukri.org/about/vision-mission-strategy/mission-history/.
Engineering and Physical Sciences Research Council (EPSRC)	The EPSRC's mission is to: • Promote and support, by any means, high quality basic, strategic and applied research and related postgraduate training in engineering and the physical sciences. • Advance knowledge and technology (including the promotion and support of the exploitation of research outcomes), and provide trained scientists and engineers, which meet the needs of users and beneficiaries (including the chemical, communications, construction, electrical, electronic, energy, engineering, information technology, pharmaceutical, process and other industries), thereby contributing to the economic competitiveness of the United Kingdom and the quality of life. In relation to the activities above, as engaged in by the Council and in such manner as the Council may see fit, to: • Generate public awareness • Communicate research outcomes • Encourage public engagement and dialogue • Disseminate knowledge • Provide advice Approximately half of all of EPSRC's research funding involves collaboration with industry (or other research users) and contributions from them either in case or kind. EPSRC also offers research funding. Source: https://epsrc.ukri.org/about/facts/mission/.
Economic and Social Research Council (ESRC)	ESRC's mission is to: • promote and support, by any means, high-quality research and related postgraduate training on social and economic issues • develop and support the national data infrastructure that underpins high-quality research • advance knowledge and provide trained social scientists who meet the needs of users and beneficiaries, thereby contributing to the economic competitiveness of the UK, the effectiveness of public services and policy, and the quality of life • communicate clearly and promote public understanding of social science. Source: https://esrc.ukri.org/about-us/what-we-do/.
Medical Research Council (MRC)	The heart of MRC's mission is to improve human health through world-class medical research. To achieve this, *MRC* supports research across the biomedical spectrum, from fundamental lab-based science to clinical trials, and in all major disease areas. *MRC* works closely with the NHS and the UK Health Departments to deliver *its* mission and give a high priority to research that is likely to make a real difference to clinical practice and the health of the population. The MRC's mission, as set out *in our Royal Charter*, is to: • encourage and support research to improve human health • produce skilled researchers • advance and disseminate knowledge and technology to improve the quality of life and economic competitiveness of the UK • promote dialogue with the public about medical research. Source: https://mrc.ukri.org/about/what-we-do/mission/.

Council	Mission statement
Natural Environment Research Council (NERC)	NERC responsibilities as set out in the Higher Education & Research Act 2017 are to: • carry out research into environmental science, technology and new ideas • encourage and support the provision of postgraduate training in environmental science, technology and new ideas • facilitate, encourage and support environmental research, technology and new ideas • facilitate, encourage and support the development and exploitation of environmental science, technology and new ideas • facilitate, encourage and support knowledge exchange in relation to environmental science, technology and new ideas • collect, disseminate and advance knowledge in environmental science, technology and new ideas • promote awareness and understanding of environmental science, technology and new ideas • provide advice on any matter relating to NERC functions • promote awareness and understanding of NERC activities. Source: https://nerc.ukri.org/about/whatwedo/vision/.
Science & Technology Facilities Council (STFC)	STFC's research seeks to understand the Universe from the largest astronomical scales to the tiniest constituents of matter, yet creates impact on a very tangible, human scale. STFC is continuing to work with its community, reflecting on the achievements we have made since 2010 and exploring how we can develop an ambitious direction of travel for publication in STFC's Strategic Delivery Plan. Source: https://stfc.ukri.org/about-us/our-purpose-and-priorities/stfc-vision/.
Research England	The Research England mission is to create and sustain the conditions for a healthy and dynamic research and knowledge exchange system in English Higher Education Providers (HEPs). It funds HEPs to deliver excellent research and high-performance knowledge exchange, unlocking potential, generating impact, and meeting national priorities and global challenges. This includes a strong focus on: • high-value, strategic and agile formula funding streams such as quality-related research funding underpinned by the Research Excellence Framework (REF) and support for knowledge exchange via the Higher Education Innovation Fund • support for innovative institutional developments. Research England wants to make the best use of taxpayers' money - prioritising funding where it can get the best value and ensuring it delivers the government's policy aims. Research England also makes sure that HEPs are accountable for the money they get, but without creating an excessive burden on them. Source: https://re.ukri.org/about-us/.
Innovate UK	Innovate UK is the UK's innovation agency. It helps UK businesses to grow through innovation. The government's vision is for the UK to be a global hub for innovation by 2035. Innovate UK mission in achieving that is to help companies to grow through their development and commercialisation of new products, processes and services, supported by an outstanding innovation ecosystem that is agile, inclusive and easy to navigate. Source: https://www.ukri.org/councils/innovate-uk/about-us/.

Source: Websites of each council.

3.9 Wellcome Trust (United Kingdom)

3.9.1 Organisational mission and structure

Mission focus

The Wellcome Trust is a charitable foundation which focuses broadly on knowledge creation to improve global health. The following information was taken from the website:

> Wellcome is an independent global charitable foundation dedicated to improving health through research. Although the way we deliver our mission has evolved since 1936, science has always been at the heart of it.
>
> For the first 30 years, a small Board of Trustees based in the UK considered all applications for funding. Grants were given to set up new laboratories and support academic posts, particularly in pharmacology and tropical medicine. Travel grants promoted collaboration between researchers in the UK and other countries, often nations where research in tropical medicine had been an aspect of British colonialism.
>
> In 1967, Wellcome began to focus more on supporting individual researchers rather than buildings and equipment. This meant more applications to process, and a larger staff to administer the charity's activities. Spending continued to increase, funding more research units outside the UK as well as a number of units at UK universities to study the history of medicine.
>
> After the sale of the company was completed in 1995, Wellcome became one of the largest grant-giving charities in the world. As well as hugely increasing our support for individuals and research centres, we began funding projects taking scientific advances and inventions towards clinical trials, and increased our support for public engagement with science. And we were able to set up – in partnership or independently – large-scale initiatives such as the Wellcome Sanger Institute, which sequenced one-third of the Human Genome Project.
>
> Today, Wellcome supports science to solve the urgent health challenges facing everyone. We have four programmes of work: one for discovery research, and three to find solutions for the challenges of mental health, global heating, and infectious diseases.

Source: https://wellcome.org/who-we-are/history-wellcome" \l "wellcome%E2%80%99s-mission—0079; https://wellcome.org/who-we-are/strategy.

Overarching decision structures

General/strategic decision making

Information taken from the website:

> The **Board of Governors** has ultimate responsibility for Wellcome's activities.
>
> The **Executive Leadership Team** leads the activities of the organization chaired by the Director.
>
> The **Research Programme Team** oversees the four pillars of Wellcome's research funding:
>
> - Discovery Research
> - Climate and Health
> - Infectious Disease
> - Mental Health
>
> The **Research Funding team:**

- manages the grant application and award processes for all our funding activities
- manages Wellcome's grant application systems
- provides advice to applicants on how to apply for grants, our funding policies, and our procedures
- manages peer review and our funding committees
- supports award holders throughout their grant.

The Board of Governors determines the broad structure of our asset management arrangements. The **Investment Committee** is a sub-committee of the Board of Governors with oversight and advisory responsibilities.

Source: https://wellcome.org/who-we-are/teams.

Decision structures for funding

Information taken from the website, addressed to reviewers:

How we make funding decisions

Our procedures vary from scheme to scheme, but we are always guided by a commitment to clarity and openness, diversity and inclusion. You [the reviewers] may notice that our forms are shorter than those of other funders; we have tried to strip out everything we feel is unnecessary for you to assess applications.

We rely on the expertise and impartiality of you and your fellow committee members to advise us, so that we can make the best possible funding decisions. Stages of the process typically include:

- Initial review

Wellcome staff check whether each application is eligible and fits with the relevant remit.

- Shortlisting

Many committees then shortlist full applications. Generally, our committees of external advisers do the shortlisting, but on occasion Wellcome staff will do it.

- Committee assessment

Applications clearing all these hurdles are assessed by committees of external advisers. For many schemes, this will involve a committee interview at our office. Your committee then produces a ranked list of applications recommended for funding.

- Final funding decision

Final decisions are made by Wellcome Research Programmes. They take into account external advice, budget considerations, and current Wellcome priorities. These decisions are overseen by our Executive Leadership Team.

Source: https://cms.wellcome.org/sites/default/files/2021-02/induction-pack-for-committee-members-2020-11.pdf.

Allocation of government funds to agency

Wellcome generally does not receive donations or government grants. Wellcome is an independent foundation, which means all its work is funded from an investment portfolio that currently stands at £38.1 billion. The original source of our funding was a bequest left by Sir Henry Wellcome on his death in 1936. An in-house team of investment professionals manage Wellcome's endowment portfolio. Their aim is to maximise returns over the long term to ensure that Wellcome continues to have sustainable resources for charitable activities.

Source: https://wellcome.org/who-we-are/investments.

3.9.2 Characteristics of funding schemes

Organisation of funding activities

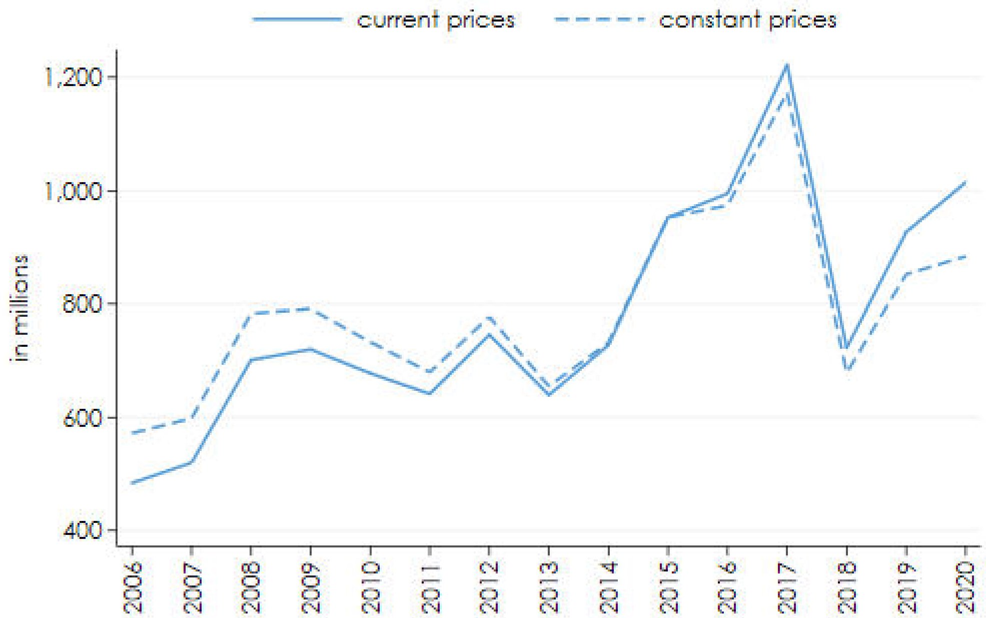
Wellcome uses a small number of funding schemes to fund research projects, people, teams and institutions; it also runs a separate entity, the Wellcome Leap fund, which mimics the US ARPA style of funding (see section 2.1).

Funding portfolio and data

Note that the Wellcome Trust has recently implemented a change in funding schemes, for which however no funding data are available, as they just started in 2021. Hence, the data in this section concerns the "old" funding schemes, which do share some of the characteristics of the new funding schemes: overall, the funding portfolio will still be a mix of 'response mode' investigator/team led ideas for funding over 5-8 years, Institutes/Centres, and strategic initiatives.

We start with overall funding over time, which is likely to fluctuate in response to varying returns on investment. For organisational planning purposes the Wellcome Trust anticipates funding £16Bn over the next decade although this may vary up or down.

Figure 39: **Wellcome Trust awarded funding in current and constant GBP, 2006-2020**



Source: Wellcome Trust Annual Reports and Grant funding data reports; World bank database for GDP deflator (2015=100); WIFO calculation.

Table 21 below shows the shares in funding of various funding schemes. The Wellcome Trust has recently undergone changes and now uses a couple of new funding schemes next to ongoing ones, such as the Wellcome Leap Fund. We still provide information on the old schemes so that we can show a data-based illustration of the funding portfolio in terms of the shares of funding for projects, people, thematic priorities, etc. The new funding portfolio includes the following schemes, for which there is already information on the website[1]:

Table 21: **Selected schemes in the new funding portfolio, 2021**

Funding scheme according to study scheme classification	**Original fund name of the scheme**	**Main aim of funding scheme**
Project funding		
Single Project Funding (SPF)	Wellcome Discovery Awards	This scheme provides funding for established researchers and teams from any discipline who want to pursue bold and creative research ideas to deliver significant shifts in understanding that could improve human life, health and wellbeing.
Funding of people		
Education & Training	PhD Fellowships for Health Professionals	Wellcome's PhD Programmes for Health Professionals offer health professionals outstanding research training in supportive and inclusive research environments. Fellowships supported through these programmes aim to create knowledge, build research capability and train a diverse group of future leaders in clinical academia, within a positive research culture.
Career	Wellcome Early-Career Awards	This scheme provides funding for early-career researchers from any discipline who are ready to develop their research identity. Through innovative projects, they will deliver shifts in understanding that could improve human life, health and wellbeing. By the end of the award, they will be ready to lead their own independent research programme.
	Wellcome Career Development Awards	This scheme provides funding for mid-career researchers from any discipline who have the potential to be international research leaders. They will develop their research capabilities, drive innovative programmes of work and deliver significant shifts in understanding that could improve human life, health and wellbeing.

Source: https://wellcome.org/grant-funding/schemes.

[1] The other schemes listed on the website may still be subject to change in view of the new strategy.

Table 22: **Selected characteristics of the funding schemes, 2020**

Note that the Wellcome Trust has recently changed its funding portfolio (see description above this table). We show the old funding schemes to be able to provide a data-based illustration of the funding portfolio.

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 2019-2020	Bottom-up vs. Top-down	Main aim of funding scheme
Total		**100%**			
Project funding		**14%**	**-2.75**		
Single Project Funding (SPF)	Investigator Awards	11%	0.94	bottom-up	Investigator Awards enable independent researchers with a compelling research vision to tackle the most important questions in science.
SPF high-risk	Seed funding	0%	-1.29	N/A	Seed Awards help researchers develop novel ideas that will go on to form part of larger grant applications to Wellcome or elsewhere.
Networks and multi-project funding	Collaborative & project funding	4%	-2.40	N/A	Collaborative Awards promote the development of new ideas and speed the pace of discovery. We fund teams of researchers, consisting of independent research groups, to work together on the most important scientific problems that can only be solved through collaborative efforts. This often involves collaborations across organisations, national borders, interdisciplinary science and partners outside of academia.
Infrastructure	**Equipment & resources**	**2%**	**-2.15**	**N/A**	**N/A**
Priority areas		**59%**	**30.63**		
Structural priority area	Strategic grants & initiatives	22%	7.77	N/A	"Strategic Awards" (now stopped) allowed teams of investigators to come together for larger response mode open grants.
Thematic priority area		13%	-1.67		
	Drug-Resistant Infections	0.4%		N/A	Our vision is a world in which escalating infectious diseases are under control in the communities most affected, and nobody is endangered by drug-resistant infections. We want to transform the world's approach towards stemming the rise and spread of antimicrobial resistance.
	Vaccines	2%		N/A	Vaccines are among the most successful and cost-effective healthcare interventions in human history. They save countless lives every year. For the world to be better prepared to combat infectious diseases, we urgently need new and improved vaccines. And we need to make sure that the people who need them can use them. We want to support the development of new and improved vaccines, and enable better and broader use of the vaccines that already exists.
	Sanger Institute	9%		N/A	The Wellcome Sanger Institute is a world leader in genome research that delivers insights into human and pathogen biology that change science and medicine through: - Being an 'ideas factory'; conceiving new questions to address through genomics

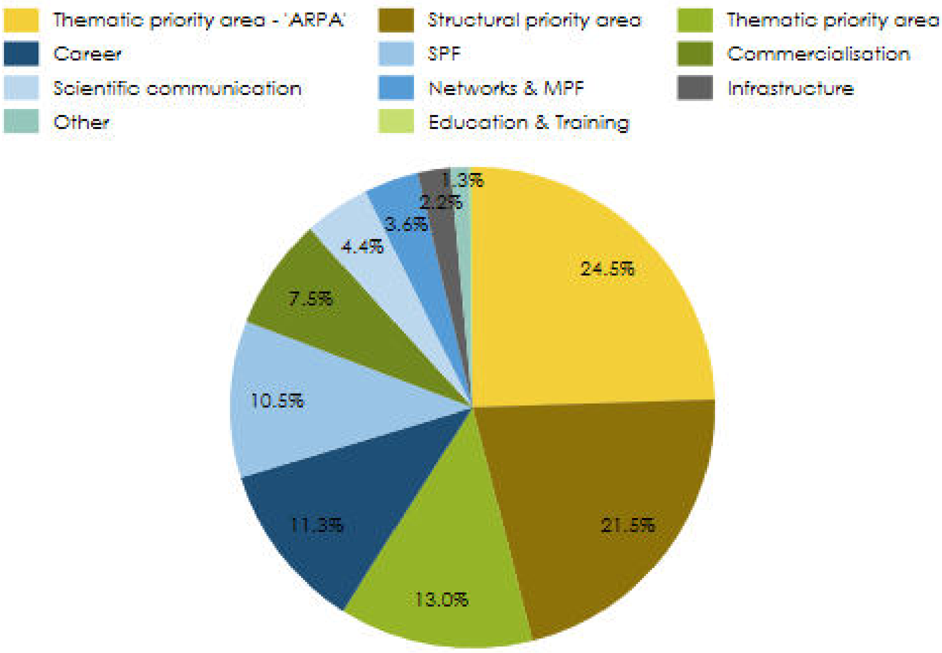
Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 2019-2020	Bottom-up vs. Top-down	Main aim of funding scheme
					and biological science at scale. - Driving genomics technology development and implementation. - Innovating genomic data aggregation and analysis. - Large-scale DNA sequence and phenotype data production from humans, pathogens and cells. - Addressing scientific questions underpinning health issues of low and middle income countries. - Training scientists and clinicians in genome sciences. - Leading global research initiatives with international partners. - Being at the centre of a collaborative network of science.
	Data for Science and Health	0.2%		N/A	Data science is central to the future of health and the scientific endeavour. We have two goals: - Put trust into practice by changing how data and software in health are funded, developed and governed. - Equip and motivate data scientists with the tools and opportunities to innovate with health data in the public interest.
	Snakebite	0.4%		N/A	This funding supports researchers working on innovative approaches to discover and develop next generation treatments for snakebite.
	Our Planet, Our Health	0.7%		N/A	Since 2015, we've supported a community of researchers who are taking on the challenges that food systems, increasing urbanisation and climate change pose to our health. We aim to stimulate research excellence and develop global collaborations to drive change. The areas we're focusing on: Climate change, Global food systems, Urban environments.
Thematic priority area - "ARPA"	Wellcome Leap	25%	24.53	N/A	Programs that aim to deliver breakthroughs in human health over 5 – 10 years and demonstrate seemingly impossible results on seemingly impossible timelines.
Funding of people		**12%**	**-16.41**		
Education & Training	Studentships	0.2%	-14.26	N/A	For example: Doctotal Studentships. This scheme enables researchers to undertake humanities or social science doctoral degrees in any area of health.
Career	Fellowships	11%	-2.15	N/A	For example: Sir Henry Wellcome Postdoctoral Fellowships. This scheme offers recently qualified postdoctoral researchers the opportunity to start independent research careers, working in some of the best research environments in the world.
Translation		**7%**	**-6.00**		
Commercialisation		7%	-6.00		

Funding scheme according to study scheme classification	Original fund name of the scheme	Share of scheme in total funding	Change of share in percentage points 2019-2020	Bottom-up vs. Top-down	Main aim of funding scheme
	Innovations	6%		N/A	Innovations Flagships support the development of exciting new products, technologies and other interventions to prevent or treat disease. Our key approach is to build a series of linked activities, which we call Flagships. Flagships are not a fund, funding scheme or grant – they reflect an explicit commitment to a portfolio approach. By developing a linked portfolio, we'll support a variety of approaches that together mitigate the risks associated with the innovation pathway and improve the chances of achieving our goals. We want to work with partners who share our commitment and can help us to realise the ambition of each Flagship.
	Therapeutics Accelerator	1%		N/A	The COVID-19 Therapeutics Accelerator (CTA) is a philanthropic collaboration supporting efforts to research, develop and bring effective treatments against COVID-19 to market quickly and accessibly.
Scientific Communication		**4%**	**0.55**		
	Public Engagement	2%		N/A	We believe that if the public – by which we mean individuals, communities and society – are actively involved in our work, then Wellcome will be more likely to succeed in its mission and will become even more accountable. We focus on people, helping everyone play their own role in improving health.
	Humanities & Social Sciences	3%		N/A	We maximise Wellcome's impact on human health by understanding the social and cultural contexts of science and health. This includes supporting research in the humanities and social sciences, and public engagement with science.
Other	Other	1%	-3.68	N/A	N/A

Source: Information provided by WT; https://wellcome.org/grant-funding/schemes (as of 11/21); WIFO calculation.

The Wellcome Trust's mission is reflected in its funding portfolio, which shows higher share of funding to address specific challenges (Leap) or thematic priorities.

Figure 40: **Total funding awarded by the Wellcome Trust by type of funding activity, 2020**

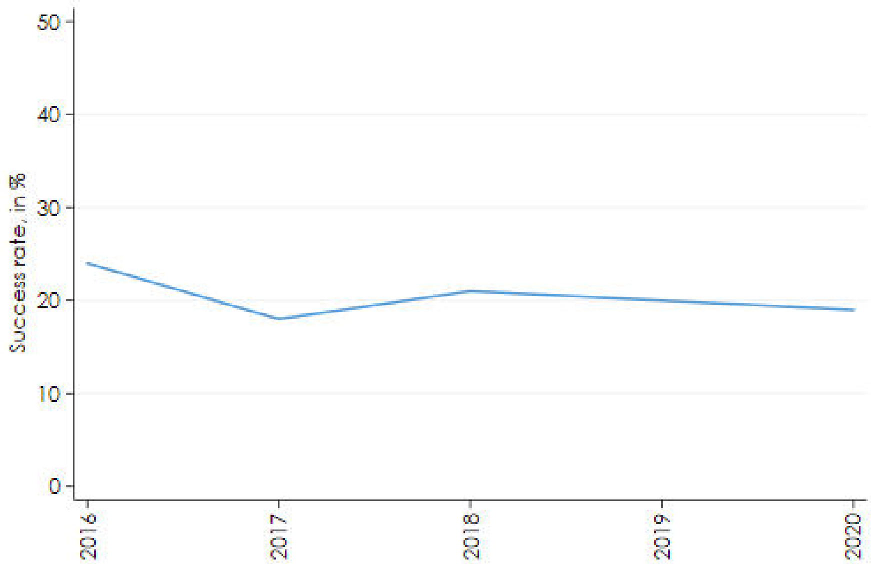


Source: Wellcome Trust Grant funding data report 2019-2020; WIFO calculation. Note: SPF = Single project funding (SPF), Networks & MPF = Networks and multi-project funding. Shares below 1% of total funding are not shown in the chart

Single project funding

Success rates in the investigator awards funding scheme have stayed broadly stable over the years.

Figure 41: **Success Rate in single project funding, 2016-2020**



Source: Wellcome Trust Grant funding data report 2019-2020; investigator awards.

3.9.3 Refundable costs and peer review

The new Wellcome Discovery Awards pay for a range of costs (see https://wellcome.org/grant-funding/schemes/discovery-awards#what-we-offer-9060) – among them staff, equipment, materials, travel costs, public engagement costs; the salary of tenured PIs is usually not included.

Table 23: **Overview of review process**

The following information is taken from the Wellcome trust website/was provided by the Trust directly:

Internal/External reviewers:	External
Number of reviewers (per proposal):	3-5
International/National reviewers:	International
Organisation of Review:	Initial peer review by Expert Panel (discipline-specific advisory groups) to shortlist applications; then written reviews by experts, then face-to-face interviews. Committee review: Wellcome staff contact applicants about the outcome of their application and give them feedback.
Assessment criteria (incl. weights or relative importance, if available):	Reviewers assess how • the application meets the scheme criteria, • the importance and likelihood of success of the proposed work, the track record of the applicant(s), • the suitability of the proposed workplace, • whether the resources requested – for staff, equipment, materials, travel etc. – are justified, and in particular whether any plans for clinical trials or use of animals are fully justified Detailed information can be found here https://wellcome.org/grant-funding/guidance/how-to-write-wellcome-grant-application
Assessment criteria for early career project funding (Wellcome Early-Career Awards):	Research proposal, skills and experience, and research environment, in more detail: "To be competitive, your research proposal will be: • **Bold.** It aims to deliver a significant shift in understanding and/or it provides a significant advance over existing methodologies, conceptual frameworks, tools or techniques. It has the potential to stimulate new and innovative research. • **Creative.** Your proposed approach is novel – it develops and tests new concepts, methods or technologies, or combines existing ideas and approaches in a new way. • **High quality.** It is well-designed, clear, supported by evidence and the proposed outcomes/outputs are feasible. Your skills and experience • your previous research outputs and contributions to the research community • your research skills and experience of different methodologies, and how you plan to develop these during the award • how you will develop your management skills and capabilities for leading a research program. Research environment • how your research environment(s) will support you to deliver your research programme and develop as a researcher • how your host organisation will help you develop your project and management skills • how you will contribute to a positive and inclusive research culture."

Source: https://wellcome.org/grant-funding/guidance/confidentiality-application-review-process. https://cms.wellcome.org/sites/default/files/2021-02/induction-pack-for-committee-members-2020-11.pdf ; https://wellcome.org/grant-funding/schemes/early-career-awards ; https://wellcome.org/grant-funding/guidance/how-to-write-wellcome-grant-application

3.9.4 Changes over time

Introduction of new funding schemes

As a charitable foundation which does not depend on government funds, the Wellcome Trust enjoys considerable autonomy with regard to funding policy. Recently, it has undergone a major set of reforms, leading to an approach with four areas of focus – Discovery Science and three Challenge Areas – Infection, Climate and Health and Mental Health. The discovery awards have replaced the investigator awards. Overall, the funding portfolio will still be a mix of 'response mode' investigator/team led ideas for funding over 5-8 years, Institutes/Centres, and strategic initiatives.

Source: https://wellcome.org/about-us/strategy/how-funding-changing.

Moreover, as outlined above, the Wellcome Trust has established a new funding division called the Wellcome Leap fund, modelled on the ARPA-style of funding, which has also taken an important share of 25% in total funding.

3.9.5 Information and data sources

Contact at Wellcome Trust

Jeremy Farrar

Director of Wellcome Trust

j.farrar@wellcome.org

Information about structure of fund

https://wellcome.org/who-we-are/history-wellcome#wellcome%E2%80%99s-mission--0079

https://wellcome.org/who-we-are/strategy

https://wellcome.org/who-we-are/governance

https://wellcome.org/who-we-are/teams

https://cms.wellcome.org/sites/default/files/2021-02/induction-pack-for-committee-members-2020-11.pdf

https://wellcome.org/who-we-are/investments

https://wellcome.org/grant-funding/schemes

Information about application and review procedures

https://cms.wellcome.org/sites/default/files/2021-02/induction-pack-for-committee-members-2020-11.pdf

https://wellcome.org/grant-funding/schemes/early-career-awards

https://wellcome.org/grant-funding/guidance/how-to-write-wellcome-grant-application

Portfolio and data

https://wellcome.org/grant-funding/schemes

Wellcome Trust Annual Reports and Grant funding data reports

Information and data provided by WT

4. The research funding organisations in international comparison

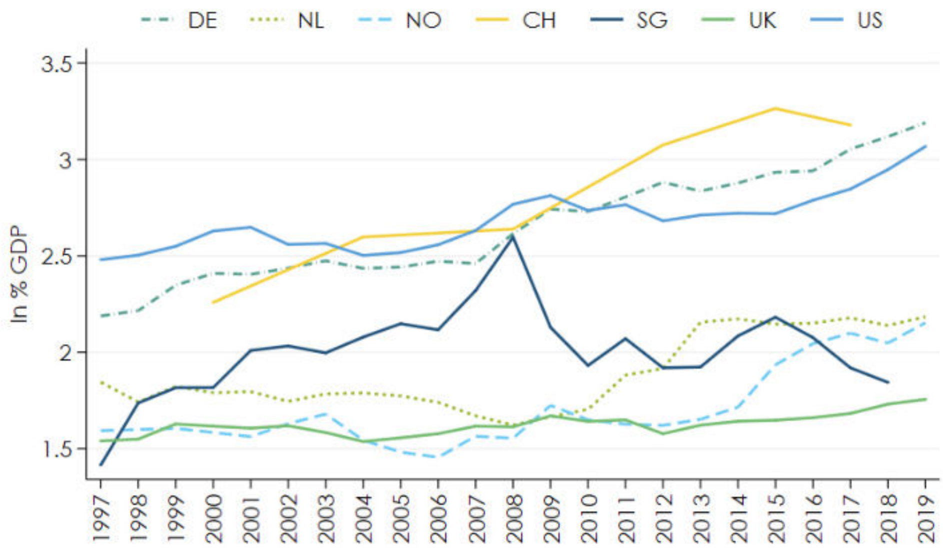
The comparative perspective first describes the context for the agencies' activities, the R&D funding landscape, and the performance of the science systems. It then looks at differences in mission and governance, aggregate funding levels, and in the funding portfolios. Finally, it looks at differences in how the agencies allocate the money, using the example of single project funding schemes, their cost reimbursement modalities and peer review criteria.

4.1 The context for the activities of the RFOs

4.1.1 Overall research funding levels

Switzerland and Germany feature the most R&D intensive economies, followed by the US, and with some distance by the Netherlands, Norway, Singapore and the UK (Figure 42). The smaller R&D ratio in the latter countries is partly explained by very low shares of manufacturing in the total economy. Basic research is usually only a small share of total R&D, but unfortunately not all OECD countries (e.g., Germany) collect data on the type of R&D, so that we cannot compare countries according to their share of basic research in total research spending.

Figure 42: **Gross domestic expenditure on R&D (GERD) in % GDP, 1997-2019**

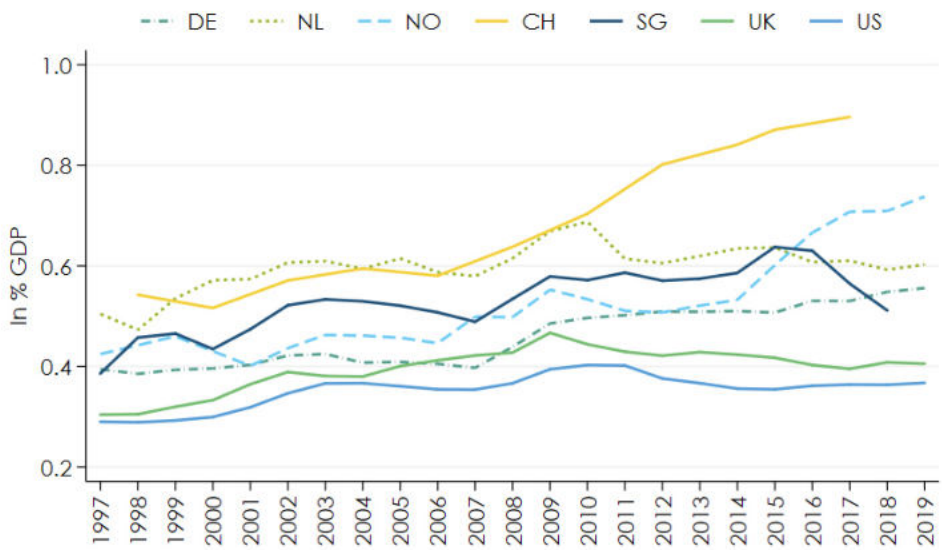


Source: OECD MSTI, variable used "GERD as a percentage of GDP".

As a proxy, we take R&D performed in the higher education sector (HERD, Figure 43). This is not perfect, as there is also applied research in higher education institutions, and there is basic research outside higher education institutions, as in e.g., Germany's Max Planck Society. However, including R&D performed in the government sector (GOVERD) would be too broad, as the bulk of GOVERD is spent in e.g., applied research institutions which usually have very low shares of basic research grant funding. Moreover, as we have seen in section 3, the agencies often also fund applied research, so that the broader HERD category may even be the more suitable reference category (in Switzerland, 76% of HERD is basic research, in the Netherlands 58% and in the UK 34%). In terms of HERD as a percentage of R&D, Switzerland also leads (by far), followed by Norway, the Netherlands, and then by Germany, Singapore, the UK and the US. Switzerland has both a strong R&D intensive manufacturing sector and a strong academic research sector. Germany and the US show a comparatively lower share of HERD in GDP as

R&D expenditure in the business sector is relatively stronger there. The Netherlands are only weakly specialised in R&D intensive manufacturing, but feature a large higher education sector, so that HERD is comparatively high as a share of GDP. In the UK, industry is not strong either, but R&D in higher education is not higher as resources are heavily concentrated by way of the Research Excellence Framework, the mechanism for allocating block funding in the UK (based on peer review).

Figure 43: **HERD in % GDP, 1997-2019**



Source: OECD MSTI, variable used "HERD as a percentage of GDP".

Table 24 shows the various funding sources of HERD in the countries based on OECD data. Within government funding, there are two sources (not always detailed in the OECD data), direct government (which includes the basic research agencies) and general university funds (GUF), the block funding given to universities. We have merged the yearly amount of funds allocated by the research grant funding organisations (bottom line) to the table, this should be similar to the "direct government" position in the table if the agencies cover a large part of the research grant funding in the higher education sector. This is not the case in Norway and in the US, indicating large other funding sources. Again, this can only provide a rough picture of the importance of the agencies for HERD, as they do not only fund higher education institutions and as there may be classification issues in terms of whether all of the money allocated by the agencies is purely R&D according to the OECD's Frascati Manual (e.g., funding for career development may not be counted as R&D).

The non-Anglo Saxon countries show clearly higher funding of HERD by public sources, between 75-84%, whereas the two Anglo-Saxon countries' (US and UK) government expenditures on HERD are lower at 56-63% of total HERD. The difference is not accounted for by business enterprise funding of HERD, with the exception of Norway. This is a development of the past 20 years. At the beginning, the UK and US had higher business funding shares of HERD, but these shares have declined, whereas the shares in Switzerland, Germany and the Netherlands have increased. This belies the often heard complaint about a lack of cooperation between academic and business research in Europe. In the past 20 years, many European countries specifically launched funding schemes for R&D collaboration between academic and corporate researchers (although often not within basic research grant funding organisations). Firms in the US fund less research in higher education institutions partly because of the developments in the wake of the Bayh-Dole act, i.e., universities becoming more aggressive towards making money out of their research (see Stephan, 2012).

Other noteworthy differences between the countries include funding by higher education itself, which is particularly high in the US and may reflect the importance of endowments and of high tuition fees which may be used on occasion to fund research (Ehrenberg - Rizzo - Jakubson, 2003). Private non-profit funding is highest in the two Anglo-Saxon countries and interestingly by far in the UK rather than in the US. Funds from abroad are highest in the UK, which may be partly linked to success in obtaining EU research funding.

Table 24: **Funding sources of HERD across countries in USD PPP, last year available**

	Country						
Source of funds	**CH**	**DE**	**NL**	**NO**	**UK**	**US**	**Average**
Total (funding sector)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Business enterprise	**10%**	**13%**	**9%**	**2%**	**4%**	**5%**	**7%**
Δ FYA	+4.60	+1.70	+0.94	-0.83	+0.09	-1.64	+0.44
Sub-total government	**82%**	**82%**	**75%**	**90%**	**63%**	**56%**	**76%**
Δ FYA	-1.94	-3.39	-7.40	+0.88	+1.78	-9.04	-3.62
Direct government	16%	-	-	20%	34%	56%	42%
Δ FYA	+0.16	-	-	-1.42	+0.96	-9.04	-3.12
General university funds	66%	-	-	70%	29%	-	55%
Δ FYA	-2.10	-	-	+2.31	+0.82	-	+0.34
Higher education	**5%**	**-**	**-**	**1%**	**-**	**28%**	**11%**
Δ FYA	-4.30	-	-	-0.07	-3.80	+7.34	+1.42
Private non-profit	**0.3%**	**-**	**6%**	**3%**	**15%**	**9%**	**7%**
Δ FYA	-1.94	-	+0.83	-0.17	+0.02	+1.66	+0.08
Funds from abroad	**4%**	**4%**	**9%**	**3%**	**18%**	**2%**	**6%**
Δ FYA	+3.58	+1.70	+5.64	+0.19	+1.90	+1.68	+2.11
Funds of agencies	**13%**	**25%**	**28%**	**4%**	**31%**	**23%**	**21%**
Δ FYA	+0.05	+0.09	+0.16	-0.003	+0.03	-0.06	+0.04

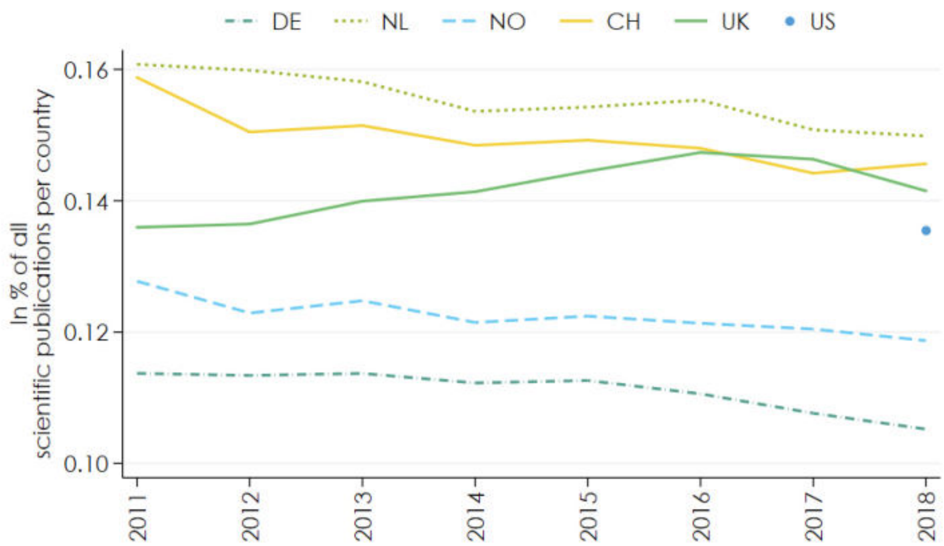
Source: OECD R&D statistics, RFO data (converted into USD PPP), WIFO calculation. Note: Last year available: 2018, except for CH=2017. First year available: 2000, except for NL=2005; NO=2016; UK=2015. Δ FYA: Difference to first year available (FYA) in percentage points.

4.1.2 Performance of science systems

The overall "performance" of science systems can be measured in various ways, here we provide just a rough overview based on citation frequency, in two different indicators – the share of articles in the top 10% cited articles of each field by country, as taken from the European Innovation Scoreboard (Figure 44), and the share of universities by rank group in the Leiden ranking which is purely based on citations (Figure 45). Such performance measurements are of course subject to debate, they just serve to provide information on the research environments the RFOs operate in and to contribute to understanding the funding policy of these agencies.

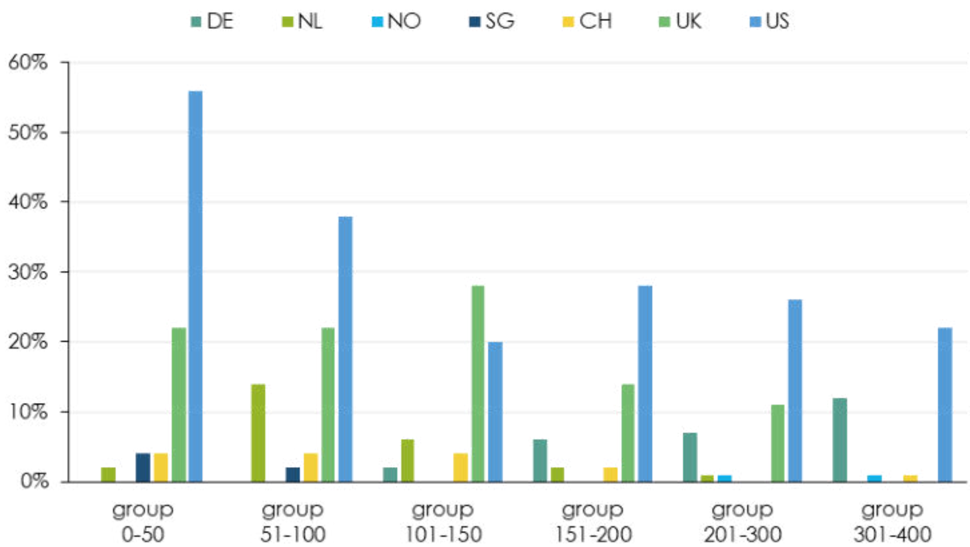
In a nutshell, in terms of absolute numbers, by far the greatest concentration of universities achieving a high share of highly cited publications is located in the US, followed by the UK. Relative to population (not shown here) or in terms of the share of all publications (Figure 45), Switzerland and the Netherlands, and also Singapore achieve a high performance. These five countries are somewhat ahead of Germany and Norway. While the DFG administers the Excellence Strategy which is supposed to change this, in Norway no similar excellence orientation can be found (see section 4.4).

Figure 44: **Scientific publications among the top 10% most cited publications worldwide as % of all scientific publications in a country, 2011-2018**



Source: European Innovation Scoreboard 2021, Indicator 1.2.2.

Figure 45: **Country share of universities in Leiden Ranking 2021 by rank groups**



Source: CWTS Leiden Ranking 2021, http://www.leidenranking.com/, WIFO calculation.

4.2 Differences in mission & structure of grant funding RFOs

Three broad governance models can be found among the RFOs examined: a privately funded charity (Wellcome Trust), agencies with a mandatory representation of scientific or academic organisations in decision-making bodies („academic self-governance" – SNSF and DFG), and governmental agencies, where scientists have of course an advisory role and are involved in peer reviewing, and funding decisions are made purely on quality reasons, but where e.g. the Head Office is appointed by the Minister in charge rather than elected or nominated by academic collegial bodies.

Table 25: **Overarching decision making, 2020**

Country	CH	DE	NL	NO	UK		US	
RFO	**SNSF**	**DFG**	**NWO**	**RCN**	**UKRI**	**WT**	**NIH**	**NSF**
Academic self-governance								
Privately funded charity								
Governmental agency or body								

Source: Assessment by WIFO based on homepages and/or information sent by RFOs. Please see detailed links in the individual sections on peer review. Note: Green shading indicates "applies" and red shading "does not apply".

The activity focus of the RFOs mirrors these governance models. There is a common focus among all of them, namely providing grant-based funding for (basic) research projects and for PhD-training/career development of researchers, so funding of projects and funding of people. But differences arise about the extent to which the RFOs aim at addressing specific missions or challenges, as well as creating economic and societal impact out of the research funded, which is more common or more widely practiced among the governmental agencies and the Wellcome Trust. In the SNSF and even more so in the DFG the core mission is funding scientific knowledge production according to high quality standards with a lower importance of the potential uses of the knowledge produced. This contrasts with e.g., UKRI, where the focus on economic and societal impact, or the requirement for the research funded to achieve this, on top of scientific quality, is made very prominent. In the wake of COVID-19, basically all agencies address this challenge through funding. The RCN and NRF and to some extent UKRI are in addition agencies which do not just fund academic researchers, but also researchers in firms, an activity which in other countries may be done by separate RFOs (as Innosuisse in Switzerland). The RCN also administers funding for extra-university research institutes.

Table 26: **Mission or activity focus of the RFOs, 2020**

Country	CH	DE	NL	NO	UK		US	
RFO	**SNSF**	**DFG**	**NWO**	**RCN**	**UKRI**	**WT**	**NIH**	**NSF**
Funding basic research								
Education and career development								
Addressing specific missions or challenges								
Creating economic and/or societal impacts								
Fostering innovation in firms					*			

Source: Assessment by WIFO based on homepages and/or information sent by RFOs. Please see detailed links in the individual sections. Note: Green shading indicates "applies", red shading "does not apply" and yellow shading "applies somewhat". * Innovate UK (part of UKRI) fosters firms, but it is not included in our analysis.

The budget approval process for the agencies can influence the long-term perspective for researchers' funding opportunities, as well as the ease of securing budget increases. There are several models, with funding directly approved by the legislative (Congress) in the US, whereas in other countries, the budgets of the agencies are a part of the budget of the corresponding Ministry. These are mostly the Ministries for science and education, however in the UK it is the Department for Business, Energy and Industrial Strategy: there is not even a ministerial department carrying the name "science" or "research" in it, which may also contribute to explaining the strong focus on impact in the Research Councils' mission statements). In Germany, the budget of the DFG needs approval from both federal and Länder executives; the current DFG's budget increases are anchored in a longer-term strategy by the German government ("Pact for Research and Innovation 2021-2030"[1]) but unlike the SNSF, the DFG nor any other agency feature a multi-year financial framework. UKRI is about to get a three year spending review settlement.

Table 27: **Budget approval process, 2020**

Country	CH	DE	NL	NO	UK		US	
RFO	**SNSF**	**DFG**	**NWO**	**RCN**	**UKRI**	**WT**	**NIH**	**NSF**
Budget directly approved by legislative								
Budget is part of the responsible government departments/ministries' budgets								
Budget comes from returns to investment of private foundation								
Budget depends on federal-state level coordination								
Multi-year financial framework								

Source: Assessment by WIFO based on homepages and/or information sent by RFOs. Please see detailed links in the individual sections. Note: NIH has a five year strategic plan, but budget appropriation is yearly. Green shading indicates "applies", red shading "does not apply" and yellow shading "applies somewhat".

Finally, the organisation of funding activities may affect the potential for experimentation and the diversity of funding schemes, as well as the ease of use for applying researchers. On paper, the Swiss, Dutch and German agencies are quite similar in that they use non-discipline specific funding schemes; however, in the Dutch case, there are cross-cutting instruments which will then be used by specific, discipline-oriented NWO domains, more similar actually to the NSF which also uses common instruments for a variety of disciplines (but is organised according to thematic research areas). The UK Research Councils have recently been merged into one agency, UKRI, but so far their funding instruments remain, usually standard grant schemes which can accommodate a lot of funding purposes, specific to each Research Council. Many Research Councils do have similar funding schemes though and there are agreements between the Councils to safeguard the possibility of interdisciplinary funding.

It is clear that smaller countries such as Switzerland will tend to have more centralised research funding organisations than large countries such as the US. For researchers, simple structures such as the SNSF and the DFG may be easier to use from an administrative viewpoint (i.e., finding the right funding opportunity). The funding activities of the NIH or the NSF are by comparison much more complex (see section 3, with the multitude of NIH activity codes and NSF funding opportunities).

[1] https://www.research-in-germany.org/en/research-landscape/r-and-d-policy-framework/pact-for-research-and-innovation.html

Table 28: **Organisation of funding activities, 2020**

Country	CH	DE	NL	NO	UK		US	
RFO	**SNSF**	**DFG**	**NWO**	**RCN**	**UKRI**	**WT**	**NIH**	**NSF**
Centralised non-discipline specific funding schemes								
Centralised discipline-specific funding schemes								
Decentralised discipline-specific funding based on common instruments								
Decentralised discipline-specific funding without common instruments								
Cross-cutting challenge or priority-funding drawing on several instruments								

Source: Assessment by WIFO based on homepages and/or information sent by RFOs. Please see detailed links in the individual sections. Note: Green shading indicates "applies", red shading "does not apply" and yellow shading "applies somewhat".

4.3 Funding at an aggregate level

Spending levels

In 2020, the SNSF spent 99 USD per capita at power purchasing parities, below the RCN and the NIH and NSF combined, NWO, but above UKRI and Wellcome Trust combined and well above Germany (Table 29). Note that these level comparisons need to be interpreted with care, as the countries' research funding systems are different and e.g. the RCN also has a budget for institutional funding of research institutes, and the NIH and NSF both fund to some extent firms via the Small Business Innovation Research grants, the same holds true for UKRI.

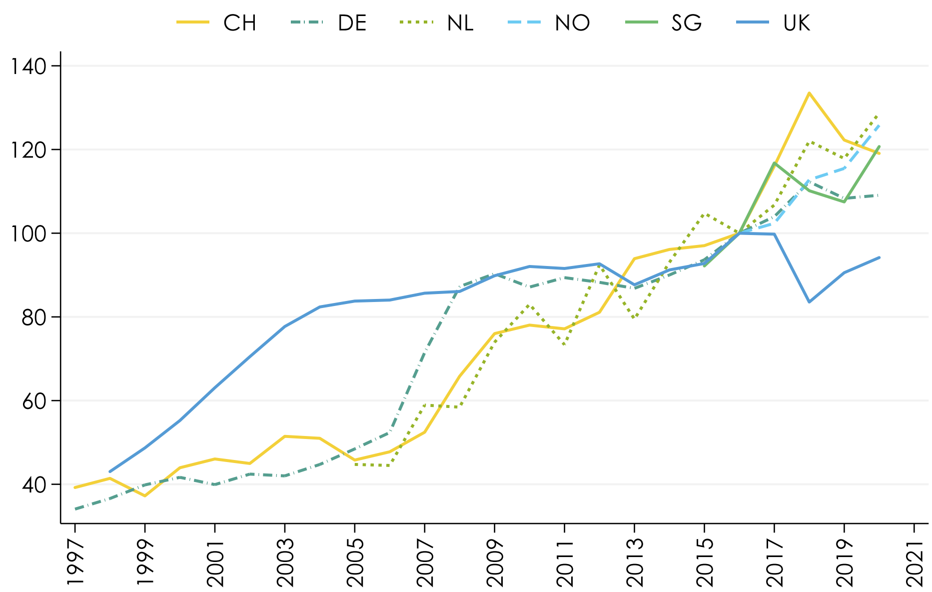
The SNSF has seen relatively strong growth of its funding between 2005 and 2018, but funding awarded has been declining recently (Figure 46 and Figure 47). The strong increase of the NIH budget at the end of the 90ies is well documented (Stephan, 2012).

Table 29: **Cumulative average growth rate (CAGR) of total funding awarded (in national nominal currency) and funding awarded by agencies per population, in USD PPP**

Country	RFO	LYA/FYA	CAGR Funding	CAGR Population	Funding awarded by RFO per population, in USD PPP (FYA)	Funding awarded by RFO per population, in PPP USD (LYA)
CH	SNSF	1997-2020	4.95%	0.83%	24.36	99.05
DE	DFG	1997-2020	5.19%	0.09%	13.03	53.36
NL	NWO	2005-2020	7.30%	0.44%	25.00	78.09
NO	RCN	2016-2020	5.91%	0.68%	117.09	143.61
UK	UKRI	2015-2020	7.21%	0.63%	48.55	65.95
	WT	2006-2020	5.43%	0.71%	11.41	21.59
US	NIH	1998-2020	4.92%	0.82%	37.98	91.30
	NSF	1997-2020	4.18%	0.88%	11.46	21.84

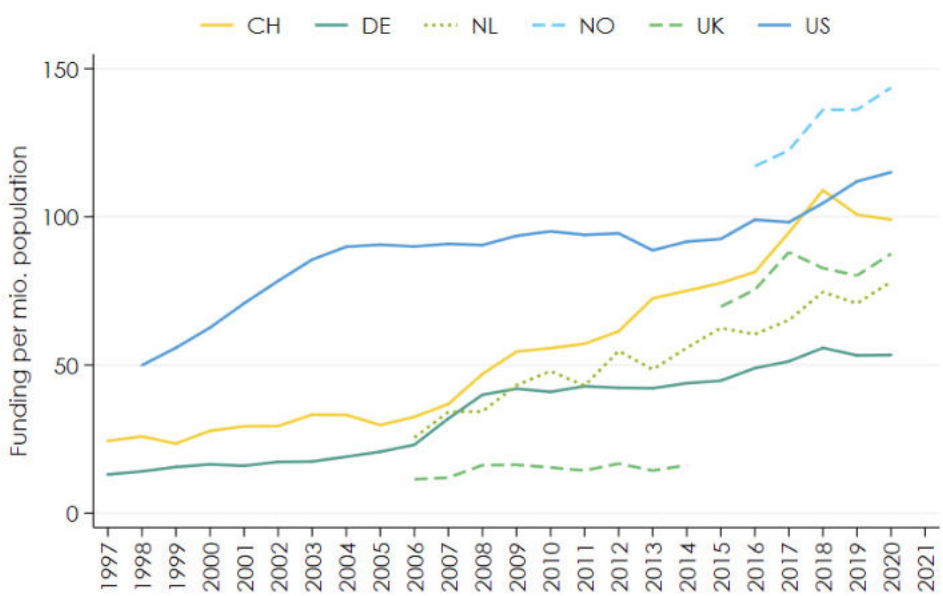
Source: Information from homepages and/or information sent by agencies. Please see links and information in the respective chapter. OECD-MSTI variable used "Population" and "Purchasing Power Parity (National currency per US dollar)". WIFO calculation. Note: NSF: Total funding is the sum of Research & Related Activities, Education & Human Resources and Major Research Equipment & Facilities Construction. RCN: The category "Innovation in firms" is excluded from the total funding of NO. LYA = Last year available, FYA = First year available.

Figure 46: **Total yearly funding by RFO on an index basis, 2016=100, 1997-2021**



Source: Information from homepages and/or information sent by RFOs. Please see links and information in the respective chapter. WIFO calculation. Note: CH: SNSF, DE: DFG; NL: NOW; SG: NRF, UK: UKRI & Wellcome Trust (Total over the funding of the RFOS); US: NIH & NSF (Total over the funding of the RFOS); NSF: Total funding is the sum of Research & Related Activities, Education & Human Resources and Major Research Equipment & Facilities Construction. RCN: The category "Innovation in firms" is excluded from the total funding of NO.

Figure 47: **Total yearly funding by RFO relative to population in PPP USD, 1997-2020**

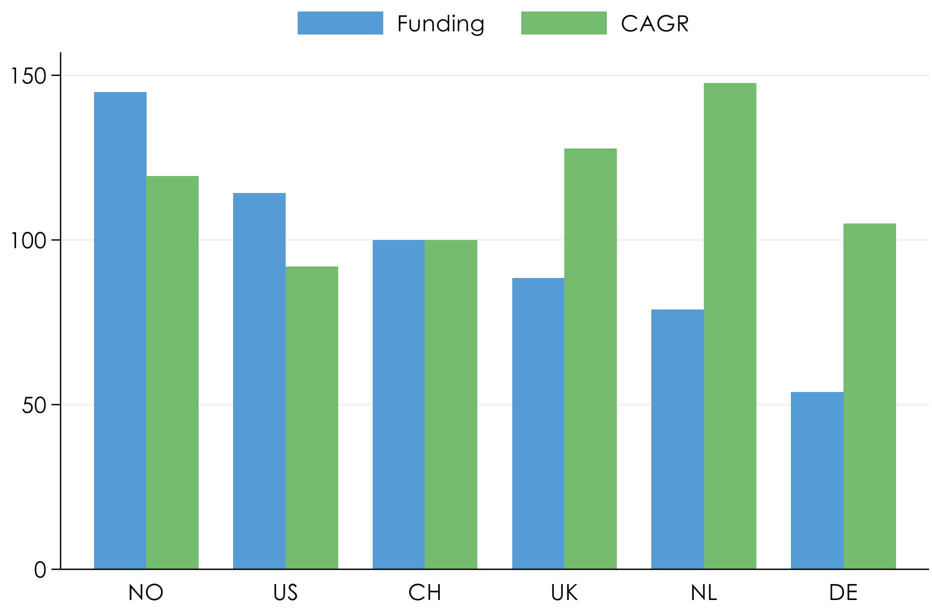


Source: Information from homepages and/or information sent by RFOs. Please see links and information in the respective chapter. OECD-MSTI variable used "Population" and "Purchasing Power Parity (National currency per US dollar)". WIFO calculation. Note: The increase in SNSF from 2005 is based on the agency's transition to the data portal (2019) and the resulting changes in data allocation or calculation. US covers the agencies NIH and NSF from 1998. UK covers the agency Wellcome Trust from 2006, incl. the councils of the agency UKRI from 2015. y. For this figure, the category "Innovation in firms" is excluded from the total funding of NO. From 2015-2019, UK covers the agencies Wellcome Trust and UKRI; prior to 2015, only the agency Wellcome Trust. Wellcome Trust also funds researchers abroad.

Comparing both growth and funding levels together (Figure 48), the SNSF shows average growth and funding levels, while RFOs with lower funding levels (UK, Netherlands, Germany) show higher growth rates. The RCN also shows a high growth rate together with high funding levels, but it has to be borne in mind that the RCN has a larger funding portfolio, also funding firms and providing institutional funding for research institutes.

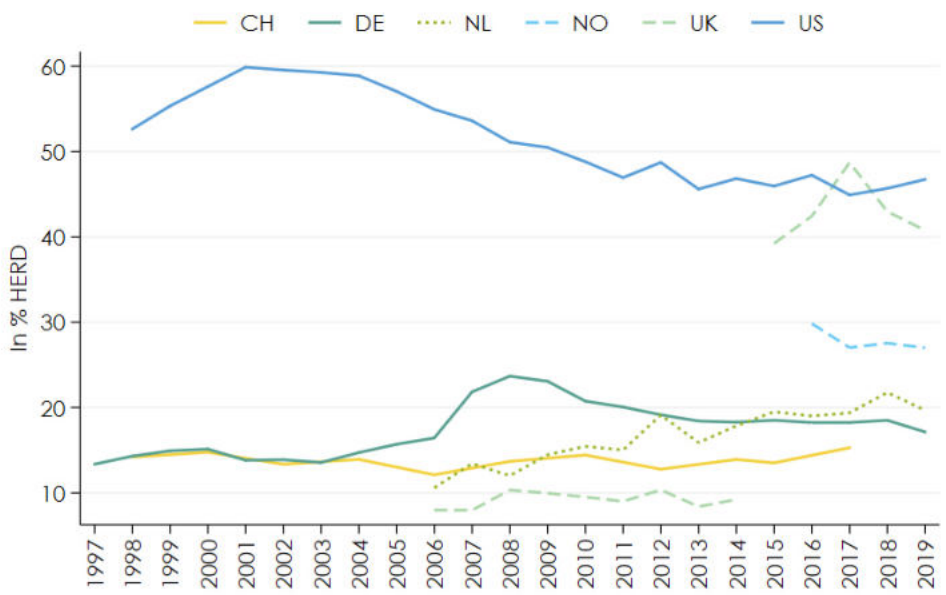
As a share of total R&D spending in the higher education sector (HERD), the SNSF's funding is rather low at about 15% (in 2017), by comparison with US (47%), UK (41%), NO (27%), NL (20%) and DE (17%), pointing to generous levels of block grant funding for Swiss universities (Figure 49).

Figure 48: **Cumulative Average Growth Rate (CAGR) and funding awarded by RFO per population on index basis, CH = 100.**



Source: Information from homepages and/or information sent by RFOs. Please see links and information in the respective chapter. OECD-MSTI variable used "Population" and "Purchasing Power Parity (National currency per US dollar)". WIFO calculation. Note: CH: SNSF, DE: DFG; NL: NOW; UK: UKRI & Wellcome Trust (CAGR: mean over the CAGR of the RFOs; Funding: Total over the funding of the RFOS), CAGR 2015-2020; US: NIH & NSF (CAGR: mean over the CAGR of the RFOs; Funding: Total over the funding of the RFOS); CAGR 1998-2020; NSF: Total funding is the sum of Research & Related Activities, Education & Human Resources and Major Research Equipment & Facilities Construction. RCN: The category "Innovation in firms" is excluded from the total funding of NO.

Figure 49: **Total yearly funding by RFO as a share of HERD, 1997-2019**



Source: Information from homepages and/or information sent by RFOs. Please see links and information in the respective chapter. OECD MSTI variable used "HERD in national currency (for euro area: pre-EMU euro or EUR). WIFO calculation. Note: US covers the agencies NIH and NSF from 1998. UK covers the agency Wellcome Trust from 2006, incl. the councils of the agency UKRI from 2015. For this figure, the category "Innovation in firms" is excluded from the total funding of NO. From 2015-2019, UK covers the agencies Wellcome Trust and UKRI; prior to 2015, only the agency Wellcome Trust. Wellcome Trust also funds researchers abroad. SG not included due to limited comparability.

4.4 Differences in funding portfolios

4.4.1 Overall funding portfolio

To make funding portfolios comparable across RFOs, we use a self-developed classification scheme (section 2.1). However, data availability at a disaggregated funding scheme level varies between the RFOs, with only the SNSF, DFG and NIH being able to provide detailed funding data over long time periods (back to 1997). Other agencies either don't have such long time series or don't provide data at a detailed funding scheme level; the NRF did not provide any funding portfolio data at all.

The shares of funding schemes also need to be interpreted bearing in mind the flexibility of the funding schemes - some RFOs will use standard grant mechanisms to fund multi-purpose cross-cutting activities, so that financial reporting is not closely linked with funding activities. Examples are the NIH Common Fund; in Germany, the standard single project funding scheme features specific assessment criteria for first-time applicants, while Switzerland has got specific funding schemes for first-time applicants (or early career principal investigators). The proposals within the main project funding scheme of the SNSF can self-declare to be use-inspired, so that it is not strictly pure basic research. In the UK, interdisciplinary projects, networks and R&D collaboration can also be filed within the standard research grants funding scheme. In the Netherlands, the talent programme could also be classified as an SPF early career funding scheme, so that project funding would not lose as much in terms of the share of total funding awarded. Thematic focus is also misleadingly low, as the NSF, the NIH, the UK Research Councils and NWO use their standard research grants and other mechanisms to fund discipline-oriented or thematic-focus calls, which are often not reflected in financial information provided on their funding portfolios.

Furthermore, before interpreting the figures, we recall that the basic research grant funding organisations are part of different research funding landscapes, so that a higher or lower diversity in funding portfolios may partly be related to different assignments of tasks in national research systems. As an example, translation programmes may also be funded by innovation or applied research funding agencies (as an example, the EPSRC funds R&D collaboration programmes with firms, while in Germany the Federal Ministry for Economic Affairs and Energy funds more innovation-oriented research activities by firms).

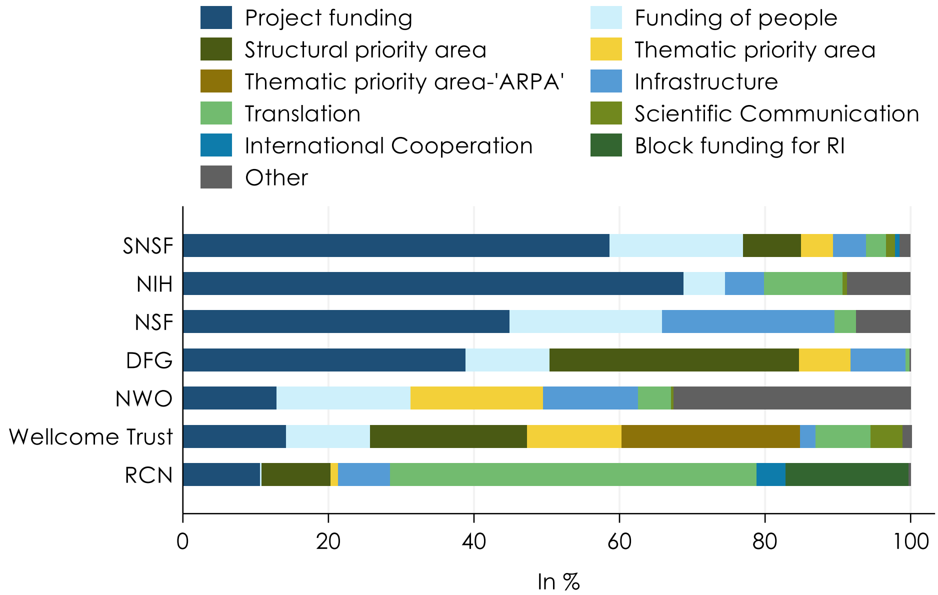
Heeding these data limitations, the broad picture which emerges is that the SNSF features the highest share at 77% in total funding of schemes which fund research projects or researchers - career development/PhD training of researchers, the two core activities of RFOs with a focus on funding basic research (Figure 50). SNSF is followed by the NIH (75%), NSF (66%) and DFG (50%). The individual research councils which make up UKRI are also likely to feature a large share of people and project funding, however data are only available for the standard grant scheme, which can be used for a variety of purposes. In the remaining agencies, project and people funding ranges from 11% (RCN) to 31% (NWO) of total funding disbursed. Note though that people funding is integrated in standard schemes in the RCN.

Schemes which fund structural priorities (e.g., NCCRs in the SNSF or the excellence strategy in Germany), thematic priorities (e.g., calls within specific fields of science), translation efforts (to speed up commercialisation or application of research) or infrastructure investments, make up a lower share of the SNSF's funding portfolio. Structural priorities show a larger share in the DFG and the Wellcome Trust.

Many agencies also have some form of translational funding scheme, although the importance in overall funding varies considerably, being particularly important in Norway (RCN) and to a smaller extent in the Netherlands (NWO), the NIH and the Wellcome Trust. The two latter RFOs focus on medicine where the connection between basic science and applications is closest. The schemes are very different though, from the SBIR programme at NSF and NIH (supporting innovation in small young businesses), to funding clinical studies in medicine or commercialisation activities in universities. NIH also has an initiative whereby it funds everything, from basic research to applied research and commercialisation/development of applications ("R&D value chain"), effectively spanning the roles of basic research and innovation agency which is also a rationale behind the merging of the UK Research Councils with Innovate UK under the umbrella of UKRI and the reforms of the Norwegian Research Council.

Spending on infrastructure is high as a share of total funding in the NSF, but also at NWO.

Figure 50: **Share of broad funding schemes in total funding, 2020**



Source: Information from homepages and/or information sent by RFOs. Please see links and information in the respective chapter. Note: Category "Other" forms funding schemes that cannot be classified according to WIFO allocation. No data are available for UKRI (data only on one standard grant scheme) and on NRF. Block funding for RI = Block funding for research institutes. Note that the funding data for the Wellcome Trust will change in the future, as new funding schemes have been introduced recently. RCN: Due to recent reorganisation and restructuring at the RCN, there is no guarantee that we have interpreted the data from the website and the funding schemes accurately. The data should hence be interpreted very cautiously.

The next table provides detailed data on the various funding schemes. As mentioned, these data need to be interpreted with caution, as the activities are not always directly linked with financial reporting.

Table 30: **Shares of funding instruments in total yearly funding, 2020**

	CH SNSF	DE DFG	NL NWO	NO RCN	US NIH	 NSF	UK WT	Average
Project funding	**59%**	**39%**	**13.0%**	**11.0%**	**69.0%**	**45.0%**	**14.0%**	**35.7%**
Δ FYA	**-6.63**	**-4.3**		**-1.03**	**2.63**	**-15.26**	**-2.75**	**-4.14**
Single project funding (SPF)	43.0%	32.0%	8.0%	9.0%	51.0%	42.0%	11.0%	28.0%
Δ FYA	-10.08	-7.42		-0.85	-0.72	-9.99	0.94	-3.61
SPF Early career	6.0%	0.0%		2.0%	0.5%			1.7%
Δ FYA	2.07	0.09		-0.18	0.48			0.13
SPF high-risk	9.0%	0.0%	0.2%		4.0%		0.0%	2.6%
Δ FYA	1.38	0.37			3.10		-1.29	0.73
Networks and multi-project funding	8.0%	6.0%	3.0%		13.0%		4.0%	6.8%
Δ FYA		1.41			-0.24		-2.40	-0.41
Interdisciplinary research					0.0%	3.0%		1.5%
Δ FYA					0.02	-5.28		-2.63
Mission/Challenge-Orientation								
Δ FYA								
Priority areas	**12.0%**	**41.0%**	**18.0%**	**11.0%**			**59.0%**	**28.2%**
Δ FYA	**9.09**	**0.27**		**-1.35**			**30.63**	**9.85**
Structural priority area	8.0%	34.0%		9.0%			22.0%	18.3%
Δ FYA	7.91	7.08		-0.54			7.77	4.77
Thematic priority area	4.0%	7.0%	18.0%	1.0%			13.0%	8.6%
Δ FYA	1.18	-6.81		-0.80			-1.67	-3.09
Thematic priority area – "ARPA"							25.0%	25.0%
Δ FYA				0.00			24.53	12.27
Infrastructure	**5.0%**	**8.0%**	**13.0%**	**7.0%**	**5.0%**	**24.0%**	**2.0%**	**9.1%**
Δ FYA	**0.44**	**3.04**		**0.65**	**2.02**	**8.72**	**-2.15**	**2.46**
Funding of people	**18.0%**	**12.0%**	**18.0%**	**0.0%**	**6.0%**	**21.0%**	**12.0%**	**12.4%**
Δ FYA	**-1.95**	**1.08**		**-0.02**	**-0.17**	**18.00**	**-16.41**	**0.49**
Education & Training	1.0%	7.0%			2.0%	13.0%	0.2%	4.6%
Δ FYA	-1.04	0.67			0.00	12.76	-14.26	-0.28
Career	15.0%	4.0%	18.0%		3.0%	5.0%	11.0%	9.3%
Δ FYA	-2.39	1.08			0.83	1.91	-2.15	-0.14
Mobility	N/A	1.0%	1.0%	0.0%				0.7%
Δ FYA	-0.10	0.56		-0.02				0.27
Diversification	3.0%				0.0%	3.0%		2.0%
Δ FYA	1.59				0.03	3.33		1.65
Prizes		1.0%						1.0%
Δ FYA		-2.52						-2.52
Translation	**3.0%**	**1.0%**	**5.0%**	**50.0%**	**11.0%**	**3.0%**	**7.0%**	**11.4%**
Δ FYA	**-2.63**	**0.54**		**1.42**	**1.68**	**-0.07**	**-6.00**	**-0.49**
Applied Research	1.0%	1.0%	2.0%		4.0%			2.0%
Δ FYA	-4.16	0.54			1.90			1.22
Innovation in firms				18.0%				18.0%
Δ FYA				1.84				1.84
Innovation in firms - thematic				13.0%				13.0%
Δ FYA				-0.46				-0.46
R&D collaboration with firms			3.0%		4.0%	3.0%		3.3%
Δ FYA					1.17	0.00		0.59
Commercialisation	2.0%				0.0%		7.0%	3.0%
Δ FYA	1.53				0.02		-6.00	-2.99
R&D Value Chain - Challenge Orientation				20.0%	3.0%			7.7%
Δ FYA				0.04	-1.41			-0.69
Scientific Communication	**1.0%**		**0.0%**		**0.6%**		**4.0%**	**1.4%**
Δ FYA	**0.68**				**0.14**		**0.55**	**0.35**
International Cooperation	**0.6%**			**4.0%**				2.3%
Δ FYA	**-0.23**			**-1.63**				-1.63
Block funding for research institutes				**0.17**				17.0%
Δ FYA				**2.25**				2.25
Other			**33.0%**	**0.0%**			**1.0%**	**11.3%**
Δ FYA				**-0.28**			**-3.68**	**-1.98**

Source: Information from homepages and/or information sent by agencies. Please see links and information in the respective chapter. WIFO calculation. Note: Individual numbers may not add up to sums due to rounding. Category "Other" forms funding schemes that cannot be classified according to WIFO allocation and can include data due to statistical differences; Δ FYA: Difference first year available (FYA) in percentage points. SNSF: 2010-2020; DFG 1997-2020; RCN: 2016-2020; NIH: 1998-2020; NSF: 1997-2020; WT: 2019-2020; RCN: The category "Innovation in firms" is excluded from the total funding of NO. Due to recent reorganisation and restructuring at the RCN, there is no guarantee that we have interpreted the data from the website and the funding schemes accurately. The data should hence be interpreted very cautiously. Note that the Wellcome Trust has recently changed its schemes in the wake of a new strategy, so that this table reflects the past funding activities. For better ease of reading, unavailable data have been omitted from this table (blank cells).

Table 31: **Total funding by basic research agencies in million USD PPP on specific schemes, 2020**

Country	**CH**		**DE**		**NL**		**NO**		**US**				**UK**	
RFO	**SNSF**		**DFG**		**NWO**		**RCN**		**NIH**		**NSF**		**WT**	
	Funding	Share	Funding	Share	Funding	Share	Funding	Share	Funding	Share	Funding	Share	Funding	Share
Project funding	502	60%	1,723	39%	175	13%	119	11%	20,737	75%	3,519	48%	206	14%
Priority areas	105	12%	1,834	41%	247	18%	117	11%					858	59%
Infrastructure	39	5%	336	8%	178	13%	79	7%	1,619	6%	1,858	26%	31	2%
Funding of people	157	19%	514	12%	251	18%	2	0%	1,726	6%	1,647	23%	167	12%
Translation	24	3%	24	1%	62	5%	562	50%	3,238	12%	232	3%	109	7%
Scientific Communication	11	1%			4	0.3%			193	1%			64	4%
International Cooperation	5	1%					45	4%						
Block funding for research institutes							188	17%						
Other					444	33%	3	0%					19	1%
Total	**843**	**100%**	**4,430**	**100%**	**1,362**	**100%**	**1,116**	**100%**	**27,513**	**100%**	**7,255**	**100%**	**1,454**	**100%**

Source: Information from homepages and/or information sent by RFOs. Please see links and information in the respective chapter. WIFO calculation. Note: RCN: The category "Innovation in firms" is excluded from the total funding of NO. Due to recent reorganisation and restructuring at the RCN, there is no guarantee that we have interpreted the data from the website and the funding schemes accurately. The data should hence be interpreted very cautiously.

Table 31 provides the absolute numbers spent on the various funding schemes, showing the tremendous differences. SNSF project funding is almost a third of Germany, although Switzerland is smaller than Germany by a factor of about 10.

Table 32: **Share of Top-Down vs. Bottom-Up in total, 2020**

Country	RFOs	Top-Down	Bottom-Up	Bottom-Up/ Top-Down	N/A
CH	SNSF	10%	90%	0%	0%
DE	DFG	12%	53%	0%	35%
NL	NWO	30%	70%	0%	0%
NO	RCN	22%	44%	0%	33%
UK	Wellcome Trust	0%	5%	0%	95%
US	NIH	0%	6%	4%	91%
	NSF	0%	22%	11%	67%

Source: Assessment by WIFO based on homepages and/or information sent by RFOs. Please see detailed links in the individual sections on characteristics of funding scheme. Note: URKI is not displayed as there is only information of Single project funding available. In the Netherlands, research organisations can apply bottom-up for infrastructure funding, but there is an infrastructure roadmap which determines eligible infrastructure.

4.4.2 Funding mission-oriented and high-risk research

COVID-19 has shown how important scientific breakthroughs can be for society. There has been a discussion on whether standard research grant funding is "sufficiently supportive of research needed for key breakthroughs" (Franzoni et al., 2021, p. 1). At the same time, the challenges which societies face have led to calls for a more mission-oriented or challenge-driven research funding approach, also requiring different funding approaches as e.g. practiced by the US-agency ARPA (Mazzucato, 2018; Tollefson, 2021). Against this background, we were asked by the Swiss Science Council to look specifically at research funding aiming at supporting risky and / or mission-oriented research, following the ARPA model. We specify this using the following elements based on (Azoulay et al., 2018):

- Dedicated funding for research on topics /research questions specified by the programme management, with (quantifiable) specification of research outcomes
- Active programme management/facilitation and matchmaking by highly qualified and independent programme managers, entailing breakthrough results

Trying to foster breakthrough results by funding high-risk research does not necessarily need a thematic focus, but can also be done at the individual project level, from a bottom-up perspective. Examples are the NIH Common Fund, NSF Early-concept Grants for Exploratory Research (EAGER), SNSF Spark, NWO Open Competition „XS", etc. The SNSF has two schemes aiming at high-risk research projects, Spark (for individual researchers) and Sinergia (for researcher groups), which amount to about 9% of total funding, considerably higher than similar programmes at the NIH, NWO and DFG (Figure 51). When considering the Wellcome LEAP funding scheme – which tries to emulate the funding style of the US-based ARPA (Advanced Research Projects Agency) – as aiming for high-risk research, this would amount to close to 25%. Note that other RFOs, such as UKRI, may use their standard grant to also address high-risk endeavours.

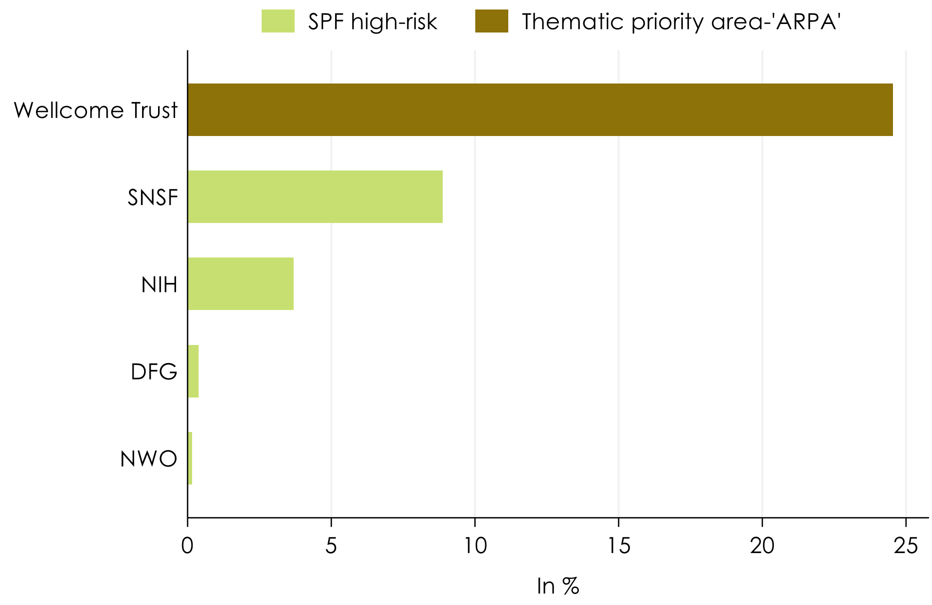
Thematic and challenge-driven funding can take a variety of forms:

- A simple form are "thematic umbrellas" – allocating money to a topic and inviting bottom-up proposals within it, e.g., funding schemes addressing emerging technologies such as artificial intelligence, quantum computing, internet of things… (e.g. NSF, RCN, NWO, SNSF…)

- Some agencies go a step further and aggregate bottom-up proposals into bigger themes with coordinated management, e.g., matchmaking among proposals (e.g. NSF Big Ideas, NWO KIC)
- Some agencies try to provide funding from idea generation right up to prototyping, combining use-inspired basic research with applied research and experimental development, e.g., RCN, NIH). This is probably easier in medicine where research and application are generally closest, and in agencies which combine funding of basic and applied research (in firms), such as the RCN.
- The most challenging way of trying to focus research to reach goals for RFOs is probably the ARPA-funding style (see above). The Wellcome Leap fund tries to do this (a division of WT), a new agency ARIA is planned for the UK, ARPA-Health is planned by the NIH, coming in addition to DARPA and ARPA-E. Also the European Innovation Council tries to emulate this funding style.

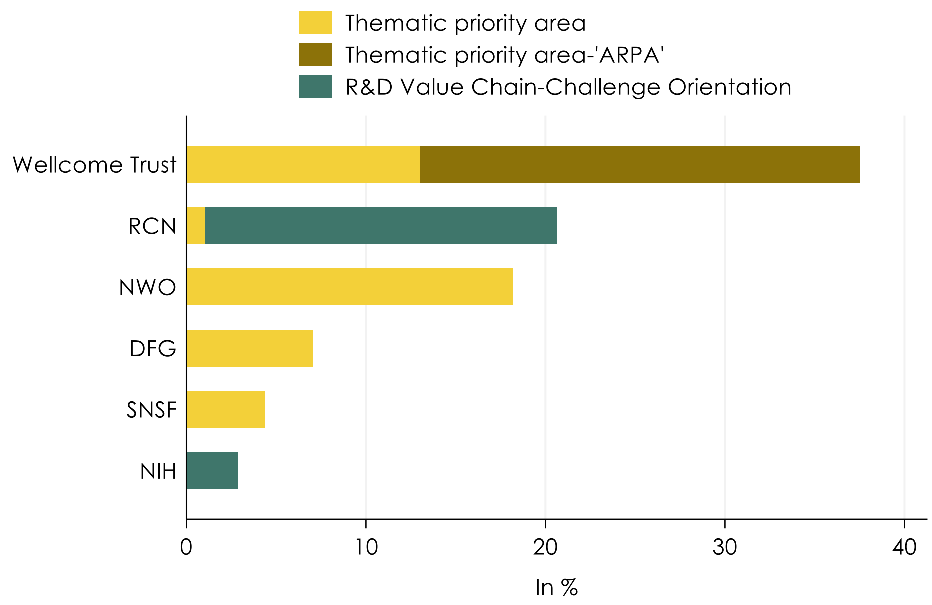
Grouping all funding schemes with a thematic focus in the RFOs we compare, including those aiming at achieving specific missions or goals, and those trying to span the whole R&D value chain, the Wellcome Trust achieves the highest share with close to 40 %, with the SNSF showing a lower share of that type of programme at about 5% (Figure 52). Generally, the SNSF is characterised by a larger share in total funding of investigator-initiated, bottom-up proposals where agencies respond to research questions raised by individual or groups of researchers. Funding research by pre-defined topics (e.g., by defining umbrellas and soliciting bottom-up proposals within this topic, or by specifying concrete research questions) is less common at the SNSF than in some of the governmental agencies, which more often "solicit" research on questions which they are interested in, or "manage" research calls by actively coordinating proposals (e.g., NIH, NWO, UKRI). This type of funding is however underestimated in the data above, as often carried out within standard project-funding schemes. Overall, the focus of RFOs on missions or setting specific goals varies considerably, while it is e.g., central for the RCN (which also funds research in firms), the DFG funds projects which researchers propose, without trying to engage in missions.

Figure 51: **Share of high risk project funding and Thematic priority area – „ARPA“ programmes, 2020**



Source: Information from homepages and/or information sent by RFOs. Please see links and information in the respective chapter.

Figure 52: **Share of Thematic priority area (incl. ARPA) and „R&D Value Chain“ – Challenge Orientation programmes, 2020**



Source: Information from homepages and/or information sent by agencies. Please see links and information in the respective chapter. Underestimation is likely, also e.g., for the DFG. RCN: Due to recent reorganisation and restructuring at the RCN, there is no guarantee that we have interpreted the data from the website and the funding schemes accurately. The data should hence be interpreted very cautiously.

4.4.3 Introducing new funding schemes

While evaluations play a role everywhere, three broad models can be differentiated: in the SNSF and DFG (with a strong role of the scientific community in governance), the introduction of new schemes basically reflects the needs of the scientific community. The SNSF uses the results of its researcher survey and discussions in the National Research Council. A second model is the introduction of new schemes based on strong government planning (e.g., RCN, NRF). The RCN implements the long-term strategy for research by the Norwegian government, but also launches new activities in response to the needs of the15 ministries in Norway which can use the RCN for their purposes. A third model is a mixture of top-down (government-driven) & bottom-up processes by agencies which have some autonomy in deciding on what to use their funds for. This is the case of the NIH and the NSF in the US, which respond to White House or Administration priorities, but where programme/center directors can launch new initiatives themselves as well, when they spot new trends, e.g., also UKRI in the UK uses a mixture of top-down and bottom-up.

Some of the trends and changes, not necessarily data-based as they may be hidden in standard grant funding schemes, are the following:

- The COVID-19 pandemic has sparked funding of rapid response research (e.g., in the SNSF), in others this existed already before (NSF RAPID)
- Some agencies have conducted large scale efforts to involve stakeholders and civil society in defining research questions of interest and associated funding opportunities (e.g., RCN, NWO)
- Some agencies have put more general emphasis on the economic or societal impact of the research they fund, in particular governmental agencies such as the UK Research Councils (now UKRI), but also NWO.
- In various forms, there are attempts at accelerating research efforts to solve specific problems or to reach scientific and technological goals beyond that what would randomly arise out of purely investigator-initiated, curiosity-driven, blue sky bottom-up proposals, in a way focusing (basic) research (section 4.4.2)
- Specific funding schemes aiming to support more risky research without a challenge orientation have also grown recently (section 4.4.2)

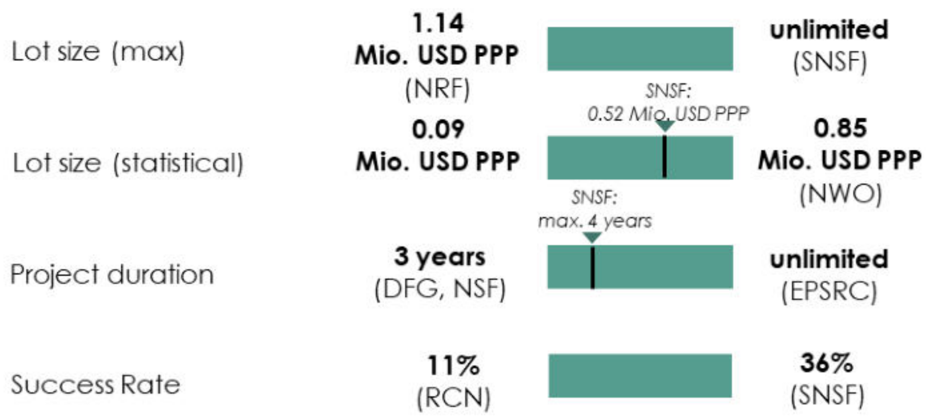
4.5 Characteristics of the main (single) project funding scheme grant design

In this section, we focus on the differences between grant funding features such as success rate, lot size and funding duration. We first focus on the main (single) project funding scheme of each agency, as they are in principle most comparable, and the data availability is best for these funding schemes. In separate sub-sections, we examine the different cost reimbursement modalities and the peer review procedure in the main project funding schemes.

4.5.1 Success rates, lot size and project duration

For the standard, single investigator-initiated project funding scheme we collected more data and information (Figure 53). The project funding scheme of the SNSF is characterised by large grants (in principle unlimited, statistically at 0.5 Mio. USD (at PPP); high, although declining success rates (36% in 2020, down from above 50% in 2010 – compared with an average across the other RFOs of 20%); as well as a more limited maximum project duration of 4 years. E.g., at the WT, max. project duration is 7 years, the EPSRC provides unlimited project duration.

Figure 53: **Selected characteristics of Single Project funding, 2020**



Source: Information from homepages and/or information sent by RFOs. Please see links and information in the respective chapter. WIFO calculation. Note: NWO: "Lotsize statistical" refers to the entire Open competition program. The formal project duration in the DFG is 3 years, but researchers can then apply for extensions as long as they see fit, so that in principle, researchers are quite free in choosing the project duration they need.

The next table provides more detail on lot size, project duration and the success rates. To properly judge success rates, they should be compared with the number of applications and average lot size (see Figure 58 which shows the number of applications over time relative to population, and Figure 59 which shows lot size over time).

Moreover, success rates need to be interpreted with care independently of the number of applications or lot size. For example, agencies may use outline proposals to do a first check, which don't enter the number of applications. And within (single) project funding, investigator-initiated and solicited research proposals may coexist (such as in the UK and in the US), which also limits comparability of overall success rates. Finally, success rates differ for resubmission or project renewals by comparison with first-time applications.

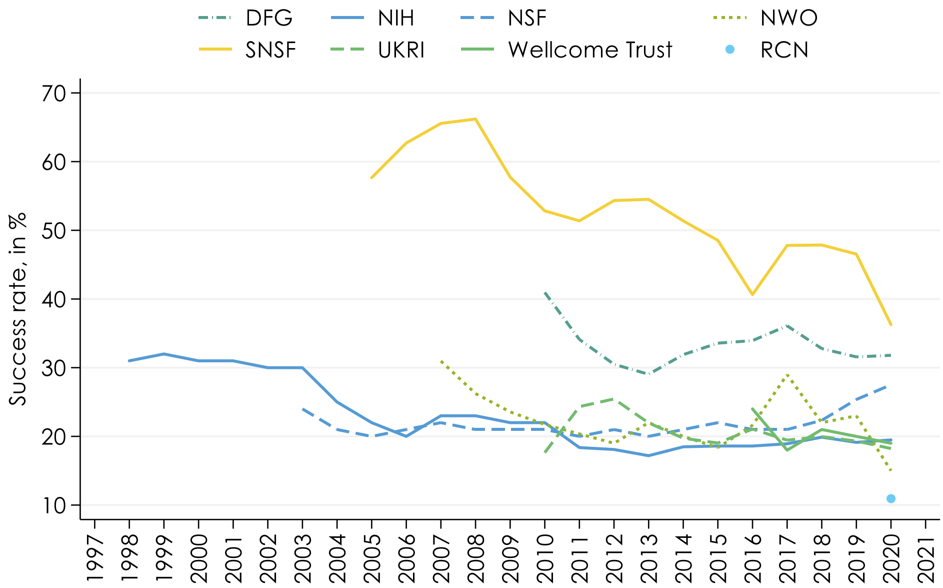
Table 33: **Single project funding, 2020**

Country	RFO	Original fund name of the scheme	Lot size in Mio. USD PPP					Project duration	Success Rate	
			min	max	average	statistical	Δ FYA	max		Δ FYA
CH	SNSF	Project Funding	0.04	N/A	N/A	0.52	0.38	4 years	36%	-21
DE	DFG	Sachbeihilfen	N/A	N/A	0.12	0.09	0.02	*3 years	32%	-2
NL	NWO	Open competition	N/A	8.28	N/A	0.85	0.08	6 years	15%	-7
NO	RCN	Fri prosjektstøtte	N/A	N/A	N/A	N/A	N/A	6 years	11%	N/A
UK	AHRC	Research Grants Standard	0.07	1.43	N/A	0.14	-0.11	5 years	18%	-14
	BBSRC	BBSRC Standard Research Grant	N/A	2.86	N/A	0.18	0.03	5 years	21%	-1
	EPSRC	Standard research grants	N/A	N/A	N/A	0.16	0.03	no limit	24%	-3
	ESRC	Research Grants	0.50	1.43	N/A	*N/A	*N/A	5 years	15%	2
	MRC	Research Boards Standard grants	N/A	N/A	N/A	0.15	0.03	5 years	14%	-2
	NERC	Standard Grant	N/A	1.14	N/A	0.14	0.02	5 years	17%	1
	Wellcome Trust	Investigator Awards	N/A	4.29	2.43	N/A	N/A	7 years	19%	-5
US	NIH	R01	N/A	N/A	N/A	0.52	0.26	5 years	20%	-12
	NSF	Research	N/A	N/A	0.20	0.34	-0.18	*3 years	28%	4

Source: Information from homepages and/or information sent by RFOs. Please see links and information in the respective chapter. WIFO calculation. Note: Δ FYA: Difference of lot size (statistical) and success rate to first year available (FYA) in percentage points. *N/A: ESRC provided mean and median funding so the value is not comparable. * project duration are averages. First year available: 1998 (NIH), 2003 (NSF), 2005 (SNSF), 2010 (BBSRC), 2011 (DFG), 2012 (EPSRC, AHRC), 2013 (NERC), 2014 (MRC, ESRC), 2016 (WT, NWO). No change rates are available for RCN and NRF. NWO: "Lot size statistical" refers to the entire Open competition program. "Lot size max refers to the Open competition program – Science

The next figure shows the evolution of success rates over time. For UKRI, we have built an average of the individual Councils, which however have quite different success rates, which can be found in the following Figure 54. The decline of the SNSF's success rate from a high level is explained by the SNSF as follows: "Success rates in the main project funding scheme have come down recently. In autumn 2016, the SNSF raised the maximum duration of projects from three to four years and encouraged re-searchers to focus as much as possible on maximum two parallel projects. This resulted in fewer projects which on average requested a higher budget than before. In the first three years of the 2017-2020 funding period, a large number of new projects were awarded funding by the SNSF. Most of these projects will run for several years and require a commensurate financial commitment. Because of these carried-over costs, the SNSF had less money at its disposal for new grants in 2020 compared to the previous years. This mainly affected project funding and explains the significant drop in the success rate in 2020" (information provided by the SNSF).

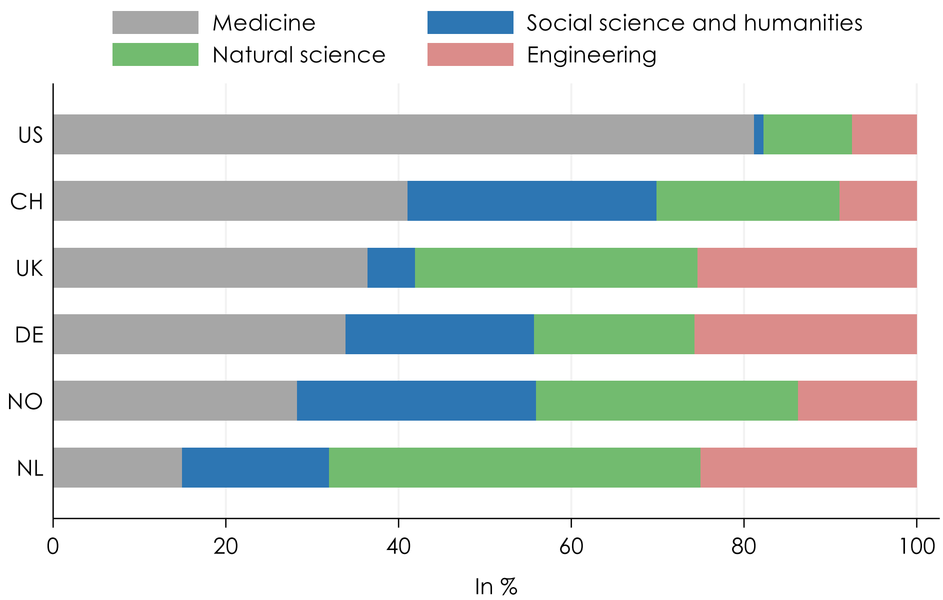
Figure 54: **Success rate in single project funding, 1998-2020**



Source: Information from homepages and/or information sent by RFOs. Please see links and information in the respective chapter. WIFO calculation. Note: For UKRI, an average value was calculated from the available councils (AHRC, BBSRC, EPSRC, ESRC, MRC, NERC) who support single-project, bottom-up 'Standard grants'. NWO: Data refer to the entire open competition program.

The share of the same disciplines in total single project funding varies considerably (for this purpose, we add the NIH and NSF as well as UKRI and WT to a "single" RFO): medicine is highest by far in the US at about 80%, followed by the SNSF at about 40% (average without SNSF: 39%; if biological sciences are counted towards natural sciences, the share of medicine in the SNSF would only be 23%). The SNSF shows the highest share of SSH (29%), followed by the RCN and the DFG (average without SNSF: 12%). Natural sciences dominate in the Netherlands at more than 40% (SNSF: 21%) average without SNSF: 15%; including biological sciences the SNSF would be at 39%), engineering is on average without the SNSF at 19%; here, the SNSF shows a share of 9%. Overall, the SNSF has hence a higher share of medicine and SSH than engineering or natural sciences, although in particular the boundaries between medicine and natural sciences are fuzzy (e.g., basic biological research could be classified either way, and as a result natural sciences would dominate over SSH, medicine and engineering.

Figure 55: **Shares of disciplines in single project funding, 2020**



Source: Information and data from homepage of RFOs and/or provided by RFOs, WIFO calculation. Note: UK consists of the agencies Wellcome Trust (medicine only) and UKRI. For UKRI, the category Medicine corresponds to the council MRC, the category Engineering to the council EPSRC which however also includes physical sciences. The category Natural science consists of the councils BBSRC (which also includes biological sciences) and NERC. The category Social science and humanities consists of the councils AHRC and ESRC. Social science and humanities for UK is underestimated in this graph as only average values for ESRC are available. For DFG: The data refer to the category Medicine corresponds to the DFG discipline Life Sciences and consists of Medicine, Biology, Agriculture, Forestry and Veterinary Medicine. The Natural Science category includes chemistry, physics, mathematics, and earth sciences. For RCN: The category medicine corresponds to the RCN discipline medicine & health sciences and agriculture & fisheries. US consists of the agencies NIH (medicine only) and NSF. NSF consists of several directorates, which have been assigned to disciplines as follows: Natural Sciences (Biological Sciences, Geosciences, Mathematical and Physical Sciences, Office of Polar Programs), Engineering (Computer and Information Science and Technology, Engineering), Social Sciences and Humanities (Social, Behavioral, and Economic Sciences). For NWO: Mean of the shares of 2019 and 2020 because the Science Open Competition XL is run once every two years and is therefore included in the 2020 data but not in the 2019 data. Also the projects granted in 2020 in SSH have been postponed to 2021 due to Covid. The category medicine corresponds to the NWO discipline medical research. Data refer to the entire open competition program. For SNSF, see footnote in Figure 5. N/A: no data available.

The next table shows more detail on the share of disciplines in single project funding.

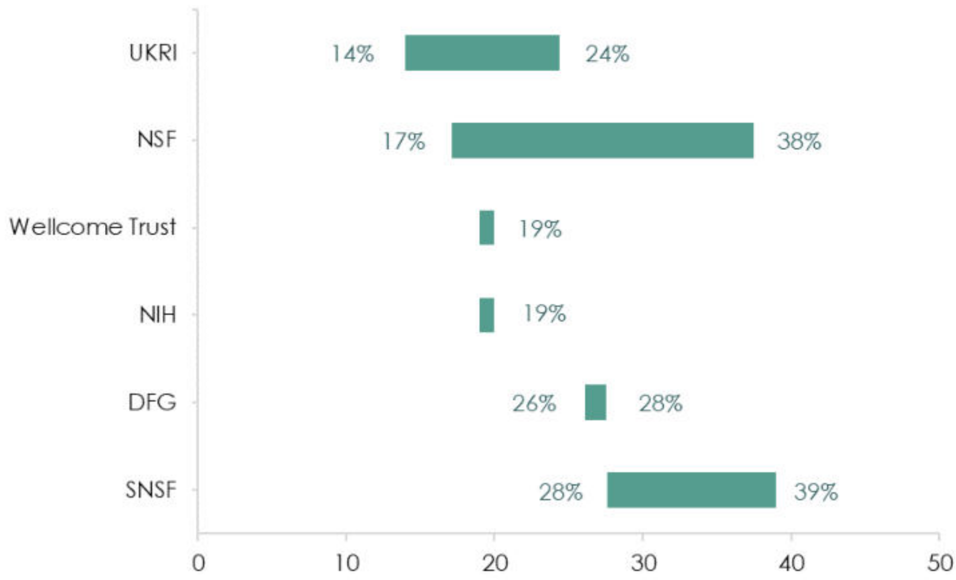
Table 34: **Shares of disciplines in single project funding, 2020 and change to first year available**

		Medicine		Natural sciences		Social Science and Humanities		Engineering		
Country	RFO	2020	Δ FYA	2020	Δ FYA	2020	Δ FYA	2020	Δ FYA	Average LYA
CH	SNSF	41%	-1.71	21%	-13.28	29%	12.52	9%	1.25	25%
DE	DFG	34%	-1.73	19%	-0.71	22%	1.49	26%	1.71	25%
NL	NWO	15%	N/A	43%	N/A	17%	N/A	25%	N/A	25%
NO	RCN	28%	N/A	30%	N/A	28%	N/A	14%	N/A	20%
UK	UKRI + WT	36%	0.91	33%	2.07	6%	-1.44	25%	-1.55	20%
US	NIH + NSF	81%	4.37	10%	-4.65	1%	-0.71	8%	0.99	20%

Source: Information and data from homepage of RFOs and/or provided by RFOs, WIFO calculation. Note: See footnote in Figure 55. N/A: no data available. Δ FYA: Difference of shares of disciplines in SPF to first year available (FYA) in percentage points. First year available: 1998 (US), 2005 (CH), 2011 (DE), 2016 (UK), 2019 (NL). LYA: Last year available (2020). For NO, no change rates are available. NWO: Mean of the shares of 2019 and 2020 because the Science Open Competition XL is run once every two years and is therefore included in the 2020 data but not in the 2019 data. Also the projects granted in 2020 in SSH have been postponed to 2021 due to Covid. Data refer to the entire open competition program. For SNSF, see footnote Figure 5 and Figure 8. RCN: Due to recent reorganisation and restructuring at the RCN, there is no guarantee that we have interpreted the data from the website and the funding schemes accurately. The data should hence be interpreted very cautiously.

The spread of success rates between fields of sciences (medicine, natural sciences, engineering and social sciences & humanities SSH) is generally low at the DFG and the SNSF, whereas in the UK it varies more between the individual Research Councils which make up UKRI (14-24%).

Figure 56: **Spread between success rates of disciplines in single project funding, 2020**



Source: Information and data from homepage of RFOs and/or provided by RFOs, WIFO calculation. Note: NRF, NWO & RCN are missing due to lack of data. For the success rate range for NSF and UKRI, the average of the success rates of the assigned directorates/councils was calculated for each discipline. Interdisciplinary fields are considered in this figure (this concers NSF). For SNSF, see footnote in Figure 8. Taking into account the alternative classification of disciplines the spread would be between 28% and 44%.

The next table shows more detail on success rates in individual disciplines.

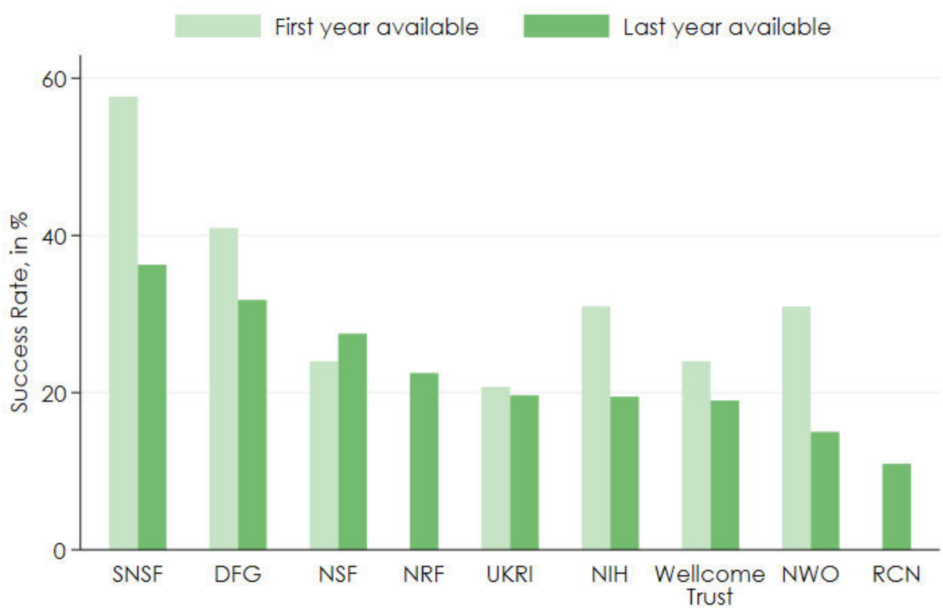
Table 35: **Success rates in single project funding by disciplines, 2020**

Country	RFOs	Original fund name of the scheme	Medicine	Natural sciences	Social Science and Humanities	Engineering
CH	SNSF	Project Funding	36%	39%	38%	28%
DE	DFG	Sachbeihilfen	26%	28%	28%	26%
NL	NWO	Open competition	26%	15%	9%	27%
NO	RCN	Fri prosjektstøtte	N/A	N/A	N/A	N/A
UK	UKRI		14%	20%	16%	24%
	Wellcome Trust	Investigator Awards	19%	-	-	-
US	NIH	R01	19%	-	-	-
	NSF	Research	-	38%	24%	24%

Source: Information and data from homepage of RFOs and/or provided by RFOs, WIFO calculation. Note: See footnote in Figure 56. For SNSF, see footnote in Figure 8. Interdisciplinary fields are not considered in this table (this concerns NSF). Note that natural sciences in the UK include BBSRC data, which also funds biological sciences.

The next figure shows that almost everywhere, with the exception of the NSF and UKRI, success rates have declined over time.

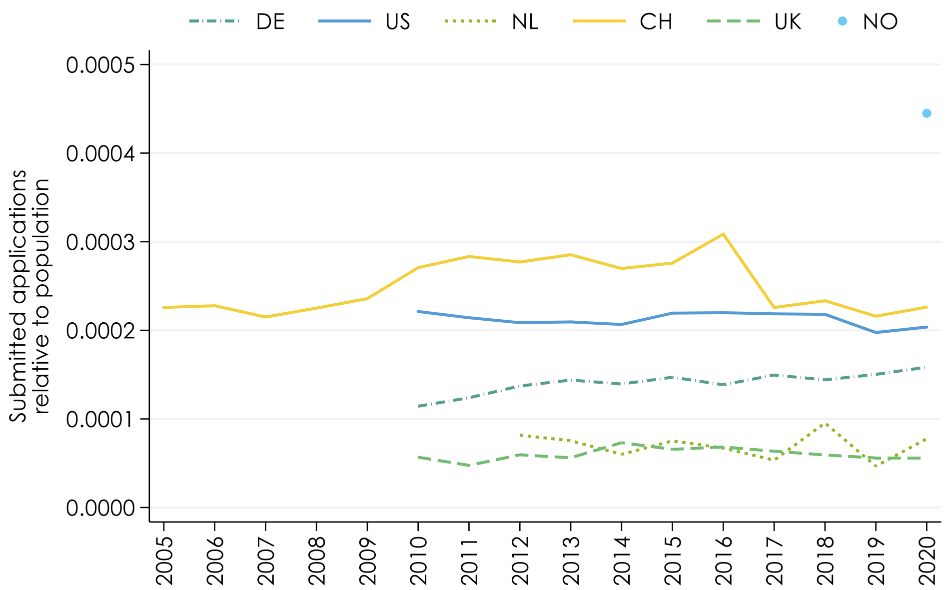
Figure 57: **Success Rates in single project funding, first and last year available**



Source: Information from homepages and/or information sent by RFOs. Please see links and information in the respective chapter. WIFO calculation. Note: Last year available=2020; First year available=1998 (NIH), 2003 (NSF), 2005 (SNSF), 2007 (NWO), 2010 (DFG), 2014 (UKRI), 2016 (Wellcome Trust). For RCN and NRF no comparison available.

To control for different country size, the next figure shows the number of applications relative to the population of the countries where the RFOs are based over time, which is mostly broadly stable for most RFOs.

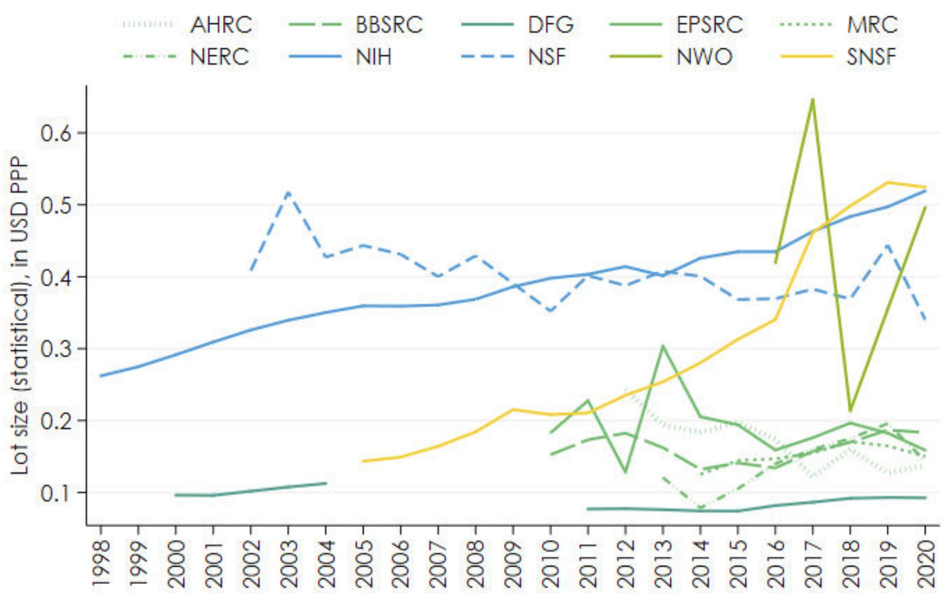
Figure 58: **Number of applications submitted in single project funding relative to population, 2005-2020**



Source: Information from homepages and/or information sent by RFOs. Please see links and information in the respective chapter. WIFO calculation. Note: No data available for SG. NWO: Data refer to the entire open competition program.

The next figure shows lot size over time – there should be an increasing trend due to inflation, the SNSF is increasing also due to structural changes (see section 3.7.2).

Figure 59: **Lot size in single project funding in Mio. USD PPP, 1998-2020**



Source: Information from homepages and/or information sent by RFOs. Please see links and information in the respective chapter. WIFO calculation. Note: Calculation: Number of awarded projects divided by funding awarded.

4.5.2 Differences in cost reimbursement

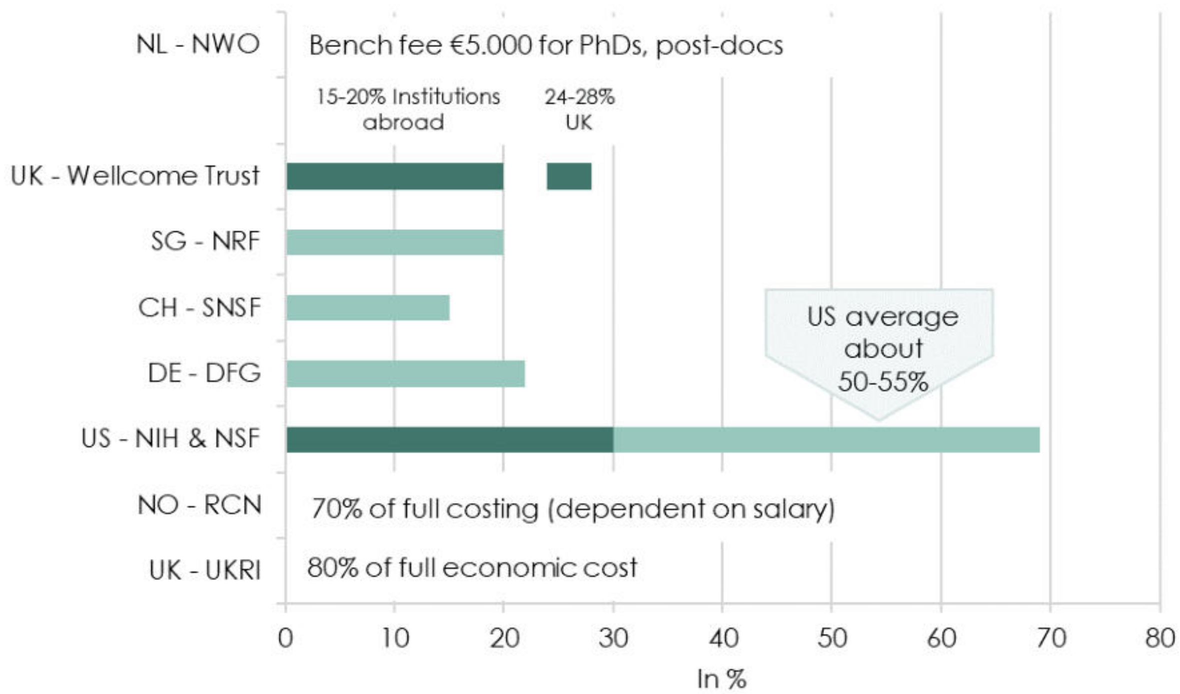
Differences in costs refunded (table below) concern mainly the salaries of the (tenured) principal investigators (PIs) and the amount of indirect costs or overheads paid (Figure 60). The SNSF, NWO and NRF do not refund salaries of PIs, the DFG and WT do so under specific circumstances while the others do. The SNSF refunds indirect costs up to 15% of total direct cost, somewhat below the NRF and DFG (22%). NWO does not refund indirect costs at all, with the exception of a bench fee paid for PhD-students and post docs. NSF and NIH refund 100% of indirect costs, which vary by institution – on average, they amount to 50-55% of the direct costs. RCN and UKRI pay according to full economic costs, albeit using different concepts and calculation models. For a reference salary indicated by RCN on its website, 70% of full economic costs are paid, in the UK it is 80%.

Table 36: **Refundable costs in standard Single project funding, 2020**

Country	CH	DE	NL	NO	UK		US	
RFO	SNSF	DFG	NWO	RCN	UKRI	WT	NIH	NSF
Wages of the principal (tenured) investigators								
Wages of scientific/technical staff								
Material expenses								
Mobility								
Third-party expenses / sub-contracting								
Costs of scientific (open access) publications					*			
Administrative/indirect costs (overheads)			**					

Source: Assessment by WIFO based on homepages and/or information sent by RFOs. Please see detailed links in the individual sections on refundable costs. Note: *Costs for publications, such as books, monographs, etc. Exceptions are journal articles and conference proceedings. **PhD-/Post-doc salary costs will be topped up by a one-off bench fee of €5.000. Green shading indicates "yes", red shading "no" and yellow shading "it depends".

Figure 60: **Share of indirect costs/overheads in total costs reimbursed, 2020**

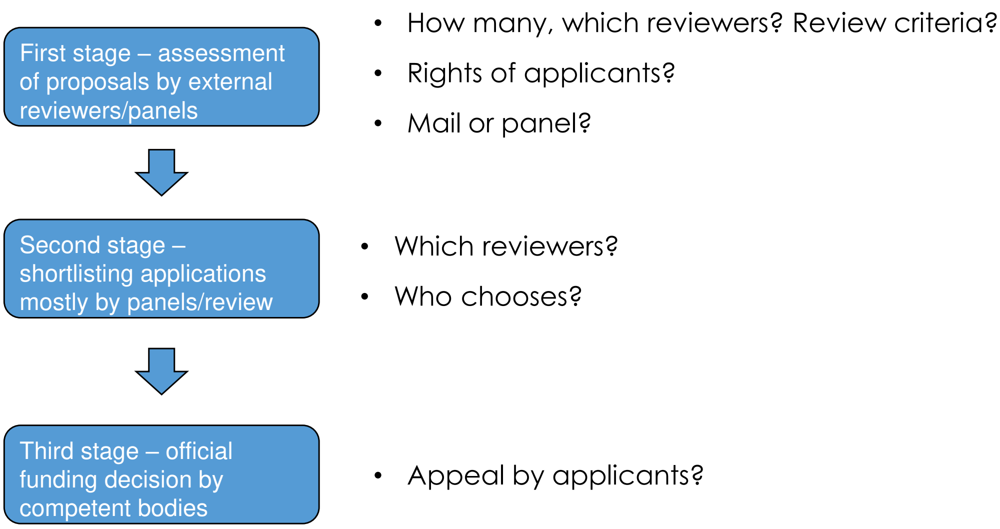


Source: Assessment by WIFO based on homepages and/or information sent by RFOs. Please see detailed links in the individual sections on refundable costs.

4.5.3 Differences in peer review

In most RFOs examined, peer review (of the single project funding schemes) is a three-part process, where in a first stage reviewers assess the quality of each proposal individually (by written mail or panel review), in a second stage mostly reviewer boards or panels shortlist the proposals and in a third stage the competent bodies take funding decisions (Figure 61). The exception is the NSF, where a programme officer substitutes for the work of the second stage. In each of these stages, there are differences in how the RFOs handle the peer review of proposals submitted to the main single project funding scheme (see some questions in the next figure).

Figure 61: **Stylized illustration of peer review stages**



Source: Authors.

Table 37 below summarises these differences by the characteristics of reviewers and the review process, as well as by the rights of applicants. The following Table **38** presents differences in peer review criteria for the single project funding scheme. Differences in detail relate to:

- Organisation of the peer review process itself (safeguarding the overall quality of the review process)
  - How the first stage review process is organised (mail vs. panel review, i.e., first stage peer reviewers come together to discuss proposals in person, rather than just the second-step quality control reviewers discussing the first-stage reviews),
  - Whether the second stage involves a different set of external academic reviewers
- Selection/Size of reviewer pool
  - Where first stage peer reviewers come from (national/international, academic/non-academic)
  - Selection of second stage reviewer pool (chosen by agency or elected by scientific community)
  - How many reviewers
- Nature and weight of first stage review criteria
  - Number of criteria
  - Criteria type, e.g., whether the potential economic or societal impact of the proposed research, or the utilisation of the knowledge created is an assessment criterion

    - Special criteria for e.g., first-time applicants (other features such as interdisciplinarity are usually dealt with by dedicated review panels)
- Rights for applicants/information provided to them
    - Refusal or nomination of reviewers
    - Appeal/feedback to reviewer comments
    - Information provided to applicants from review

In the following, we describe the three stages in more detail.

The **first stage** in more detail: The nationality of reviewers varies with country size – small countries (e.g., SNSF) use mostly international reviewers, large ones (NIH, NSF) national ones. The number of reviewers who provide a written review varies from a minimum of 2 (SNSF, DFG, NWO, RCN), 3 (WT, NSF) to 4 (EPSRC). RCN, WT and the NIH use panels already in the first stage, while the others use mail review. In some RFOs applicants can refuse (NRF, NIH, NOW, SNSF) or suggest reviewers (EPSRC, NRF, NSF).

The number of review criteria ranges from 2 (NWO to 6 (NSF, WT), SNSF uses 3. All judge scientific quality of the proposal, most qualifications of the investigator (exception: NWO) and feasibility or suitability of the environment. Impact, including economic and societal benefits, is a criterion in all RFOs, except for the DFG and the SNSF standard project funding scheme when applicants do not self declare their proposal as "use-inspired".

The **second stage** in more detail: The SNSF and DFG – due to their academic self-governance structure – differ in that the members of review boards of the second stage are elected by the scientific community, rather than chosen by the agencies as in the case of WT and the governmental agencies. The process is different though in the SNSF from the DFG, in that members of the national research council, which are nominated and then elected, are assisted by further evaluation panels selected by the National Research Council. Second stage reviewers are exclusively academics in the SNSF and DFG, while in other agencies, non-academics (industry or public sector) may also participate (NIH, Wellcome Trust, RCN, NWO). The second stage review boards can also have additional functions to safeguarding scientific quality: e.g., the RCN uses 15 portfolio boards which select projects supposed to advance the strategic goals of their portfolio area, which can be either scientific disciplines (natural sciences and technologies) but also more topic-oriented, such as oceans or petroleum. The WT invites applicants for a presentation and interview. Funding decisions can be appealed against at the SNSF, NWO, EPSRC and NIH.

The third stage is similar in the agencies, in that prepared funding recommendations are presented to the funding decision making bodies of the RFOs (see section 3 for details).

Table 37: **Summary table: Organisation of peer review of and criteria used in Single project funding, 2020**

Country	**CH**	**DE**	**NL**	**NO**	**UK**		**US**	
RFO	**SNSF**	**DFG**	**NWO**	**RCN**	**EPSRC**	**WT**	**NIH**	**NSF**
Reviewers								
External reviewers only academics/researchers	*1							
External reviewers predominantly national (N), international (I) or both (N & I)	I	N & I	I	I	N & I	I	N	N
"Review board/panel" reviewers elected/nominated by scientific community								
"Review board/panel" reviewers chosen by agency								N/A
Review Process								
Pre-screening (formal review)								
First stage predominantly mail (M) or panel (P) review	M	M	M	P	M	P	P	(M)
Number of (first-stage) reviewers per proposal/panel	min. 2	2	min. 2	4-7 panel, 2 written	min. 4	min. 3-5	20-30 per panel	min. 3
Second stage involves discussion of proposals among "review boards / panels" (researchers different to first stage-researchers discuss proposals)								N/A
Review board / panel members only academics / researchers	*1							
Rights of Applicants								
Applicants can suggest reviewer(s)								
Applicants can refuse specific reviewers							*2	
Applicants have no influence on reviewer selection							N/A	
Applicants can provide feedback to/appeal against reviewers' comments								
Review Criteria								
Number of criteria	3*6	4	2	4	4	6	5	6
Priority ranking of criteria							*3	N/A
Special criteria for first time applicants	*4		*4	N/A	*4	*4		
Impact or applicability/utilisation of research is a criterion	*5			N/A				

Source: Assessment by WIFO based on homepages and/or information sent by RFOs. Please see detailed links in the individual sections on peer review. Note: *1 With the exception of proposals declared as use-inspired; *2 Applicants are informed about the assignment of the Scientific Review Group and may ask for reconsideration; *3 According to Stephan 2012, the criteria most highly correlated with the overall impact score are approach and significance; *4 There are specific first-time applicant/early career PI-schemes; *5 Only for proposals for use-inspired research; *6 for use-inspired projects. Green shading indicates "applies", red shading "does not apply" and yellow shading "applies somewhat".

Table 38: **Summary table: Review criteria in detail, 2020**

	CH	DE	NL		NO	UK		US	
			NWO						
			Open Competition						
RFO	**SNSF**	**DFG**	M	XS	**RCN**	**EPSRC**	**WT**	**NIH**	**NSF**
Dimension									
Overall/broad impact, including societal and economic benefits			30%					*	
Scientific Quality of project			70%						
Qualifications of investigator									
Feasibility									
Suitability of environment									
Funding resources									
Commitment to diversity and inclusion									

Source: Assessment by WIFO based on homepages and/or information sent by RFOs. Please see detailed links in the individual sections on peer review. Note: * NIH has five criteria - significance, innovation, investigator, approach and environment, based on these, reviewers give an overall impact score. Green shading indicates "applies", red shading "does not apply" and yellow shading "applies somewhat".

4.6 Staff in relation to proposals and funding

We also collected some numbers on staff in relationship to applications and funding disbursed. As section 4.4 has shown, however, the RFOs are so different that any comparison of staff numbers in relationship to proposals would need much more detailed analysis. E.g., lot sizes (and hence the grants to be examined) are different, funding schemes are different in terms of how much effort the RFOs need to put in (simple quality control, or more active matchmaking of proposals, specifying research questions), role of preliminary formal control to reduce the number of full assessments, etc.

Table 39: **Number of staff, applications and funding by RFO in single project funding and total, 2020**

		Staff		Applications		Funding in Mio. USD PPP	
Country	**RFO**	**Total**	**SPF**	**Total**	**SPF**	**Total**	**SPF**
CH	SNSF	303	N/A	8,213	1,955	856	372
DE	DFG	950	N/A	21,850	13,175	4,437	1,424
NL	NWO	603	N/A	7,098	1,353	1,362	175
NO	RCN	450	150	5,122	2,394	1,116	83
UK	UKRI *(NERC)*	N/A	N/A *(14)*	4,668	3,748 *(308)*	4,431	44
	Wellcome Trust	N/A	N/A	3,584	N/A	1,451	153
US	NIH	N/A	N/A	68,487	32,345	30,143	14,073
	NSF	539	N/A	42,400	34,900	7,842	3,267

Source: Information from homepages and/or information sent by RFOs. WIFO calculation. Note: NWO: Since the figures for staff and application relate to the entire open competition program, the budget for SPF is also shown for the entire open competition program, and not just that part that can be allocated to SPF.

5. Summary and conclusions

Study design and agencies covered

Using a systematic comparative approach, this study analyses differences in (basic) research grant funding between 9 research funding organisations (RFOs) based in 7 countries: Switzerland (Swiss National Science Foundation SNSF), Germany (Deutsche Forschungsgemeinschaft DFG), Netherlands (Dutch Research Council NWO), Norway (Research Council of Norway RCN), Singapore (National Research Foundation NRF), UK (UK Research & Innovation UKRI, Wellcome Trust WT), USA (National Institutes of Health NIH, National Science Foundation NSF). UKRI is the new umbrella organisation for the traditional discipline-specific Research Councils in the UK, such as the Engineering and Physical Sciences Research Council (EPSRC). It updates and expands on an earlier study from which it also uses text and information when still relevant.[1] We want to thank the Swiss Science Council for helping to establish contact with the RFOs and our contacts in the RFOs for providing invaluable information and support.

Governance structure and activity focus

Three broad governance models can be found among the RFOs examined (bottom part of Table 40): a privately funded charity (WT), agencies with mandatory representation of scientific organisations in decision-making bodies („academic self-governance" – SNSF and DFG), and governmental agencies. They are mirrored in the activity focus of the RFOs (top part of Table 40): While all provide grant-based funding for basic research projects and funding for PhD-training/career development of researchers, aiming at addressing specific missions or challenges, as well as creating economic and societal impact out of the research funded, is more common among the governmental agencies and the Wellcome Trust. In the SNSF and even more so in the DFG the core mission is funding scientific knowledge production according to high quality standards with a lower importance of the potential uses of the knowledge produced. The RCN and NRF and to some extent UKRI are in addition agencies which do not just fund academic researchers, but also innovation and research by firms, an activity which in other countries may be done by separate RFOs (as Innosuisse in Switzerland). The RCN also administers funding for extra-university research institutes.

[1] Janger, J., Schmidt, N., Strauss, A. International Differences in Basic Research Grant Funding. A Systematic Comparison. WIFO, 2019.

Table 40: **Mission / activity focus and governance structures of RFOs**

Country	CH	DE	NL	NO	UK		US	
RFO	**SNSF**	**DFG**	**NWO**	**RCN**	**UKRI**	**WT**	**NIH**	**NSF**
Funding basic research								
Education and career development								
Addressing specific missions or challenges								
Creating economic and/or societal impacts								
Fostering innovation in firms								
Academic self-governance								
Privately funded charity								
Governmental agency or body								

Source: Assessment by WIFO of self-declared mission statements and organisational structures by RFOs. Note: UKRI refers to the 7 traditional Research Councils without Innovate UK (which fosters firms) or Research England which provides block grants. Green shading indicates "applies", red shading "does not apply" and yellow shading "applies somewhat".

Spending levels

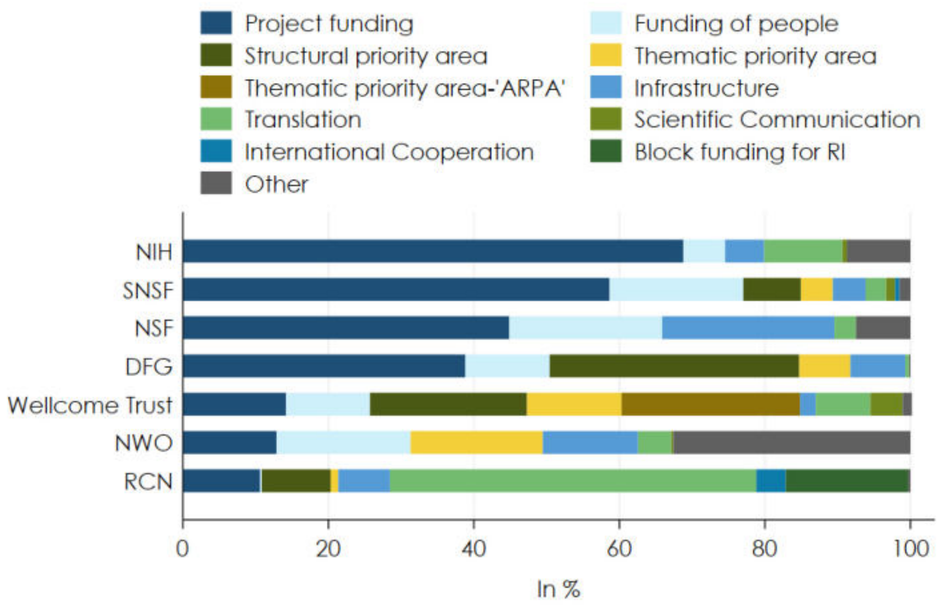
The SNSF has seen relatively strong growth of its funding between 2005 and 2018, but funding awarded has been declining recently. In 2020, the SNSF spent 99 USD per capita at power purchasing parities, below the RCN but at similar levels as the NIH and NSF combined, NWO, and in the UK UKRI and Wellcome Trust combined. As a share of total R&D spending in the higher education sector (HERD), the SNSF's funding is rather low at about 15% (in 2017), by comparison with US (47%), UK (41%), NO (27%), NL (20%) and DE (17%), pointing to generous levels of block grant funding for Swiss universities.

Funding portfolio

Overall funding portfolio

To make funding portfolios comparable across RFOs, we use a self-developed classification scheme. However, data availability at a disaggregated funding scheme level varies between the RFOs, with only the SNSF, DFG and NIH being able to provide detailed funding data over long time periods (back to 1997). Other agencies either don't have such long time series or don't provide data at a detailed funding scheme level. Some will also use standard grant mechanisms to fund cross-cutting activities (e.g., the NIH Common Fund). Heeding these data limitations, the broad picture which emerges is that the SNSF features the highest share at 77% in total funding of schemes which fund research projects or career development/PhD training of researchers, the two core activities of RFOs with a focus on funding basic research (Figure **62**). SNSF is followed by the NIH (75%), NSF (66%) and DFG (50%).

Figure 62: **Share of broad funding schemes in total funding, 2020**



Source: Annual Reports, Homepages and/or information sent by RFOs, WIFO. No information on UKRI, as information only on one standard grant scheme available; no information on NRF, as no data provided. Funding of people is integrated into other schemes in the RCN. RCN: Due to recent reorganisation and restructuring at the RCN, there is no guarantee that we have interpreted the data from the website and the funding schemes accurately. The data should hence be interpreted very cautiously.

The individual research councils which make up UKRI are also likely to feature a large share of people and project funding, however data are only available for the standard grant scheme, which can be used for a variety of purposes. In the remaining agencies, project and people funding ranges from 11% (RCN) to 31% (NWO) of total funding disbursed. Note though that people funding is integrated in standard schemes in the RCN. Schemes which fund structural priorities (e.g., NCCRs in the SNSF or the excellence initiative in Germany), thematic priorities (e.g., calls within specific fields of science), translation efforts (to speed up commercialisation or application of research) or infrastructure investments, make up a lower share of the SNSF's funding portfolio. Structural priorities show a larger share in the DFG and the Wellcome Trust. Translation is particularly important in Norway (RCN) and to a smaller extent in the Netherlands (NWO), the NIH and the Wellcome Trust. The two latter RFOs focus on medicine where the connection between basic science and applications is closest. Spending on infrastructure is high as a share of total funding in the NSF.

Funding mission-oriented and high-risk research

The SNSF has two schemes aiming at high-risk research projects, Spark (for individual researchers) and Sinergia (for researcher groups), which amount to about 9% of total funding, considerably higher than similar programmes at the NIH, NWO and DFG. When considering the Wellcome LEAP funding scheme – which tries to emulate the funding style of the US-based ARPA (Advanced Research Projects Agency) – as aiming for high-risk research, this would amount to close to 25%. Note that other RFOs, such as UKRI, may use their standard grant to also address high-risk endeavours.

Grouping all funding schemes with a thematic focus, including those aiming at achieving specific missions or goals, the Wellcome Trust achieves the highest share with close to 40 %, with the SNSF showing a lower share of that type of programme at about 5%. Generally, the SNSF is characterised by a larger share in total funding of investigator-initiated, bottom-up proposals where agencies respond to research questions raised by individual or groups of researchers. Funding research by pre-defined topics (e.g., by defining umbrellas and soliciting bottom-up proposals within this topic, or by specifying concrete research questions) is less common at the SNSF than in some of the governmental agencies, which more often "solicit" research on questions which they are interested in, or "manage" research calls by actively coordinating proposals (e.g., NIH, NWO, UKRI). This type of funding is however underestimated in the data above, as often carried out within standard project-funding schemes.

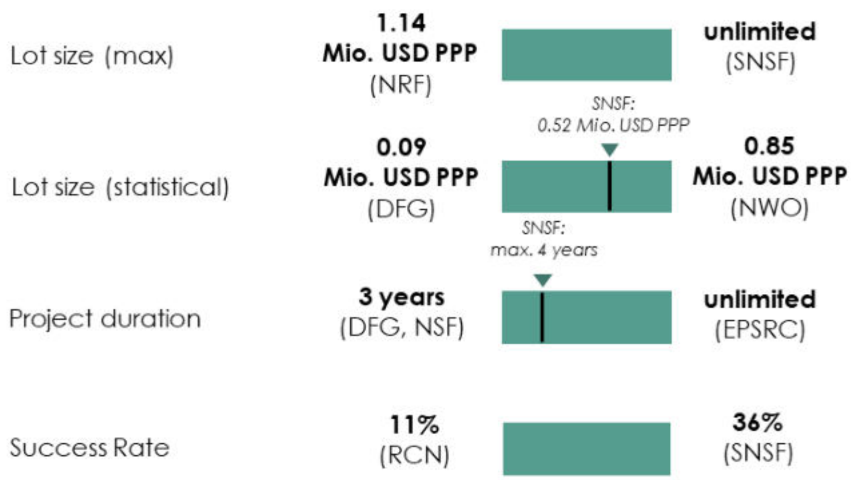
Introduction of new schemes

While evaluations play a role everywhere, three broad models can be differentiated: in the SNSF and DFG (with a strong role of the scientific community in governance), the introduction of new schemes basically reflects the needs of the scientific community. The SNSF uses the results of its researcher survey and discussions in the National Research Council. A second model is the introduction of new schemes based on strong government planning (e.g., RCN, NRF). The RCN implements the long-term strategy for research by the Norwegian government, but also launches new activities in response to the needs of the15 ministries in Norway which can use the RCN for their purposes. A third model is a mixture of top-down (government-driven) & bottom-up processes by agencies which have some autonomy in deciding on what to use their funds for. This is the case of the NIH and the NSF in the US, which respond to White House or Administration priorities, but where programme/center directors can launch new initiatives themselves as well, when they spot new trends, e.g., also UKRI in the UK uses a mixture of top-down and bottom-up.

Single Project Funding schemes – a more detailed comparison

For the standard, single investigator-initiated project funding scheme we collected more data and information. The project funding scheme of the SNSF is characterised by large grants (in principle unlimited, statistically at 0.5 Mio. USD (at PPP); high, although declining success rates (36% in 2020, down from above 50% in 2010 – compared with an average across the other RFOs of 20%); as well as a more limited maximum project duration of 4 years. E.g., at the WT, max. project duration is 7 years, the EPSRC provides unlimited project duration. The spread of success rates between fields of sciences (medicine, natural sciences, engineering and social sciences & humanities SSH) is generally low at the DFG and the SNSF, whereas in the UK it varies more between the individual Research Councils which make up UKRI (14-24%).

Figure 63: **Selected characteristics of (single) project funding schemes, 2020**



Source: Annual Reports, Homepages and/or information sent by agencies, WIFO. Note: NWO: "Lotsize statistical" refers to the entire Open competition program. The formal project duration in the DFG is 3 years, but researchers can then apply for extensions as long as they see fit, so that in principle, researchers are quite free in choosing the project duration they need.

The share of the same disciplines in total single project funding varies considerably (for this purpose, we add the NIH and NSF as well as UKRI and WT to a "single" RFO): medicine is highest by far in the US at about 80%, followed by the SNSF at about 40% (average without SNSF: 39%; if biological sciences are counted towards natural sciences, the share of medicine in the SNSF would only be 23%). The SNSF shows the highest share of SSH (29%), followed by the RCN and the DFG (average without SNSF: 12%). Natural sciences dominate in the Netherlands at more than 40% (SNSF: 21%) average without SNSF: 15%; including biological sciences the SNSF would be at 39%), engineering is on average without the SNSF at 19%; here, the SNSF shows a share of 9%. Overall, the SNSF has hence a higher share of medicine and SSH than engineering or natural sciences, although in particular the boundaries between medicine and natural sciences are fuzzy (e.g., basic biological research could be classified either way, and as a result natural sciences would dominate over SSH, medicine and engineering.

Differences in costs refunded concern mainly the salaries of the (tenured) principal investigators (PIs) and the amount of indirect costs or overheads paid. The SNSF, NWO and NRF do not refund salaries of PIs, the DFG and WT do so under specific circumstances while the others do. The SNSF refunds indirect costs up to 15% of total direct cost, somewhat below the NRF and DFG (22%). NWO does not refund indirect costs at all, with the exception of a bench fee paid for PhD-students and post docs. NSF and NIH refund 100% of indirect costs, which vary by institution – on average, they amount to 50-55% of the direct costs. RCN and UKRI pay according to full economic costs, albeit using different concepts and calculation models. For a reference salary indicated by RCN on its website, 70% of full economic costs are paid, in the UK it is 80%.

Peer review procedures

In most RFOs examined, peer review (of the single project funding schemes) is a three-part process, where in a first stage reviewers assess the quality of each proposal individually (by written mail or panel review), in a second stage mostly reviewer boards or panels shortlist the proposals and in a third stage the competent bodies take funding decisions. The exception is the NSF, where a programme officer substitutes for the work of the second stage. The **first stage** in more detail: The nationality of reviewers varies with country size – small countries (e.g., SNSF) use mostly international reviewers, large ones (NIH, NSF) national ones. The number of reviewers who provide a written review varies from a minimum of 2 (SNSF, DFG, NWO, RCN), 3 (WT, NSF) to 4 (EPSRC). RCN, WT and the NIH use panels already in the first stage, while the others use mail review. In some RFOs applicants can refuse (NRF, NIH, NWO, SNSF) or suggest reviewers (EPSRC, NRF, NSF).

The number of review criteria ranges from 2 (NWO to 6 (NSF, WT), SNSF uses 3. All judge scientific quality of the proposal, most qualifications of the investigator (exception: NWO) and feasibility or suitability of the environment. Impact, including economic and societal benefits, is a criterion in all RFOs, except for the DFG and the SNSF standard project funding scheme when applicants do not self-declare their proposal as "use-inspired".

The **second stage** in more detail: The SNSF and DFG differ in that the members of review boards (or the National Research Council NRC in the case of SNSF) of the second stage are elected by the scientific community, rather than chosen by the agencies as in the case of WT and the governmental agencies. Evaluation panels assisting the NRC are however selected. Second stage reviewers are exclusively academics in the SNSF and DFG, while in other agencies, non-academics (industry or public sector) may also participate (NIH, Wellcome Trust, RCN, NWO). The second stage review boards can also have additional functions to safeguarding scientific quality: e.g., the RCN uses 15 portfolio boards which select projects supposed to advance the strategic goals of their portfolio area, which can be either scientific disciplines (natural sciences and technologies) but also more topic-oriented, such as oceans or petroleum. The WT invites applicants for a presentation and interview. Funding decisions can be appealed against at the SNSF, NWO, EPSRC and NIH.

Changes over time

Changes over time are not always reflected in shifts in funding portfolio data, as RFOs can use standard mechanisms to address new topics or use other tools such as e.g., changing the way projects are assessed, in terms of peer review criteria. Some of these changes are the following:

- Some agencies have put more general emphasis on the economic or societal impact of the research they fund, in particular governmental agencies such as the UK Research Councils (now UKRI), but also NWO.
- In various forms, there are attempts at accelerating research efforts to solve specific problems or to reach scientific and technological goals beyond that what would randomly arise out of purely investigator-initiated, curiosity-driven, blue sky bottom-up proposals, in a way focusing (basic) research.
    - A simple form are "thematic umbrellas" – allocating money to a topic and inviting bottom-up proposals within it, e.g., funding schemes addressing emerging technologies such as artificial intelligence, quantum computing, internet of things… (e.g. NSF, RCN, NWO, SNSF…)
    - Some agencies go a step further and aggregate bottom-up proposals into bigger themes with coordinated management, e.g., matchmaking among proposals (e.g. NSF Big Ideas, NWO KIC)
    - Some agencies try to provide funding from idea generation right up to prototyping, combining use-inspired basic research with applied research and experimental development, e.g., RCN, NIH). This is probably easier in medicine where research and application are generally closest, and in agencies which combine funding of basic and applied research (in firms), such as the RCN.
    - The most challenging way of trying to focus research to reach goals for RFOs is probably the ARPA-funding style, where autonomous, highly qualified researcher-programme officers specify ambitious, concrete goals and invite proposals, but also provide matchmaking. The Wellcome Leap fund tries to do this (a division of WT), a new agency ARIA is planned for the UK, ARPA-Health is planned by the NIH, coming in addition to DARPA and ARPA-E. Also the European Innovation Council tries to emulate this funding style.
    - Overall, however, the focus of RFOs on missions or setting specific goals varies considerably, while it is e.g. central for the RCN (which also funds research in firms), the DFG funds projects which researchers propose, without trying to engage in missions.
- Trying to foster breakthrough results by funding high-risk research does not necessarily need a thematic focus, but can also be done at the individual project level, from a bottom-up perspective. Examples are the NIH Common Fund, NSF Early-concept Grants for Exploratory Research (EAGER), SNSF Spark, NWO Open Competition „XS", etc.
- The COVID-19 pandemic has sparked funding of rapid response research (e.g., in the SNSF), in others this existed already before (NSF RAPID)
- Last, but not least, some agencies have conducted large scale efforts to involve stakeholders and civil society in defining research questions of interest and associated funding opportunities (e.g., RCN, NWO)

The SNSF in contrast with the other RFOs

In summary the SNSF is an RFO with a strong role of the scientific community in its governance structure. Its activities are more focused on quality control of research projects proposed by researchers, than on actively soliciting and coordinating research to solve specific goals. Assuring the quality of scientific knowledge production looms larger in the SNSF's mission than actively fostering economic and societal impacts from the knowledge produced. Funding levels are generous, characterized by high if declining success rates and large sums per project, even if project duration is on the low side. Proposals in single project funding are assessed by a relatively low number of reviewers, indirect cost coverage is average, salaries of principal investigators are not covered.

6. References

Azoulay, P., Fuchs, E., Goldstein, A., & Kearney, M. (2018). *Funding Breakthrough Research: Promises and Challenges of the "ARPA Model"* (Working Paper No. 24674). National Bureau of Economic Research. https://doi.org/10.3386/w24674

Berg, J. (2010, July 21). Even More on Criterion Scores: Full Regression and Principal Component Analyses. *NIGMS Feedback Loop Blog - National Institute of General Medical Sciences*. https://loop.nigms.nih.gov/2010/07/even-more-on-criterion-scores-full-regression-and-principal-component-analyses/

Collins, F. S., Schwetz, T. A., Tabak, L. A., & Lander, E. S. (2021). ARPA-H: Accelerating biomedical breakthroughs. *Science*, *373*(6551), 165–167. https://doi.org/10.1126/science.abj8547

Franzoni, C., Stephan, P., & Veugelers, R. (2021). *Funding Risky Research* (No. w28905). National Bureau of Economic Research. https://doi.org/10.3386/w28905

Janger, J., Schmidt, N., & Strauss, A. (2019). *International differences in basic research grant funding – a systematic comparison* (Nr. 9-2019; Studien Zum Deutschen Innovationssystem). Expertenkommission Forschung und Innovation (EFI).

Mazzucato, M. (2018). Mission-oriented innovation policies: Challenges and opportunities. *Industrial and Corporate Change*, *27*(5), 803–815. https://doi.org/10.1093/icc/dty034

OECD. (2015). *Frascati Manual 2015. Guidelines for Collecting and Reporting Data on Research and Experimental Development*. OECD Publishing.

Sampat, B. N. (2012). Mission-oriented biomedical research at the NIH. *Research Policy*, *41*(10), 1729–1741. https://doi.org/10.1016/j.respol.2012.05.013

Tollefson, J. (2021). The rise of 'ARPA-everything' and what it means for science. *Nature*, *595*(7868), 483–484. https://doi.org/10.1038/d41586-021-01878-z

Annexe VI

Study D

SNSF funding under the aspect of the value chain

Fachhochschule Nordwestschweiz
Hochschule für Wirtschaft

Victoria crater from HiRise (NASA, JPL, & University of Arizona, 2006, http://photojournal.jpl.nasa.gov/catalog/PIA08813)

Overall evaluation of the SNSF
Value chain thematic block (Mandate D)

On behalf of the Swiss Science Council, Federal Department of Economic Affairs, Education and Research

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Abbreviations

CML	Commercial Maturity Level
CTI	Commission for Technology and Innovation
DFG	Deutsche Forschungsgemeinschaft
ERI	Education, Research & Innovation
ETH	Eidgenössische Technische Hochschule (Federal Institute of Technology)
KTT	Knowledge and Technology Transfer
MOF	Mission-Oriented Funding
NCCR	National Centre of Competence in Research
NPOs	Non-Profit Organizations
NRP	National Research Programme
NSF	(US) National Science Foundation
PI	Principal Investigator
R&D	Research and Development
SERI	State Secretariat for Education, Research and Innovation
SNSF	Swiss National Science Foundation
SSC	Swiss Science Council
TRL	Technology Readiness Level
UAS	University of applied sciences
UIBR	Use-inspired Basic Research
UTE	University of Teacher Education
VCOF	Value Chain Oriented Funding

1. Introduction

The mandate of the Swiss National Science Foundation (SNSF) is to promote scientific research in all disciplines represented at a university research institution, including support for measures to evaluate and exploit the results of the research it funds (Art. 10 RIPA). The SNSF is thus a central instrument of the Confederation for the promotion of research and innovation. In the Education, Research & Innovation ERI Dispatch 2017-2020, the Federal Council has formulated the focus of orienting this funding system more strongly towards the value chain. The value chain is understood as the "interaction of basic research, application-oriented research and market-oriented innovation" (ERI Dispatch 2017-2020, 3142).

In addition to the transformation of the Commission for Technology and Innovation (CTI) funding organization into the public-law institution Innosuisse, a second measure consisted in the establishment of a special Bridge programme jointly supported by the SNSF and Innosuisse, which is intended to support researchers in identifying the application potential of research in the form of a product or service. Furthermore, according to the ERI Dispatch 2017-2020, the two established instruments of the SNSF "National Research Programmes (NRPs)" and "National Centres of Competence in Research (NCCRs)" with clearly different programme objectives are also assigned to the overarching goal of strengthening knowledge and technology transfer (KTT) and innovation (ERI Dispatch 2017-2020, 3184). SNSF project funding is not explicitly included under value chain oriented funding (VCOF). However, the ERI Dispatch 2017-20 mentioned that for certain fundamental research problems an indirect application orientation can be fruitful (p. 3184). Hence, we included as a fourth programme in this evaluation the funding of use-inspired basic research (UIBR) projects.

The systemic evaluation outlined here therefore aims to analyse whether the four SNSF funding programmes Bridge, NRP, NCCR and UIBR supported the interaction of basic research, application-oriented research and market-oriented innovation, as formulated in the ERI Dispatch 2017-2020. The State Secretariat for Education, Research and Innovation (SERI) and the Swiss Science Council (SSC) formulated the guiding questions for the mandate which mainly relate to the coverage of the funding, understood as sufficient funding of research and application-related activities in the value chain according to the needs of researchers:

1. How are the various measures of the SNSF assessed with regard to funding in the entire value chain? Are there any funding gaps in this regard? Are there funding gaps along the value chain in relation to the portfolios of the SNSF and Innosuisse?
2. How is the promotion in the pre-competitive area, which is run in cooperation with Innosuisse, to be assessed? Does the newly created "Bridge" instrument sufficiently cover the need or are further measures required? [Supplementary question from SWR: How well does the SNSF handle the interface between industry and academic research?]
3. Given the growing complexity of the interrelationships between basic research, applied research and innovation, does Switzerland also need cross-cutting or "mission-oriented" funding measures linked to specific themes (such as energy) that are "offered" in a coordinated manner between the SNSF and Innosuisse?

Supplementary questions from the SSC office are:

4. Were "soft" technologies (e.g., low tech, social innovations, experiental and human-centred approaches in the arts) sufficiently taken into account and welcomed for the above-mentioned funding areas?
5. Which types of higher education institutions are using SNSF funds to further develop which technologies?
6. Which TRLs can be covered by this? Are there gaps at the beginning of the chain or later with respect to market-oriented innovation? Are there maturity concepts for soft technologies (e.g., societal readiness levels)?
7. Are there barriers for certain types of higher education institutions? How can these be reduced? Why do certain types of higher education institutions switch to EU offers?

2. Literature review

The literature review discusses four questions by reviewing the academic literature in the field. The answers guided the empirical work:

1. What is value chain oriented funding and what is known on it in Switzerland (section 2.1)?
2. What characterizes scientists and research projects which are likely to generate value chain oriented results, respectively contribute to bringing about market-oriented innovation (section 2.2)?
3. Which factors influence the funding of scientists and approval of grant applications (section 2.3)?
4. What are the characteristics of mission-oriented research funding? (section 2.4)

2.1 On the value chain and recent evaluations of SNSF funding along the value chain

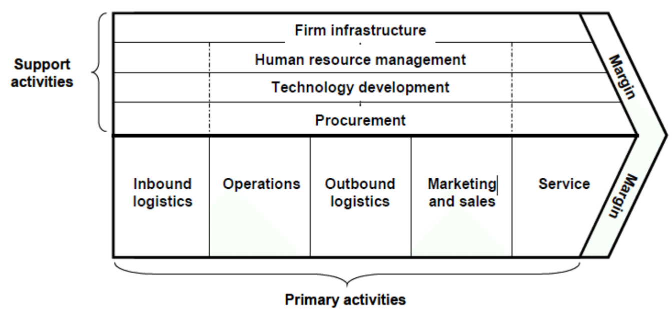
Value chain

The concept of the value chain is multi-layered and is by no means uniformly used with regard to research and innovations and their promotion.

It originally goes back to Michael Porter. He wrote in 1985:

"The value chain disaggregates a firm into its strategically relevant activities in order to understand the behaviour of costs and the existing and potential sources of differentiation. A firm gains competitive advantage by performing these strategically important activities more cheaply or better than its competitors. A firm's value chain is embedded in a larger stream of activities that I term the value system." (Porter, 1985).

Figure 1. Generic value chain



Source: Porter, 1985, p. 37.

Later publications on innovation value chains describe them as a "recursive process of knowledge acquisition, transformation and exploitation" (Roper et al., 2008, p. 961) or as a process of transforming ideas into commercial outcomes consisting of the three steps of idea generation, implementation and dissemination (Hansen & Birkinshaw, 2007).

The elements of a value chain thus differ depending on what kind of value is created and what perspective the observers take on it. Common to the approaches is the focus on a sequence of activities in an organization to create (economic) value, which is additionally embedded in a value system of complementary, upstream and downstream activities contributed by other organizations.

With regard to innovations, these considerations also show great proximity to the so-called linear innovation model, whose origins lie in the first half of the 20th century and which has strongly influenced innovation policy in many countries (Flink & Kaldewey, 2018; Godin, 2006, 2008, 2011). This postulates a sequence of basic research, applied research, (technological) development, (production and) diffusion. However, one of the supposed fathers of this model, the US-American Maurice Holland, Director of the Division of Technical and Industrial Research at the US National Research Council, already pointed out in 1928 that scientific research reduces the period between scientific discovery and mass production (Godin, 2011). Thus, in addition to basic research leading to scientific discovery, other scientific research activities can decisively influence and accelerate the innovation process. From the 1980s onwards, the linear sequence was increasingly questioned and the role of science as a repository of knowledge and source of expertise for innovation was emphasised. Recursive innovation models (Kline & Rosenberg, 1986) and systemic innovation models (Lundvall, 1988) pointed to the contribution of scientific research in different phases of the innovation process and via different mechanisms (quasi analogous also to Porter's "value system").

In this study, the SNSF funding of the value chain from basic research, application-oriented research and market-oriented innovation is placed at the centre. It sheds light on how easy the access to SNSF funding is for value chain oriented applicants and applications. Collaborations between different organizations, in particular the different types of universities, research institutions, companies and other non-academic organizations might also be central for the implementation and exploitation of results from funded research, as well as additional funding from other, complementary funding sources (such as Innosuisse, the EU or others). These aspects had to be excluded from the present analysis, as they would have increased the scope and the observation period of the evaluation beyond what is feasible.

Recent evaluations of SNSF funding along the value chain

In recent years, various evaluations have addressed the importance of research funding and the results of research for innovation in the Swiss economy and society. Three of these evaluations are presented below in an overview of the aspects relevant to this study (cf. Table 1):

- Kolarz, P., Arnold, E., & Farla, K. (2017, May). Use-inspired basic research at SNSF. Final Report. Brighton: Technopolis.
- Langfeldt, L., Brorstad Borlaug, S. (2016). Swiss National Centres of Competence in Research (NCCR). Evaluation of the Selection Process. Oslo: Nordic Institute for Studies in Innovation, Research and Education (NIFU).
- Rieder, S., Knubel, S., & Gärtner, S. (2014). Knowledge and technology transfer in the first series of National Centres of Competence in Research (NCCR). Final report for the attention of the Secretariat of the Swiss Science and Innovation Council (SSIC). Lucerne: Interface Policy Studies Research Consulting.

In terms of methodology, the three evaluations used a comparable portfolio of methods: in all evaluations, interviews were conducted with grantees and programme managers (in some cases also with those involved in the selection process) and funding data from the SNSF was analysed. Two of the three evaluations also conducted standardised written surveys of applicants. The analysis of the KTT activities of the first NCCR cohort used interviews at this point. The Technopolis evaluation of funding for use-inspired basic research (UIBR) also gained further insights through participant observation of a selection meeting and the analysis of (parts of) applications and reviews. Thus, it is methodologically the most broadly based.

The three evaluations find that the inclusion of aspects of application and exploitation of research results in project selection increases the complexity of the funding applications and projects. The subsequent implementation, i.e., knowledge transfer and commercialisation in the funded projects, is also fairly complex. Furthermore, several findings point to funding gaps: the lower approval rate of UIBR, the identified funding bottlenecks in the product development coming from the NCCRs, and last but not least the SSC-finding that the funding of interuniversity networks following an NCCR is at least partly difficult (Conseil suisse de la science et de l'innovation CSSI, 2015).

Table 1. Overview of selected evaluations of SNSF funding

Evaluation	Kolarz et al. (2017)	Langfeldt & Borlaug (2016)	Rieder et al. (2014)
Evaluation object	Applications UIBR within SNSF project funding	NCCRs of the 3rd and 4th call	KTT activities of the NCCRs of the 1st call for proposals
Evaluation methods	Interviews on the UIBR evaluation process, online survey of applicants, analysis of SNSF funding data, content analyses of applications and reviewer feedback, participant observation of a Research Council meeting	Analysis of data on applicants, documents of the 4th NCCR review and review panels, survey of funded and rejected applicants, interviews with stakeholders, comparison with Centre of Excellence funding in NO and DK	Analysis of NCCR documents (final reports, contracts, websites, SNSF impact assessments, etc.), SNSF data on the NCCRs, interviews with NCCR leaders and KTT managers.
Central Results	Success rate of UIBR applications is lower than non-UIBR applications, Possible causes are: - in the use of metrics (e.g., h-index) to assess applicants, - the review process and the reviewers used (e.g., lack of practical relevance) and referees (e.g., under-representation of UAS/UTE), - the lack of clarity on UIBR and differentiation from neighbouring types of research, - a higher direct rejection rate for UIBR applications.	NCCRs are a success: - the NCCR selection process is well organised, works according to the intentions and the stakeholders are satisfied, - but the process deviates from international standards and practices, - there are some ambiguities and weaknesses in the selection process concerning the breadth of expertise of the reviewers, the transparency and clarity of the review basis and the complexity and length of the process, - funding documents and requirements tend to favour larger universities, - applicants tended to rate the competences of evaluators as lower than in other programmes.	Importance of KTT varied greatly between NCCRs, - but most NCCRs set up structures or/and instruments, - breadth and diversity of instruments is positive given the diversity of NCCRs, - high variance in the amount and type of KTT outputs, - positive impacts of the NCCR KTT through staff transfers, R&D projects with companies and awareness raising among scientists, - financial and human resources for product development were a challenge, - conflicts of objectives between excellent research and KTT.

Implications for the implementation of funding

The complexity of projects that pursue application and implementation goals in addition to research goals thus already has an impact on project selection and makes it more difficult for the reviewers and experts involved in the selection process to grasp and weigh the overall scientific and practical potential of the applications. The uncertainty in the selection process increases.

The SNSF has used the principle of double-blind evaluation in the Spark programme to ensure "that the evaluation focuses entirely on the idea of the project" (http://www.snf.ch/de/foerderung/programme/spark/Seiten/default.aspx). Conversely, this means that in the other programmes there is a deliberate departure from limiting the evaluation to the quality of the applications, and that so-called “Matthew effects” (Merton, 1968) can thus arise.

An analysis of such cumulative effects in SNSF funding would require data that allow a distinction to be made between the quality of applications and the status of applicants (Azoulay et al., 2013), and is not the aim of this evaluation. However, it forms a possible explanation for the coverage of funding to be analysed and any coverage gaps that may exist in the value chain or for organizations that focus on certain activities in the value chain. In its statement on the dispatch on the funding of Swiss participation in Horizon Europe, the SSC put forward further arguments for possible underfunding of research groups in applied research or technology development, especially at universities of applied sciences. These aspects receive special attention in the project outlined here.

2.2 Measuring the consideration of the value chain in research funding

The central question underlying this study is: How well does the SNSF succeed in reaching researchers and funding research projects that contribute to the goal of promoting the value chain? This leads directly to the question of what types of researchers and projects typically come close to this goal. We are not aware of any analyses that provide conclusive results on the characteristics of scientists or funding applications (or the funded research projects) that increase the chances that value chain oriented results will be generated and the interplay between basic research, application-oriented research and market-oriented innovation will be strengthened. However, from the literature on knowledge and technology transfer, academic engagement and contributions to innovation based on public research we know that a number of different features influence whether scientists become involved in such activities. These features can be sorted into three groups (Borge & Bröring, 2020; Perkmann et al., 2013, 2021; Phan & Siegel, 2006):

1. Individual determinants
2. Organizational factors
3. Institutional context

1. *Individual determinants* refer to characteristics of the scientists which engage with knowledge recipients outside of science either to transfer or commercialize their research results or even co-create new knowledge through collaborative research, contract research, or related activities. In addition to a number of individual characteristics, such as age, gender, seniority, place of academic socialization or scientific productivity and quality, the following characteristics are relevant for involvement in knowledge exchange: Scientists who have in the past collaborated successfully with industry or who have previously commercialised research results are more likely to do this again (D'Este & Patel, 2007; Perkmann et al., 2013, 2021; Phan & Siegel, 2006; Schartinger et al., 2001).

Moreover, the findings of different studies propose that experience in industry prepares academics better for knowledge exchange: Tartari et al. (2012) suggested that "hybrid" academics with previous work experience in industry better understand its needs and norms, have more relevant social networks, and manage better to overcome transactional barriers. The latter is not confirmed in their analysis. However, academics with industry experience indeed rated orientation barriers, which are barriers related to differences in timing, research choice, and speed between industry and academic researchers, lower than more traditional academics without such experiences (ibid.). Drawing on data from a Dutch university Van Rijnsoever (2008) determined positive effects of academics' (previous) industry activities on their industry networks and confirmed thus a higher social capital hypothesis. The patterns in Abreu and Grinevich's (2013) survey of British academics are diverse, but only ownership of a small company has a consistent positive effect on engagement with industry (e.g., consulting activities, contract research, informal knowledge exchange) and knowledge commercialization (licenses, spin-outs). Employment in small companies only has a positive effect on consulting and informal exchange, and employment in large firms does not have any effect at all in this study of British academics. However, the authors did not provide an explanation for this result.

Abreu and Grinevich (2013) also asked their academic respondents about previous employment in the public or third sectors and found negative effects on involvement in commercialization, but a positive effect on academic engagement.

Last but not least, Abreu and Grinevich (2013) also point to another relevant individual characteristic, the motivation of scientists for engaging in research and in further activities which support the application or commercialization of research findings, drawing on Stokes' 1997 Pasteur's quadrant model. Stokes (1997) distinguished in his widely acclaimed book "Pasteur's Quadrant: Basic Science and Technological Innovation" scientists according to two dimensions:

- Quest for fundamental understanding,
- Considerations of use

The resulting two-by-two matrix contains one empty cell (no on both dimensions) and three groups of scientists with distinct motivations of their research: 1) "Bohr's quadrant" scientists engage in pure basic research and disregard use; 2) "Edison's quadrant" scientists have applied research interests only and no aim of fundamental understanding; 3) "Pasteur's quadrant" scientists combine both dimensions or purposes and engage in basic research but with a focus on application of the results, i.e., they conduct "use-inspired basic research".

Empirical studies trying to operationalize Stokes' model and measuring researchers' motivations are scarce. The study by Amara et al. (2019) is at the motivational level and explains the likelihood of high motivation for use-inspired research with high motivations to gain access to additional research resources, to gain additional insights for research from the application of research results, and to increase personal income. Furthermore, a low interest in strengthening one's own scientific career and a low perception of cultural differences between science and application correlate with a high motivation for use-inspired research. Abreu and Grinevich (2013) include measures for Stokes motivational dispositions in their analysis of British researchers' commercialization and engagement activities. They find that the groups of use-inspired basic researchers and applied researchers are more likely to be involved in spin-outs, licencing, consulting, contract research, and informal advice than basic researchers. Tijssen (2018) suggested to add to Stokes two dimensions a third dimension, the engagement with end users (through commercialisation, entrepreneurship and innovation), generating "Pasteur's Cube" in the process. In other words, Tijssen added another level of activities reflecting the engagement with users and going beyond the motivations for research, not necessarily providing for more clarity of the concept.

2. *Organizational factors.* Perkmann et al. (2021) list three organizational factors in their review which are relevant for academic engagement: a) quality of the university/department, b) incentives for commercialization and c) peer effects.

a) They point out that the evidence on quality is inconclusive and that studies have found either no effects or negative effects, i.e., higher industry involvement for scientists from lower quality universities. In their earlier 2013 review they report a positive effect of quality on universities' commercialization outcomes (Perkmann et al., 2013), that has been found above all in the US (Friedman & Silberman, 2003; Mansfield, 1995; Mansfield & Lee, 1996; Sine et al., 2003). However, Mansfield and Lee (1996) as well as German studies also found that less prestigious, local universities and universities of applied sciences are preferred partners especially of SMEs (Beise & Stahl, 1999; Fritsch & Schwirten, 1999). Scandura and Iammarino (2021) explain these differences with regard to the role of quality in knowledge exchange by differences between scientific disciplines: in the more basic disciplines top-rated departments and scientists would opt for "blue-sky" research rather than engage with industry, whereas in more applied disciplines engagement with industrial partners is actually in line with the research objectives.
b) Evidence from several countries and universities has pointed to a positive correlation between incentives and the technology transfer performance of universities, with regard to financial incentives and non-financial incentives (Baldini, 2010; Barjak et al., 2015; Caldera & Debande, 2010; Lach & Schankerman, 2008; Siegel et al., 2003). However, the evidence on the impact of commercialisation incentives on academic engagement is inconclusive (Perkmann et al., 2013, 2021).
c) Peer effects are a phenomenon that has been explored more recently. Studies for the UK (Tartari et al., 2014), Germany (Aschhoff & Grimpe, 2014), the US (Bercovitz & Feldman, 2008; Hunter et al., 2011; Stuart & Ding, 2006) and Switzerland (Barjak & Heimsch, 2021) have provided evidence, that peers and the organizational climate that they create matter for involvement in knowledge exchange activities. However, not only departmental peers, but also peers from the field working at other organizations matter, and to what extent they serve as a role model also depends on the transfer mechanism in question (Barjak & Heimsch, 2021).

3. *Institutional context.* This last group of influences on the participation of scientists in knowledge exchange with firms and other organizations outside of science refers mainly to the scientific disciplines and the geographic context in which the scientists are embedded (Perkmann et al., 2013, 2021). Scientists working in applied scientific disciplines have more often been found to be involved in

knowledge exchange than scientists working in disciplines with a strong basic orientation (Arvanitis et al., 2008; Baldini, 2010; Bekkers & Bodas Freitas, 2008; Caldera & Debande, 2010). Thursby and Thursby (2011) put forth the hypothesis that scientists working in new fields like nanotechnology and nanobiotechnology are more often involved in collaborative knowledge exchange, as the knowledge is often tacit, embodied in the scientists and not mobile over large distances. As new knowledge areas often develop out of combinations of knowledge from different disciplines and research fields, successful knowledge transfer also needs interdisciplinary collaboration (Borge & Bröring, 2020). Interdisciplinary training and working in several disciplines may have a positive effect on participation in knowledge commercialisation (Bercovitz & Feldman, 2008).

The geographic context matters at different levels. National Intellectual Property regulations define who owns the results of academic research, the funder, the researcher, the employer of the researcher as is the standard in most European countries (Geuna & Rossi, 2011), or the partner in industry. This influences the performance of universities in technology transfer as well as the research collaborations in which their scientists engage (Conti & Gaule, 2011; Valentin & Jensen, 2007). The demand side for academic research results also plays a role, e.g., the more research-intensive, technology-intensive or generally more developed and prosperous the companies, the more they demand academic research results. This has been analysed at national and regional levels (see Barjak & Es-Sadki, 2016, and the literature cited there).

In sum, we find that a large set of influences related to the researchers themselves, their experiences and preferences, the organizations to which they are affiliated, and the disciplines and geographies in which they conduct their research determine how intensively and through which mechanisms they exchange knowledge with users outside science. Since we cannot empirically assess whether a particular applicant's application is capable of achieving the value chain-oriented goals and contributing to the integration of basic research, application-oriented research and market-oriented innovation, we take in particular the individual and organizational characteristics as indications that the chances are there.

2.3 Influences on the evaluation and selection of research applications

Another question that has to be answered before conducting the empirical analyses refers to the influences on grant evaluation and approval. It tries to identify, how use- and innovation-related features influence grant approval and what further variables matter, to ensure that the empirical analyses can estimate comprehensive models and do not produce spurious correlations, respectively that they do not fail to separate the value chain oriented effects from other competing influences. One of the two typical applications of scientific peer review is the selection of research proposals for funding, the other is the selection of publications (Bornmann, 2011). A multitude of factors has been discussed that can influence grant selection. They can be separated into four different types:

- Characteristics of the application, such as quality, feasibility, novelty, or relevance,
- Characteristics of the applicants (individuals and teams), such as scientific reputation, track record of successful research projects, academic position, access to resources, or demographic characteristics which approximate these factors,
- Characteristics of the applicants' organizations, such as size, reputation, research standing,
- Characteristics of the reviewers, such as familiarity with the topic of the application, origin/affiliation) (compared to applicants).

Characteristics of the application

First and foremost, the goal of conducting peer reviews of research grant and project applications is to identify the most promising applications which are likely to produce the highest scientific return on investment – projects which produce the highest quantity and quality of research results, excellence, or even bear the potential of overthrowing an established paradigm and establishing a new or transforming an existing research field. Identifying the potentially best projects before making the funding decision is also discussed under the headline of predictive validity (Bornmann, 2011).

Criteria that are commonly used in the process are scientific quality, feasibility, and usefulness of the innovations (Laudel, 2005, 2006). Quality refers, for example, to the relevance of the research objectives, stringency of the theoretical arguments and the research plan. Feasibility primarily answers the question of whether the research plan seems suitable and feasible with the available resources and under the existing conditions. Innovation relates to the degree of novelty and benefit in comparison to the existing body of knowledge in a field. Research in the US (Boudreau et al., 2012) and Europe (Luukkonen, 2012) has shown that peer reviews rather disfavour extreme novelty because of its inherent risks.

With regard to a bias against interdisciplinary research the empirical evidence is rather mixed. Early research in the US has found a bias against interdisciplinary research (Porter & Rossini, 1985), but newer studies found little evidence that this could be a serious problem in research funding (Langfeldt, 2006; C. J. Lee et al., 2013; Rinia et al., 2001). The extent to which applications from different research disciplines are successful depends, of course, on the specificities of each individual funding instrument and the goals and regulations of the funding – for instance in Germany engineers had a higher likelihood of being successful when applying for EU, governmental or industry funding, and a lower likelihood when applying for funding from (research) foundations (Grimpe, 2012). The funding regulations also determine the resources which scientists need to invest in order to acquire and realize a research project successfully, e.g. transaction costs for setting up consortia, learning costs for writing a proposal and administrating a project (Enger & Castellacci, 2016). Grimpe (2012) showed that scientists do rather not build up a portfolio of different funding sources, but specialize on a particular funding source in order to reduce these acquisition and management costs.

A further characteristic of an application that is particularly relevant from the perspective of this evaluation of funding of the value chain is the (intended) technological and commercial readiness of the results. Drawing on older work at the North American Space Agency NASA, Mankins (1995) formulated nine Technology Readiness Levels (TRLs) for space technologies which have since then been updated, extended to other technologies, such as energy (Australian Renewable Energy Agency ARENA, 2014; U.S. Department of Energy, 2010) or research in general (European Association of Research & Technology Organizations EARTO, 2014). See Appendix 1 for an overview. Extending the concept beyond space research has contributed to its increasing complexity: The US Department of Energy (2010) has published a Technology Readiness Level Calculator consisting of more than 160 questions to assess the stage of technologies between TRLs 1 and 6. Héder (2017) criticized the use of TRLs for failing to put sufficient attention to the fact that the whole of a technology is usually more than the sum of the parts, i.e., the problems of integrating components are not adequately reflected in the levels, and that, above all in newer uses in the EU context, the concept is extended beyond assessing the technological features of a new development.

In order to evaluate the commercial or customer readiness and marketability of a new technological development, further indices have been used, for instance by individual universities (KTH Royal Institute of Technology in Stockholm, University of Liège) and governmental organizations (Australian Renewable Energy Agency ARENA, 2014). They focus on measuring the commercial properties and customer involvement in technological developments. EARTO's (2014) suggestion also places a strong focus on the set up of manufacturing processes. An overview table of this line of work is included in Appendix 2.

The task of evaluating the quality of a research proposal on the one hand demands a lot of expertise on the state-of-the-art in a field and the different aspects of the research. As reviewers have incomplete information and are unable to anticipate all eventualities that might affect the implementation of a project, the persons of the applicants and applying teams and their affiliations come into play.

Characteristics of applying scientists and research teams

Professional characteristics of the applicants, such as scientific reputation, track record of successful research projects, academic position, or access to resources are often used by reviewers as proxies for the likelihood that research projects can be concluded successfully (Banal-Estañol et al., 2019;

Laudel, 2006). The seminal study by Cole et al. (1981) found that the prestige of the applicants' academic departments, their academic rank, geographic location, NSF funding history over the previous 5 years, and locus of Ph.D. training influenced the peer review results and funding decisions. Grimpe (2012) found in his study of German scientists that the importance of individual characteristics varies across the different funding sources: for European research funding only being head of a research group contributed to acquiring grants; for government and for industry funding this applies as well, and for the former also being tenured matters. For acquiring research funding from foundations, including the German research foundation DFG, the publication record and patenting activities contribute to explaining success with grant acquisition, as does a dual affiliation with more than one university or research organization.

The higher the importance of applicants' characteristics, the lower the importance of the applications and their underlying ideas in the selection process (M. Lee et al., 2000). Whenever social clues affect the project selection, the outcome will be different compared to when only the scientific merit of an application counts. Advantages for the more established applicants and their research teams will result (Azoulay et al., 2013). Such status effects and the resulting cumulative advantage have been known for a long time and were introduced into science research by Robert Merton as the "Matthew effect" (Merton, 1968). On the one hand, the Matthew effect is associated with a concentration of resources, while on the other hand, researchers and research institutions are excluded from funding. As this can be perceived as undesirable, it has been recommended, for example, that the reviewers of research applications should not be given information about the applicants and that, especially in disciplines with low infrastructure and material requirements, care should be taken to distribute the funding among as many researchers as possible (Bol et al., 2018).

However, it can also be justified that the characteristics of the applicants (or their organizations) are taken into account in the selection, as they may actually measure factors which influence the success of a project and therefore raise the predictive validity of the peer review (Banal-Estañol et al., 2019; Viner et al., 2004). For example, the applicants' professional characteristics can indicate the availability of complementary resources or other influences that have affected past performance but are not part of the idea or the application itself. In such cases it could be desirable to take the applicants' characteristics into account in the project selection in order to predict the probability of project success as good as possible.

Whenever these professional characteristics are approximated by demographic characteristics, like gender, age, ethnicity, or nationality, which do *not* reflect scientists' ability to do research, problematic selection biases might be introduced, which may have the consequence "that some excellent researchers have received less funds than they could have usefully used and have not produced as much research as they might otherwise have" (Viner et al., 2004, p. 453). This indeed is highly undesirable, as it affects the legitimacy and effectiveness of the peer review process. Viner et al. (2004) found effects of gender and ethnicity biases in funding decisions of the UK Engineering and Physical Sciences Research Council (EPSRC) from 1995 to 2001; the study by Cole et al. (1981) found no effects of academic age or career length for NSF applications. Grimpe (2012) did not find any impact of gender and age on the chances of German scientists of winning funding from four sources of research funding (European framework programmes, foundations, government funds, industry funds) from 2002 to 2006.

Characteristics of the applicants' organizations

Early on Cole et al. (1981) found that the prestige of the academic department influences NSF funding decisions moderately. Grimpe (2012) stresses that from 2005 to 2007 75% of all DFG grants went to one third of all German universities. This may reflect different aspects, of course, such as size, and numbers of submitted applications, quality of the research conducted, reputation and more. The analysis stresses that size of the field at the university, reflecting the existence of critical mass and visibility, indeed bears a strong influence not only on DFG funding, but also on EU and government funding. In addition, there is a clear pattern that scientists from more applied research organizations (Fraunhofer and Helmholtz societies) are less successful with acquiring grants from foundations than scientists working at universities.

Enger and Castellacci (2016) report on previous studies which found that size, fields, scientific productivity and impact of organizations contribute to explaining the success of their scientists with acquiring research funding from the European Union. Their own analysis of Norwegian applications to Horizon 2020 also finds that larger organizations are more likely to apply for EU funding but not more likely to be successful. Success in previous framework programmes contributes to explaining the number of applications to Horizon 2020 and success in winning the projects, i.e., the more projects an organization obtained in FP 7, the more it obtained in Horizon 2020. Moreover, the scientific reputation, measured as the average number of citations in the period preceding the application period, had a positive effect on the number of projects won (Enger & Castellacci, 2016).

Characteristics of the reviewers

Drawing on an experiment of peer review of NSF proposals Cole, Cole and Simon (1981) concluded that the fate of a proposal is approximately half determined by the characteristics of application and applicants and half by “luck of the reviewer draw”. Later studies have tried to take apart this luck and assess which characteristics of reviewers influence the outcome of a review.

A number of studies has reported an influence of personal characteristics of the reviewers, for instance their gender, seniority, affiliation, or fields of research and expertise (in comparison to the applicants) on the outcome of reviews (Bornmann, 2011). Viner et al. (2004) summarise this as an often shared belief that old boy’s networks influence the distribution of funds and take care that like-minded scientists are being funded. They also report on a study from the UK which found reviewers allying to particular perspectives or schools which excluded new ideas and can even become some type of cronyism and another study from Sweden which found nepotism and gender bias in the reviews of fellowship applications.

2.4 Mission-oriented research funding

At a very general level, mission-oriented research funding (MOF) has been defined as government programmes which aid the development and deployment of technologies which are needed for confronting broad and global societal challenges, such as climate change, devastating diseases, or rapid urbanization (Foray et al., 2012). MOF should not be confused with value chain oriented funding (see Table 2). Whereas the former relates to research and technology development and deployment for confronting broad and global societal challenges, the latter refers more generally to integrating basic research, application-oriented research and market-oriented innovation, independently of possible societal challenges or particular missions. In terms of the scope of research, value chain-oriented funding is thus a broader concept than mission-oriented funding. In terms of the societal ambition, the involvement of non-scientific actors and the character of the resulting (technological) innovations, on the other hand, mission-oriented funding is the more comprehensive construct. Mission-oriented funding focuses more on societal missions as the driver of the research and its funding and value chain oriented funding more on the process and seamless integration of (basic) research results into innovation.

Table 2. Distinction between value chain oriented and mission-oriented research funding

	Value chain oriented funding	Mission-oriented funding
Objective	Funding projects which integrate basic research, applied research and market-oriented innovation	Funding projects which provide knowledge for fighting global societal challenges
Scope of research	Broad, not limited to specific problems, aims, or fields	Narrower, as limited to specific problems, aims, or fields linked to global societal challenges
Involvement of society and non-academic actors	Narrower, either in collaborative research or via knowledge and technology transfer after the research cycle has been completed	Broad, involvement and mobilization of societies and economies to generate momentum and impact
Focus	Research and innovation processes	Societal challenges and resulting missions

The EU Commission's decision to include five missions as a new instrument in the European framework programme Horizon Europe has given new impetus to the debate on mission-oriented funding of research and innovation in Europe. The EU Commission has announced that up to € 1.9 billion will initially be made available until 2023 (https://ec.europa.eu/commission/presscorner/detail/en/ip_21_4747) to work on five missions:

1. Adaptation to Climate Change: support at least 150 European regions and communities to become climate resilient by 2030
2. Cancer: working with Europe's Beating Cancer Plan to improve the lives of more than 3 million people by 2030 through prevention, cure and solutions to live longer and better
3. Restore our Ocean and Waters by 2030
4. 100 Climate-Neutral and Smart Cities by 2030
5. A Soil Deal for Europe: 100 living labs and lighthouses to lead the transition towards healthy soils by 2030

The EU Commission then goes on to describe the missions as overarching goals for which not only research and development funding is made available, but researchers and societies should be mobilised to achieve concrete results by 2030:

> *“EU Missions are a coordinated effort by the Commission to pool the necessary resources in terms of funding programmes, policies and regulations, as well as other activities. They also aim to mobilise and activate public and private actors, such as EU Member States, regional and local authorities, research institutes, farmers and land managers, entrepreneurs and investors to create real and lasting impact. Missions will engage with citizens to boost societal uptake of new solutions and approaches.” (https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/missions-horizon-europe_en)*

This proposal draws heavily on the work of Mazzucato who has described and argued for the idea in a number of reports and articles (Mazzucato, 2018a, 2018b, 2019; Mazzucato & Semieniuk, 2017) and a recent book (Mazzucato, 2021). She defined mission-oriented policies as “systemic public policies that draw on frontier knowledge to attain specific goals, or “big science deployed to meet big problems” (Ergas, 1987)” (Mazzucato, 2018b, p. 804) citing Henry Ergas’ 1987 book section “Does Technology Policy Matter?” (Ergas, 1987).

It has become a commonplace that “grand challenges” like climate change, diseases and public health, poverty, or the overuse of the earth's renewable and depletion of its non-renewable resources are global, complex, broad and diffuse phenomena. However, in order to understand them fully Horst Rittel’s construct of “wicked problems” is helpful. Rittel described wicked problems as problems without a definitive problem formulation whenever “problem understanding and problem solution are concomitant to each other.” (Rittel & Webber, 1973, p. 161). This implies that the formulation of the problem is not less contested than the solution: “The formulation of a wicked problem *is* the problem!” (ibid.). This adds an additional level of complexity, in the sense that research not only must contribute to generating the knowledge for producing, developing, and diffusing problem solutions, but, actually before focusing on solutions, it must establish conceptualizations, collect empirical evidence and explore these problems with all their details and ramifications. In this context scientists contribute to defining and analysing the problem and helping societies to develop a shared and agreed upon understanding of the problems.

Work on mission-oriented funding has highlighted a number of characteristics of the wicked problems which underly the societal challenges:

- Problems do not end at country or even continental borders, but they are global and solutions must also be sought at the global level (Foray et al., 2012).
- They are also not limited to one or a few scientific disciplines, but cross-disciplinary requiring contributions from different disciplines and long-term commitments (Mazzucato, 2018b).

- The challenges are broad, interconnected, complex, and diffuse and require action from many actors in societies, public as well as private (Foray et al., 2012; Mazzucato, 2018b). Such actions can be coordinated, but competition will not only be inevitable but may contribute to find the best (technological) solutions (Foray et al., 2012).
- The above argument of a general lack of conceptualization and agreement implies a strong basic research component within mission-oriented funding. However, previous work has suggested to put a particular focus on the other end of the value chain and focus on "technical areas that reside in nascent S-curves – the technology exists, is relatively unexplored, and has great potential for improvement" (Azoulay et al., 2019, p. 88). Mazzucato and Semieniuk (2017, p. 24) even go beyond this suggestion. Drawing on previous technological developments, e.g., technologies in smartphones, and their support by US governmental agencies, they demand that mission-oriented funding does not limit itself to remedying market or (innovation) system failures, but adopts "a market-creating and -shaping perspective" which "may be useful for understanding the financing of transformative innovation needed for confronting contemporary societal challenges."

Indeed, above all Mazzucato (2018b, 2021; 2017) goes beyond conceptualizing mission-oriented research funding and addresses mission-oriented innovation policies which also include regulations, fiscal policies, and demand side innovation policies to support the development, adoption and diffusion of innovations addressing the societal challenges. This is beyond the scope of this evaluation and cannot be discussed further.

3. Approach and methods

In order to answer the questions on the coverage of the funding and the consideration of the needs of scientists engaging in value chain oriented research, data from three groups of scientists are necessary: I) scientists with approved applications, II) scientists with rejected applications and III) comparable scientists without applications to SNSF. For resource reasons, the data collection was limited to two surveys of these three groups, which are briefly explained below. They generated data on the activities and opinions of the respondents.

3.1 Survey 1: Applicants for SNSF value-chain oriented funding instruments

3.1.1 Population and sample

Four SNSF research funding instruments were identified as placing a particular focus on the value chain. Hence, these instruments were included in this analysis:

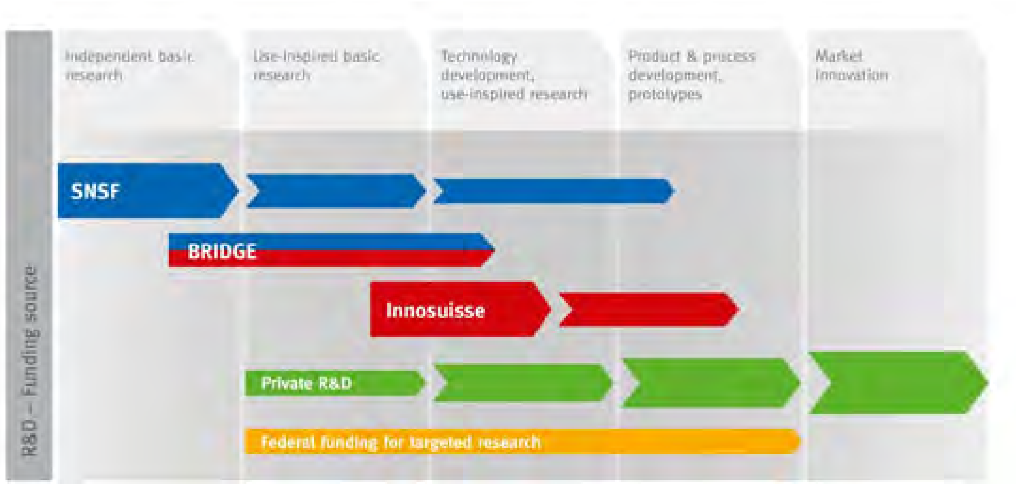
1.) Use-inspired basic research (UIBR). The SNSF writes on its website that even though its core mission is to promote basic research and it does not grant funding for applied research with an immediate commercial potential, "it does support research that is linked to practical issues and that also increases scientific knowledge." (https://www.snf.ch/en/IVQhkSYdL4taqcul/topic/use-inspired-basic-research). It lists the following seven criteria which UIBR projects should match: 1) the project aims to produce scientific insights and solve practical problems; 2) although the project is primarily concerned with basic science, it might help to resolve practical problems or issues; 3) the research question was defined by scientists in collaboration with a user or practitioner community; 4) the project has the potential to be implemented in the near future (e.g. by means of technology transfer financed with a Innosuisse grant); 5) the project will produce academic and non-academic publications; 6) the results will be made accessible to a lay public outside academia; 7) the research team is composed of scientists and practitioners. Researchers can declare their project applications in the social science and humanities, science, technology, engineering and maths (STEM) fields, or life sciences as "use-inspired".

2. Bridge is a joint funding programme of SNSF and Innosuisse at the interface between basic research, use-inspired research and technology development (see Figure 2). It was set up in 2016 "to help realise the economic and societal potential of scientific research by strengthening collaboration

between science, business and society" (https://www.snf.ch/en/I3e9TrK1lQGl0KNa/news/bridge-programme-the-snsf-and-the-cti-build-bridges). In includes two funding schemes that cater to different target groups:

- Bridge Proof of Concept is open to young researchers who want to develop an innovative application based on their own research results. It funds the applicants' salaries and materials directly linked to the project for a period of 12 months.
- Bridge Discovery funds experienced researchers who aim to explore and implement the innovation potential of research results for a period of up to five years. Applications can be submitted by single applicants or small consortiums of a maximum of 3 applicants (https://www.bridge.ch/en/discovery).

Figure 2. R&D funding by source



Source: https://www.snf.ch/en/IVQhkSYdL4taqcul/topic/use-inspired-basic-research

3. National Research Programmes (NRPs) are another funding mechanism that should result in research that helps to deliver "scientifically proven solutions to Switzerland's most pressing problems" (https://www.snf.ch/en/ELxP53n5RBBa08a2/funding/programmes/national-research-programmes-nrp). SNSF describes the NRPs as 1) solution-oriented and close to the practical realm, 2) interdisciplinary and transdisciplinary, 3) jointly pursuing an overall goal, and 4) placing particular value on knowledge transfer and the communication of results. This description suggests that NRP projects could cover the steps in the value chain in Figure 2 closer to the right side, i.e., technology development, use-inspired research and even product & process development and prototypes. An NRP lasts 6-7 years and has a budget of CHF 10 to 20 million. The interdisciplinary and transdisciplinary research topics are specified by the Swiss Federal Council and the NRPs were listed in the ERI Dispatch 2017-2020 under the overarching goal of strengthening knowledge and technology transfer and innovation (ERI Dispatch 2017-2020, 3184). Seven NRPs were active in the reference period of this study 2017-20 and therefore included:

- NRP 72 "Antimicrobial Resistance"
- NRP 73 "Sustainable Economy"
- NRP 74 "Smarter Health Care"
- NRP 75 "Big Data"
- NRP 76 "Welfare and Coercion – Past, Present and Future"
- NRP 77 "Digital Transformation"
- NRP 78 "Covid-19"

4. The National Centres of Competence in Research (NCCRs) were included in the national ERI Dispatch 2017-2020 (p. 3184) as well as a mechanism that serves to strengthen innovation. According to the NCCR website (https://www.snf.ch/en/EcRzGgwFJMZjfnNc/page/national-centres-of-compe-

tence-in-research-nccrs), “NCCRs promote long-term research networks in areas of strategic importance for Swiss science, the Swiss economy and Swiss society”. The NCCR brochure characterises them as strengthening areas of outstanding, internationally visible research, wherever excellent researchers aim to push the boundaries of science, but also aiming to promote young researchers, gender equality and knowledge transfer. This suggests that NCCRs could in principle cover all steps in the value chain of Figure 2, from basic research to product and process development. 22 NCCRs of the series three to five were active in the reference period 2017-20 and therefore included in the analysis, as well as rejected applications made to the NCCR calls four and five. In addition to the main NCCR applicants, co-applicants of approved NCCRs were included in the sample as well.

SNSF provided a database of overall 4’565 applications of which roughly one third had been approved and two thirds had been rejected for these four funding instruments (see Table 3). The largest share of 44% were UIBR applications. Approximately the same shares of 21 to 22% belonged to Bridge and the NRPs and the smallest share of 13% was from NCCR applications. The population of applicants was, however, considerably smaller, as an applicant may have submitted several applications to the same or to different funding instruments in the reference period 2017-20. Reducing these duplicate applicants resulted in an address data set of close to 3’300 addresses of which 1’413 (43%) had at least one approved application and 1’885 (57%) had no approved application but only rejected or withdrawn applications. We used these 3’300 addresses as the sampling frame for the survey.

Table 3. Population of applications of survey 1 by funding instrument

	Approved		Rejected		Total	
	Obs.	in % of total	Obs.	in % of total	Obs.	in % of total
UIBR	712	16%	1’286	28%	1’998	44%
Bridge	160	4%	856	19%	1’016	22%
NRP 72-78	184	4%	777	17%	961	21%
NCCRs[a]	492	11%	98	2%	590	13%
Total	1’548	34%	3’017	66%	4’565	100%

a NCCR applications: 492 approved applications (478 research groups/projects of the 22 NCCRs of series 3-5, 14 main applicants of series 4 and 5) as well as 30 rejected and 68 withdrawn applications of NCCR series 4 and 5.

Table 4. Sampling frame of applicants of survey 1 by funding instrument

	Approved		Rejected		Total	
	Obs.	in % of total	Obs.	in % of total	Obs.	in % of total
UIBR	640	19%	700	21%	1’340	39%
Bridge	160	5%	617	18%	777	23%
NRP 72-78	172	5%	558	16%	730	22%
NCCRs[a]	472	14%	76	2%	548	16%
Total	1’444	43%	1’951	57%	3’395	100%

a See Note a to Table 3.

Table 5. Sampling frame of applicants of survey 1 by organization type

	Approved		Rejected		Total	
	Obs.	in % of total	Obs.	in % of total	Obs.	in % of total
Universities	748	22%	902	27%	1’650	49%
ETH domain	461	14%	433	13%	894	26%
UAS	130	4%	444	13%	574	17%
Univ. of teacher education	31	1%	66	2%	97	3%
Others	74	2%	106	3%	180	5%
Total	1’444	43%	1’951	57%	3’395	100%

a See Note a to Table 3.

We drew a stratified random sample from this sampling frame of applicants that had to meet the following criteria:

- Applicants should only be asked about one application,
- applicants with an approved application should not be asked about a rejected application (if they had submitted applications which were rejected),
- funding instruments with few applications should be prioritised over those with many applications in the selection process.

The strata included in the sampling were the approval status of the applicants' applications, funding instrument and type of higher education or research institution to which the applicants were affiliated according to the address database. The stratified sampling should secure a sufficiently large subsample in each of the cells of the matrix generated by the three variables approval status, funding instrument and type of organization.

Table 6 shows the distribution of the gross sample of applicants by funding instrument and Table 7 by organization type. Generally, for every funding instrument and organization type the gross sample is larger for applicants with rejected applications than for applicants with approved applications, as we expected to obtain higher response rates from applicants with positively evaluated and funded applications. However, the NCCR sample is an exception. As it contained only 14 approved and 30 rejected applications from main applicants, we extended it in two ways: first, we included the 478 co-applicants of the 14 approved NCCRs, and second, we included 68 applications which were withdrawn after the first funding round. The helped to generate a total NCCR sampling frame of 574 applicants (see Table 4) from which we drew a gross sample of 281 (see Table 6). Still, approved and rejected/withdrawn NCCR applications in the sample are structurally different which implies that comparisons must be done with care. Sample size is also rather small for the universities of teacher education which did not submit more applications to the four funding instruments included in the analysis in the reference period 2017-20. The sample includes between 40% (applicants from universities with approved applications) and 100% (applicants from universities of teacher education and from other organizations with approved applications) of each organization type in the sampling frame.

Table 6. Gross sample of applicants of survey 1 by funding instrument

	Approved			Rejected			Total		
	Obs.	in % of total	in % of frame	Obs.	in % of total	in % of frame	Obs.	in % of total	in % of frame
UIBR	260	8%	41%	300	20%	43%	560	28%	42%
Bridge	138	12%	86%	357	4%	58%	495	16%	64%
NRP 72-78	134	8%	78%	279	16%	50%	413	24%	57%
NCCRs	205	15%	43%	76[a]	17%	100%	281	32%	51%
Total	737	42%	51%	1'012	58%	52%	1'749	100%	52%

a Includes applicants of withdrawn NCCR applications.

Table 7. Gross sample of applicants of survey 1 by organization type

	Approved			Rejected[a]			Total		
	Obs.	in % of total	in % of frame	Obs.	in % of total	in % of frame	Obs.	in % of total	in % of frame
Universities	294	17%	39%	368	21%	41%	662	38%	40%
ETH domain	229	13%	50%	244	14%	56%	473	27%	53%
UAS	109	6%	84%	228	13%	51%	337	19%	59%
Univ. of teacher education	31	2%	100%	66	4%	100%	97	6%	100%
Others	74	4%	99%	106	6%	100%	180	10%	99%
Total	737	42%	51%	1'012	58%	52%	1'749	100%	52%

a Includes applicants of withdrawn NCCR applications.

3.1.2 Questionnaire development

The main concepts of the evaluation were converted into a questionnaire with 43 questions. The questions asked the respondents a set of socio-economic questions, questions on their research, on one selected application submitted to the SNSF, on their organization (for which they had submitted the SNSF application), and on their opinions towards research funding.

The questions were mostly developed specifically for the survey. The socio-economic questions in part complemented data in the SNSF address data file and used the same categories for function (8 categories) and position (8 categories) as SNSF. Moreover, we adopted SNSF's classification of research domains and disciplines to describe applicants and applications. The remaining questions were designed to cover all the questions that this evaluation is intended to answer and to enable the analysis of funding decisions according to the state of the literature (see section 2).

During questionnaire development we conducted cognitive interviews with SNSF applicants. Interview partners were selected to have a variation across funding types (six applicants with approved and four with rejected applications) and organization types (4 UAS, 3 universities, 3 ETH-domain). As the questionnaire was trilingual and the questions were translated into English and French, seven tests were conducted with the German, two with the French and one with the English version.

3.1.3 Fieldwork and response statistics

The survey invitation was mailed out to the 1'749 respondents in July 2021. The invitation included a covering email in German, English, or French according to the main language in the SNSF address database (786 records in the sample in German, 604 in English and 354 in French). Two reminders were mailed out to non-respondents in August. The closing date of the survey was after a 7-week period in September 2021 in which we received the responses as shown in Table 8.

Table 8. Responses to the survey invitation

	Obs.	in %
Gross sample	1'749	–
of which		
Could not be reached by email (error notices)	105	6.0%
Could be corrected through subsequent internet searches	68	3.9%
Adjusted gross sample	1'712	100%
of which Responses (link to survey was activated, reply mail)	1'059	61.9%
Explicit refusal to participate in the survey	33	1.9%
Dropouts, incomplete (no answer to question on underfunding)	60	3.5%
Net sample (= usable responses included in the analysis)	966	56.4%

In Table 9 and Table 10 we show the structure of the dataset by funding instrument and by organization type. Out of 966 responses 46% are on approved applications and 54% on rejected applications.

Table 9. Realised sample of applicants of survey 1 by funding instrument

	Approved			Rejected[a]			Total		
	N	in % of total	in % of frame	n	in % of total	in % of frame	n	in % of total	in % of frame
UIBR	182	19%	27%	169	17%	20%	351	36%	23%
Bridge	72	7%	45%	142	15%	21%	214	22%	26%
NRP 72-78	85	9%	47%	161	17%	22%	246	25%	27%
NCCRs	105	11%	22%	50[a]	5%	58%	155	16%	27%
Total	444	46%	31%	522	54%	28%	966	100%	29%

a Includes applicants of withdrawn NCCR applications.

Table 10. Realised sample of applicants of survey 1 by organization type

	Approved			Rejected[a]			Total		
	n	in % of total	in % of frame	n	in % of total	in % of frame	n	in % of to-tal	in % of frame
Universities	171	18%	23%	198	20%	22%	369	38%	22%
ETH domain	117	12%	25%	113	12%	26%	230	24%	26%
UAS	78	8%	60%	115	12%	26%	193	20%	34%
Univ. of teacher education	26	3%	84%	41	4%	62%	67	7%	69%
Others	52	5%	70%	55	6%	52%	107	11%	59%
Total	444	46%	31%	522	54%	27%	966	100%	28%

a Includes applicants of withdrawn NCCR applications.

3.1.4 Weighting

We estimated the response probability R for deciding whether to include weights in the analysis using information from the address data set:

R = f (funding instrument, funding status, organization type) *{= stratification variables}*

The estimation produced the following results:

- Significantly below-average response rate (RR) of Bridge applicants,
- Slightly below-average RR of applicants with rejected applications,
- Slightly below-average RR of applicants from the ETH-domain,

Consequently, we decided to weigh the results according to the stratification variables funding instrument, funding status, and organization type. Using logit regression, this approach allows to calculate probabilities for the forty strata (5 funding instruments, 2 funding status and 4 organization types). Subsequently, weights are calculated as the inverse of this probability.

The resulting weighted and unweighted realised samples are shown in Table 11 and Table 12. The weighting shifts frequencies from instruments and organization types for which a higher share of the sampling frame was included in the sample to those for which a lower share was included. The same shift applies from high to low response rates. Weighting ensures that the results of the stratified random sample that are presented correspond as closely as possible to the structure of the sampling frame.

Table 11. Realised sample survey 1 by funding status, weighting, and funding instrument

	Approved				Rejected[a]				Total	
	Unweighted		Weighted		Unweighted		Weighted		Unweight.	Weighted
	Obs.	in % of total	Obs.	in % of total	Obs.	in % of total	Obs.	in % of total	Obs.	Obs.
UIBR	182	19%	182	19%	169	17%	199	21%	351	381
Bridge	72	7%	46	5%	142	15%	175	18%	214	221
NRP 72-78	85	9%	49	5%	161	17%	159	16%	246	208
NCCR	105	11%	135	14%	50[a]	5%	22	2%	155	157
Total	444	46%	412	43%	522	54%	555	57%	966	967[b]

a Includes applicants of withdrawn NCCR applications.
b The difference to 966 is due to rounding errors.

Table 12. Realised sample survey 1 by funding status, weighting, and type of organization

	Approved				Rejected[a]				Total	
	Unweighted		Weighted		Unweighted		Weighted		Unweight.	Weighted
	Obs.	in % of total	Obs.	in % of total	Obs.	in % of total	Obs.	in % of total	Obs.	Obs.
Universities	171	18%	213	22%	198	20%	257	27%	369	470
ETH domain	117	12%	131	14%	113	12%	123	13%	230	254
UAS	52	8%	21	4%	55	12%	30	13%	193	163
Univ. of teacher education	78	3%	37	1%	115	4%	126	2%	67	28
Others	26	5%	9	2%	41	6%	19	3%	107	51
Total	444	46%	411	43%	522	54%	555	57%	966	966

a Includes applicants of withdrawn NCCR applications.

3.2 Survey 2: Convenience sample of scientists not applying for SNSF value chain oriented funding

3.2.1 Population and sample

For the second survey we used the respondents to the first survey as input and manually compiled a comparison sample of scientists which did not submit an application to the four above-mentioned funding instruments in the time period 2017-20.

Research assistants were given the task to identify for every respondent two comparison persons who worked at the same organization and faculty, and eventually also department and/or institute, in a similar function (e.g., head of unit, group leader, post-doc) and professorial position (e.g., full professor, associate professor, no professorship). Gender was included as a further matching variable.

They identified in total 1’817 scientists. The full sample of 966*2=1’932 scientists could not be collected, as 1) for some respondents it was not possible to obtain names or mail addresses of their colleagues (above all in non-university institutions) or 2) no further non-SNSF funded scientists could be identified. This gross sample still included scientists who were not among the 966 respondents of the first survey, but in the gross sample or sampling frame and who had either not replied to the first survey or were not drawn into the gross sample. These scientists were eliminated from the sample for survey 2, leaving 1’469 scientists in the gross sample. The distribution on organization types is shown in Table 13. In comparison to survey 1, the share of scientists from organizations in the ETH domain is smaller, and the shares of scientists from UAS and above all UTE are somewhat larger.

Table 13. Gross sample of scientists of survey 2 by organization type

	Obs.	in %
Universities	557	38%
ETH domain	331	23%
UAS	303	21%
University of teacher education	117	8%
Others	161	11%
Total	1’469	100%

3.2.3 Fieldwork and response statistics

The survey invitation was mailed out to the 1’469 respondents in the first week of October 2021. The invitation included a covering email in German, English, or French according to the main language in the SNSF address database (658 records in the sample in German, 484 in English and 330 in French). Two reminders were mailed out to non-respondents in the second half of October. The closing date of the survey was after 25 days on October 31st. In this 3-week period we received the responses as shown in Table 8. Overall, almost two thirds of the invited scientists replied to the invitation in one way or another and 57% provided answers which could be used in the analysis.

Table 14. Responses to the survey invitation in survey 2

	Obs.	in %
Gross sample	1’469	–
of which		
Could not be reached by email (error notices)	23	1.6%
Could be corrected through subsequent internet searches	14	1.0%
Adjusted gross sample	1’460	100%
of which Responses (link to survey was activated, reply mail)	968	66.3%
Explicit refusal to participate in the survey	53	3.6%
Dropouts, incomplete response	81	5.5%
Net sample (= usable responses included in the analysis)	834	57.1%

Table 15 shows the distribution of the combined dataset, i.e., the respondents to both surveys, across organization types. The shares are very similar in both surveys and we see only a slightly lower share of respondents from the ETH domain in survey 2 and a higher share of respondents from UTE.

Table 15. Realised sample by survey and respondents’ affiliations

	Survey 1 (SNSF applicants)		Survey 2 (comparison group)		Total	
	Obs.	in %	Obs.	in %	Obs.	in %
Cantonal University	369	38.2	324	38.8	693	38.5
ETH Domain	230	23.8	177	21.2	407	22.6
University of applied sciences UAS	193	20.0	163	19.5	356	19.8
University of Teacher Education UTE	67	6.9	78	9.4	145	8.1
Other	107	11.1	92	11.0	199	11.1
Total	966	100.0	834	100.0	1’800	100.0

The full dataset of 1’800 respondents was not weighted in any of the analyses conducted in this study.

3.3 Indicators for value chain and mission oriented funding

Value chain oriented funding

The literature review in section 2.2 suggests a number of indicators for anticipating the possible value chain implications of a research project. These indicators either relate to the applicants or to the applications themselves.

Characteristics related to the applicants:

1. *Type of organization to which the applicants are affiliated*. Universities, organizations in the ETH domain, UAS, UTE, and other organizations all have different functions and roles in the Swiss research and innovation system. Above all, universities of applied sciences are expected to conduct applied research and development and transform knowledge into marketable innovation (Staatssekretariat für Bildung Forschung und Innovation SBFI, 2020). However, also the research organizations in the ETH domain have been described as orientated towards basic and applied research, and virtually all higher education institutions and research organizations are mandated to exploit their research results commercially (ibid.).

2. *Degree of applicants' involvement in interdisciplinary research.* Practical problems and the practical implementation of research results do not follow the structures and borders of scientific disciplines. We therefore expect that the more researchers engage in interdisciplinary research, the more they produce knowledge that has a practical value. This degree of interdisciplinarity was measured through adding up the research areas in which scientists stated to conduct research, using the SNSF classification of research areas as shown in Appendix 21 (questions 9-10).
3. *Motivational disposition for doing research according to Stokes' "Pasteur's quadrant" model.* As we have described above, Stokes suggested three types of researchers based on whether they are motivated by either a quest for fundamental understanding, considerations of use or both. Previous studies have shown that Pasteur's quadrant and Edison's quadrant researchers are more likely to get involved in knowledge exchange with users outside science (see section 2.2, p. 8). The surveys therefore collected the respondents' motivations for doing research (see Appendix 21, question 13).
4. *Professional experiences outside academia* have been shown to promote understanding of the needs and norms of non-academic organizations and potential users of research results. Such understanding lowers the barriers to collaborating for producing socially or commercially beneficial research results or to transferring the results obtained in scientific research to practice. We separately collected data on previous work experience in companies and in public administrations, NPOs or other organizations outside academia (see Appendix 21, questions 15-16).

Characteristics related to the applications:

5. *Interdisciplinarity of SNSF applications.* The same logic as for the applicants themselves (see above, no. 2) applies to the applications. Interdisciplinary funding applications have a greater potential to be connected to practical problems and to produce solutions that do justice to the complexity of practical problems.
6. *Projected main results of applications.* Research projects may produce different types of results. This to some degree depends on the disciplines in which the research is conducted and to some degree on the distance of the research to practical application and use. We distinguish between seven types of results in survey 1: (a) new data, (b) new knowledge and insights, (c) new technology, (d) further development of an existing technology, (e) new application, (f) marketable or almost immediately applicable innovation (new good, service, process or similar that is used), (g) other result (see Appendix 21, questions 31-32). Six of these seven types were added up to differentiate between funding applications suggesting new data or knowledge (a+b), technology (c+d), or an application or innovation (e+f) as the main result. Other results were disregarded in the analysis if they could not be recoded. We perceive new data or knowledge as closer to basic research and further away from application or commercialization, and the opposite for technology or an application/innovation.
7. *Technology readiness levels TRLs of the planned project results.* As described in section 2.3 above (see p. 11) TRLs have been defined as an indicator of the development level of a technology. Higher TRLs indicate a higher development level of a technology, with TRL 1 (observing basic scientific principles) as the starting point and TRL 9 (system proven in operational environment) as the end point. The survey asked respondents to distinguish their funding application results between four TRL groups, TRL 1, TRLs 2-4, TRLs 5-6, and TRLs 7-9 (see Appendix 21, questions 33).
8. *Application-related or commercial maturity levels of the planned projects.* Along similar lines, use-related or commercial maturity levels (CMLs) were distinguished from TRLs to obtain a self-assessment of the practical and commercial development status of a funding application. Five levels were distinguished. Again, a higher CML indicates a higher practical or commercial development status; the implementation outside of science or commercialisation of the results not foreseen (CML 1) and uses of the results in the real environment, production, or pilot sales to early customers planned (CML 5) were included as the endpoints in the survey (see Appendix 21, questions 34).

9. *Cooperation with users and/or implementation partners in the planned projects.* Another indicator of the extent to which an application would be suitable for achieving value chain-oriented goals was the inclusion of users or practitioners and implementation or business partners in the application. This was surveyed in two separate questions, with an additional distinction as to whether such cooperation was envisaged during project implementation or as a follow-up activity after project completion (see Appendix 21, questions 35-36).

Mission-oriented funding

The perceptions towards mission-oriented funding (MOF) will be assessed firstly through a question asking for the perceived need of research and innovation funding to provide more mission-oriented funding (see survey 1, question 40, and survey 2, question 23).

Another question tried to measure the importance of particular aspects of MOF (see section 2.4, above) by asking whether research funding should take into account the following eight principles or goals:

1. Funding of research programmes with a very long-term time horizon (at least 12 years).
2. Cooperative funding programmes by the SNSF, Innosuisse and, on a case-by-case basis, federal offices or other public agencies.
3. Coordination with research and innovation funding in Europe and other world regions or globally.
4. Funding interdisciplinary research and across research disciplines and fields of knowledge.
5. Focus on relatively unexplored technologies with great potential for significant and rapid improvement.
6. Focus on creating the knowledge-based and technological conditions for the emergence of new markets (such as with the invention of the internet).
7. Focus on challenges defined by politics and society.
8. Coordination of public research and innovation funding with business enterprises.

3.4 Data analysis

The analysis of this report consists of four parts.

Part I. Decision to apply for SNSF funding 2017-20. The first part on the decision to apply for SNSF funding 2017-20 makes a comparison of socio-economic and research-related characteristics of three groups of scientists: 1) Applicants for value chain oriented funding instruments (UIBR, Bridge, NRPs, NCCRs), 2) applicants for other SNSF funding instruments, and 3) scientists not applying for SNSF funding. In order to distinguish the three groups of scientists, a multinomial logit model is applied with a large set of explanatory variables:

This part uses the combined dataset of surveys 1 and 2 (see Table 15). After removing implausible but influential outliers a total of 1’653 observations were included in the regressions. The results are shown in Figure 5 and the dependent variables are explained in Appendix 3. Survey weights were not applied, but robust standard errors were calculated. The reference group is the first group of applicants to value chain oriented funding instruments.

Part II. Application success. The second part on application success looks at the socio-economic and research-related characteristics of 1) applicants with approved applications for value chain oriented funding instruments, and 2) applicants with rejected or withdrawn applications, and at the characteristics of the applications. The analysis of the differences between applicants with approved and applicants with rejected/withdrawn applications relies on survey 1 data only (see Table 15). Survey weights were calculated in order to match the frequencies across strata in survey 1 to the population of 3’395 applicants for the SNSF value chain oriented funding instruments (see above, section 3.1.4). In addition, the analysis applied finite population correction and removed influential outliers. Applications to the NCCRs had to be excluded, as no grades from the reviews were available and the sample of approved and rejected/withdrawn NCCR applications contained systematic differences. On average

600 observations were used for the multivariate analyses of part II. The analyses consisted of two stages: in a first step, the final grade of the research application was regressed on researcher-specific and application-specific characteristics of the proposal. In a second step, the residuals from the first step were used as a quality measure (adjusted for researcher-specific and application-specific characteristics) of the application in a base model with an additional full set of control variables and the indicators for value chain oriented funding were added sequentially.

Part III. Underfunding of applications. We analyse the underfunding of applications by comparing applicants who experienced underfunding with applicants who did not experience underfunding. Underfunding was measured as 1) no or reduced funding for necessary activities and/or equipment (variable *ufin1*), budget cuts during project approval (variable *ufin2*), and 3) the general opinion that the funding programme in question did not completely cover the costs (variable *ufin3*). This part of the analysis relies on respondents to survey 1 with approved SNSF applications, as applicants with rejected applications were not trusted to be able to provide valid responses on the characteristics of applications and funding programmes which mostly did not lead to a funded research project. The sample of the estimations consisted of on average 370 observations excluding item missing values (see Table 9 and Table 10 on the structure of approved applications). Survey-weights were used for the strata as described in part II. The estimations used logistic regressions to identify the determinants of underfunding.

Part IV. Attitudes towards mission-oriented research funding. We compared attitudes towards mission-oriented research funding between different groups of scientists (e.g., organization type, domain of research, functions, academic age, SNSF funding status etc.). This part did not use any multivariate analyses but graphs and tables to describe the differences between different respondent groups.

4. Results

4.1 Submission of applications

4.1.1 Overview

In the first chapter of the analysis of the survey results we focus on a comparison of the 1’800 responses to the two surveys grouped into three categories:

- Group 1 “Applicants to value chain oriented funding (VCOF)”: 966 scientists (54%) who submitted 2017-20 at least one application to the four SNSF funding instruments, project funding for use-inspired basic research (UIBR), Bridge, National Research Programs (NRPs), or National Competence Centres of Research (NCCRs), not differentiating between approved and rejected or withdrawn applications. This group from survey 1 is shown in different shades of blue in the diagrams.
- Group 2 “Applicants to other SNSF funding”: 491 scientists (27%) who submitted applications to other programmes provided by the SNSF between 2017 and 2020.
- Group 3 “Non-applicants to SNSF”: 316 scientists (18%) who stated in the survey that 2017-20 they did not submit any applications to the SNSF.[1] Groups 2 and 3 from survey 2 are shown in different shades of orange and brown in the diagrams.

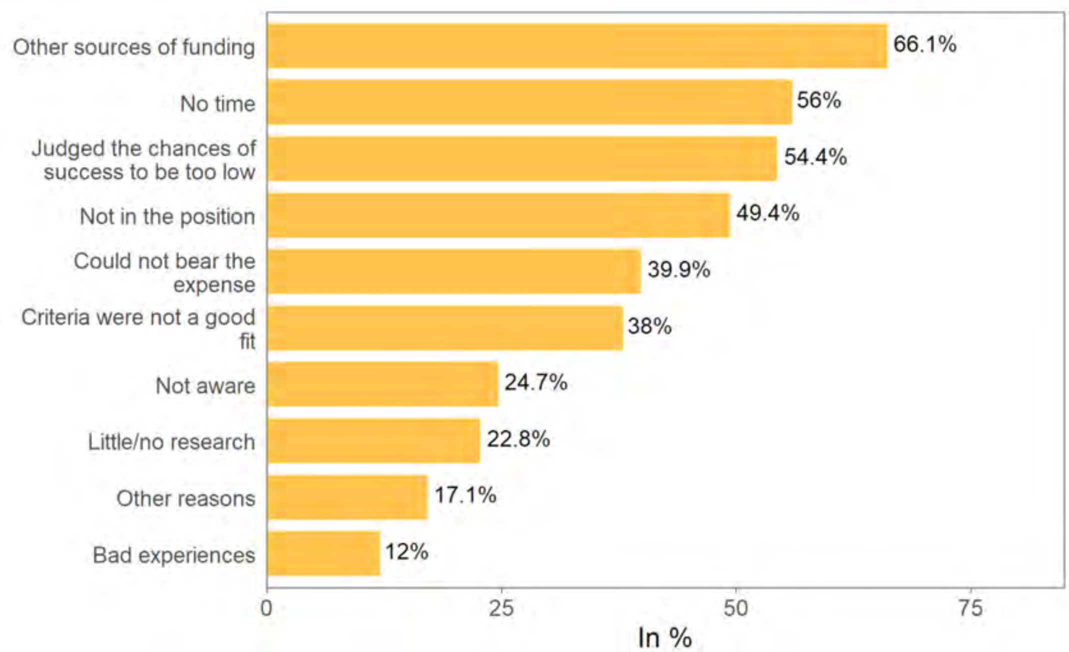
The members of groups 2 and 3 belong to a convenience sample of scientists that was put together to compare the data for applicants to value chain oriented funding with data for comparable scientists (with regard to organization type, function, position, and gender, see section 3.2). The dataset is most likely biased and not suitable to be generalised to Swiss scientists overall; for instance, it would be incorrect to assume that 18%, i.e., the share of group 3, of all Swiss scientists have not applied to

[1] Out of 834 respondents to the second survey of non-applicants to value chain oriented funding 27 (3.2%) did not answer the question on SNSF funding. They are excluded from the analyses in this chapter.

SNSF between 2017 and 2020. However, the dataset is sufficiently large to permit a first exploration of the differences between the three groups of scientists.

Scientists who have not applied for SNSF-funding in the years 2017-20 were asked for the reasons for this (see Figure 3). The availability of other sources of funding ("I had other sources of funding that were well suited to my research.") was the most important reason given by two thirds of the respondents. Other important reasons are that respondents did not have the time ("I did not have time to submit applications, e.g., due to very heavy workload with ongoing research projects, teaching or other tasks.), judged the success chances as too low ("I judged the chances of success of an SNSF funding application to be too low.") or did not feel that they were in a position or lacked the network for a successful application ("I was not in the position or did not have the contacts for a promising submission to the SNSF."). The costs of an application and the lacking fit between SNSF's funding criteria and their research were also mentioned by approximately 40% of the respondents. All other reasons are of minor importance above all bad experiences with applications in the past, which was only mentioned by 12% as true.

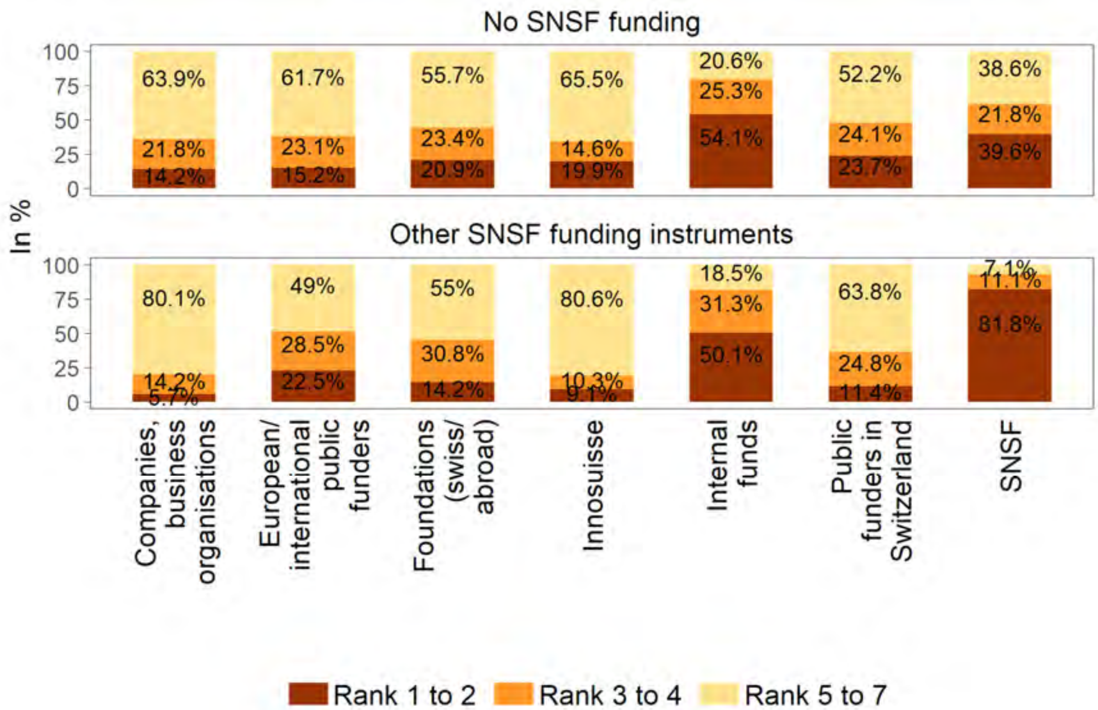
Figure 3. Share of totally and mostly true reasons for not applying for SNSF-funding in %



Source: FHNW-survey of a group of comparison researchers 2021.

The importance of funding sources of these scientists who have not applied for SNSF value chain oriented funding in the years 2017-20 is distinct (see Figure 4 and Figure 12, p. 39). Scientists who applied for other SNSF funding instruments ranked funding sources very similar to those with approved applications for SNSF value chain oriented funding (Figure 12, p. 39): SNSF is the most important funding source, followed by internal funding, and European/international funding in third place. Other sources, above all companies and Innosuisse, are of low importance for this group. Surprisingly, even those respondents, who have not applied for SNSF funding from 2017-20, still put SNSF funding in first or second place. Though internal funding is even more important, it also comes as a surprise that Innosuisse funding has low importance, even lower than funding from other public funders (the survey listed the federal government, cantons, and municipalities as examples) and from foundations. Almost two thirds of the respondents in this group included Innosuisse funding among the three *least* important research funding sources. This points to a generally low importance of Innosuisse research and innovation funding in the entire sample of scientists that we surveyed, those who applied for SNSF value chain oriented funding, those who applied for other SNSF funding sources, but also those who did not apply for SNSF funding 2017-20.

Figure 4. Importance of funding sources for scientists not applying to SNSF in 2017-20 and scientists applying to other SNSF funding instruments in %



Source: FHNW-survey 2 of a group of comparison researchers 2021.

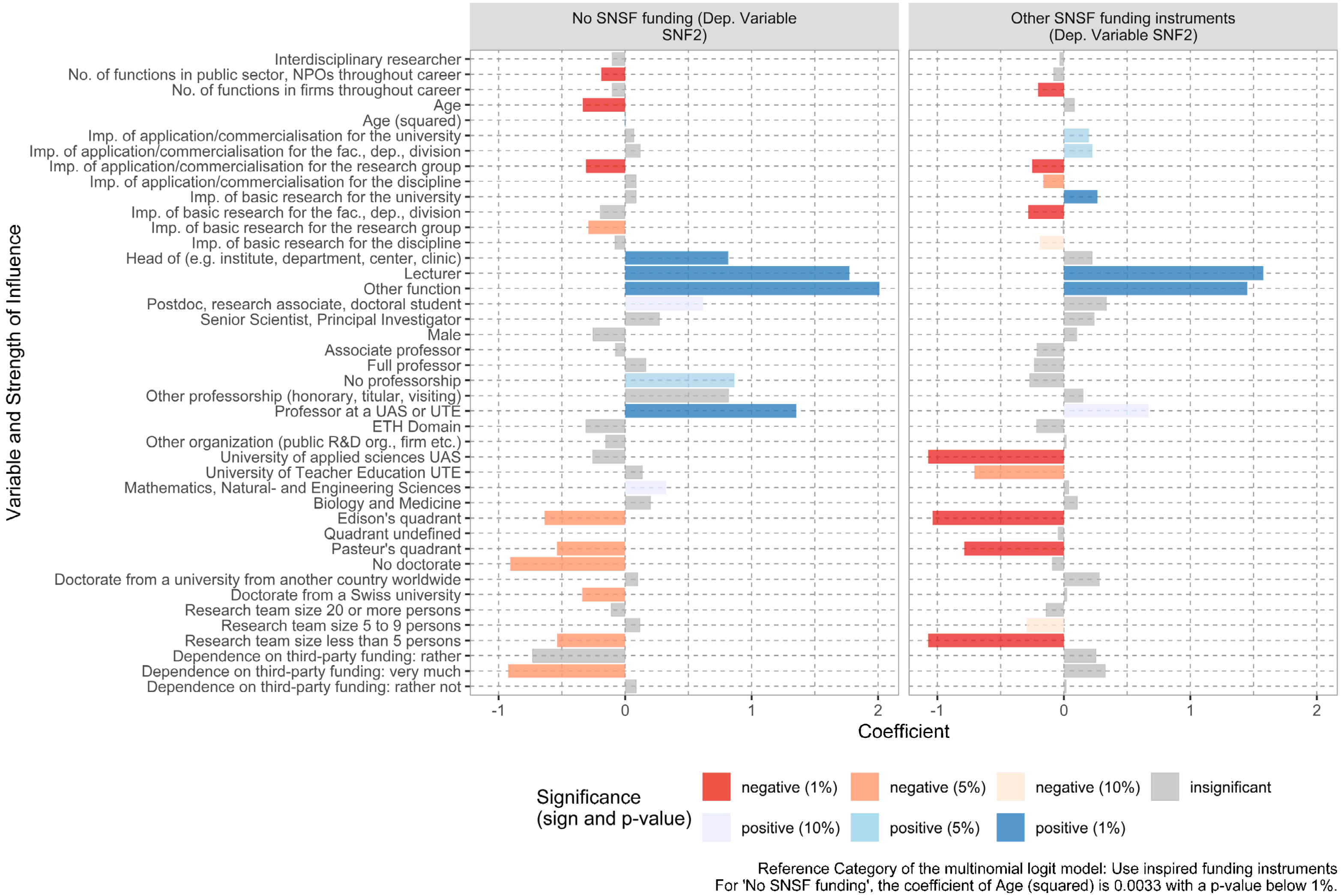
4.1.2 Differences between scientists applying for SNSF value chain oriented funding, other SNSF funding and scientists not applying for SNSF funding

Membership to groups 1 (applicants for value chain oriented funding), 2 (applicants for other SNSF funding), and 3 (no application to SNSF) was estimated in multinomial logit models using a broad set of variables. They measure the following constructs:

- *Socio-demographic characteristics* of the applicants, such as age, gender,
- *Characteristics of the research*, such as domain of research, interdisciplinarity of the research, motivations for doing research, and dependency on third party-funding for doing research,
- *Career-related characteristics*, such as years since completing the doctorate ("academic age"), country of the doctorate, whether they have collected experiences in business enterprises, whether they have worked in/for the public sector or non-profit organizations,
- *Professional characteristics* such as function in their organization, professorial position,
- *Organization-related characteristics* such as the type of organization for which they work, the size of the research group,
- *Influence of peers* measured via their perception of their peers' opinions towards basic research and towards applying and/or commercialising research results, differentiating between peers from the organization, organizational unit (faculty, department, division), research group, and research area or discipline.

Figure 5 shows the best performing model which correctly predicted the group membership of 1'033 out of 1'653 respondents (62.5%). We estimated several variations of this model, using, for instance, biological age instead of academic age, research group size and squared group size to evaluate non-linear effects, or leaving out professorial position and gender.

Figure 5. Estimation results, dependent variable group membership with regard to SNSF funding 2017-20[a]



Note: Variables are further explained in Appendix 3.

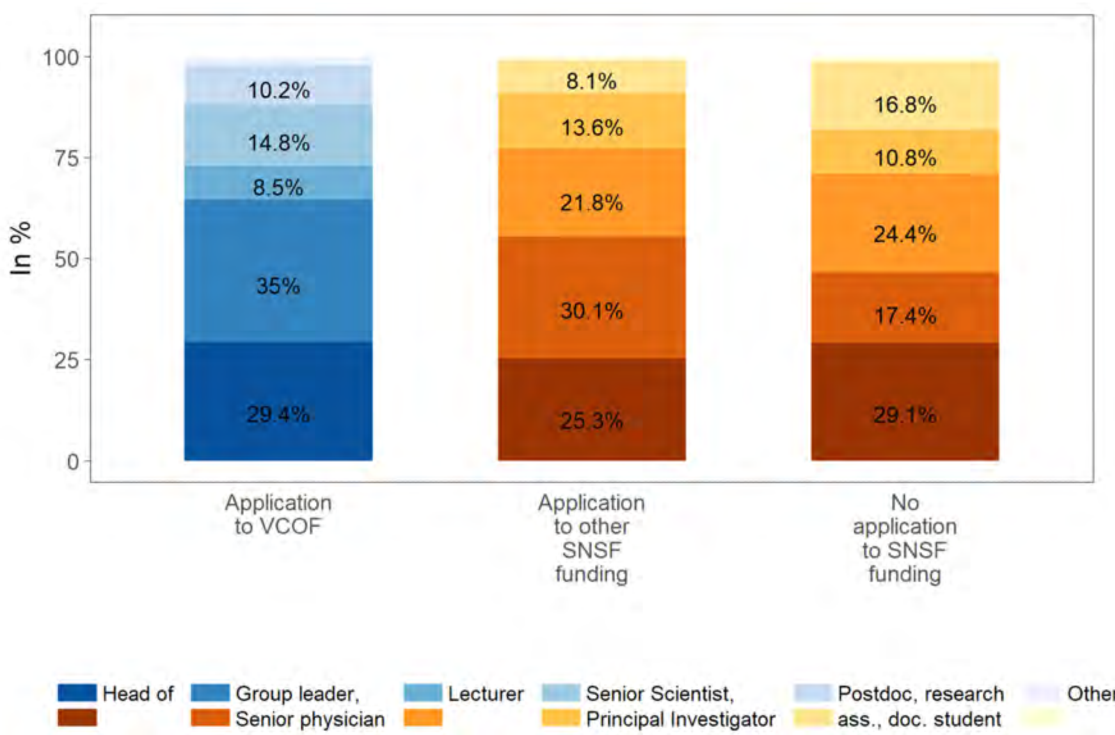
Source: FHNW-surveys among SNSF-applicants and a group of comparison researchers 2021.

Respondents from group 2, i.e., the applicants for other SNSF funding, were also asked for which SNSF funding instruments they applied. The answers are shown in Appendix 22 (question 16). The most important instrument was project funding which was selected by 70% of the respondents. We included among the funding instruments also the three value chain oriented instruments Bridge, NRP, and NCCR, even though we had excluded all known applicants to these instruments (as included in the SNSF address database) from this sample. However, scientists might have applied as co-applicants and members of applicant teams: indeed, 140 respondents stated that they had applied to one of these three funding instruments. We took this into account in a sensitivity analysis which included these 140 respondents in group 1 (1106 applicants to value chain oriented funding instruments) and excluded them from group 2 (351 applicants to other SNSF funding instruments). The results were generally robust to these modifications (see Appendix 1) and the slight differences of the results are mentioned in the interpretation below.

The following results are noteworthy:

1. The function of the respondents in their organizations contributes to explaining group membership. Group leaders are strongly represented among the scientists applying for value chain oriented SNSF funding (see Figure 6) and lecturers have applied less often for this type of funding. Lecturers are more frequent among scientists applying for other SNSF funding. Among the group of scientists who have not applied for SNSF-funding we find heads of units, lecturers, and post-docs and PhD students overrepresented and above all group leaders and senior scientists and principal investigators (PIs) underrepresented.

Figure 6. Status with regard to SNSF-funding applications by function in %



Source: FHNW-surveys among SNSF-applicants (survey 1) and a group of comparison researchers (survey 2) 2021.

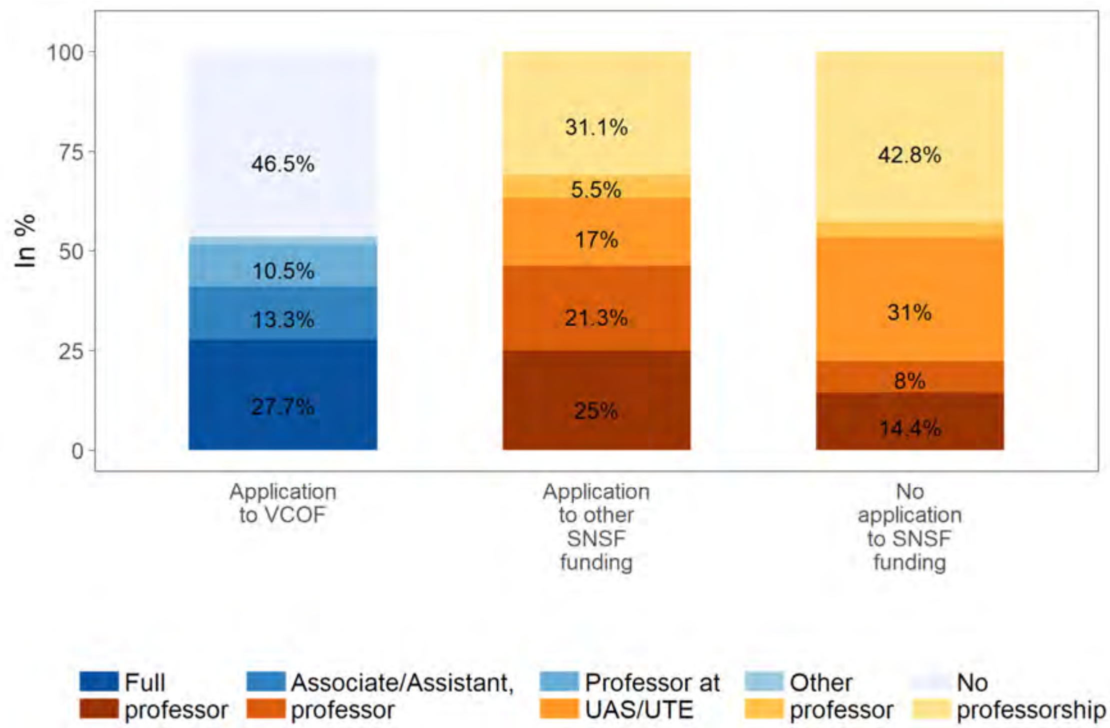
2. Gender does not play a role and we do not see that either men or women are overrepresented in one of the groups. However, it should be noted that the selection of the comparison sample took into account the gender of the respondents in group 1 for the compilation of the sample for the survey of groups 2 and 3. Age, either academic age (years since doctorate) or biological age, matters for belonging to the group of applicants to other SNSF funding instruments and to the group of non-applicants. Age reduces membership to group 2 significantly, i.e., younger scientists prefer other SNSF

funding over use-inspired funding (not shown in Figure 5). This is in line with a career-building hypothesis and that younger researchers focus on building up their careers through generating high impact (basic) research findings. The older scientists are, the more often they engage in value chain oriented research and the less often they belong to the group of non-applicants. This effect is nonlinear, however: more mature researchers have a higher likelihood to have submitted to SNSF, but close to and after retirement age this likelihood goes down again (see Figure 5).

3. Whether scientists have a doctorate and where they obtained it also have a weakly significant statistical effect on group membership: respondents without a doctorate, which are partly doctoral researchers and partly senior scientists without a doctorate, are less often found in the group of non-applicants to SNSF funding, as are scientists who obtained their doctorates in Switzerland. This could suggest positive effects of an academic education and socialization in Switzerland on applying for SNSF funding or higher barriers for scientists from abroad with regard to applying for SNSF funding. A related finding stresses the influence of the academic socialization on the selection of funding sources: in the sensitivity analysis with the modified allocations to groups 1 and 2, scientists who obtained their doctorate outside of Europe are overrepresented in the group of applicants to other SNSF funding. This could be an indication that foreign scientists lack the non-academic networks and contacts which make participation in VCOF easier.

4. Professorship also differs across the three groups (see Figure 7). Above all professors at UAS and UTE are less often found in the group of applicants to value chain oriented funding, but more often in the group of non-applicants. The latter also applies for respondents without a professorship who are also common in the first group of applicants to VCOF.

Figure 7. Status with regard to SNSF-funding applications by professorship in %



Source: FHNW-surveys among SNSF-applicants (survey 1) and a group of comparison researchers (survey 2) 2021.

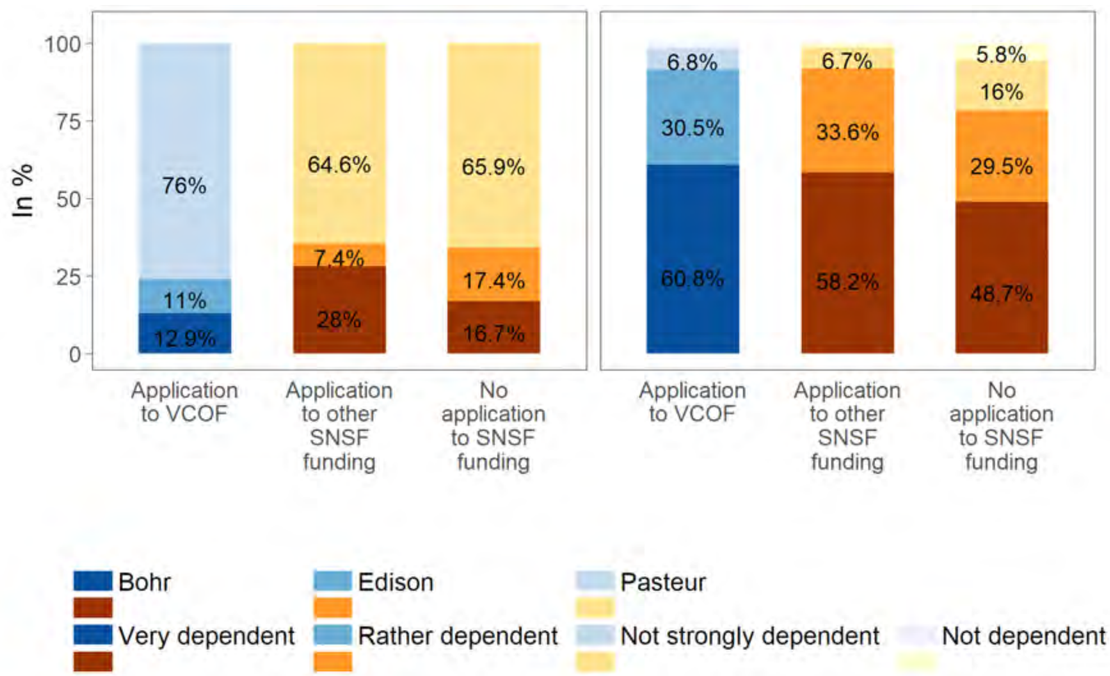
5. At first glimpse it is a little bit surprising, that the type of organization to which the respondents belong varies rather little across the three groups. Only respondents from UAS and UTE are less often found in group 2 of applicants to the other, not value chain oriented funding programmes of SNSF. This generally underlines the more use- and application-oriented focus of scientists at UAS and their lower interest in basic research. However, we do not see scientists from UAS and UTE more often in

the group of non-applicants (note, however, that UAS/UTE professors are more often in this group, as illustrated in Figure 7, above).

6. The motivation of the scientists, distinguishing between purely motivated for basic research ("Bohr's quadrant"), purely motivated for applied research ("Edison's quadrant"), and motivated for use-inspired basic research ("Pasteur's quadrant") also varies significantly between the groups (see Figure 8a). Whereas in group 1 clearly the Pasteur's quadrant scientists dominate, the Bohr's quadrant scientists are more common in groups 2 and 3. In group 3 of the scientists who have not applied for SNSF funding, the Edison's quadrant scientists who are mainly motivated by considerations of use and generating practical benefits have a high share. This mirrors the finding that scientists who do not or not very much depend on third-party funding are also slightly more common in the group that does not apply to the SNSF than in the group of applicants to value chain oriented SNSF funding (see Figure 8b)

Figure 8. Status with regard to SNSF-funding applications

a) By researcher-type in % b) By dependence on third-party funding in %

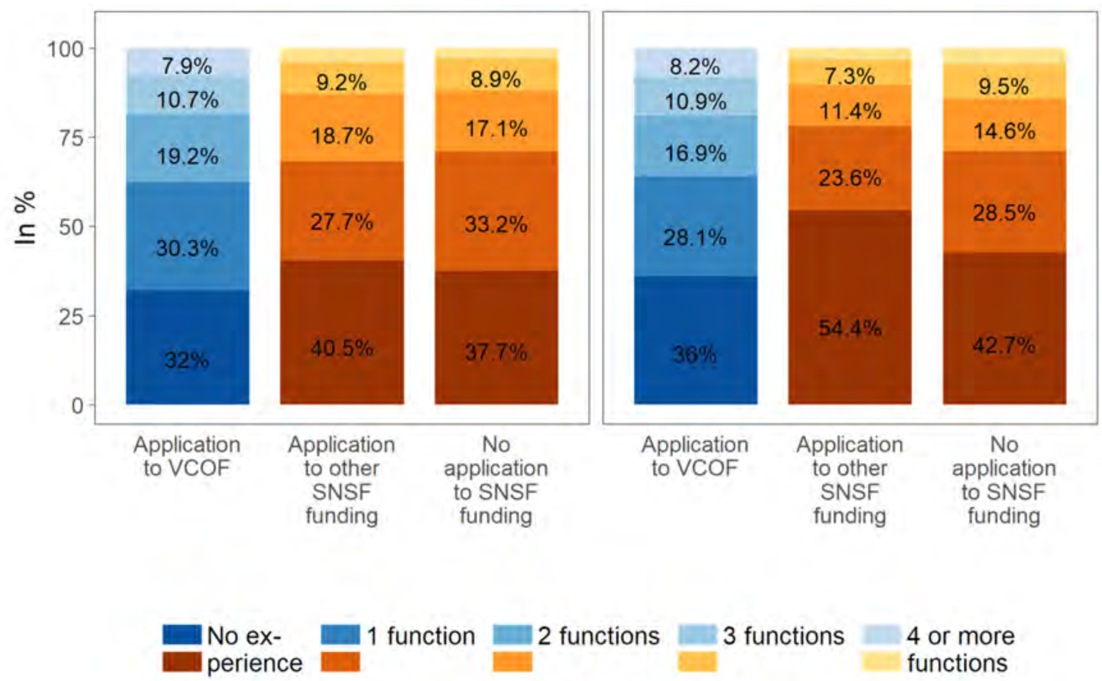


Source: FHNW-surveys among SNSF-applicants (survey 1) and a group of comparison researchers (survey 2) 2021.

7. The domain of research plays only a minor role for explaining group membership and interdisciplinarity plays no role at all, i.e., interdisciplinary scientists are distributed rather evenly across the three groups. Intersectoral experiences, that is previous positions in a) government institutions, non-profit organizations, or other organizations outside academia or b) business enterprises vary notably across the groups. Applicants to other SNSF funding have less often held positions in business enterprises or in government institutions, non-profit organizations, or other organizations outside academia in their careers, underlining that for scientists involved in basic research career mobility outside academia is rather low (see Figure 9). And this is not a consequence of distinct age structures, as we controlled for age in the regressions. Moreover, scientists who have held positions in governments or NPOs are slightly less often found in the group of non-applicants than in the group of applicants to other SNSF funding. In sum, the more scientists have collected experiences outside academia, the higher the chance that they got involved in applications for value chain oriented funding.

Figure 9. Status with regard to SNSF-funding applications by the number of positions held outside academia in %

a) In government institutions, NPOs, or others b) In business enterprises



Source: FHNW-surveys among SNSF-applicants (survey 1) and a group of comparison researchers (survey 2) 2021.

8. Research group size also varies between the three groups: scientists with small groups of less than five persons and five to nine persons are less often found in the group of applicants to other SNSF funding instruments and they are also less common in the group of non-applicants. However, smaller research groups are more common for applicants to the value chain oriented funding instruments.

9. A final point refers to the influence of peer effects. We assessed this through asking respondents for their perceptions of the importance that their 1) university or research institution, 2) organizational unit (faculty, department, division), 3) research group, and 4) research area(s) and discipline(s) attributed firstly to basic research and secondly to applying and/or commercialising research results. Some of these eight variables also vary significantly across the three groups and the results are somewhat clearer for modified groups of the sensitivity analysis (see above).

Scientists who belong to group 1 and applied for value chain oriented funding rated the perceptions of their research group and their research domain or disciplines with regard to the importance of application and/or commercialization of research results significantly higher than scientists belonging to the other two groups (see Table 16 and Table 17).

The perception of the importance attributed to basic research and application/commercialization by the university or research organization explains membership to group 2, scientists applying for other SNSF funding instruments: generally, respondents from this group find more often, that their peers at all levels rate basic research as important, than respondents from the other two groups. Above all the perception of the opinions at the level of the university matter for basic research, but also for the application and/or commercialization of research results this is significant in the estimations (see Table 16 and Table 17). However, it is the opposite at discipline level: if respondents perceived that their disciplines put high value to the application and/or commercialization of research results, then they less often belonged to this group of scientists who applied for other SNSF funding instruments.

Scientists in group 3 who have not applied for SNSF funding perceive that their colleagues attach less importance to basic research than scientists in groups 1 and 2. Above all the perceptions with regard to the research group correlate with membership to group 3: respondents who think that the research group finds basic research less important and who think that the group also finds applying and/or commercialising research results less important more often belong to the group of scientists who have not applied at all for SNSF funding than to the group that has applied for value chain oriented funding (group 1, see Figure 5, above, Table 16 and Table 17).

Table 16. Status with regard to SNSF-funding applications by the importance of basic research[a] for the respondents' environment in %

Importance of basic research attributed to …	Value chain funding instruments	Other SNSF funding instruments	No SNSF funding	Total
University or research organization	4.0	4.2	3.6	3.9
Organizational unit (faculty, department, division)	3.9	4.0	3.4	3.8
Research group	4.1	4.1	3.4	4.0
Research area(s) and discipline(s)	4.1	4.1	3.7	4.0
Observations	1'080	349	312	1'741

a Scale from 1 very low or no importance to 5 very high importance.
Source: FHNW-surveys among SNSF-applicants (survey 1) and a group of comparison researchers (survey 2) 2021.

Table 17. Status with regard to SNSF-funding applications by the importance of application and/or commercialization of research results[a] for the respondents' environment in %

Importance of application and/or commercialization of research results attributed to …	Value chain funding instruments	Other SNSF funding instruments	No SNSF funding	Total
University or research organization	3.8	3.8	3.8	3.8
Organizational unit (faculty, department, division)	3.6	3.4	3.6	3.6
Research group	3.8	3.3	3.5	3.6
Research area(s) and discipline(s)	3.7	3.3	3.6	3.6
Observations	1'080	349	312	1'741

a Scale from 1 very low or no importance to 5 very high importance.
Source: FHNW-surveys among SNSF-applicants (survey 1) and a group of comparison researchers (survey 2) 2021.

One of the guiding questions of this study related to barriers for higher education institutions with regard to SNSF funding. Among those scientists who did not apply for SNSF funding we find a number of different sub-groups: 1) Junior scientists which lack the position and resources, including network, for a successful application; 2) senior scientists close to retirement which do not want to start new research projects anymore; 3) established scientists, e.g., at UAS, with a strong application and practice orientation which fund their research from other sources ; 4) another group of established scientists, also often professors at UAS/UTE, points to reasons which can be interpreted as access barriers, above all low expectations of success and general lack of funding for producing SNSF applications. Scientists who are no longer seeking SNSF funding due to age do not need to be motivated to do so. For the other three groups, specific measures would be necessary in each case, for example concerning the resourcing and pre-financing of SNSF applications or networking with SNSF-experienced scientists. Additional funding programmes with an even stronger application orientation would also be conceivable in principle, above all as the Innosuisse funding was given a surprisingly low importance overall.

4.1.3 Answers to open ended questions on comments to SNSF funding

At the end of the questionnaire we gave the respondents the opportunity to provide comments on SNSF funding and SNSF in general. Out of the total of 1'800 respondents to surveys 1 and 2 466 respondents (26%) made use of this opportunity. All responses were coded and a selection is shown in Appendix 23.

In Table 18 we show the frequencies of general comments made on SNSF and SNSF funding. We count 43 positive and 169 negative comments overall, or a ratio of 4:1 negative:positive. Positive comments are often quite short testimonies thanking SNSF for its funding, praising its services and administration, and endorsing in general its approach to funding basic research (see Appendix 23 on examples). Negative comments tend to be longer, and pick up a range of different topics, such as:

- Dissatisfaction with the evaluation of research applications and the rejection letters, perceived lack of transparency of the selection criteria and processes,
- Too high importance of publications, ignoring other work results (e.g., software, patent submissions, art),
- Criticism of poor reviews and uninformed reviewers, and nconsistent feedbacks from reviewers and research council,
- Criticism of the handling of interdisciplinary applications and applications outside the prevailing paradigms in a field,
- Dissatisfaction with the limitation of the number of projects that can be funded at the same time,
- Perception that SNSF has become more bureaucratic, and scientists have lost influence,
- Negative comments on the possibilities with regard to long-term funding and employment of researchers, especially post-docs,
- Exclusion of junior and non-permanent personnel from grant-based funding.

Table 18. General comments on SNSF and SNSF funding by type of organization

	Positive comments on SNSF funding		Negative comments on SNSF funding		Ratio negative:positive	Total of comments by respondents to survey 1
	Obs.	in %	Obs.	in %		Obs.
Cantonal University	13	7.1%	68	37.2%	5.2	183
ETH Domain	12	12.6%	42	44.2%	3.5	95
University of applied sciences UAS	4	3.7%	31	28.4%	7.8	109
University of Teacher Education UTE	6	17.1%	12	34.3%	2.0	35
Other	8	18.2%	16	36.4%	2.0	44
Total	43	9.2%	169	36.3%	3.9	466

The ratio of negative to positive general comments is twice as high at the UAS as the average for all organisation types. On top, respondents from UAS and UTE made a number of further specific comments on their access to SNSF funding. 23% of the comments from UAS and UTE respondents (33 out of 144) criticised the situation of their organisations in SNSF funding, in particular the very difficult and burdensome access to SNSF funding, the selection criteria not adapted to the biographies of UAS researchers, the lack of funding for project leaders and the insufficient funding for applied research. The majority of comments came from UAS (31 of 33) and the 33 negative comments are not well balanced by the 2 positive comments which pointed to first improvements (see Appendix 23).

4.2 Funding of applications

4.2.1 Overview

The second section of results focuses on the characteristics of funded versus unfunded (rejected and withdrawn) applications to three SNSF funding programmes, UIBR, Bridge, and NRP in the years 2017-20. The applications to NCCRs were excluded from all analyses in this section, as the samples of approved and rejected applications differ systematically: whereas the applicants of approved applications include the NCCR leading houses and co-applicants, the applicants of rejected or withdrawn applications only included the leading houses or main applicants. We describe and compare funded and unfunded applications according to selected characteristics of the applicants (section 4.2.2), and according to characteristics of the applications themselves (section 4.2.3).

We start with the results of the multivariate analysis in Table 19. We used two dependent variables for the estimations:

1) A variable measuring the final grade that each application received from the SNSF referee panel (*grade*). This variable reflects the result of the peer review of an application and the discussion in the grants committee. We use *grade* as the dependent variable in first step regressions for all instruments together and for UIBR, NRP, and Bridge applications separately.
2) The second step models regress the binary funding decision variable (*funded*) in base models on the grade residuals (as an indicator for application quality) and on a set of control variables (again for all instruments together and for UIBR, NRP, and Bridge applications separately). The variables measuring the value chain orientation are added in extended models.

In sum, the following results are noteworthy. Further explanations and illustrations are provided in sections 4.2.2 and 4.2.3.

- Among the control variables the *grade* residuals (only in the second step regressions on *funded*), the age of the applicants, having collected experiences with previous SNSF applications, experience in the subject area of the application, doing research in the domains of biological or medical sciences, and the size of the application (measured via the size of the research team) matter.
- For cantonal universities and applicants from the ETH domain we get higher grades and/or success rates and for UAS and UTE lower grades and/or success rates than for other organizations.
- The more functions in businesses the applicants have held, the higher their chances of approval across all instruments and in the NRPs and Bridge in particular.
- Interdisciplinary applications received lower grades overall and in the Bridge program but were more often funded in UIBR.
- If the projected result or results were an application or innovation, both grades and funding success were lower across all instruments and in the NRPs.
- The patterns with regard to Technology Readiness Levels (TRLs) are mixed, but above all in the NRPs and in Bridge applications aiming for higher TRLs 5-6 and 7-9 are less often funded than applications of TRL 1.
- We obtain a similar result, if we take commercial maturity levels. For instance, if applications foresaw testing with pilot users, preparatory work/test runs, partnerships with key customers (level 4) or uses of the results in the real environment, production, or pilot sales (level 5) they were less often funded than applications which did not provide a response on the commercial maturity level.

Table 19. Estimation results, dependent variables final grade and application approved/rejected[a]

	All instruments		UIBR		NRP		Bridge	
	Grade	Funded	Grade	Funded	Grade	Funded	Grade	Funded[b]
Characteristics of the applicants								
Age of applicant	–	–			–	–	–	
Type of organization								
Cantonal university	+		+		+			
ETH domain	+	–			+	+		+
UAS	–	–	–			–		
UTE	–	–	–				–	
Other organizations	Intercept							
Bio/Medicine		–				–		
Experience with applications	+	+	+	+		+	+	
Experience in the field of the application	–	–	–	–	–	–		
No. of functions in/for businesses	+	+				+	+	+
Characteristics of the applications								
Size of research team	+	+		–	+	+	+	+
Interdisciplinary applications	–	+		+			–	–
Projected main result								
New knowledge, data	Intercept							
New technology								
New application, innovation	–	–			–	–		
Technology Readiness Level TRL								
TRL 1	Intercept							
TRLs 2-4					–			
TRLs 5-6		–				–		
TRLs 7-9	–						–	–
NA (TRL not provided)		–		–		–		
Commercial Maturity Level								
Level 1 (implementation or commercial. not envisaged)					+		–	
Level 2 (implementation or commercialisation planned and described)			+					
Level 3 (initial market analyses, customer surveys, user feedback foreseen)							+	+
Level 4 (more testing with pilot users, preparatory work/ test runs, partnerships with key customers)		–		–		–		
Level 5 (uses of the results in the real environment, production, or pilot sales)	–	–					–	–
NA (level not provided)	Intercept							

a Only stable results are shown. The estimations included further control variables for the function of the respondent and the funding instrument (only estimations with the full sample of all instruments) which are not shown in this overview. Full estimation results with all included control variables are shown in Appendix 5 to Appendix 12. Variable specifications are shown in Appendix 3.
b Bridge estimations including the *residuals grade* quality measure were overdetermined and results without *residuals grade* were used instead. Greyed out control variables had to be excluded.

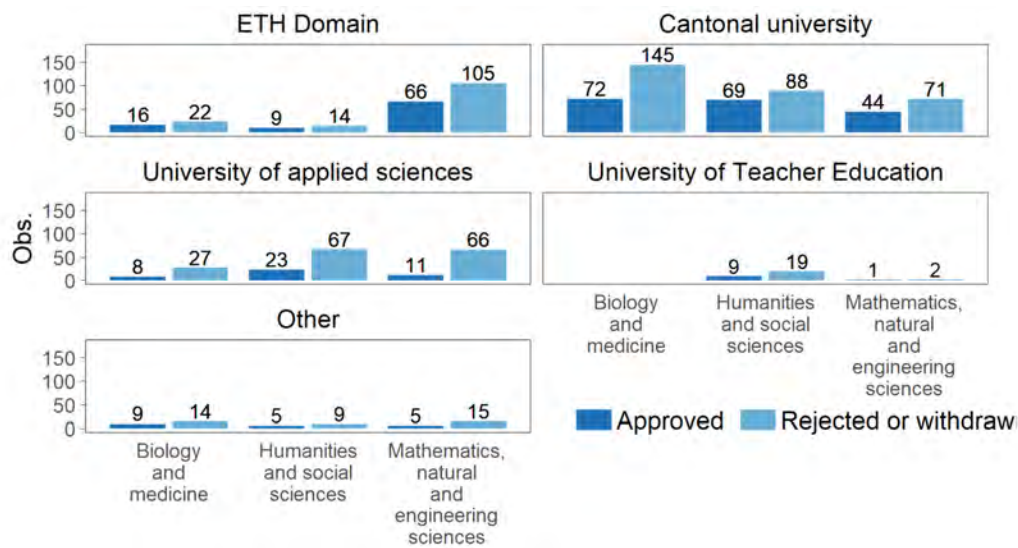
4.2.2 Funding status by characteristics of the applicants and their organizations

Involvement in interdisciplinary research

In Figure 10 we show applicants by organization type, domain of research and funding status. We see that the domains of research are not evenly distributed across organization types, but ETH applicants predominantly listed mathematics, natural and engineering sciences as their domains, whereas universities are strongest in biology and medicine, followed by humanities and social sciences, and mathematics, natural and engineering sciences. UAS applicants are strongest in the social sciences and humanities and UTE applicants are almost exclusively focused on the latter domain. Applicants from other organizations distribute their research fairly well across the domains. The ratios of approved to not approved applicants are fairly similar across the research domains: 0.5 in biology and medicine and mathematics, natural and engineering sciences, and slightly higher (0.58) in the social sciences and humanities. In the ETH domain (0.65) and in cantonal universities (0.61) they are notably higher than in other organizations (0.5), UTE (0.48) and above all UAS (0.26) – in other words, whereas in the ETH domain and universities there are six to seven approved for ten rejected applicants, in UAS there are only two to three approved for ten rejected applicants.

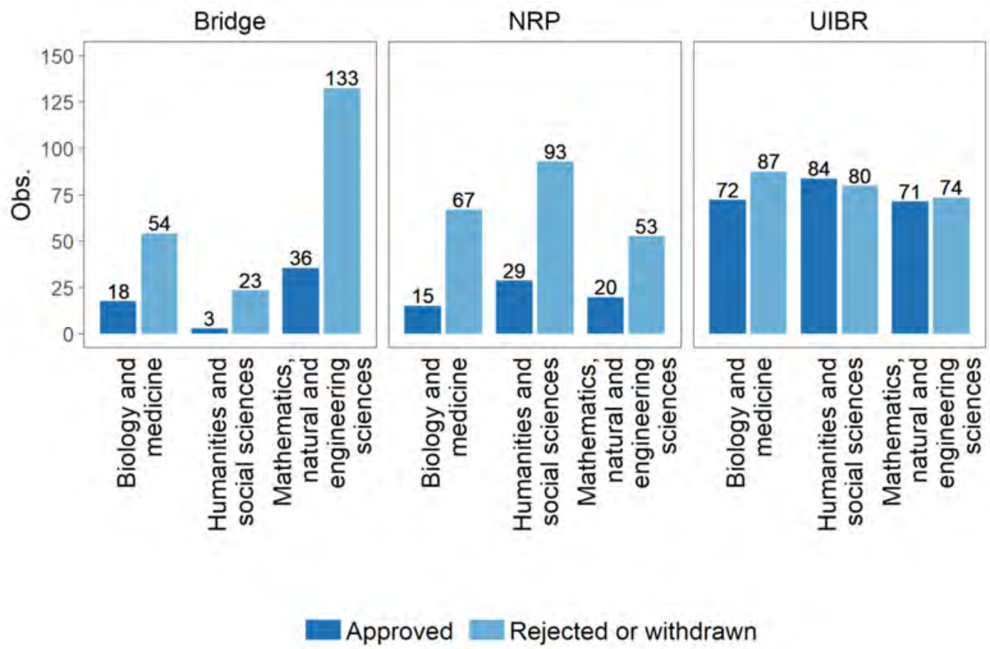
Figure 11 shows the same data but differentiated by the three funding instruments included in the survey. For UIBR the ratio of approved to rejected applicants is close to one (0.95). For Bridge and the NRPs the ratio is on average 0.3. Humanities researchers and social scientists fared worse in Bridge (ratio of 0.13 approved/rejected applications) and biological and medical applicants in the NRPs (0.22).

Figure 10. Applicants by organization type, domain of research* and funding status



*Multiple domains of research possible per applicant
Source: FHNW-survey among SNSF-applicants 2021.

Figure 11. Applicants by funding instrument, domain of research* and funding status

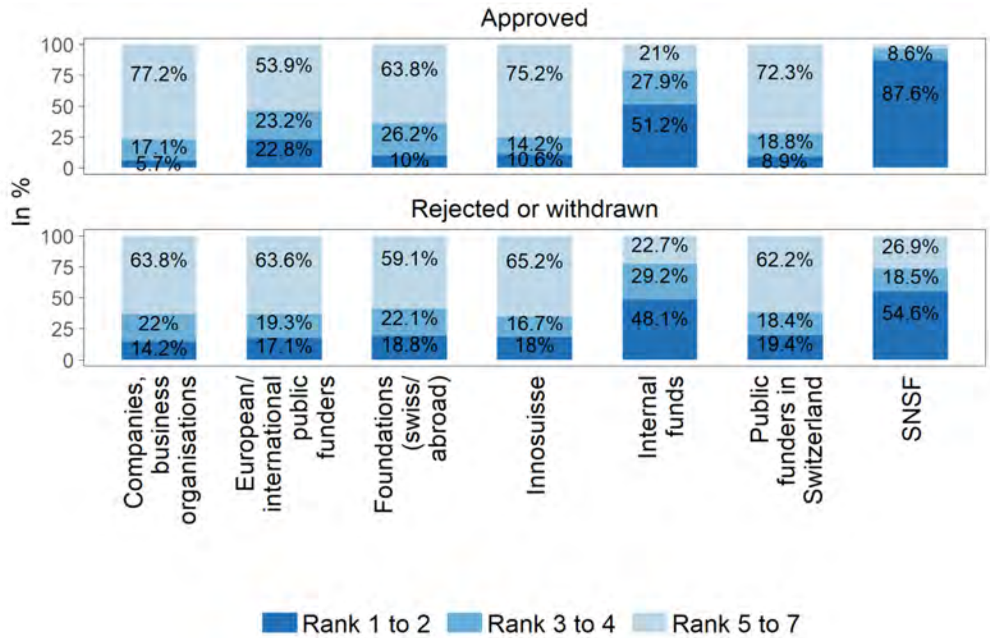


*Multiple domains of research possible per applicant
Source: FHNW-survey among SNSF-applicants 2021.

Importance of different funding sources

The importance of funding sources for the applicants depends on several influences, such as the type of research that scientists do, their degree of international connectedness (EU funding), or success with funding applications. Figure 4 shows, as we would expect, that scientists with at least one approved SNSF application in any of the four instruments included in this study ranked SNSF funding more often among their three most important funding sources (88%) than scientists which did not have any approved applications (55%). Internal funds, the second most important funding source, are very similarly ranked in both groups. European or other international public funding was considered the third most important funding source by applicants with approved SNSF applications, whereas applicants with rejected applications ranked this funding source on average lower. These scientists gave higher ranks to other public funding bodies in Switzerland, other foundations, Innosuisse and companies and business organizations than applicants with approved applications. Thus, we see a concentration on SNSF funding and some additional European funding among the successful applicants, and also high importance of SNSF funding but overall a broader funding base among the unsuccessful (only with regard to the four instruments of the analysis and the reference period 2017-20) applicants.

Figure 12. Importance of funding sources by approval status of the applicants' SNSF applications in %



Source: FHNW-survey among SNSF-applicants 2021.

Researcher quadrant according to Stokes

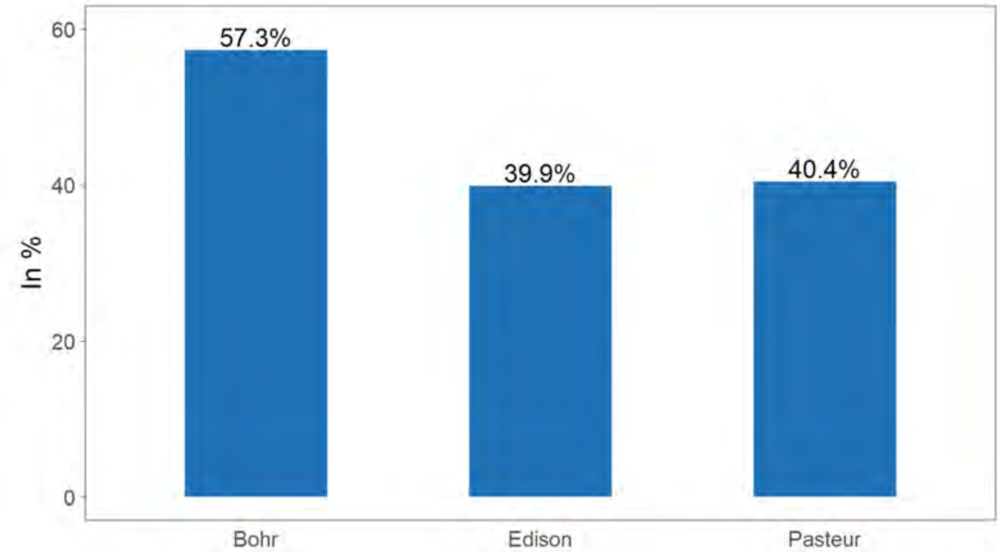
On the basis of the question about the motives of the research distinguishing between the quest for fundamental understanding and considerations of use we applied Stokes' (1997) model and distinguished the four types of researchers as shown in Table 20. The distribution of researchers across the types reflects the specific characteristics of the study population: more than three quarters can be included in the group of use-inspired basic researchers (Pasteur's quadrant). Bohr's quadrant and Edison's quadrant researchers are minorities. If we differentiate these researcher types by the status of their applications between researchers with at least one approved application and researchers without any approved applications, we find considerable differences (Figure 13): the share of applicants with approved applications is highest among the Bohr's quadrant researchers (57%) and lower among both, Pasteur's and Edison's quadrant (40%). However, this result was not confirmed in the multivariate regressions, which means that motivational disposition is an expression of other factors influencing approval and does not have an independent effect.

Table 20. Applicants according to Stokes' Quadrant model of scientific research

Research inspired by:		Considerations of use	
		No	Yes
Quest for fundamental understanding	Yes	129 (13%) Pure basic research (Bohr)	732 (76%) Use-inspired basic research (Pasteur)
	No	4 (0.4%)	98 (10%) Pure applied research (Edison)

Note: 963 valid observations out of 966, 3 missing values.
Source: Stokes (1997), FHNW-survey among SNSF-applicants 2021.

Figure 13. Applicants with approved applications by researcher type in %



Source: FHNW-survey among SNSF-applicants 2021.

Experiences outside of science in business, governmental positions, or others

The survey participants were asked in two separate questions whether they have held functions in and for business enterprises and/or for government institutions, non-profit organizations, or other organizations outside academia (excluding companies) in their professional lives. Table 21 shows the results for functions in business enterprises and Table 22 for functions in other organizations. Applicants with approved applications have been more often founders of companies and members of boards of directors or supervisory bodies than applicants with rejected applications. Applicants with rejected applications more often have held positions in government institutions, non-profit organizations or other organizations than applicants with approved applications (Table 22).

Table 21. Applicants by functions in and for business enterprises held in their professional lives and funding status of the application in %

	Approved		Rejected or withdrawn		Total	
	Obs.	in %	Obs.	in %	Obs.	in %
Employee	102	36.8	212	39.8	314	38.8
Management function	59	21.3	123	23.1	182	22.5
Founder of a company	73	26.4	94	17.6	167	20.6
Member of a board of directors or supervisory body	53	19.1	69	12.9	122	15.1
Member of a Scientific Advisory Board	80	28.9	137	25.7	217	26.8
Other function	21	7.6	40	7.5	61	7.5
No function in a commercial enterprise	88	31.8	194	36.4	282	34.8
Non-responses	0	0	0	0	0	0
Total	277	100	533	100	810	100

Note: Multiple functions were possible and the sum of positive responses is therefore larger than the total.

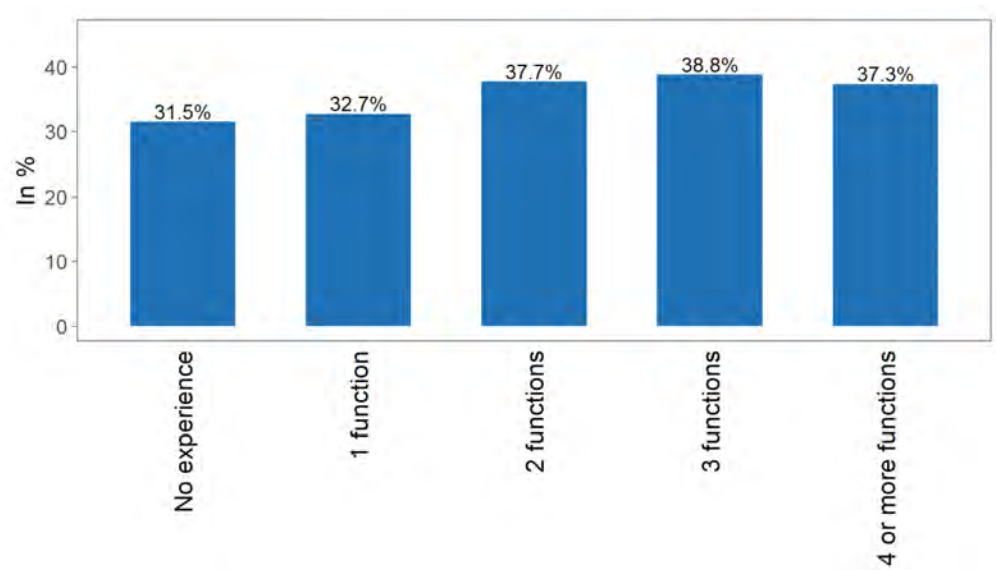
Table 22. Applicants by functions in and for government institutions, non-profit organizations or other organizations outside academia (excluding companies) held in their professional lives and funding status of the application in %

	Approved		Rejected or withdrawn		Total	
	Obs.	in %	Obs.	in %	Obs.	in %
Employee	75	27.1	176	33.0	251	31.0
Management function	68	24.5	155	29.1	223	27.5
Founder of an organization	22	7.9	49	9.2	71	8.8
Member of an advisory or supervisory body	67	24.2	147	27.6	214	26.4
Member of a Scientific Advisory Board	99	35.7	165	31.0	264	32.6
Other function	22	7.9	52	9.8	74	9.1
No function in such organizations outside of science	84	30.3	149	28.0	233	28.8
Non-responses	0	0	0	0	0	0
Total	277	100	533	100	810	100

Note: Multiple functions were possible and the sum of positive responses is therefore larger than the total.

In the multivariate regressions we also found that applicants belonging to the group with approved applications held generally more functions in private enterprises than applicants belonging to the group with rejected applications (see Figure 14).

Figure 14. Applicants with approved applications by number of functions held in business enterprises in %



Source: FHNW-survey among SNSF-applicants 2021.

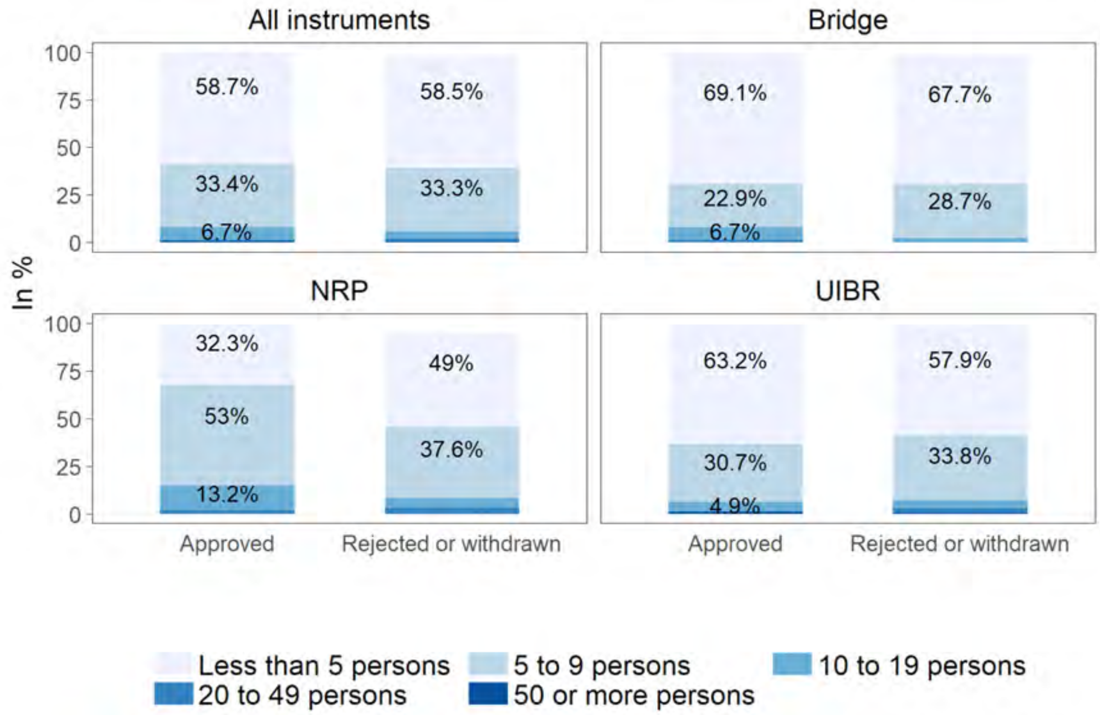
4.2.3 Funding status by characteristics of the applications

The survey included two sections on the preparation of an SNSF-application by the respondents and on the application itself (e.g., on the size, planned activities, or planned results). We first differentiate a few structural characteristics of the applications/projects between funded and unfunded applications and then take a closer look at the attributes of the applications/projects that relate to the value chain.

Structural characteristics of the applications/projects

Average application sizes, measured via team size, are similar across the funding instruments Bridge, NRP, and UIBR. The majority of applications included up to nine persons in the application team. Approved Bridge and NRP applications seem to be a little bit bigger than rejected applications. However, this might be a consequence of the application decision which permitted the resulting projects to start and eventually grow beyond the originally planned size (and making it difficult for the survey respondents to give the teams size as included in the application).

Figure 4. Applications by funding instrument, funding status and team size in %



Source: FHNW-survey among SNSF-applicants 2021.

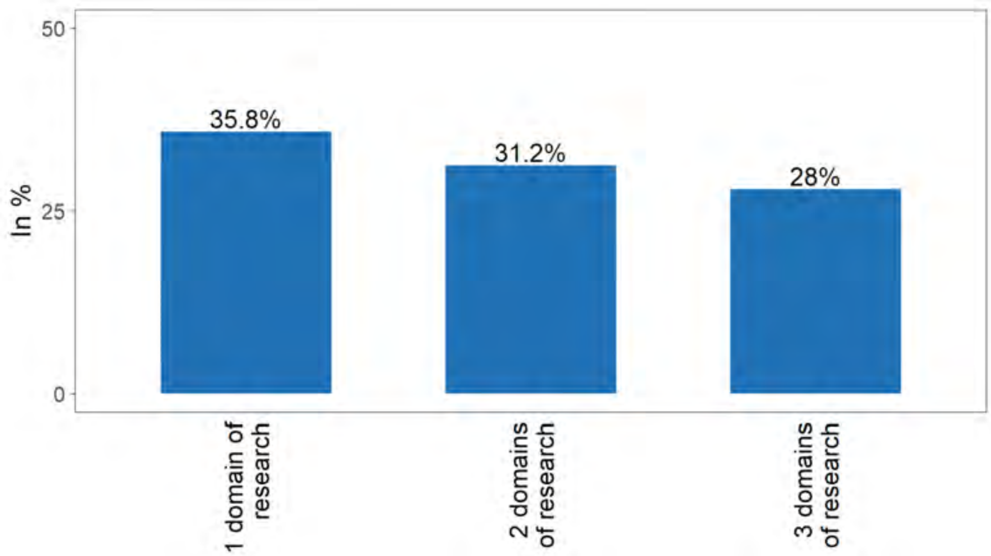
As explained in section 3.3, the following characteristics strike us as particularly important from the value chain perspective:

1. Interdisciplinarity of applications
2. Main activities of the planned projects
3. Main results of the planned projects
4. Technology readiness levels (TRLs) of the planned projects
5. Application-related or commercial maturity level of the planned projects
6. Cooperation with users or/and implementation partners in the planned projects

Interdisciplinarity of applications

We generated two measures for the interdisciplinarity of the applications: the first one measures in how many domains an application intended to do research (variable *interdis1*, see Figure 15) and the second counts the number of disciplines (variable *interdis2*, see Figure 16). Both graphics show that interdisciplinary projects were approved less often than projects within a single domain or discipline.

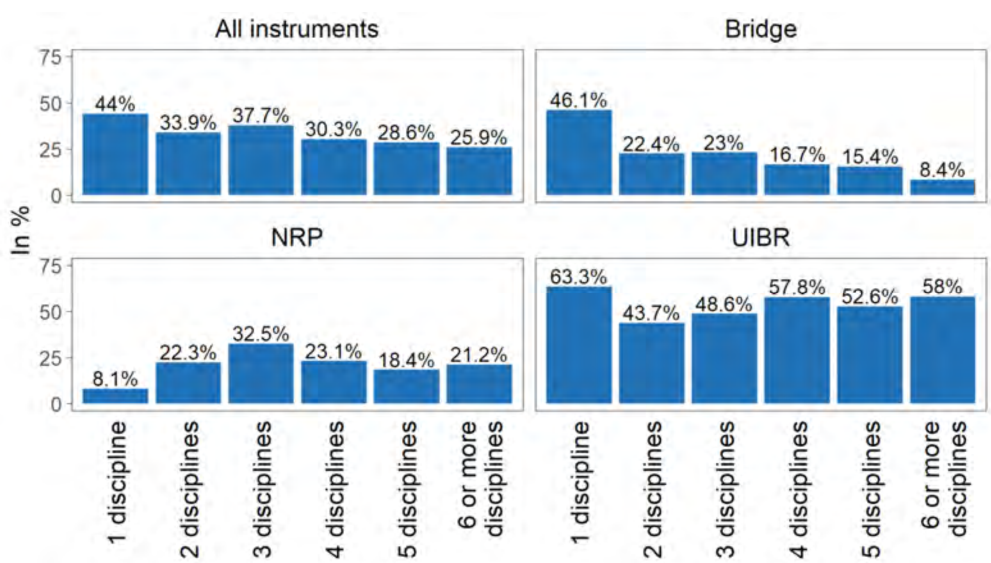
Figure 15. Approved applications by number of domains (*interdis1*) in %



Source: FHNW-survey among SNSF-applicants 2021.

However, differentiating the data by funding instrument shows that the patterns vary considerably across instruments. In Bridge applications with a single discipline were clearly most often approved and the more disciplines an application covered, the less often the applicants belong to the group of approved applicants (see Figure 16). For NRPs the largest share of approved applicants is among those who submitted applications with three disciplines. Applications for use-inspired project funding with a single discipline were most often approved, but those with four or more disciplines were almost as successful. This is key for interpreting the seemingly clear negative relationship between interdisciplinarity and approved applications across all instruments in the graphic. In fact, in the multivariate regressions we got a significant *positive* coefficient that indicates that interdisciplinary projects had *higher* chances for approval in the value chain oriented funding instruments. In this sense the bivariate graphic is only correct for Bridge and even misleading for all instruments.

Figure 16. Approved applications (*interdis2)* by funding instrument and number of disciplines in %



Source: FHNW-survey among SNSF-applicants 2021.

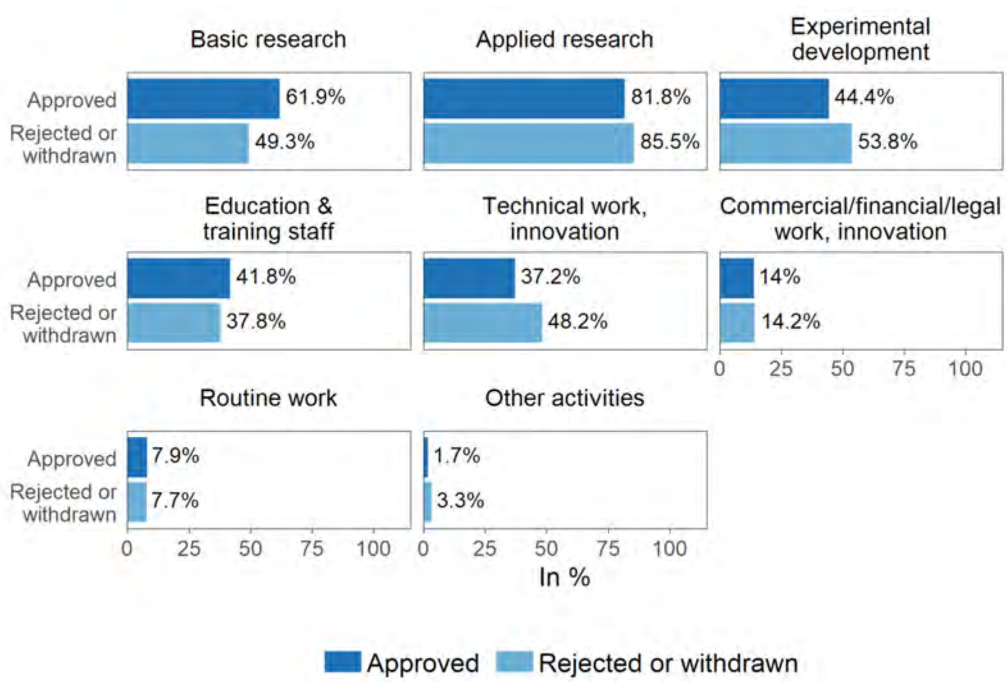
Main activities of the planned projects

Survey respondents were also asked to rate the importance of seven activities in their applications:

- Basic research, defined as experimental or theoretical work carried out primarily to gain new knowledge about the fundamentals of phenomena and observable facts, without a specific application or benefit in mind.
- Applied research is independent research conducted to gain new knowledge. It is primarily directed towards a specific practical goal or purpose.
- Experimental development is systematic work directed, on the basis of findings from research and practical experience, towards producing new materials, products and devices, installing new processes, systems and services or substantially improving those already produced or installed. It produces, for example, prototypes and pilot plants.
- Education and training of staff, excluding doctorates and post-docs which should have been counted as research.
- Technical work related to innovation is work that may be required for the transfer of scientific knowledge into innovations, e.g., routine tests, work on approval, toolmaking, engineering, industrial design, acquisition of equipment and instruments, production start-up, routine software development, etc.
- Commercial, financial or legal work related to innovation are, for example, market studies and advertising, drafting a patent specification, acquiring financing.
- Any kind of routine work is, e.g., routine examinations of specialist care, interviews, surveys, observations for general purposes in the public interest, routine testing for standardisation.

Applied research, basic research and experimental development were most often classified as important activities in the applications (see Figure 17). Notably, 61.9% of the applicants with approved applications classified basic research as important, compared to only 49.3% of the applicants with rejected applications. Education and training of staff were also relatively more common in the approved applications than in the rejected applications. For all other activities this is vice versa, most prominently for technical work related to innovation, which was more important in rejected applications.

Figure 17. Applications by activities rated as very important or important and funding status in %



Source: FHNW-survey among SNSF-applicants 2021.

Main results of the planned projects

The survey respondents answered a question on the results of the research projects proposed in the applications, distinguishing between seven possible types of results (see Table 23). Multiple results per project were possible and a follow-up question asked for the main result, which could be provided by 734 out of 810 respondents (91%), excluding the NCCR respondents again from the sample. By far the most common result was new knowledge and insights that for about half of all applicants was the key result of the application on which they reported. All other response options were listed less often. A pattern is also visible between the different result types, if we classify (a) and (b) as scientific results, (c) and (d) as technological results, and (e) and (f) as application results: whereas 40% of the proposed projects with scientific results was approved, only one third of the proposed projects with technological results and less than a quarter of proposed projects with applications/innovations as main results were approved (see Figure 18). The multivariate analysis confirmed that applicants with funding applications with a new application or innovation as the main result were more common among the group of rejected applicants.

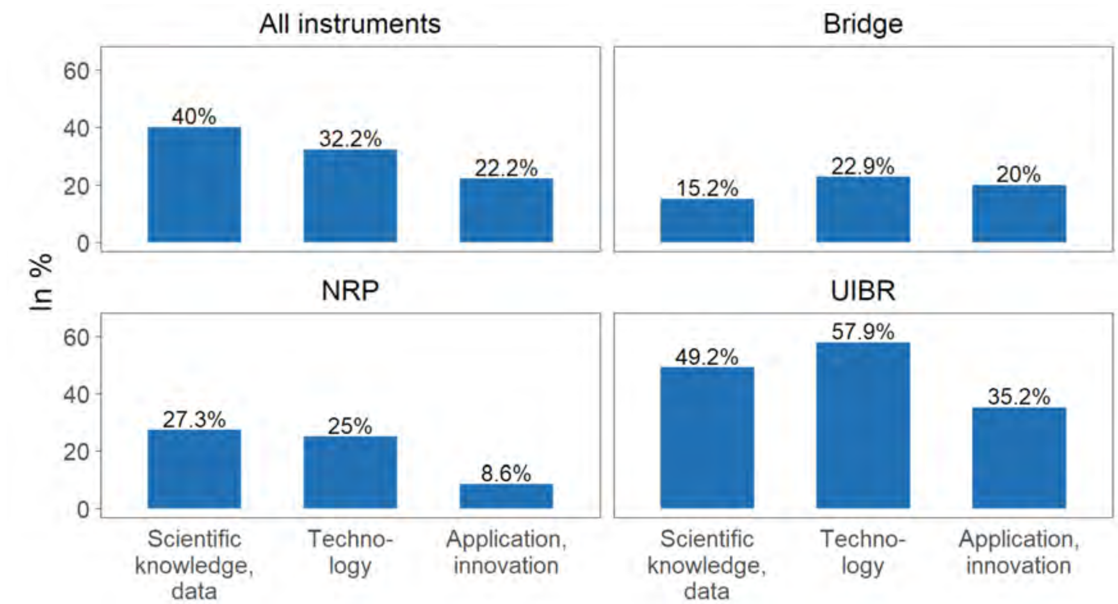
Table 23. Applications by funding status and main planned project result

	Approved applications		Rejected applications		Total		
	Obs.	In %	Obs.	In %	Obs.	In %	In %
(a) New data	10	41.7	14	58.3	24	100	3.0
(b) New knowledge and insights	155	39.8	234	60.2	389	100	48.0
(c) New technology	28	33.3	56	66.7	84	100	10.4
(d) Further development of an existing technology	15	30.6	34	69.4	49	100	6.0
(e) New application	12	23.5	39	76.5	51	100	6.3
(f) Marketable or practically immediately applicable innovation	25	22.1	88	77.9	113	100	14.0
(g) Other result	5	20.8	19	79.2	24	100	3.0
Missing values	27	35.5	49	64.5	76	100	9.4
Total	277	34.2	533	65.8	810	100	100.0

Source: FHNW-survey among SNSF-applicants 2021.

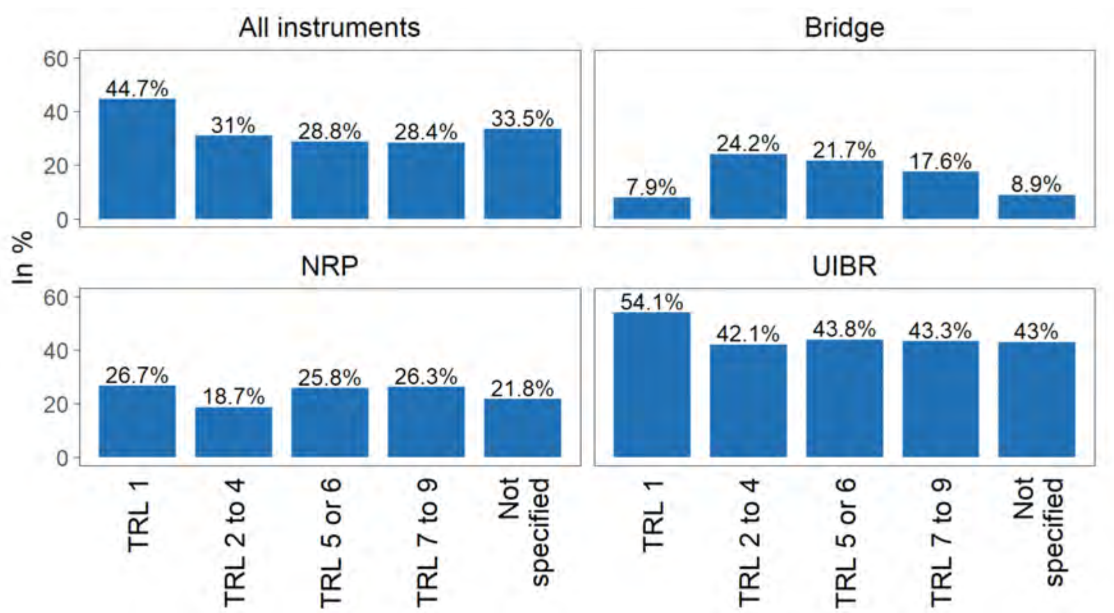
The picture gets considerably more differentiated, if we distinguish this information by funding instrument (see Figure 18). The overall pattern applies to NRPs where funding applications with an application/innovation as the main result were less often approved than applications with a scientific main result. In Bridge and UIBR there is no significant difference with respect to approval between applications referring to data and knowledge, technology, or an application or innovation as the main project result. For these two instruments the differences in the graph are not due to expected results, but to other overlapping variables.

Figure 18. Approved applications by funding instrument and main product of the proposed project in %



Source: FHNW-survey among SNSF-applicants 2021.

Figure 19. Approved applications by funding instrument and TRL of the proposed project in %



Notes: Percentages add up to more than 100, because multiple responses were possible.
Source: FHNW-survey among SNSF-applicants 2021.

Technology readiness levels TRLs of the planned projects

As pointed out in the methodology section of this report, Technology Readiness Levels (TRLs) have been used as a measure to compare the level of technical development in space research and beyond (see section 2.3, p. 11). The questionnaire included an overview of the nine TRLs which are commonly distinguished. The question itself grouped these nine levels into four groups, as we assumed that several respondents were not familiar with the concept and would find it difficult to assess the (planned) technical development level in detail (above all in non-technology fields).

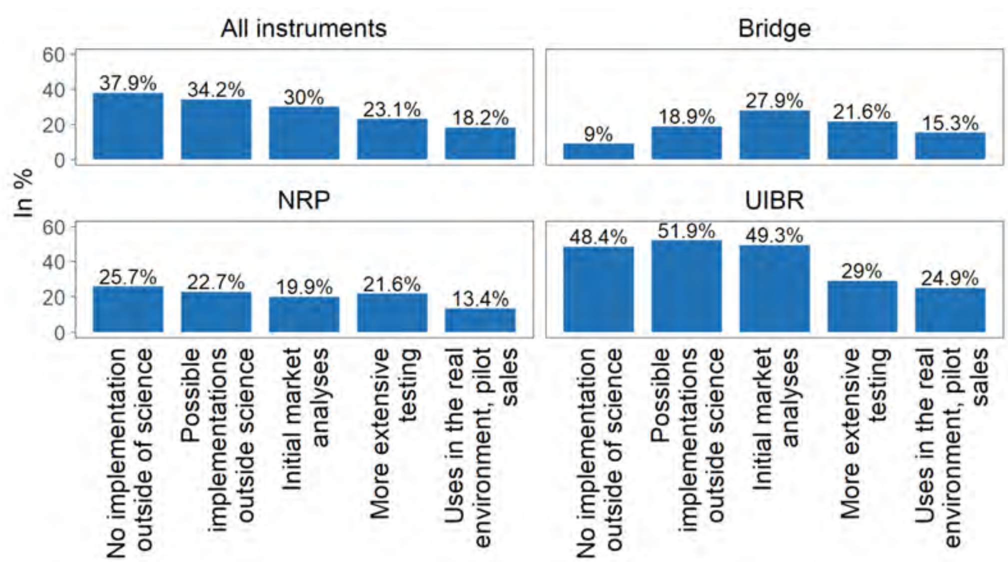
Comparing the share of approved applications across the different TRLs, we find that applications proposing projects with TRL 1 had higher success rates than applications with higher TRLs (see Figure 19, above). Above all for TRLs 5-6 and 7-9 the success rates are clearly lower than for applications with TRL 1 which is confirmed in the multiple regressions for all applications together, NRP and Bridge applications.

Use-related or commercial maturity level of the planned projects

Similar to the technology readiness levels use-related and commercial maturity levels (CMLs) have been used to evaluate the commercial or customer readiness and marketability of a new technological development. We asked respondents to rate the use-related/commercial maturity of their proposed project results according to five levels CML1-CML5 (see section 3.3).

In Figure 20 we report on the share of approved applications by use-related/commercial maturity. The graphic clearly shows that the lower the level of maturity, the higher were the chances of an application to obtain approval from SNSF. The multiple regressions confirmed for all instruments, as well as for UIBR, Bridge and NRP applications separately that higher commercial maturity levels were significantly more common in the group of rejected applications. In Bridge also applications with the lowest maturity level (level 1) in which implementation or commercialization are disregarded had lower chances of approval.

Figure 20. Approved applications by funding instrument and use-related/commercial maturity of the proposed project in %



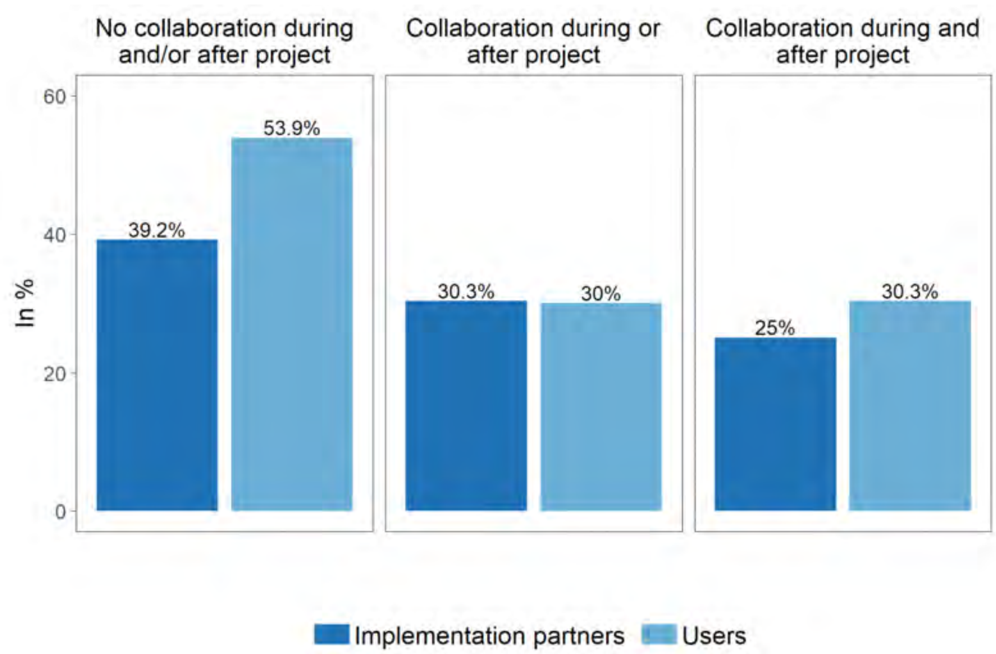
Notes: Percentages add up to more than 100, because multiple responses were possible.
Source: FHNW-survey among SNSF-applicants 2021.

Cooperation with users or/and implementation partners in the planned projects

In order to get further information on the importance of application and implementation in the proposed projects we asked the survey respondents whether either during project realisation or after the end of the project they planned to involve two types of partners: a) practitioners or users of the results and b) implementation or business partners.

We see from Figure 6 that the involvement of users goes hand in hand with a 24 percentage points lower share of approved applications – 54% compared to 30%. The involvement of implementation partners has a similar, but slightly smaller effect. It does not matter, whether implementation partners or users should have been involved during project realisation or after it. This result was not confirmed in the multiple regressions, i.e., other characteristics of the applicants and applications which also correlate with the involvement of implementation partners and users are actually responsible for this result.

Figure 21. Approved applications by involvement of implementation partners and users and time of involvement in the proposed project in %



Source: FHNW-survey among SNSF-applicants 2021.

General opinions towards SNSF value chain oriented funding

In Table 24 the frequency of comments on VCOF – on the instruments Bridge, NRP and NCCR and general comments – from the open-ended question 42 in survey 1 is shown (see Appendix 21 on the questionnaire and Appendix 23 on selected responses). Only few comments were made. Negative comments related for instance to the evaluation criteria and selection processes, positive comments more generally praise the instruments. Overall, the ratio of negative to positive comments is 4:1. Whereas this ratio is lower for respondents from the ETH domain, it is considerably higher for UAS respondents indicating a lower satisfaction with the VCOF instruments.

Table 24. Comments on SNSF implementation of VCOF by type of organization

	Negative comments on VCOF implementation		Positive comments on VCOF implementation		Ratio negative:positive	Total of comments by respondents to survey 1
	Obs.[a]	in %	Obs.[a]	in %		Obs.[a]
Cantonal University	7.1	5.7%	1.7	1.3%	4.3	124.9
ETH Domain	10.5	18.2%	4.2	7.3%	2.5	57.8
University of applied sciences UAS	8.0	12.6%	0.4	0.7%	19.1	63.2
University of Teacher Education UTE	0.0	0.0%	0.0	0.0%	nd	8.7
Other	2.3	18.9%	0.5	4.3%	4.4	12.1
Total	27.9	10.5%	6.8	2.5%	4.1	266.7

a Weighted data.

Summary

The analyses of the factors that explain whether applicants belong to the group with approved applications or rejected applications show that neither value chain oriented scientists nor value chain oriented applications have higher chances of approval. Scientists from universities of applied sciences and universities of teacher education have lower chances for having their applications approved than scientists from universities and from the ETH domain. Funding applications with an application or innovation as main result have lower approval chances and applications where the applicants planned to produce results with a high commercial maturity level have lower approval chances as well. Higher technology readiness levels are a disadvantage in the entire set of VCOF, but in in Bridge and NRP applications in particular. However, applicants' experiences in companies increased their chances of project approval significantly. This might suggest that the evaluation processes of value chain oriented funding applications find it easier to consider supportive characteristics of the applicants than of the applications. If applications deviate from standard features of (basic) research applications their chances for approval are reduced even in the value chain oriented funding instruments. This seems most pronounced in the applications to the NRPs and less so in UIBR applications.

4.3 Problems of underfinancing

While section 4.2 focused on the most far-reaching form of underfinancing of research, namely the full rejection of a funding application, this section takes a slightly less extreme conceptualisation. We measure underfunding in three different ways:

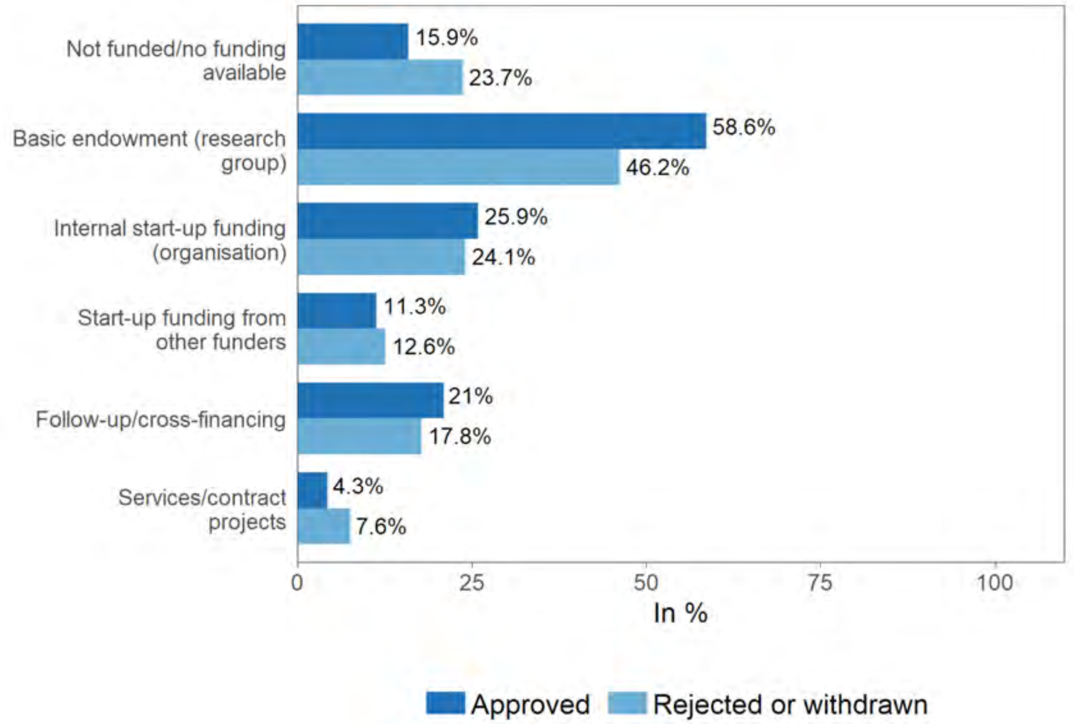
1. All applicants of the value chain oriented funding instruments were asked whether they had access to pre-financing for the application they had submitted to SNSF (section 4.3.1).
2. The applicants with approved applications where asked whether they encountered specific funding restrictions during or after project approval (section 4.3.2).
3. The applicants with rejected applications were asked whether they found alternative means for realising the application which had been rejected by SNSF (section 4.3.3).

4.3.1 Pre-financing of funding applications

We know from previous research that the availability of funding for applications, be it the general funding situation of an organization or its access to third-party funding for writing grant applications, influences the quality of the resulting applications and application success (Enger & Castellacci, 2016; Laudel, 2006).

The survey of SNSF applicants included a question which asked for the sources that were used to pre-finance the application and its submission to the value chain oriented funding instrument. One fifth of the respondents stated that they did not have any funding for writing the application. By far the most common funding source was internal funding, included in the questionnaire as "funding from the basic endowment of the research group" followed by "internal start-up funding for research projects from your organization" (see Figure 22). We also see that applications without pre-funding are more frequent in the group of rejected applications than in the group of approved applications. Above all funding from the basic institutional endowment correlates positively with being in the group of funded applications.

Figure 22. Pre-financing of applications by funding status and sources in %



Source: FHNW-survey among SNSF-applicants 2021.

Table 25. Availability of sources for pre-financing SNSF applications by organization type in %

	Cantonal university	ETH Domain	UAS	UTE	Other	Total
Not funded, no funding available	25.3	9.2	23.7	22.5	18.8	25.3
Basic endowment of the research group	48.5	69.1	35.0	48.2	45.5	48.5
Internal start-up funding (organization)	23.1	16.9	40.5	36.3	25.0	23.1
Start-up funding from other funders	14.3	11.6	6.4	5.9	15.0	14.3
Follow-up/cross-financing	18.7	25.1	16.8	1.0	10.8	18.7
Services/contract projects	4.7	8.2	6.8	3	9.4	4.7

Differentiating the availability of pre-financing by the type of organization to which the respondents are affiliated shows that across all institution types one fifth to one fourth of the applications were written without such pre-financing (see Table 25). Only in the ETH domain this share is considerably smaller, i.e., no pre-funding applies to less than one out of ten applications. The basic endowment is the main funding source in the ETH domain and was used by 70% of the applicants. In cantonal universities, universities of teacher education (UTE) and other research organizations about half the applications were funded in this way. Only in universities of applied sciences (UAS) this share was lower and actually less important than internal start-up funding for research projects. Internal funding for starting research projects was also common in UTE. External funding for putting together research applications is less important and in UTE even virtually non-existent. Merely follow-up or cross-financing from funded research projects is important, above all in the ETH domain and cantonal universities where it is used by a quarter respectively one fifth of the applicants. If we distinguish the frequency of these sources of pre-financing at different types of organizations between approved and rejected/withdrawn applications, we see that the availability of a basic endowment for research was important across the board, but particularly for other organizations (see Appendix 19 and Appendix 20). Follow-up or cross-financing had a positive effect on the approval chances for applications from other organizations as well, but not for applications from UAS. This could be explained in different ways: either the follow-up/cross-funding is of a different nature (size, purpose) or the applications generated with follow-up/cross-funding differ between UAS and other organizations with regard to characteristics relevant for approval.

4.3.2 Underfunding of approved applications

In order to identify the frequency of situations of underfunding we asked the participants of survey 1 four questions about possible reasons for underfunding of their applications:

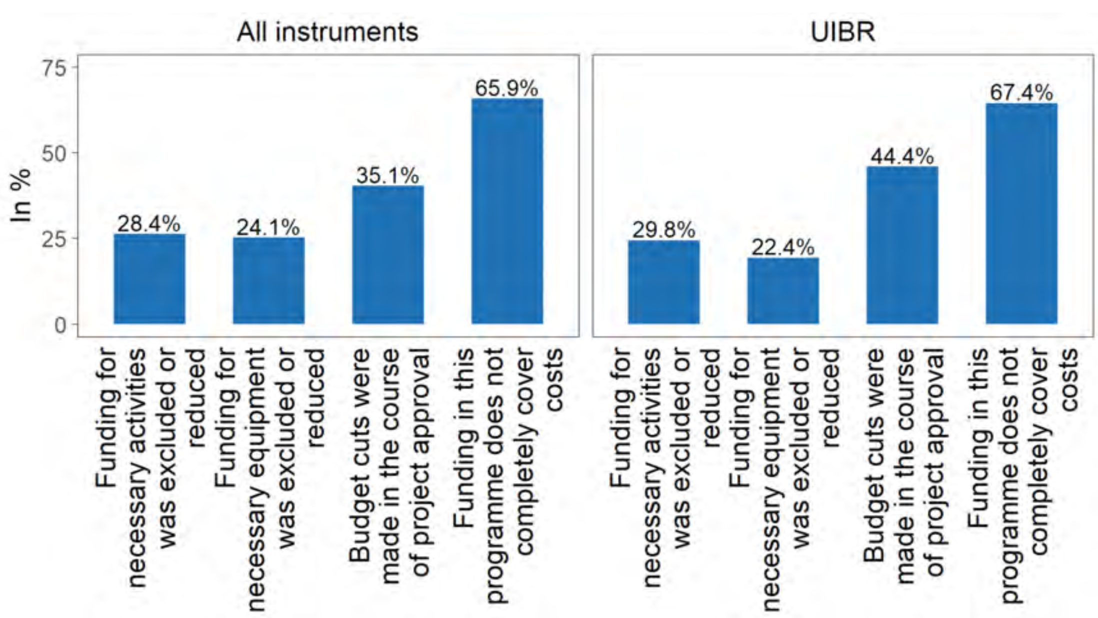
- Reason 1: The specific funding guideline excluded funding for certain necessary activities altogether or provided only partial funding.
- Reason 2: The specific funding guideline excluded funding for certain necessary equipment or consumables altogether or provided only partial funding.
- Reason 3: Budget cuts were made in the course of project approval.
- Reason 4: The funding in this programme does not completely cover costs.

We limited the analysis of underfunding to applicants with approved applications for the four funding instruments UIBR, Bridge, NRPs and NCCRs. Responses from rejected or withdrawn applications were excluded, as we expected that the respondents might have found it challenging to recall such details of a rejected application. Moreover, rejected applications have in many cases not led to research projects (as we will show below).

Figure 23 compares the reasons for underfinancing. Overall, two thirds of the respondents said that the funding programme to which they applied does not completely cover the costs. Approximately one quarter of the respondents agreed that certain necessary activities were not or only partially funded; a slightly smaller share said this about necessary equipment. Budget cuts were experienced by 35% of the respondents.

We get comparable percentages for UIBR applications; only budget cuts seem to be slightly more common for this instrument. The numbers of approved applications for the other value chain oriented funding instruments are too small to be analysed separately.

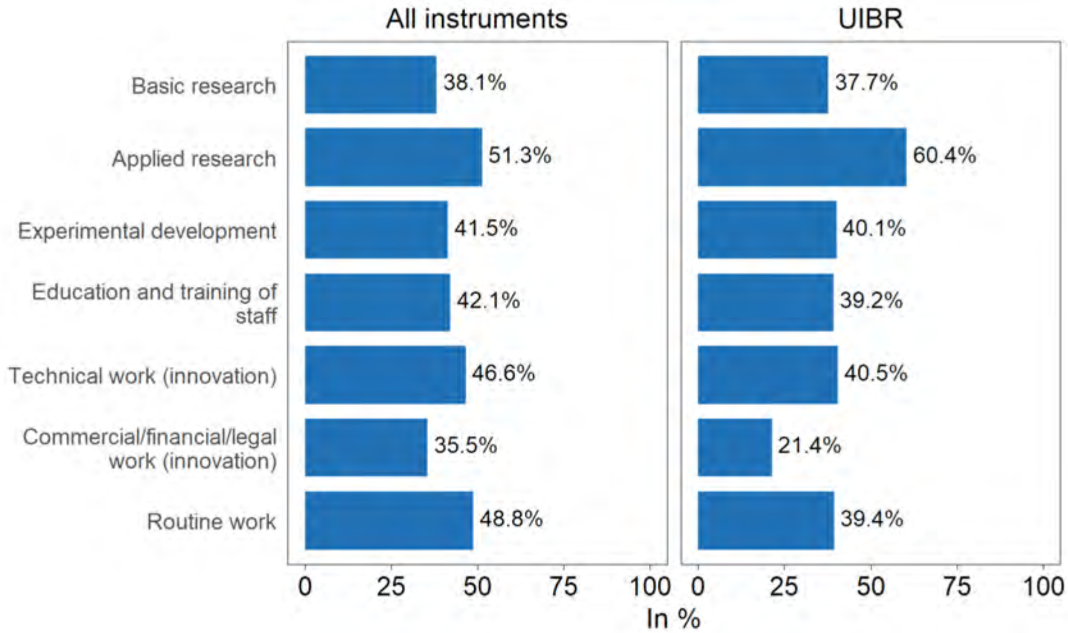
Figure 23. Reasons for underfunding across all funding instruments and for UIBR in %



Source: FHNW-survey among SNSF-applicants 2021.

If we ask those who agreed that any of the four reasons for underfunding is relevant, which activities were affected by the underfunding, we obtain the picture shown in Figure 24. Funding restrictions affected most often applied research and development, and least often commercial, financial and legal work related to innovation. The other activities were affected to more or less the same degree.

Figure 24. Activities affected by underfunding across all funding instruments and for UIBR in %



Source: FHNW-survey among SNSF-applicants 2021.

Reasons for underfunding

To evaluate the influences on underfinancing we conducted multivariate logistic regressions on the four reasons:

- *ufin1*: combines reasons 1 and 2 and measures whether respondents agree that the funding guideline excluded/reduced funding for certain necessary activities or equipment,
- *ufin2*: budget cuts were experienced during project approval,
- *ufin3*: funding in the programme does not completely cover the costs.

The variables measure slightly different aspects of underfunding: *ufin3* is formulated in very general terms and can be understood as an expression of general problems with regard to co-funding SNSF research projects. *Ufin2* is very narrowly evaluating whether there have been budget cuts during project approval. *Ufin1* stands between both. The results of these estimations are summarized in Table 26. They do not paint a clear picture of an underfunding problem for applicants or applications that focus on the value chain. This would be the case if, for example, applications with higher TRLs, higher commercial maturity levels, or applications/innovations as projected results were more frequently affected by underfunding. This is not the case. Still, some of the results are noteworthy.

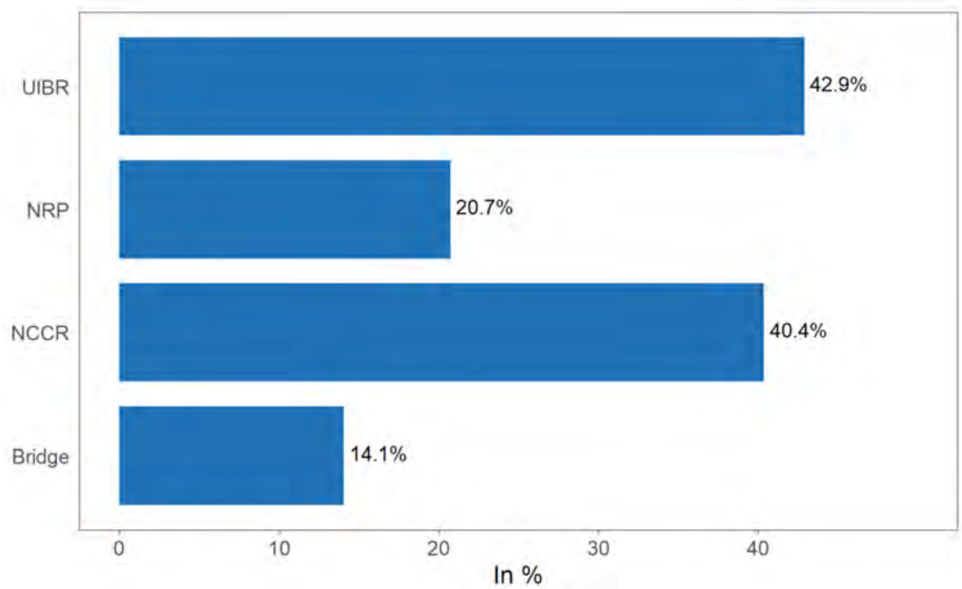
Table 26. Estimation results, dependent variables *ufin1*, *ufin2* and *ufin3*[a]

	All instruments			UIBR		
	ufin1	ufin2	ufin3	ufin1	ufin2	ufin3
Intercept	–	–		–		+
Characteristics of the applicants						
Age of applicant			+			+
Function of the applicant						
Head of Institute, dep., etc.	+	+				
Group leader		+				
Lecturer, Senior scientist, PI		+	–	–	–	
Post-doc, doctoral student	Intercept					
Other						
Type of organization						
Cantonal university	Intercept					
ETH domain	–			–		
UAS or UTE	+		+	+		
Other organization		–	+		–	
Type of researcher						
Bohr’s quadrant researcher	Intercept					
Pasteur’s quadrant researcher	–		–			
Edison’s quadrant researcher		–		–		
No of. functions in/for businesses						
Characteristics of the applications						
Funding instrument						
NCCR		+				
Bridge	Intercept					
NRP						
UIBR		+				
Size of research team						
Size of research team < 10		–	–			–
Size of research team 10-19	Intercept					
Size of research team ≥ 20						
Interdisciplinary applications				+		
Importance of activities						
Basic research						
Applied research				+		
Experimental development	+		+			+
Edu. and training of staff			–	+		
Tech. work related to innovation					+	
Commercial, financial or legal work related to innovation						+
Routine work		+		+		
Pilot user tests, production preparation, partnerships with customers (CML 4)			–			–

	All instruments			UIBR		
	ufin1	ufin2	ufin3	ufin1	ufin2	ufin3
Technology Readiness Levels TRL of the planned project results						
TRL 1		–			–	–
TRLs 2-4						
TRLs 5-6						
TRLs 7-9		+	+			
TRL not answered	Intercept					

a Only stable results are shown. Full estimation results are shown in Appendix 13 to Appendix 18. Variable specifications are shown in Appendix 3. Greyed out control variables were excluded.

Figure 25. Budget cuts (*ufin2*) in approved applications by funding instrument in %

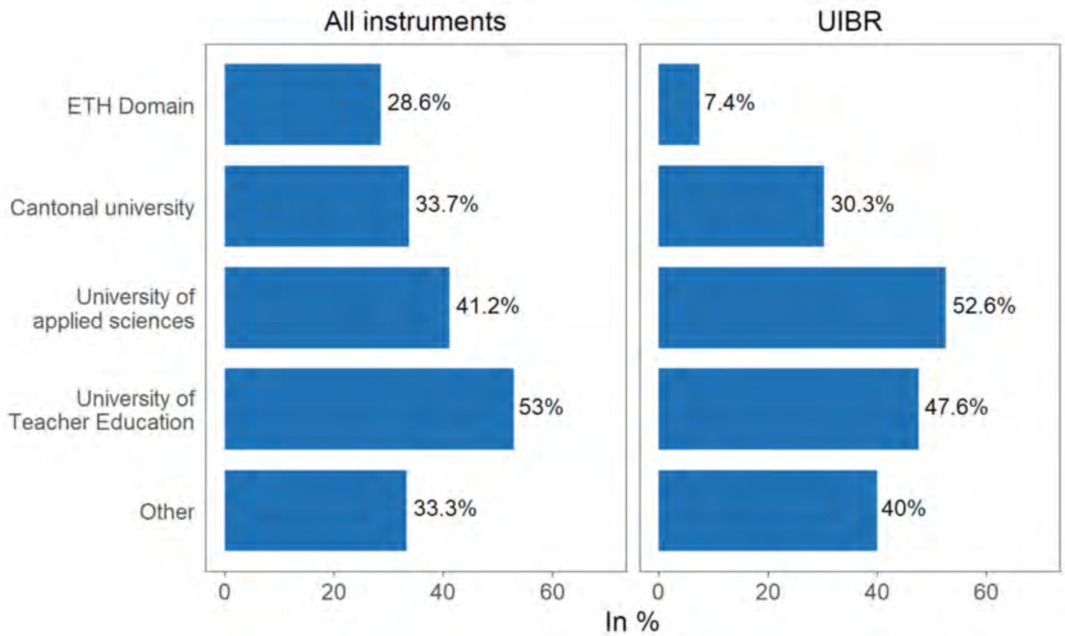


Source: FHNW-survey among SNSF-applicants 2021.

1. Differentiating the three underfunding variables between the funding instruments we do not get any significant results for *ufin1* and *ufin3*, but respondents assessed the funding instruments differently with regard to budget cuts (*ufin2*): they mentioned such cuts significantly more often for approved use-inspired basic research and for NCCR applications than for Bridge and NRP applications (see Figure 25). In fact, more than 40% of the respondents with approved UIBR and NCCR applications pointed to budget cuts, compared to only 20% of applicants with approved NRP applications and 14% of the successful Bridge applicants.

2. In Figure 26 we compare the frequency of experiencing underfunding of necessary activities or necessary equipment (*ufin1*) by organization type. As the regressions also confirmed, applicants from the ETH domain encountered less often underfinancing across all instruments and in relation to applications for use-inspired basic research UIBR. Applicants from UAS and UTE, in contrast, encountered underfunding more often. They also more often agreed to the statement that “The funding in this programme does not completely cover costs.”, which points to a generally tight funding situation.

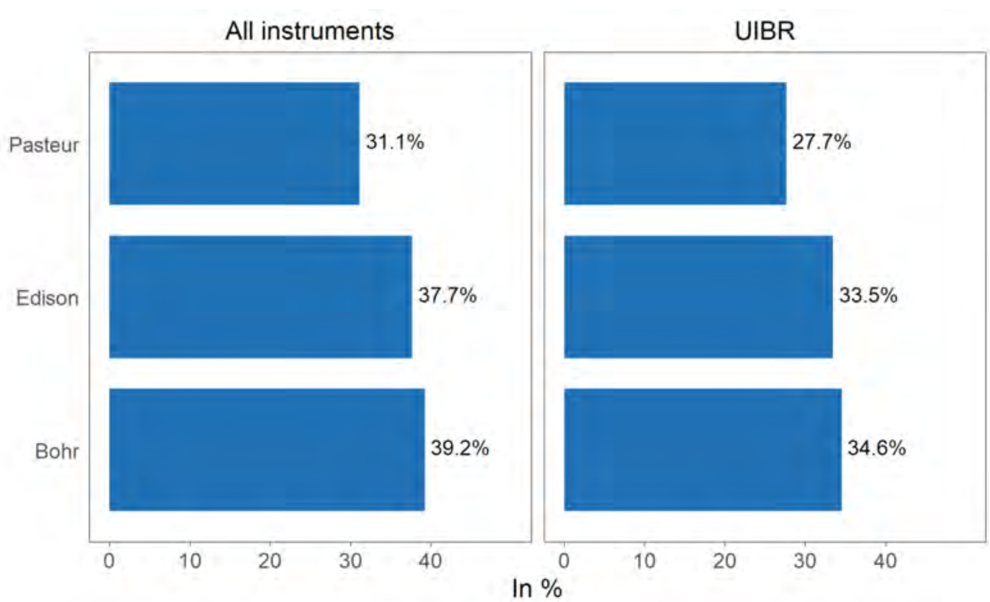
Figure 26. Underfunding of necessary activities or necessary equipment (*ufin1*) in approved applications to all instruments and to UIBR by organization type in %



Source: FHNW-survey among SNSF-applicants 2021.

3. Moreover, the motivations of scientists, differentiating between a focus on fundamental understanding of phenomena and interest in use and practical benefits, also correlate with experiencing underfunding. Pasteur's quadrant scientists with a focus on both, fundamental understanding and societal use and practical benefits, *less* often experienced underfunding of activities and/or equipment (*ufin1*) across all included funding instruments than Bohr's quadrant scientists who concentrate on fundamental understanding (see Figure 27). The same applies for Edison's quadrant scientists which primarily consider the immediate fulfilment of a social need and practical benefit in applications to use-inspired basic research funding – though the differences in Figure 27 are rather small, they were significant in the multivariate regressions which controlled for other influences (see Table 26).

Figure 27. Underfunding of necessary activities or necessary equipment (*ufin1*) in approved applications to all instruments and to UIBR by researcher type (Bohr, Pasteur, Edison) in %

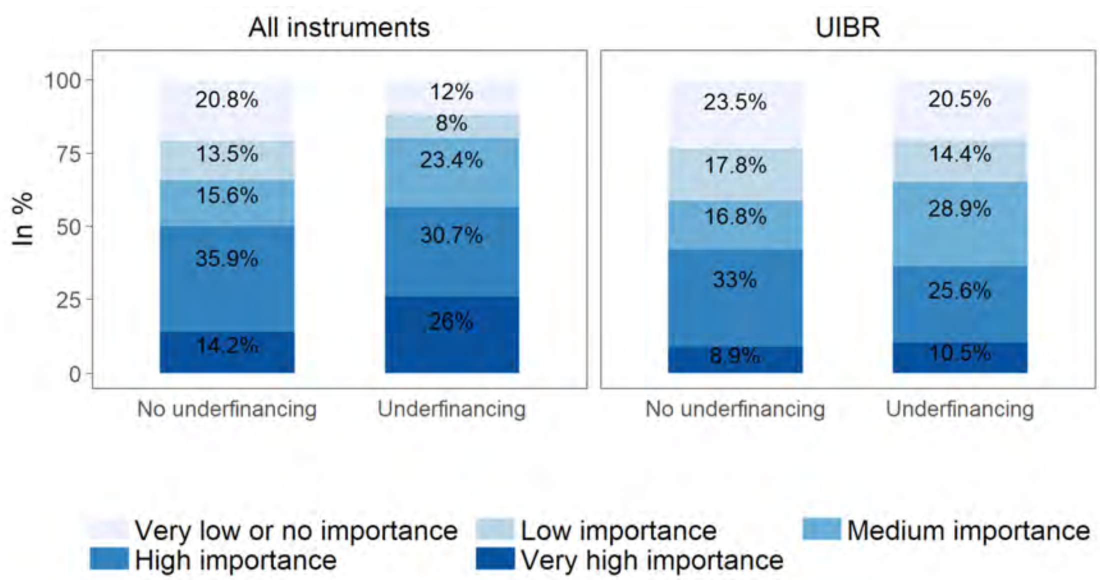


Source: FHNW-survey among SNSF-applicants 2021.

This result signals that the value chain-oriented funding instruments included in the analysis are designed in terms of funding guidelines in such a way that they positively reward the society-oriented and practical motivations of Pasteur's and Edison's quadrant scientists when they are reflected in their funding applications.

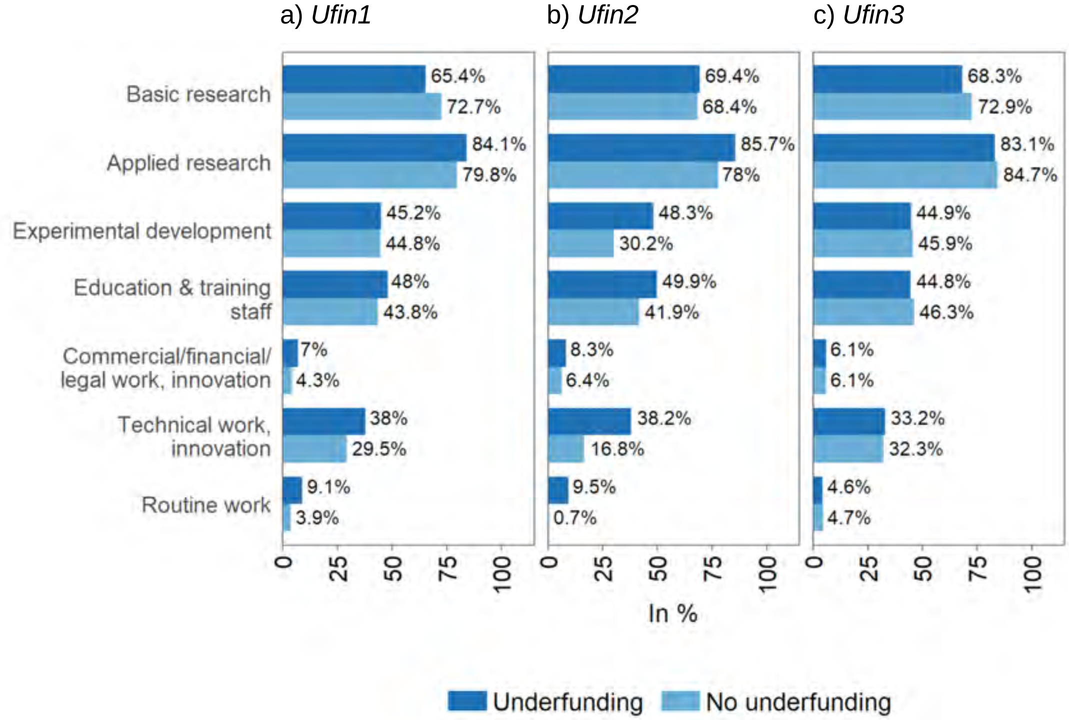
4. We also asked the survey respondents to rate the importance of seven activities in their applications (basic research, applied research, experimental development, education & training of staff, technical work related to innovation, commercial, financial or legal work related to innovation, routine work). Relating the importance of these activities to the relevance of underfinancing of activities and/or equipment (*ufin1*) does not produce any clear patterns for most activities (see Table 26). An exception is experimental development (see Figure 28): the more important this was, the more often the respondents encountered underfunding problems with regard to their applications. We do not see this, however, in the sub-sample of applicants to UIBR – UIBR contributed 155 of the 363 observations in these estimations which implies that the other instruments, Bridge, NCCR and NRP, were particularly critical to funding experimental development. However, UIBR applicants who stressed the high importance of applied research, education and training of staff and any kind of routine work were more likely to encounter funding constraints regarding activities and/or equipment than UIBR applicants who did not stress these activities. UIBR applicants who stressed the importance of technical work related to innovation (e.g., routine tests, work on approval, toolmaking, engineering, industrial design, production start-up etc.) more often pointed to budget cuts (*ufin2*) than those who gave these activities little importance (see Figure 29).

Figure 28. Importance of experimental development by funding instrument and underfinancing (ufin1) in %



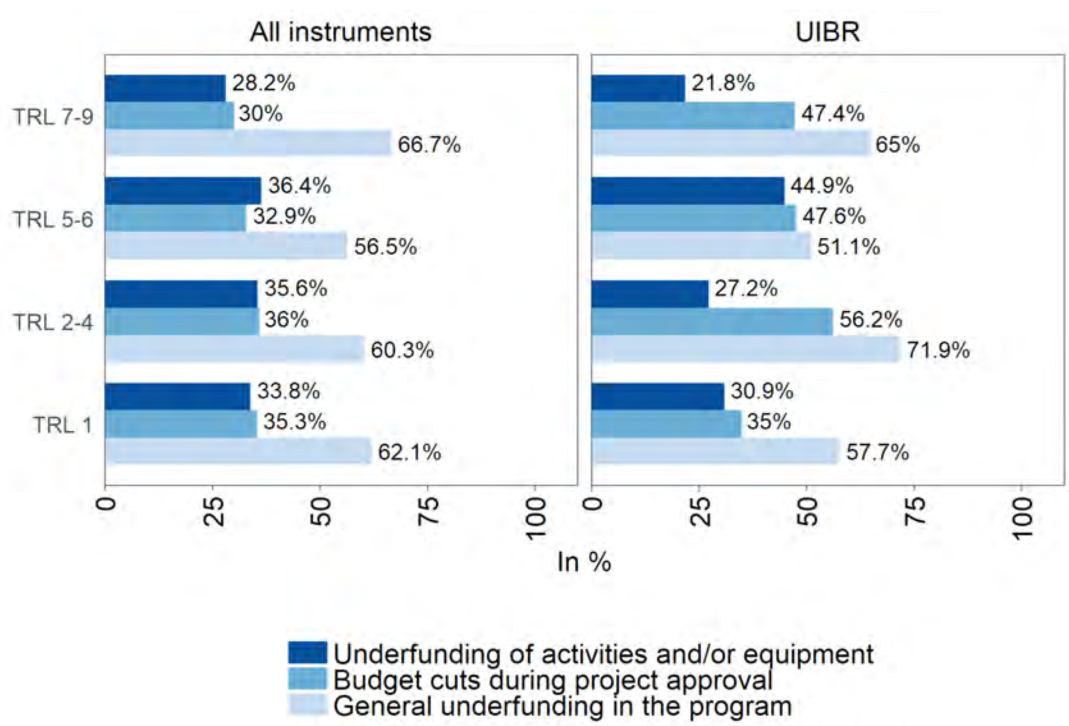
Source: FHNW-survey among SNSF-applicants 2021.

Figure 29. Share of respondents which rated an activity in a UIBR application as very important or important by underfinancing (*ufin1, ufin2* and *ufin3*) in %



Source: FHNW-survey among SNSF-applicants 2021.

Figure 30. Underfunding in approved applications to all instruments and to UIBR by type of underfunding (*ufin1, ufin2, ufin3*) and projected TRL in %



Source: FHNW-survey among SNSF-applicants 2021.

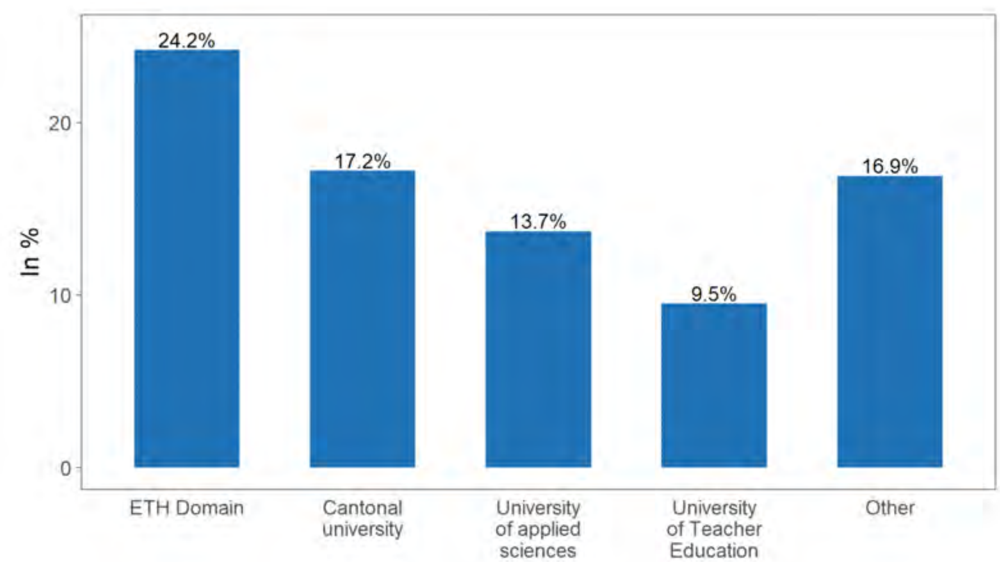
5. Another interesting result from the value chain perspective refers to how much applications were affected by underfunding problems depending on the projected TRLs of their results. As the regressions showed, applications with TRL 1 ("Basic principles observed and reported") which is still far from

any application and closely related to generating basic research results experienced less often budget cuts (*ufin2*) and general funding problems (*ufin3*) than applications with higher TRLs (see Table 26, above). On the other hand, applicants with (approved) funding applications with the highest TRLs 7-9, i.e., applications that intended to integrate the resulting knowledge/technology (prototype, demonstrator) into a relevant system, test it and demonstrate the applicability in the system context, encountered more often funding problems (*ufin2* and *ufin3*). This applies across all instruments and for UIBR only (see Figure 30). Note that the seemingly lower appearance of underfunding of activities and/or equipment (*ufin1*) for TRL 7-9 compared to the other levels is not significant and can be explained by other characteristics of the applications.

4.3.3 Funding of rejected applications

Respondents of rejected/withdrawn applications were also asked whether they have found other funding sources for these applications. Only 18% of those answering this question (97 out of 548) agreed that they have obtained funding for the project in the meantime and more than half of these pointed to internal funding sources. Other external funding sources were mostly of minor importance (see Appendix 21, question 24-25). The share of applicants who were successful with obtaining funding was one quarter among respondents from the ETH domain, on average for respondents from universities and other organizations, and below average from respondents from UAS and UTE (see Figure 31). This implies that for respondents from UAS and UTE it is most difficult to find alternative means in-house or improve their applications to such an extent that they become eligible for SNSF funding in a second submission or other funders. In these organizations the waste of resources for developing research applications that do not get the approval of funders is therefore highest.

Figure 31. Share of applicants who obtained funding for applications rejected by SNSF in %



Source: FHNW-survey among SNSF-applicants 2021.

In sum, we found in this part that the funding through the value chain oriented funding instruments is experienced differently by scientists from different types of research organizations: whereas the funding meets the needs of scientists from the ETH domain, it does less so for scientists from UAS and UTE which encounter more often funding restrictions and less often have access to resources for prefinancing application work and funding applications rejected by SNSF. In addition, the funding situation is more often restrictive for applications aiming at higher technological readiness levels and if the projects rely on other activities than basic research. This points to unequal funding situations and possibly funding gaps even in approved projects, above all as only a small share of projects with underfunding found other sources to cover the funding gaps. We do not find underfunding in connection to particular projected results (technology, innovation) nor in connection to application-related or commercial maturity levels of the planned projects. Hence, funding gaps seem to be related more to planned processes and activities than to the projected outputs, e.g., innovation and commercialisation. Why this is the case would need a detailed analysis of the evaluation of applications and funding agreements, but intuitively it is not surprising, that SNSF funding for research is less inclined to fund non-research activities.

4.4 Attitudes towards mission-oriented research funding

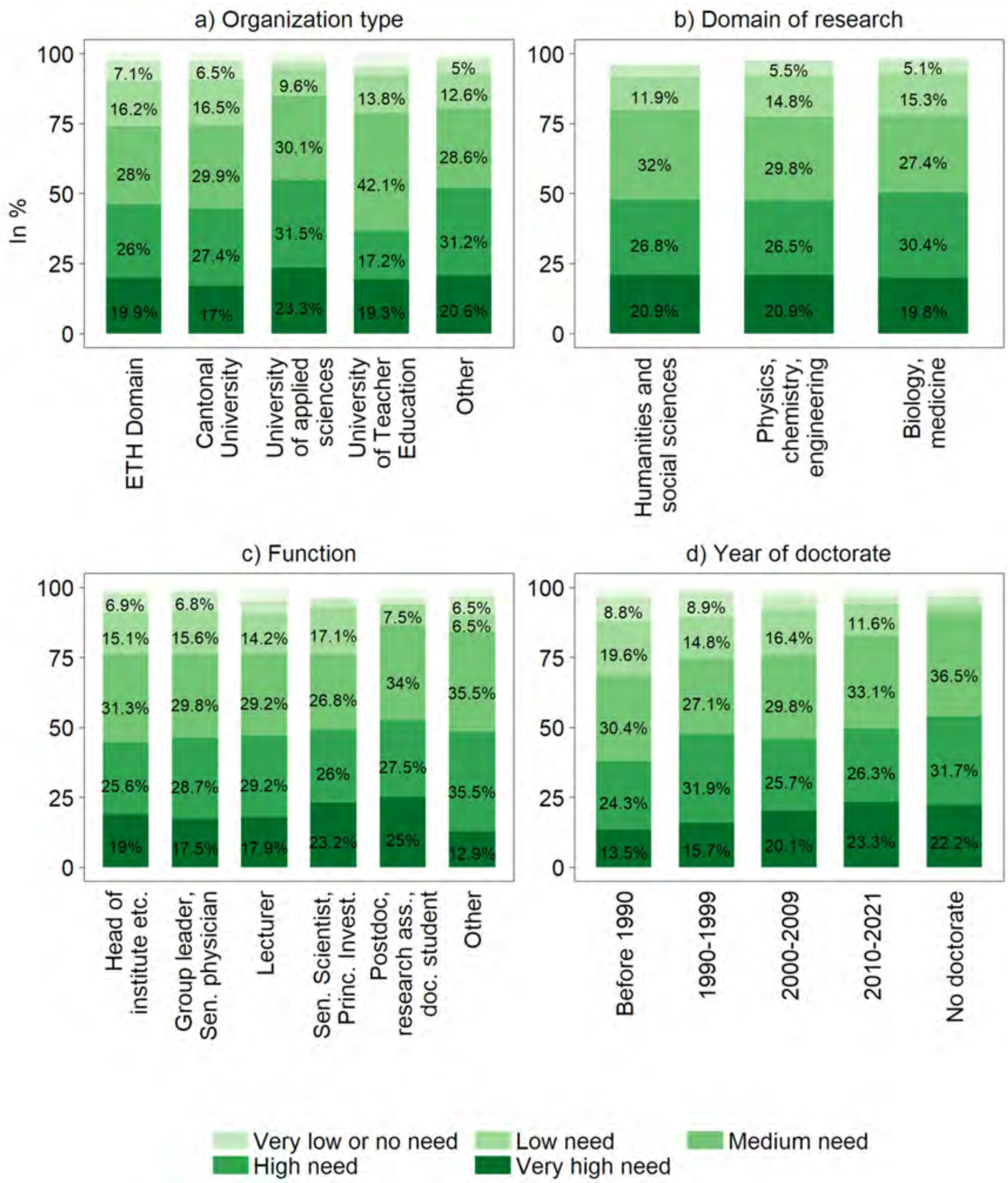
The final part of the questionnaire collected the respondents' opinions on mission-oriented funding. Both concepts, value chain-oriented funding (VCOF) and mission-oriented funding (MOF), should not be confused: the former refers to the process and integration of basic research, application-oriented research and market-oriented innovation; the latter refers to dedicating research and development funding to broad and global societal challenges (see section 2.4 and Table 2, p. 13).

One question in the questionnaire simply asked whether the respondents perceived an additional need for research and innovation funding in Switzerland to take up global challenges and provide more MOF than before. Almost half of the respondents to both surveys (48%) agreed that there was a very high or high additional need for more mission-oriented funding in Switzerland and 31% agreed that there was medium need. All in all, four fifths of the respondents see a need for MOF and only one fifth does not see it.[2]

The need for MOF was particularly felt by respondents from the universities of applied sciences (see Figure 6). There are virtually no differences between the domains of research (Figure 6b). The differences between different types of established researchers are small, i.e., similar shares of heads of sub-units (institutes, departments, etc.), group leaders, lecturers and senior scientists/PIs, perceive high or very high needs for MOF (Figure 6c). However, post-docs, research associates, and doctoral students as well as researchers which obtained their doctorate after 2009 or which do not (yet) have a doctorate (Figure 6d) see more often a high need for MOF.

[2] Diagrams which use shades of green combine the responses from survey 1 of applicants to SNSF VCOF funding, and survey 2 of the comparison group of researchers.

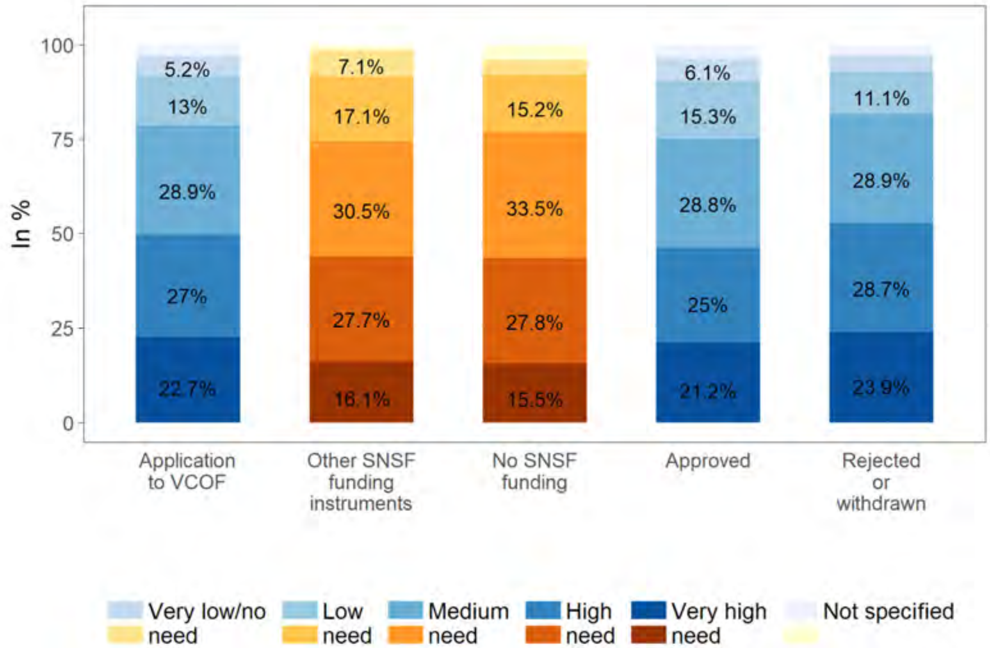
Figure 32. Need for mission-oriented funding by organization type, year of doctorate, function and domain of research in %



Source: FHNW-surveys among SNSF-applicants (survey 1) and a group of comparison researchers (survey 2) 2021.

We also differentiated the opinion on MOF by the status of the respondents versus the SNSF, on the one hand distinguishing between respondents who have applied for the use-inspired funding instruments covered in this study (UIBR, Bridge, NRPs, NCCRs), respondents who have applied for other SNSF-funding instruments since 2017, and respondents who have not applied for SNSF-funding since 2017. On the other hand, we compared between SNSF-applicants to the value chain oriented funding instruments with approved applications and applicants with rejected/withdrawn applications. Figure 33 shows the results. Clearly, respondents with approved applications to UIBR, Bridge, the NRPs, or the NCCRs see a smaller need for MOF than respondents with rejected or withdrawn applications. Respondents from the comparison group who have not applied to SNSF-funding at all or who only applied to other SNSF-instruments than the ones discussed in this report tend to perceive a lower need for mission-oriented funding. However, the difference is small.

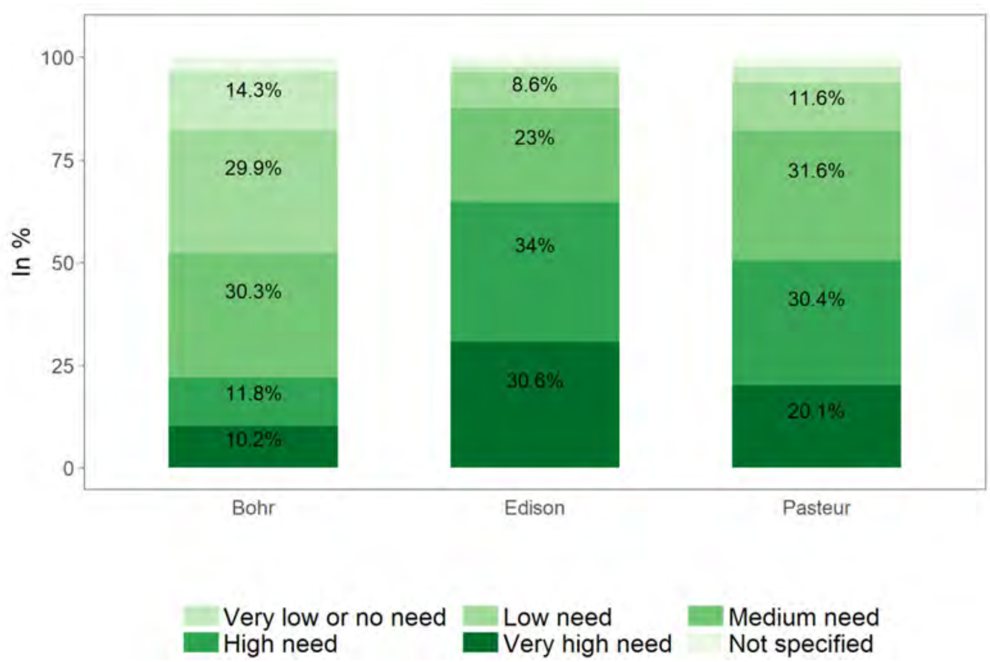
Figure 33. Need for mission-oriented funding by SNSF funding status in %



Source: FHNW-surveys among SNSF-applicants (survey 1) and a group of comparison researchers (survey 2) 2021.

If we differentiate the responses on the need for MOF by researcher types (Stokes' quadrant model), we obtain strong differences (see Figure 34): the more respondents are motivated by contributing to the immediate fulfilment of a social need or generating a practical benefit to do research, the more they see a need for MOF: whereas less than one quarter of Bohr's quadrant researchers saw a very high or high need, half of the Pasteur's quadrant researchers perceived this need and two thirds of the Edison's quadrant researchers did.

Figure 34. Need for mission-oriented funding by researcher quadrant in %



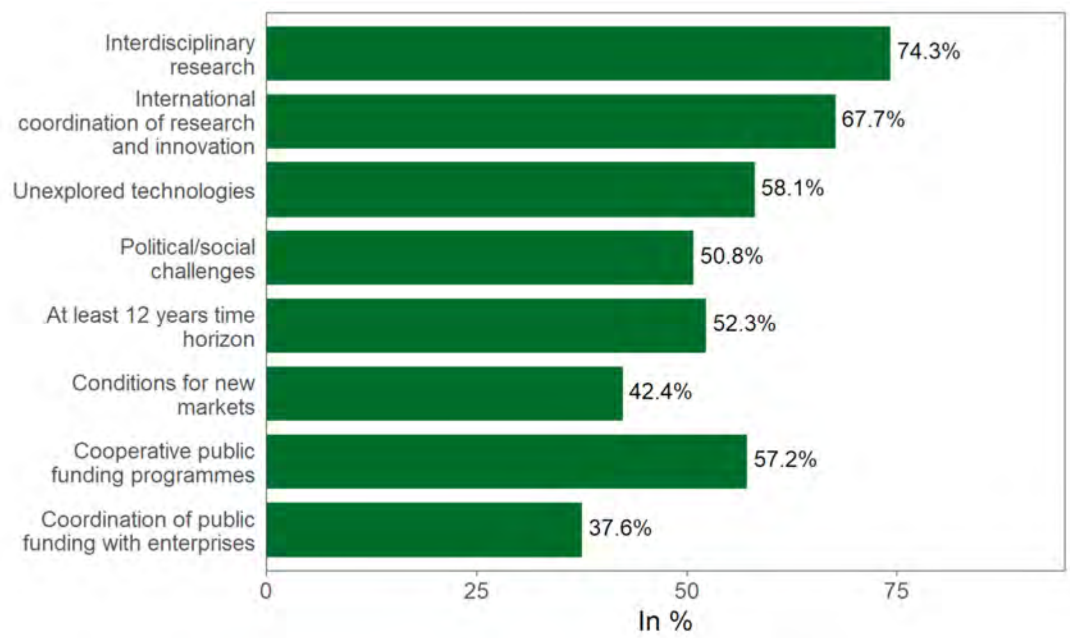
Source: FHNW-surveys among SNSF-applicants (survey 1) and a group of comparison researchers (survey 2) 2021.

A second question tried to assess the importance of particular aspects of MOF by asking whether research funding should take into account eight principles or goals (see Figure 35).

The funding of interdisciplinary research and the coordination of research and innovation funding in Europe and other world regions or globally are widely accepted principles among our respondents: three quarters respectively two thirds of the respondents give them at least high importance.

It is interesting to see that laying a focus on relatively unexplored technologies with great potential for significant and rapid improvement and the establishment of cooperative funding programmes by the SNSF, Innosuisse and, on a case-by-case basis, federal offices or other public agencies follow in third and fourth position. This indeed confirms that a large share of the respondents sees a need for more cooperation and coordination of the funding agencies which could be seen as one aspect of formulating missions. Laying a focus on unexplored technologies can be understood as another aspect of missions, namely the need for prioritizing. This is not a trivial undertaking, of course. Which technologies can be improved quickly and at the same time are relevant for addressing societal challenges needs in-depth knowledge of scientific and technological fields. Small majorities are in favour of using more long-term time horizons for research and focusing on challenges defined by politics and society. The lowest levels of agreement were found for "Focus on creating the knowledge-based and technological conditions for the emergence of new markets (such as with the invention of the internet)" and "Coordination of public research and innovation funding with business enterprises". Both objectives place a high value on the market and application proximity of research and on business needs. Such a focus is viewed rather sceptically by the respondents.

Figure 35. Share of respondents giving very high or high importance to principles of research funding in %



Source: FHNW-surveys among SNSF-applicants (survey 1) and a group of comparison researchers (survey 2) 2021.

We also obtained a small number of comments on MOF in the open-ended questions terminating both surveys. The negative comments outweighed the positive ones by a factor of two and even higher in the ETH domain (see Table 27 and Appendix 23 on selected examples). Respondents seemed to be at least as concerned with other topics however, as shown by the frequencies in Table 28 (see Appendix 23 on selected examples). Hit topics of research funding are:

- The Swiss exclusion from Horizon Europe and its consequences,
- More international openness, cross-border funding opportunities also in Europe,
- Too little research funding in cantonal universities compared to federal institutions,
- Lack of funding for research infrastructures,

- Too limited funding for applied research,
- Certain disciplines are being overlooked, e.g., sport science, nursing and other (non-medical) health sciences, art studies.

Also a large number of comments of a more general nature was made which are, however, outside the scope of the present analysis.

Table 27. General comments on mission-oriented funding (MOF) by type of organization

	Positive comments on MOF		Negative comments on MOF		Ratio negative:positive	Total of comments by respondents to survey 1
	Obs.	in %	Obs.	in %		Obs.
Cantonal University	5	2.7%	14	7.7%	2.8	183
ETH Domain	2	2.1%	9	9.5%	4.5	95
University of applied sciences UAS	4	3.7%	2	1.8%	0.5	109
University of Teacher Education UTE	1	2.9%	1	2.9%	1.0	35
Other	1	2.3%	3	6.8%	3.0	44
Total	13	2.8%	29	6.2%	2.2	466

Table 28. General comments on research funding and other comments by type of organization

	General comments on research funding		Other general comments		Total of comments by respondents to survey 1
	Obs.	in %	Obs.	in %	Obs.
Cantonal University	40	21.9%	33	18.0%	183
ETH Domain	17	17.9%	7	7.4%	95
University of applied sciences UAS	24	22.0%	13	11.9%	109
University of Teacher Education UTE	5	14.3%	9	25.7%	35
Other	6	13.6%	7	15.9%	44
Total	92	19.7%	69	14.8%	466

In summary, the results of the opinion survey on mission-oriented funding confirm that a large proportion of scientists accept MOF and some of the underlying ideas. Respondents stressed that funding should become more interdisciplinary, internationally coordinated, concentrated on technological breakthroughs, and coordinated across agencies, less that it should focus on challenges defined by politics and society, and least that more coordination of research and innovation funding with industry is needed. Established scientists and those who focus strongly on basic research are more reluctant to agree than less established scientists and those who are already open to societal needs.

5. Conclusions

SNSF succeeds with attracting Pasteur's quadrant scientists which combine the interests in basic research and societal application/practical benefit to the value chain oriented funding instruments. It also attracts scientists with industry experiences to these funding programmes and it rewards such experiences in approval decisions (in Bridge and the NRPs).

However, applications for value chain-oriented funding that meet the standards of basic research encounter fewer difficulties than applications that deviate from them. Applicants who foresaw activities other than basic research in their applications more often mentioned underfinancing. Funding applications which included the application of a research result or an innovation as the main project output were less often approved than applications with scientific knowledge or data as the main output; the result is similar for applications with a high commercial maturity, e.g., when applicants had planned testing with or sales to pilot users, preparatory work or test runs of production, partnerships with key customers, or uses of the results in the real environment. High TRLs of the results not only reduce the chances of obtaining the approval of an application, they also increase the risk that the applicants of an approved application encounter funding restrictions. Activities and outputs connected to the value chain are even in the SNSF value chain oriented funding somewhat neglected.

Bridge, the new funding instrument for proof-of-concept work and work that intends to realise the innovation potential of research results is not so different to the other instruments included in this study. We do not find that applications intending to produce an innovation or a technology have higher chances for being approved and we see a lower approval rate for high TRLs in Bridge as well. However, Bridge is more lenient than the other programmes with regard to permitting market analyses, customer surveys, or user feedback which is certainly positive. The funding situation in approved Bridge projects could not be analysed, due to the low number of observations.

One of the guiding questions for this study asked whether "soft" technologies are being taken into account sufficiently and welcomed for value chain oriented funding. Generally, we do not find that applications from the humanities or social sciences encounter greater (or fewer) challenges than applications from the other domains mathematics, natural and engineering sciences and biology and medicine. More fine-grained analyses of individual disciplines were not possible due to limited numbers of observations.

Scientists from universities of applied sciences and in many regards also scientists from universities of teacher education are at a disadvantage compared to scientists from universities and even more compared to scientist in the ETH domain: they apply less for SNSF funding, because of other finding sources, but also because of lower chances to succeed and a lack of resources to pre-finance SNSF applications. They indeed succeed significantly less often with their applications, and, when they succeed, they are more confronted with underfunding. They also have less means to fund applications rejected by SNSF. This is most likely an expression of their overall more restricted funding situation which makes it more difficult to find alternative means if an SNSF project does not fund certain activities or equipment which are necessary.

The idea of mission-oriented funding, which should not be confused with value-chain-oriented funding, was widely accepted by scientists in this sample, as they mainly conduct research to gain fundamental knowledge while at the same time achieving societal benefits or meeting practical needs. They mostly agreed that more interdisciplinary and internationally coordinated funding, as well as funding that is concentrated on technological breakthroughs and coordinated across agencies would be desirable. They reject, however, more coordination of research funding with companies.

Bibliography

Abreu, M., & Grinevich, V. (2013). The nature of academic entrepreneurship in the UK: Widening the focus on entrepreneurial activities. *Research Policy*, *42*(2), 408–422. https://doi.org/10.1016/j.respol.2012.10.005

Amara, N., Olmos-Peñuela, J., & Fernández-de-Lucio, I. (2019). Overcoming the “lost before translation” problem: An exploratory study. *Research Policy*, *48*(1), 22–36. https://doi.org/10.1016/j.respol.2018.07.016

Arvanitis, S., Sydow, N., & Wörter, M. (2008). Do specific forms of university-industry knowledge transfer have different impacts on the performance of private enterprises? An empirical analysis based on Swiss firm data. *The Journal of Technology Transfer*, *33*(5), 504–533.

Aschhoff, B., & Grimpe, C. (2014). Contemporaneous peer effects, career age and the industry involvement of academics in biotechnology. *Research Policy*, *43*(2), 367–381. https://doi.org/10.1016/j.respol.2013.11.002

Australian Renewable Energy Agency ARENA. (2014). *Technology Readiness Levels for Renewable Energy Sectors*. https://arena.gov.au/assets/2014/02/Technology-Readiness-Levels.pdf

Azoulay, P., Fuchs, E., Goldstein, A. P., & Kearney, M. (2019). Funding Breakthrough Research: Promises and Challenges of the “ARPA Model”. *Innovation Policy and the Economy*, *19*, 69–96. https://doi.org/10.1086/699933

Azoulay, P., Stuart, T., & Wang, Y. (2013). Matthew: Effect or Fable? *Management Science*, *60*(1), 92–109. https://doi.org/10.1287/mnsc.2013.1755

Baldini, N. (2010). Do royalties really foster university patenting activity? An answer from Italy. *Technovation*, *30*(2), 109–116. https://doi.org/DOI: 10.1016/j.technovation.2009.09.007

Banal-Estañol, A., Macho-Stadler, I., & Pérez-Castrillo, D. (2019). Evaluation in research funding agencies: Are structurally diverse teams biased against? *Research Policy*, *48*(7), 1823–1840. https://doi.org/10.1016/j.respol.2019.04.008

Barjak, F., & Es-Sadki, N. (2016). Influences of the regional and national economic environment on the technology transfer performance of academic institutions in Europe. In D. B. Audretsch, E. E. Lehmann, M. Meoli, & S. Vismara (Eds.), *University Evolution, Entrepreneurial Activity and Regional Competitiveness* (pp. 207–234). Springer.

Barjak, F., Es-Sadki, N., & Arundel, A. (2015). The effectiveness of policies for formal knowledge transfer from European universities and public research institutes to firms. *Research Evaluation*, *24*(1), 4–18. https://doi.org/10.1093/reseval/rvu024

Barjak, F., & Heimsch, F. (2021). Organisational mission and the involvement of academic research units in knowledge sharing with private companies. *Industry and Innovation*, *28*(4), 395–423. https://doi.org/10.1080/13662716.2020.1813090

Beise, M., & Stahl, H. (1999). Public Research and Industrial Innovations in Germany. *Research Policy*, *28*, 397–422.

Bekkers, R., & Bodas Freitas, I. M. (2008). Analysing knowledge transfer channels between universities and industry: To what degree do sectors also matter? *Research Policy*, *37*(10), 1837–1853. https://doi.org/10.1016/j.respol.2008.07.007

Bercovitz, J., & Feldman, M. (2008). Academic Entrepreneurs: Organizational Change at the Individual Level. *Organization Science*, *19*(1), 69–89.

Bol, T., de Vaan, M., & van de Rijt, A. (2018). The Matthew effect in science funding. *Proceedings of the National Academy of Sciences*, *115*(19), 4887–4890. https://doi.org/10.1073/pnas.1719557115

Borge, L., & Bröring, S. (2020). What affects technology transfer in emerging knowledge areas? A multi-stakeholder concept mapping study in the bioeconomy. *The Journal of Technology Transfer*, *45*(2), 430–460. https://doi.org/10.1007/s10961-018-9702-4

Bornmann, L. (2011). Scientific peer review. *Annual Review of Information Science and Technology*, *45*(1), 197–245. https://doi.org/10.1002/aris.2011.1440450112

Boudreau, K. J., Guinan, E., Lakhani, K. R., & Riedl, C. (2012). The Novelty Paradox & Bias for Normal Science: Evidence from Randomized Medical Grant Proposal Evaluations. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2184791

Caldera, A., & Debande, O. (2010). Performance of Spanish universities in technology transfer: An empirical analysis. *Research Policy*, *39*(9), 1160–1173.

Cole, S., Cole, J. R., & Simon, G. A. (1981). Chance and Consensus in Peer Review. *Science*, *214*(4523), 881–886.

Conti, A., & Gaule, P. (2011). Is the US outperforming Europe in university technology licensing? A new perspective on the European Paradox. *Research Policy*, *40*(1), 123–135. http://dx.doi.org/10.1016/j.respol.2010.10.007

D'Este, P., & Patel, P. (2007). University-industry linkages in the UK: What are the factors underlying the variety of interactions with industry? *Research Policy*, *36*(9), 1295–1313.

Enger, S. G., & Castellacci, F. (2016). Who gets Horizon 2020 research grants? Propensity to apply and probability to succeed in a two-step analysis. *Scientometrics*, *109*(3), 1611–1638. https://doi.org/10.1007/s11192-016-2145-5

Ergas, H. (1987). Does Technology Policy Matter? In B. R. Guile & Harvey Brooks (Eds.), *Technology and Global Industry: Companies and Nations in the World Economy.* (pp. 191–245). National Academies Press.

European Association of Research & Technology Organisations EARTO. (2014). *The TRL Scale as a Research & Innovation Policy Tool, EARTO Recommendations*. EARTO. https://www.earto.eu/wp-content/uploads/The_TRL_Scale_as_a_R_I_Policy_Tool_-_EARTO_Recommendations_-_Final.pdf

Foray, D., Mowery, D. C., & Nelson, R. R. (2012). Public R&D and social challenges: What lessons from mission R&D programs? *Research Policy*, *41*(10), 1697–1702. http://dx.doi.org/10.1016/j.respol.2012.07.011

Friedman, J., & Silberman, J. (2003). University Technology Transfer: Do Incentives, Management, and Location Matter? *The Journal of Technology Transfer*, *28*(1), 17–30.

Fritsch, M., & Schwirten, C. (1999). Enterprise-university co-operation and the role of public research institutions in regional innovation systems. *Industry and Innovation*, *6*, 69–83.

Geuna, A., & Rossi, F. (2011). Changes to university IPR regulations in Europe and the impact on academic patenting. *Research Policy*, *40*(8), 1068–1076.

Grimpe, C. (2012). Extramural research grants and scientists' funding strategies: Beggars cannot be choosers? *Research Policy*, *41*(8), 1448–1460. https://doi.org/10.1016/j.respol.2012.03.004

Héder, M. (2017). From NASA to EU: The evolution of the TRL scale in Public Sector Innovation. *The Innovation Journal*, *22*(2), 1–23.

Hunter, E. M., Perry, S. J., & Currall, S. C. (2011). Inside multi-disciplinary science and engineering research centers: The impact of organizational climate on invention disclosures and patents. *Research Policy*, *40*(9), 1226–1239. https://doi.org/10.1016/j.respol.2011.05.024

Kolarz, P., Arnold, E., & Farla, K. (2017). *Use-inspired basic research at SNSF. Final Report*. http://www.snf.ch/SiteCollectionDocuments/SNSF_UIBR_Final_Report_by_Technopolis_May2017.pdf

Lach, S., & Schankerman, M. (2008). Incentives and invention in universities. *The RAND Journal of Economics*, *39*(2), 403–433.

Langfeldt, L. (2006). The policy challenges of peer review: Managing bias, conflict of interests and interdisciplinary assessments. *Research Evaluation*, *15*(1), 31–41. https://doi.org/10.3152/147154406781776039

Langfeldt, L., & Borlaug, S. B. (2016). *Swiss National Centres of Competence in Research (NCCR). Evaluation of the selection process* (Report 2016:42; p. 84). Nordic Institute for Studies in Innovation, Research and Education (NIFU). http://www.snf.ch/SiteCollectionDocuments/NIFU_Final_Report.pdf

Laudel, G. (2005). Is external research funding a valid indicator for research performance? *Research Evaluation*, *14*(1), 27–34. https://doi.org/10.3152/147154405781776300

Laudel, G. (2006). The 'Quality Myth': Promoting and Hindering Conditions for Acquiring Research Funds. *Higher Education*, *52*(3), 375–403. https://doi.org/10.1007/s10734-004-6414-5

Lee, C. J., Sugimoto, C. R., Zhang, G., & Cronin, B. (2013). Bias in peer review. *Journal of the American Society for Information Science and Technology*, *64*(1), 2–17. https://doi.org/10.1002/asi.22784

Lee, M., Om, K., & Koh, J. (2000). The bias of sighted reviewers in research proposal evaluation: A comparative analysis of blind and open review in Korea. *Scientometrics*, *48*(1), 99–116. Scopus. https://doi.org/10.1023/A:1005636503358

Luukkonen, T. (2012). Conservatism and risk-taking in peer review: Emerging ERC practices. *Research Evaluation*, *21*(1), 48–60. https://doi.org/10.1093/reseval/rvs001

Mankins, J. C. (1995). Technology readiness levels: A white paper. In *Http://www.Hq.Nasa.Gov/Office/Codeq/Trl/Trl.Pdf* (Issue January 1995, pp. 1–5). https://doi.org/10.1080/08956308.2010.11657640

Mansfield, E. (1995). Academic research underlying industrial innovations: Sources, characteristics and financing. *Review of Economics and Statistics*, *77*, 55–65.

Mansfield, E., & Lee, J.-Y. (1996). The Modern University: Contributor to Industrial Innovation and Recipient of Industrial R&D Support. *Research Policy*, *25*, 1047–1058.

Mazzucato, M. (2018a). *Mission-oriented research & innovation in the European Union: A problem solving approach to fuel innovation led growth*. Publications Office of the European Union. https://data.europa.eu/doi/10.2777/360325

Mazzucato, M. (2018b). Mission-oriented innovation policies: Challenges and opportunities. *Industrial and Corporate Change*, *27*(5), 803–815. https://doi.org/10.1093/icc/dty034

Mazzucato, M. (2019). *Governing missions in the European Union*. Publications Office of the European Union. https://data.europa.eu/doi/10.2777/618697

Mazzucato, M. (2021). *Mission economy: A moonshot guide to changing capitalism*. Allen Lane an imprint of Penguin Books.

Mazzucato, M., & Semieniuk, G. (2017). Public financing of innovation: New questions. *Oxford Review of Economic Policy*, *33*(1), 24–48.

Merton, R. K. (1968). The Matthew Effect in Science. *Science*, *159*(3810), 56–63.

Perkmann, M., Salandra, R., Tartari, V., McKelvey, M., & Hughes, A. (2021). Academic engagement: A review of the literature 2011-2019. *Research Policy*, *50*(1), 104114. https://doi.org/10.1016/j.respol.2020.104114

Perkmann, M., Tartari, V., McKelvey, M., Autio, E., Broström, A., D'Este, P., Fini, R., Geuna, A., Grimaldi, R., Hughes, A., Krabel, S., Kitson, M., Llerena, P., Lissoni, F., Salter, A., & Sobrero, M. (2013). Academic engagement and commercialisation: A review of the literature on university–

industry relations. *Research Policy*, *42*(2), 423–442. http://dx.doi.org/10.1016/j.respol.2012.09.007

Phan, P. H., & Siegel, D. S. (2006). The Effectiveness of University Technology Transfer. *Foundations and Trends in Entrepreneurship*, *2*(2), 77–144.

Porter, A. L., & Rossini, F. A. (1985). Peer Review of Interdisciplinary Research Proposals. *Science, Technology, & Human Values*, *10*(3), 33–38. https://doi.org/10.1177/016224398501000304

Rieder, S., Knubel, S., & Gärtner, S. (2014). *Der Wissens- und Technologietransfer im Rahmen der ersten Serie der Nationalen Forschungsschwerpunkte (NFS). Schlussbericht zuhanden der Geschäftsstelle des Schweizerischen Wissenschafts- und Innovationsrates (SWIR)*. Interface Politikstudien Forschung Beratung,. https://www.interface-pol.ch/app/uploads/2019/02/Be_WTT_NFS.pdf

Rinia, E. J., van Leeuwen, Th. N., van Vuren, H. G., & van Raan, A. F. J. (2001). Influence of interdisciplinarity on peer-review and bibliometric evaluations in physics research. *Research Policy*, *30*(3), 357–361. https://doi.org/10.1016/S0048-7333(00)00082-2

Rittel, H., & Webber, M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, 155–169.

Scandura, A., & Iammarino, S. (2021). Academic engagement with industry: The role of research quality and experience. *The Journal of Technology Transfer*. https://doi.org/10.1007/s10961-021-09867-0

Schartinger, D., Schibany, A., & Gassler, H. (2001). Interactive Relations Between Universities and Firms: Empirical Evidence for Austria. *Journal of Technology Transfer*, *26*, 255–268.

Siegel, D. S., Waldman, D. A., Atwater, L. E., & Link, A. N. (2003). Commercial knowledge transfers from universities to firms: Improving the effectiveness of university-industry collaboration. *The Journal of High Technology Management Research*, *14*(1), 111–133.

Sine, W. D., Shane, S., & Di Gregorio, D. (2003). The Halo Effect and technology licensing: The influence of institutional prestige on the licensing of university inventions. *Management Science*, *49*(4), 478–496.

Staatssekretariat für Bildung Forschung und Innovation SBFI. (2020). *Forschung und Innovation in der Schweiz 2020*. SBFI. https://www.sbfi.admin.ch/sbfi/de/home/forschung-und-innovation/forschung-und-innovation-in-der-schweiz/f-und-i-bericht.html

Stokes, D. E. (1997). *Pasteur's Quadrant: Basic Science and Technological Innovation*. Brookings Institution Press.

Stuart, T. E., & Ding, W. W. (2006). When do scientists become entrepreneurs? The social structural antecedents of commercial activity in the academic life sciences. *American Journal of Sociology*, *112*(1), 97–144. https://doi.org/10.1086/502691

Tartari, V., Perkmann, M., & Salter, A. (2014). In good company: The influence of peers on industry engagement by academic scientists. *Research Policy*, *43*(7), 1189–1203. https://doi.org/10.1016/j.respol.2014.02.003

Tartari, V., Salter, A., & D'Este, P. (2012). Crossing the Rubicon: Exploring the factors that shape academics' perceptions of the barriers to working with industry. *Cambridge Journal of Economics*, *36*(3), 655–677. https://doi.org/10.1093/cje/bes007

Thursby, J., & Thursby, M. (2011). University-industry linkages in nanotechnology and biotechnology: Evidence on collaborative patterns for new methods of inventing. *The Journal of Technology Transfer*, *36*(6), 605–623. https://doi.org/10.1007/s10961-011-9213-z

Tijssen, R. J. W. (2018). Anatomy of use-inspired researchers: From Pasteur's Quadrant to Pasteur's Cube model. *Research Policy*, *47*(9), 1626–1638. https://doi.org/10.1016/j.respol.2018.05.010

U.S. Department of Energy. (2010). *Technology Readiness Assessment Guide* (DOE G 413.3-4). U.S. Department of Energy. https://www.directives.doe.gov/directives-documents/400-series/0413.3-EGuide-04/@@images/file

Valentin, F., & Jensen, R. (2007). Effects on academia-industry collaboration of extending university property rights. *The Journal of Technology Transfer*, *32*(3), 251–276.

van Rijnsoever, F. J., Hessels, L. K., & Vandeberg, R. L. J. (2008). A resource-based view on the interactions of university researchers. *Research Policy*, *37*(8), 1255–1266. https://doi.org/10.1016/j.respol.2008.04.020

Viner, N., Powell, P., & Green, R. (2004). Institutionalized biases in the award of research grants: A preliminary analysis revisiting the principle of accumulative advantage. *Research Policy*, *33*(3), 443–454. https://doi.org/10.1016/j.respol.2003.09.005

Appendix

Appendix 1. Technology Readiness Levels

Level	NASA (Mankins, 1995)	US DOE (2010)	EU Horizon 2020	EARTO (2014)
TRL 1	Basic principles observed and reported	Basic principles observed and reported	Basic principles observed	Basic principles observed
TRL 2	Technology concept and/or application formulated	Technology concept and/or application formulated	Technology concept formulated	Technology concept formulated
TRL 3	Analytical and experimental critical function and/or characteristic proof-of concept	Analytical and experimental critical function and/or characteristic proof-of concept	Experimental proof of concept	First assessment feasibility of the concept and technologies
TRL 4	Component and/or breadboard validation in laboratory environment	Component and/or system validation in laboratory environment	Technology validated in lab	Validation of integrated prototype in a laboratory
TRL 5	Component and/or breadboard validation in relevant environment	Laboratory scale similar system validation in a relevant environment	Technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)	Testing of the prototype in a user environment
TRL 6	System/subsystem model or prototype demonstration in a relevant environment (ground or space)	Engineering/ pilot-scale, similar (prototypical) system validation in a relevant environment	Technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)	Pre-production of the product, including testing in a user environment
TRL 7	System prototype demonstration in a space environment	Full scale, similar (prototypical) demonstrated in a relevant environment	System prototype demonstration in operational environment	Low scale pilot production demonstrated
TRL 8	Actual system completed and "flight qualified" through test and demonstration (ground or space)	Actual system completed and qualified through test and demonstration	System complete and qualified	Manufacturing fully tested, validated and qualified
TRL 9	Actual system "flight proven" through successful mission operations	Actual system operated over the full range of expected conditions	Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)	Production and product fully operational and competitive

Sources: NASA (Mankins, 1995), US DOE (2010), EU Horizon 2020, EARTO (2014)

Appendix 2. Commercial Readiness Indices

Level	EARTO (2014)	ARENA (2014)	KTH Customer Readiness Levels
CRI 1	Basic principles observed: Basic scientific research is translated into potential new basic principles that can be used in new technologies	Hypothetical commercial proposition	Hypothesizing on possible needs in market
CRI 2	Technology concept formulated: Potential application of the basic (technological) principles are identified, including their technological concept. Also, the first manufacturing principles are explored, as well as possible markets identified. A small research team is established to facilitate assessment of technological feasibility.	Commercial trial, small scale	Identified specific needs in market
CRI 3	First assessment of feasibility of the concept and technologies: Based on preliminary study, now actual research is conducted to assess technical and market feasibility of the concept. This includes active R&D on a laboratory scale and first discussions with potential clients. The research team is further expanded and early market feasibility assessed.		First market feedback established
CRI 4	Validation of integrated prototype in a laboratory: Basic technological components are integrated to assess early feasibility by testing in a laboratory environment. Manufacturing is actively researched, identifying the main production principles. Lead markets are engaged to ensure connection with demand. Organization is prepared to enter into scale up, possible services prepared and a full market analysis conducted.		Confirmed problems/needs from several customers or users
CRI 5	Testing of the prototype in a user environment: The system is tested in a user environment, connected to the broader technological infrastructure. Actual use is tested and validated. Manufacturing is prepared and tested in a laboratory environment and lead markets can test pre-production products. Fist activities within the organization are established to further scale up to pilot production and marketing.		Established interest for product and relations with target customers
CRI 6	Pre-production of the product, including testing in a user environment: Product and manufacturing technologies are now fully integrated in a pilot line or pilot plant (low rate manufacturing). The interaction between the product and manufacturing technologies are assessed and fine-tuned, including additional R&D. Lead markets test the early products and manufacturing process and the organization of production is made operational (including marketing, logistics, production and others).	Commercial scale up	Benefits of the product confirmed through partnerships or first customer testing
CRI 7	Low scale pilot production demonstrated: Manufacturing of the product is now fully operational at low rate, producing actual commercial products. Lead markets test these final products and organizational implementation is finalized (full marketing established, as well as all other production activities fully organized). The product is formally launched into first early adopter markets.	Multiple commercial applications	Customers in extended product testing or first test sales
CRI 8	Manufacturing fully tested, validated and qualified: Manufacturing of the product, as well as the product final version is now fully established, as well as the organization of production and marketing. Full launch of the product is now established in national and general early majority markets.	Marketing competition driving widespread development	First products sold and increased structured sales efforts
CRI 9	Production and product fully operational and competitive: Full production is sustained, product expanded to larger markets and incremental changes in the product create new versions. Manufacturing and overall production is optimized by continuous incremental innovations to the process. Early majority markets are fully addressed.	Bankable asset class	Widespread product sales that scale

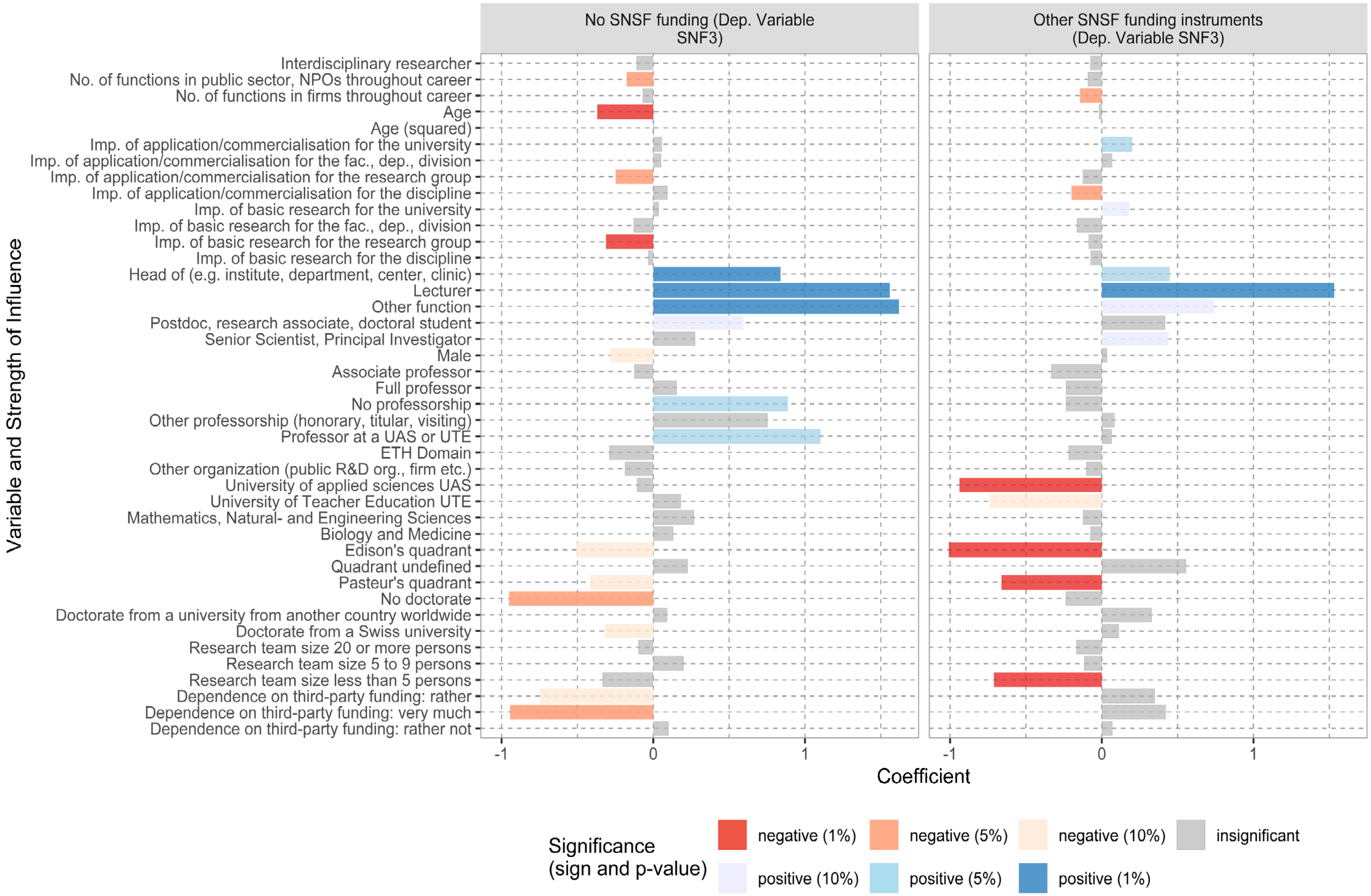
Sources: EARTO (2014), ARENA (2014), KTH Customer Readiness Levels (https://kthinnovationreadinesslevel.com/)

Appendix 3. Overview of variable specifications used in the estimations

Variable	Explanation	Sources
Related to the individual respondents		
Age (squared age)	Year 2021 – birth year (squared)	address data, S2Q2
Academic age (squared academic age)	Year 2021 – year of doctorate (squared)	address data, S1Q3, S2Q4
Interdisciplinary researcher	No. of disciplines in which the respondent conducts research	S1Q9-10, S2Q8-9
High experience with grant applications	Has submitted more than 16 research applications to the SNSF or other comparable research funding institutions abroad, and at least 40% as principal applicant	S1Q17
Low experience with grant applications	Has submitted less than 10 research applications to the SNSF or other comparable research funding institutions abroad	S1Q17
Researcher type		
Edison's quadrant	Contribution to the immediate fulfilment of a social need or generating a practical benefit are important drivers for conducting research and contributing to the fundamental understanding of phenomena is not an important driver	S1Q13, S2Q10
Bohr's quadrant	Contributing to the fundamental understanding of phenomena is an important driver for conducting research and contributing to the immediate fulfilment of a social need or generating a practical benefit are not important drivers	S1Q13, S2Q10
Pasteur's quadrant	Contributing to the fundamental understanding of phenomena and contributing to the immediate fulfilment of a social need or generating a practical benefit are both important drivers for conducting research	S1Q13, S2Q10
No. of functions in firms throughout career	No. of functions in and for business enterprises which respondents have held in their professional lives	S1Q15, S2Q18
No. of functions public sector, NPOs throughout career	No. of functions in and for government institutions, non-profit organizations or other organizations outside academia which respondents have held in their professional lives	S1Q16, S2Q19
Experience in the field of the application	Sum of the affirmative answers to four statements on the experience in the subject area of the application at its time of submission	S1Q18
Related to the application submitted by the respondent to SNSF		
Grade	Final grade of each application from the SNSF referee panel	address data
Residuals grade	Residuals of grade from first stage regressions	address data, S1, estimations
Research team size (application)	Number of people on the research team for the research project described in the application	S1Q22
Interdisciplinary application (*interdis2*)	No. of disciplines which are covered by an application	S1Q23
Importance of activities in an application		
Basic research	Importance of basic research, i.e., experimental or theoretical work carried out primarily to gain new knowledge about the fundamentals of phenomena and observable facts, without a specific application or benefit in mind.	S1Q26
Applied research	Importance of applied research, i.e., independent research conducted to gain new knowledge directed towards a specific practical goal or purpose.	S1Q26
Experimental development	Importance of experimental development that is systematic work directed, on the basis of findings from research and practical experience, towards producing new materials, products and devices, installing new processes, systems and services or substantially improving those already produced or installed.	S1Q26
Education and training of staff	Importance of education and training of staff excluding doctorates and post-docs.	S1Q26

Variable	Explanation	Sources
Technical work related to innovation	Importance of technical work related to innovation, i.e., work that may be required for the transfer of scientific knowledge into innovations.	S1Q26
Commercial, financial or legal work related to innovation	Importance of commercial, financial or legal work related to innovation, for example, market studies and advertising, drafting a patent specification, acquiring financing.	S1Q26
Any kind of routine work	Importance of any kind of routine work.	S1Q26
Other	Importance of other activities	
Underfinancing of an application		
Underfinancing 1 (*ufin1*)	Agreement to the statement that "The specific funding guideline excluded funding for certain necessary activities altogether or provided only partial funding." or "The specific funding guideline excluded funding for certain necessary equip-ment or consumables altogether or provided only partial funding."	S1Q27
Underfinancing 2 (*ufin2*)	Agreement to the statement that "Budget cuts were made in the course of project approval."	S1Q27
Underfinancing 3 (*ufin3*)	Agreement to the statement that "The funding in this programme does not completely cover costs."	S1Q27
Projected main result of the application		
Knowledge	New data or new knowledge and insights	S1Q32
Technology	New technology or further development of an existing technology	S1Q32
Application, innovation	New application or marketable or almost immediately applicable innovation (new good, service, process or similar that is used).	S1Q32
Technology readiness levels		
TRL 1	Planned results in the application were at TRL 1: Basics should be observed and documented in writing.	S1Q33
TRLs 2-4	Planned results in the application were at TRLs 2-4: The applicability of a scientific finding or technology should be demonstrated experimentally/in the laboratory (proof-of-concept)	S1Q33
TRLs 5-6	Planned results in the application were at TRLs 5-6: The applicability of a scientific finding or technology should be demonstrated in a relevant application environment (prototype, demonstrator)	S1Q33
TRLs 7-9	Planned results in the application were at TRLs 7-9: The knowledge/technology (prototype, demonstrator) should be integrated into a relevant system, tested and the applicability in the system context demonstrated	S1Q33
Commercial maturity levels		
CML 1	Planned results in the application were at use-related or commercial maturity level 1: An implementation outside of science or commercialisation of the results was not envisaged in the application	S1Q34
CML 2	Planned results in the application were at use-related or commercial maturity level 2: Possible implementations outside science or commercialisation of the results were planned and de-scribed in the application.	S1Q34
CML 3	Planned results in the application were at use-related or commercial maturity level 3: Initial market analyses, surveys of user/customer needs, feedback from users on parameters of the technology, or involvement of key customers were included in the application.	S1Q34
CML 4	Planned results in the application were at use-related or commercial maturity level 4: More extensive testing with pilot users, preparatory work or test runs of production, or partnerships with key customers were envisaged in the application.	S1Q34
CML 5	Planned results in the application were at use-related or commercial maturity level 5: In the application, uses of the results in the real environment, production, or pilot sales to early customers were planned.	S1Q34

Appendix 4. Estimation results, dependent variable group membership with regard to SNSF funding 2017-20[a]



Source: FHNW-surveys among SNSF-applicants and a group of comparison researchers 2021.

Appendix 5. Estimation results for grade, full sample of applicants

Dependent Var.: grade, Model 3 (615 obs.)	Estimate	Std. Error	t value	Pr(>|t|)	Sig.
(Intercept)	1.516	0.390	3.891	0.0001	***
Group leader	-0.304	0.321	-0.947	0.3440	
Head of (e.g. institute, department, center, clinic)	-0.185	0.323	-0.573	0.5670	
Lecturer, Senior Scientist, Principal Investigator	-0.238	0.323	-0.737	0.4615	
Doctoral Student, Postdoc, Research Associate	-0.308	0.341	-0.901	0.3681	
Type of organization					
Cantonal university	0.148	0.050	2.952	0.0033	**
ETH Domain	0.196	0.055	3.555	0.0004	***
University of applied sciences UAS	-0.081	0.056	-1.438	0.1510	
University of Teacher Education UTE	-0.260	0.066	-3.971	0.0001	***
Other organization	Intercept				
Age	-0.010	0.003	-3.288	0.0011	**
High experience with grant applications	0.109	0.067	1.631	0.1034	
Low experience with grant applications	-0.053	0.059	-0.903	0.3670	
Experience in the field of the application	-0.025	0.009	-2.778	0.0057	**
Research team size 10 or more persons	0.245	0.107	2.290	0.0224	*
Research team size 5 to 9 persons	0.130	0.054	2.424	0.0157	*
Mathematics, Natural- and Engineering Sciences	0.010	0.056	0.170	0.8648	
Biology and Medicine	0.050	0.058	0.867	0.3864	
Instrument NRP	1.032	0.064	16.215	0.0000	***
Instrument UIBR	1.078	0.064	16.774	0.0000	***
Stokes' quadrants					
Bohr's quadrant	Intercept				
Edison's quadrant	0.166	0.125	1.322	0.1866	
Pasteur's quadrant	0.016	0.095	0.171	0.8640	
Undefined (4^{th} quadrant)	-0.374	0.174	-2.147	0.0322	*
Interdisciplinary application	-0.025	0.018	-1.391	0.1647	
No. of functions in firms throughout career	0.049	0.019	2.637	0.0086	**
Technology readiness levels					
Technology readiness level 1	Intercept				
Technology readiness levels 2-4	-0.073	0.063	-1.168	0.2431	
Technology readiness levels 5-6	-0.002	0.057	-0.026	0.9791	
Technology readiness levels 7-9	-0.166	0.061	-2.719	0.0068	**
Technology readiness level: no answer	0.042	0.086	0.490	0.6246	
Commercial maturity levels: Model 4 (615 obs.)					
Commercial maturity level 1	0.032	0.064	0.499	0.6180	
Commercial maturity level 2	0.044	0.062	0.712	0.4768	
Commercial maturity level 3	0.096	0.090	1.068	0.2858	
Commercial maturity level 4	0.067	0.081	0.834	0.4044	
Commercial maturity level 5	-0.178	0.091	-1.968	0.0496	*
Commercial maturity level: no answer	Intercept				
Main application result: Model 5 (563 obs.)					
Main application result: new knowledge, data	Intercept				
Main application result: new application, innovation	-0.142	0.069	-2.069	0.0390	*
Main application result: other	-0.127	0.162	-0.787	0.4319	
Main application result: new technology	-0.004	0.083	-0.049	0.9606	

Error probabilities: *** 0.1%, ** 1%, * 5%, . 10%

Appendix 6. Estimation results for funded, full sample of applicants

Dependent Var.: funded, Model 3 (615 obs.)	Estimate	Std. Error	t value	Pr(>|t|)	Sig.
(Intercept)	7.061	2.064	3.420	0.0007	***
Group leader	-3.577	1.184	-3.022	0.0026	**
Head of (e.g. institute, department, center, clinic)	-1.835	1.195	-1.536	0.1252	
Lecturer, Senior Scientist, Principal Investigator	-2.825	1.187	-2.380	0.0176	*
Doctoral Student, Postdoc, Research Associate	-8.089	1.463	-5.529	0.0000	***
Type of organization					
Cantonal university	0.013	0.447	0.030	0.9763	
ETH Domain	-0.965	0.532	-1.813	0.0703	.
University of applied sciences UAS	-2.103	0.549	-3.828	0.0001	***
University of Teacher Education UTE	0.357	0.573	0.623	0.5336	
Other organization	Intercept				
Age	-0.054	0.022	-2.391	0.0171	*
High experience with grant applications	1.187	0.438	2.712	0.0069	**
Low experience with grant applications	-0.574	0.430	-1.337	0.1819	
Experience in the field of the application	-0.149	0.063	-2.380	0.0176	*
Research team size 10 or more persons	1.257	0.515	2.443	0.0149	*
Research team size 5 to 9 persons	0.266	0.349	0.764	0.4452	
Mathematics, Natural- and Engineering Sciences	-0.358	0.437	-0.820	0.4126	
Biology and Medicine	-0.815	0.355	-2.299	0.0219	*
Instrument NRP	-5.457	0.671	-8.136	0.0000	***
Instrument UIBR	-2.620	0.568	-4.611	0.0000	***
Residuals grade	7.474	0.547	13.664	0.0000	***
Stokes' quadrants					
Bohr's quadrant	Intercept				
Edison's quadrant	0.710	0.744	0.954	0.3406	
Pasteur's quadrant	-1.518	1.598	-0.950	0.3425	
Undefined (4th quadrant)	0.135	0.532	0.254	0.7997	*
Interdisciplinary application	0.341	0.150	2.272	0.0235	
No. of functions in firms throughout career	0.211	0.114	1.848	0.0651	**
Technology readiness levels					
Technology readiness level 1	Intercept				
Technology readiness levels 2-4	-0.354	0.394	-0.896	0.3704	
Technology readiness levels 5-6	-0.658	0.390	-1.687	0.0921	.
Technology readiness levels 7-9	-0.048	0.412	-0.118	0.9065	
Technology readiness level: no answer	-1.573	0.483	-3.259	0.0012	**
Commercial maturity levels: Model 4 (615 obs.)					
Commercial maturity level 1	-0.112	0.400	-0.280	0.7797	
Commercial maturity level 2	0.390	0.372	1.049	0.2946	
Commercial maturity level 3	0.738	0.501	1.474	0.1409	
Commercial maturity level 4	-1.281	0.584	-2.193	0.0287	*
Commercial maturity level 5	-0.919	0.464	-1.981	0.0480	*
Commercial maturity level: no answer	Intercept				
Main application result: Model 5 (563 obs.)					
Main application result: new knowledge, data	Intercept				
Main application result: new application, innovation	-1.241	0.480	-2.587	0.0100	**
Main application result: other	-2.144	0.709	-3.024	0.0026	**
Main application result: new technology	-0.049	0.585	-0.085	0.9327	

Error probabilities: *** 0.1%, ** 1%, * 5%, . 10%

Appendix 7. Estimation results for grade, UIBR applicants

Dependent Var.: grade, Model 3 (262 obs.)	Estimate	Std. Error	t value	Pr(>|t|)	Sig.
(Intercept)	1.295	0.403	3.211	0.0015	**
Group leader	0.394	0.277	1.424	0.1558	
Head of (e.g. institute, department, center, clinic)	0.447	0.275	1.624	0.1058	
Lecturer, Senior Scientist, Principal Investigator	0.508	0.279	1.821	0.0699	.
Other function	0.052	0.388	0.134	0.8936	
Type of organization					
Cantonal university	0.173	0.064	2.718	0.0071	**
ETH Domain	0.038	0.074	0.512	0.6094	
University of applied sciences UAS	-0.168	0.075	-2.254	0.0251	*
University of Teacher Education UTE	-0.157	0.101	-1.550	0.1226	
Other organization	Intercept				
Age	0.006	0.004	1.356	0.1763	
High experience with grant applications	0.159	0.075	2.112	0.0358	*
Low experience with grant applications	0.164	0.069	2.379	0.0182	*
Experience in the field of the application	-0.041	0.013	-3.174	0.0017	**
Research team size 10 or more persons	-0.074	0.121	-0.611	0.5418	
Research team size 5 to 9 persons	-0.015	0.071	-0.203	0.8389	
Mathematics, Natural- and Engineering Sciences	-0.028	0.078	-0.358	0.7208	
Biology and Medicine	-0.033	0.071	-0.470	0.6385	
Stokes' quadrants					
Bohr's quadrant	Intercept				
Edison's quadrant	-0.063	0.148	-0.423	0.6725	
Pasteur's quadrant	-0.067	0.120	-0.562	0.5744	
Undefined (4th quadrant)	0.015	0.027	0.554	0.5801	
Interdisciplinary application	0.011	0.021	0.527	0.5990	
No. of functions in firms throughout career	-0.067	0.120	-0.562	0.5744	
Technology readiness levels					
Technology readiness level 1	Intercept				
Technology readiness levels 2-4	0.041	0.075	0.548	0.5842	
Technology readiness levels 5-6	-0.095	0.063	-1.504	0.1339	
Technology readiness levels 7-9	-0.099	0.085	-1.165	0.2452	
Technology readiness level: no answer	-0.007	0.108	-0.069	0.9453	
Commercial maturity levels: Model 4 (262 obs.)					
Commercial maturity level 1	0.092	0.084	1.094	0.2752	
Commercial maturity level 2	0.188	0.081	2.316	0.0214	*
Commercial maturity level 3	-0.230	0.145	-1.578	0.1159	
Commercial maturity level 4	0.020	0.104	0.189	0.8503	
Commercial maturity level 5	-0.153	0.134	-1.140	0.2554	
Commercial maturity level: no answer	Intercept				
Main application result: Model 5 (240 obs.)					
Main application result: new knowledge, data	Intercept				
Main application result: new application, innovation	-0.076	0.094	-0.808	0.4200	
Main application result: other	-0.225	0.233	-0.965	0.3358	
Main application result: new technology	0.079	0.093	0.852	0.3954	

Error probabilities: *** 0.1%, ** 1%, * 5%, . 10%

Appendix 8. Estimation results for funded, UIBR applicants

Dependent Var.: funded, Model 3 (262 obs.)	Estimate	Std. Error	t value	Pr(>|t|)	Sig.
(Intercept)	-5.853	1.841	-3.179	0.0017	**
Group leader	5.034	1.162	4.334	0.0000	***
Head of (e.g. institute, department, center, clinic)	6.041	1.223	4.941	0.0000	***
Lecturer, Senior Scientist, Principal Investigator	6.054	1.151	5.259	0.0000	***
Other function	3.490	1.623	2.150	0.0326	*
Type of organization					
Cantonal university	0.934	0.601	1.556	0.1211	
ETH Domain	0.714	0.768	0.930	0.3534	
University of applied sciences UAS	-0.601	0.746	-0.805	0.4216	
University of Teacher Education UTE	0.722	0.719	1.004	0.3162	
Other organization	Intercept				
Age	0.040	0.032	1.225	0.2217	
High experience with grant applications	1.758	0.658	2.671	0.0081	**
Low experience with grant applications	-0.427	0.610	-0.700	0.4847	
Experience in the field of the application	-0.346	0.106	-3.246	0.0014	**
Research team size 10 or more persons	-1.789	0.674	-2.653	0.0086	**
Research team size 5 to 9 persons	-1.117	0.502	-2.226	0.0270	*
Mathematics, Natural- and Engineering Sciences	-0.894	0.678	-1.318	0.1889	
Biology and Medicine	-0.673	0.454	-1.483	0.1396	
Residuals grade	9.511	0.990	9.604	0.0000	***
Stokes' quadrants					
Bohr's quadrant	Intercept				
Edison's quadrant	1.535	0.970	1.582	0.1151	
Pasteur's quadrant	-0.231	0.610	-0.379	0.7053	
Undefined (4th quadrant)	0.440	0.223	1.972	0.0498	*
Interdisciplinary application	0.119	0.184	0.644	0.5201	
No. of functions in firms throughout career	-0.231	0.610	-0.379	0.7053	
Technology readiness levels					
Technology readiness level 1	Intercept				
Technology readiness levels 2-4	-0.698	0.603	-1.158	0.2479	
Technology readiness levels 5-6	-0.776	0.571	-1.358	0.1757	
Technology readiness levels 7-9	-0.244	0.628	-0.389	0.6980	
Technology readiness level: no answer	-1.878	0.733	-2.562	0.0111	*
Commercial maturity levels: Model 4 (262 obs.)					
Commercial maturity level 1	0.775	0.554	1.399	0.1631	
Commercial maturity level 2	1.489	1.368	1.089	0.2773	
Commercial maturity level 3	-3.000	0.976	-3.073	0.0024	**
Commercial maturity level 4	-0.839	0.864	-0.972	0.3323	
Commercial maturity level 5	-0.136	0.618	-0.220	0.8259	
Commercial maturity level: no answer	Intercept				
Main application result: Model 5 (240 obs.)					
Main application result: new knowledge, data	Intercept				
Main application result: new application, innovation	-0.729	0.627	-1.163	0.2464	
Main application result: other	-3.559	0.955	-3.726	0.0003	***
Main application result: new technology	0.076	0.820	0.093	0.9261	

Error probabilities: *** 0.1%, ** 1%, * 5%, . 10%

Appendix 9. Estimation results for grade, NRP applicants

Dependent Var.: grade, Model 3 (184 obs.)	Estimate	Std. Error	t value	Pr(>|t|)	Sig.
(Intercept)	2.060	0.372	5.541	0.0000	***
Group leader	0.191	0.175	1.089	0.2779	
Head of (e.g. institute, department, center, clinic)	0.092	0.178	0.520	0.6039	
Lecturer, Senior Scientist, Principal Investigator	0.081	0.177	0.456	0.6489	
Other function	0.455	0.181	2.506	0.0133	*
Type of organization					
Cantonal university	0.388	0.114	3.396	0.0009	***
ETH Domain	0.651	0.115	5.646	0.0000	***
University of applied sciences UAS	0.122	0.119	1.023	0.3079	
University of Teacher Education UTE	-0.142	0.116	-1.221	0.2241	
Other organization	Intercept				
Age	-0.010	0.005	-1.943	0.0539	.
High experience with grant applications	0.099	0.098	1.017	0.3110	
Low experience with grant applications	-0.057	0.093	-0.611	0.5422	
Experience in the field of the application	-0.025	0.013	-1.853	0.0658	.
Research team size 10 or more persons	0.383	0.116	3.317	0.0011	**
Research team size 5 to 9 persons	0.131	0.079	1.658	0.0995	.
Mathematics, Natural- and Engineering Sciences	-0.043	0.083	-0.510	0.6107	
Biology and Medicine	-0.100	0.095	-1.057	0.2920	
Stokes' quadrants					
Bohr's quadrant	Intercept				
Edison's quadrant	-0.258	0.184	-1.403	0.1627	
Pasteur's quadrant	-0.140	0.137	-1.019	0.3099	
Undefined (4th quadrant)					
Interdisciplinary application	0.011	0.031	0.359	0.7204	
No. of functions in firms throughout career	0.045	0.031	1.433	0.1538	
Technology readiness levels					
Technology readiness level 1	Intercept				
Technology readiness levels 2-4	-0.214	0.099	-2.155	0.0328	*
Technology readiness levels 5-6	0.043	0.091	0.469	0.6399	
Technology readiness levels 7-9	-0.069	0.090	-0.773	0.4408	
Technology readiness level: no answer	0.044	0.120	0.369	0.7125	
Commercial maturity levels: Model 4 (184 obs.)					
Commercial maturity level 1	0.176	0.093	1.892	0.0604	.
Commercial maturity level 2	0.125	0.087	1.436	0.1530	
Commercial maturity level 3	0.061	0.128	0.479	0.6327	
Commercial maturity level 4	-0.053	0.106	-0.506	0.6139	
Commercial maturity level 5	0.027	0.124	0.221	0.8252	
Commercial maturity level: no answer	Intercept				
Main application result: Model 5 (173 obs.)					
Main application result: new knowledge, data	Intercept				
Main application result: new application, innovation	-0.202	0.101	-1.993	0.0482	*
Main application result: other	-0.071	0.198	-0.356	0.7222	
Main application result: new technology	-0.004	0.173	-0.022	0.9822	

Error probabilities: *** 0.1%, ** 1%, * 5%, . 10%

Appendix 10. Estimation results for funded, NRP applicants

Dependent Var.: funded, Model 3 (184 obs.)	Estimate	Std. Error	t value	Pr(>|t|)	Sig.
(Intercept)	-1.381	2.451	-0.564	0.5738	
Group leader	0.217	1.257	0.173	0.8630	
Head of (e.g. institute, department, center, clinic)	-0.478	1.109	-0.431	0.6674	
Lecturer, Senior Scientist, Principal Investigator	-0.833	1.235	-0.674	0.5012	
Other function	4.498	1.360	3.308	0.0012	**
Type of organization					
Cantonal university	0.407	1.076	0.378	0.7057	
ETH Domain	3.365	1.257	2.676	0.0083	**
University of applied sciences UAS	-2.212	1.468	-1.507	0.1339	
University of Teacher Education UTE	-0.508	1.320	-0.384	0.7012	
Other organization	Intercept				
Age	-0.056	0.032	-1.769	0.0789	.
High experience with grant applications	3.700	1.061	3.488	0.0006	***
Low experience with grant applications	1.744	0.755	2.309	0.0223	*
Experience in the field of the application	-0.315	0.095	-3.297	0.0012	**
Research team size 10 or more persons	5.495	1.163	4.725	0.0000	***
Research team size 5 to 9 persons	3.512	0.664	5.288	0.0000	***
Mathematics, Natural- and Engineering Sciences	1.307	0.640	2.040	0.0431	*
Biology and Medicine	-3.365	0.836	-4.028	0.0001	***
Residuals grade	7.433	1.065	6.976	0.0000	***
Stokes' quadrants					
Bohr's quadrant	Intercept				
Edison's quadrant	-0.592	1.296	-0.457	0.6486	
Pasteur's quadrant	1.715	0.977	1.756	0.0812	.
Undefined (4th quadrant)					
Interdisciplinary application	-0.136	0.237	-0.573	0.5674	
No. of functions in firms throughout career	0.391	0.235	1.659	0.0991	.
Technology readiness levels					
Technology readiness level 1	Intercept				
Technology readiness levels 2-4	-0.166	0.775	-0.214	0.8312	
Technology readiness levels 5-6	-2.273	0.958	-2.373	0.0189	*
Technology readiness levels 7-9	-0.859	0.624	-1.377	0.1707	
Technology readiness level: no answer	-2.625	1.007	-2.608	0.0100	*
Commercial maturity levels: Model 4 (184 obs.)					
Commercial maturity level 1	-0.663	0.659	-1.006	0.3161	
Commercial maturity level 2	-1.163	0.798	-1.458	0.1470	
Commercial maturity level 3	-0.233	0.983	-0.237	0.8130	
Commercial maturity level 4	-1.317	0.846	-1.556	0.1218	
Commercial maturity level 5	0.537	0.683	0.785	0.4336	
Commercial maturity level: no answer	Intercept				
Main application result: Model 5 (173 obs.)					
Main application result: new knowledge, data	Intercept				
Main application result: new application, innovation	-2.226	0.714	-3.116	0.0022	**
Main application result: other	-1.363	0.881	-1.546	0.1243	
Main application result: new technology	-1.936	0.914	-2.118	0.0359	*

Error probabilities: *** 0.1%, ** 1%, * 5%, . 10%

Appendix 11. Estimation results for grade, Bridge applicants

Dependent Var.: grade, Model 3 (212 obs.)	Estimate	Std. Error	t value	Pr(>|t|)	Sig.
(Intercept)	2.798	0.498	5.623	0.0000	***
Group leader	-1.285	0.230	-5.592	0.0000	***
Head of (e.g. institute, department, center, clinic)	-0.943	0.300	-3.145	0.0020	**
Lecturer, Senior Scientist, Principal Investigator	-1.316	0.235	-5.610	0.0000	***
Doctoral Student, Postdoc, Research Associate	-1.550	0.155	-9.970	0.0000	***
Type of organization					
Cantonal university	0.016	0.177	0.090	0.9287	
ETH Domain	0.120	0.155	0.776	0.4389	
University of applied sciences UAS	-0.007	0.175	-0.041	0.9670	
University of Teacher Education UTE	-0.870	0.318	-2.732	0.0071	**
Other organization	Intercept				
Age	-0.030	0.007	-4.142	0.0001	***
High experience with grant applications	-0.061	0.174	-0.348	0.7284	
Low experience with grant applications	-0.263	0.137	-1.924	0.0565	.
Experience in the field of the application	-0.007	0.022	-0.322	0.7477	
Research team size 10 or more persons	1.015	0.558	1.818	0.0713	.
Research team size 5 to 9 persons	0.171	0.141	1.212	0.2276	
Mathematics, Natural- and Engineering Sciences	0.111	0.175	0.636	0.5260	
Biology and Medicine	0.264	0.177	1.494	0.1374	
Stokes' quadrants					
Bohr's quadrant	Intercept				
Edison's quadrant	0.707	0.270	2.614	0.0100	**
Pasteur's quadrant	0.410	0.203	2.023	0.0451	*
Undefined (4^{th} quadrant)	-0.248	0.620	-0.400	0.6902	
Interdisciplinary application	-0.084	0.037	-2.271	0.0247	*
No. of functions in firms throughout career	0.158	0.048	3.316	0.0012	**
Technology readiness levels					
Technology readiness level 1	Intercept				
Technology readiness levels 2-4	-0.053	0.136	-0.387	0.6995	
Technology readiness levels 5-6	0.174	0.133	1.310	0.1924	
Technology readiness levels 7-9	-0.279	0.134	-2.075	0.0399	*
Technology readiness level: no answer	0.278	0.569	0.489	0.6259	
Commercial maturity levels: Model 4 (212 obs.)					
Commercial maturity level 1	-0.394	0.203	-1.939	0.0546	.
Commercial maturity level 2	-0.149	0.128	-1.161	0.2476	
Commercial maturity level 3	0.239	0.127	1.887	0.0613	.
Commercial maturity level 4	0.097	0.139	0.701	0.4848	
Commercial maturity level 5	-0.336	0.167	-2.012	0.0463	*
Commercial maturity level: no answer	Intercept				
Main application result: Model 5 (188 obs.)					
Main application result: new knowledge, data	Intercept				
Main application result: new application, innovation	-0.193	0.200	-0.968	0.3351	
Main application result: other	-0.031	0.450	-0.070	0.9446	
Main application result: new technology	-0.007	0.193	-0.036	0.9710	

Error probabilities: *** 0.1%, ** 1%, * 5%, . 10%

Appendix 12. Estimation results for funded, Bridge applicants

Dependent Var.: funded, Model 3 (212 obs.)	Estimate	Std. Error	t value	Pr(>|t|)	Sig.
(Intercept)	0.540	0.890	0.607	0.5448	
Group leader, Head or Lecturer	-0.892	0.303	-2.943	0.0037	**
Doctoral Student, Postdoc, Research Associate	Intercept				
Type of organization					
Cantonal university	0.323	0.212	1.521	0.1300	
ETH Domain	0.731	0.202	3.614	0.0004	***
University of applied sciences UAS or University of Teacher Education UTE	-0.181	0.227	-0.799	0.4253	
Other organization	Intercept				
Age					
High experience with grant applications					
Low experience with grant applications					
Experience in the field of the application					
Research team size 10 or more persons	Intercept				
Research team less than 5 persons	-1.917	0.732	-2.619	0.0095	**
Research team size 5 to 9 persons	-1.610	0.755	-2.131	0.0344	*
Mathematics, Natural- and Engineering Sciences					
Biology and Medicine					
Residuals grade					
Stokes' quadrants					
Bohr's quadrant					
Edison's quadrant					
Pasteur's quadrant					
Undefined (4th quadrant)					
Interdisciplinary application	-0.275	0.080	-3.451	0.0007	***
No. of functions in firms throughout career	0.396	0.106	3.744	0.0002	***
Technology readiness levels					
Technology readiness level 1	Intercept				
Technology readiness levels 2-4	0.102	0.306	0.333	0.7395	
Technology readiness levels 5-6	-0.097	0.290	-0.336	0.7373	
Technology readiness levels 7-9	-0.723	0.319	-2.270	0.0243	*
Technology readiness level: no answer	0.303	0.700	0.433	0.6658	
Commercial maturity levels: Model 4 (212 obs.)					
Commercial maturity level 1	-0.392	0.281	-1.395	0.1646	
Commercial maturity level 2	0.689	0.294	2.346	0.0200	*
Commercial maturity level 3	-0.039	0.279	-0.140	0.8889	
Commercial maturity level 4	-0.553	0.358	-1.544	0.1242	
Commercial maturity level 5	-1.450	0.969	-1.496	0.1362	
Commercial maturity level: no answer	Intercept				
Main application result: Model 5 (188 obs.)					
Main application result: new knowledge, data	Intercept				
Main application result: new application, innovation	-0.354	0.458	-0.772	0.4409	
Main application result: other	-0.971	1.037	-0.936	0.3507	
Main application result: new technology	0.072	0.435	0.166	0.8681	

Error probabilities: *** 0.1%, ** 1%, * 5%, . 10%

Greyed out variables had to be excluded due to estimation problems.

Appendix 13. Estimation results for ufin1, all applicants

Dependent Var.: ufin1, Model 3 (396 obs.)	Estimate	Std. Error	t value	Pr(>|t|)	Sig.
(Intercept)	-2.564	1.160	-2.211	0.0277	*
Group leader	0.719	0.501	1.435	0.1521	
Head of (e.g. institute, department, center, clinic)	1.073	0.548	1.960	0.0509	.
Lecturer, Senior Scientist, Principal Investigator	0.660	0.508	1.300	0.1946	
Other function	0.588	0.890	0.661	0.5091	
Type of organization					
Cantonal university	Intercept				
ETH Domain	-0.592	0.310	-1.908	0.0572	.
Other organization	0.235	0.288	0.814	0.4160	
University of applied sciences UAS or University of Teacher Education UTE	0.591	0.262	2.257	0.0246	*
Age	-0.010	0.014	-0.670	0.5036	
Research team size					
less than 5 persons	0.160	0.387	0.414	0.6789	
5 to 9 persons	0.503	0.396	1.271	0.2045	
10 to 49 persons	Intercept				
50 or more persons	0.713	0.549	1.299	0.1948	
Mathematics, Natural- and Engineering Sciences	0.038	0.311	0.122	0.9031	
Biology and Medicine	0.130	0.263	0.492	0.6227	
Instrument NCCR	0.720	0.509	1.415	0.1580	
Instrument NRP	-0.133	0.406	-0.328	0.7433	
Instrument UIBR	0.015	0.423	0.036	0.9710	
Instrument Bridge	Intercept				
Stokes' quadrants					
Bohr's quadrant	Intercept				
Edison's quadrant	-0.098	0.492	-0.199	0.8426	
Pasteur's quadrant	-0.630	0.344	-1.834	0.0675	.
Interdisciplinary application	0.040	0.088	0.458	0.6475	
No. of functions in firms throughout career	0.141	0.098	1.438	0.1513	
Importance of activities					
Basic research	0.060	0.117	0.514	0.6075	
Applied Research	-0.005	0.144	-0.037	0.9708	
Experimental development	0.200	0.105	1.911	0.0568	.
Education & training staff	0.042	0.086	0.490	0.6241	
Technical work related to innovation	-0.014	0.127	-0.111	0.9115	
Commercial, legal, financial work related to innovation	-0.072	0.144	-0.503	0.6156	
Any kind of other routine work	0.101	0.135	0.746	0.4560	
Technology readiness levels					
Technology readiness level 1	-0.139	0.257	-0.542	0.5885	
Technology readiness levels 2-4	0.069	0.265	0.261	0.7946	
Technology readiness levels 5-6	0.245	0.276	0.886	0.3760	
Technology readiness levels 7-9	0.162	0.289	0.559	0.5769	
Technology readiness level: no answer	Intercept				

Error probabilities: *** 0.1%, ** 1%, * 5%, . 10%

Appendix 14. Estimation results for ufin1, UIBR applicants

Dependent Var.: ufin1, Model 3 (166 obs.)	Estimate	Std. Error	t value	Pr(>|t|)	Sig.
(Intercept)	-4.946	2.059	-2.402	0.0177	*
Group leader	-1.650	0.927	-1.780	0.0774	.
Head of (e.g. institute, department, center, clinic)	-1.654	1.009	-1.639	0.1035	
Lecturer, Senior Scientist, Principal Investigator	-2.671	0.796	-3.356	0.0010	**
Other function	-18.548	1.779	-10.424	0.0000	***
Type of organization					
Cantonal university	Intercept				
ETH Domain	-2.107	0.861	-2.447	0.0157	*
Other organization	-0.064	0.417	-0.154	0.8777	
University of applied sciences UAS or University of Teacher Education UTE	1.602	0.550	2.916	0.0042	**
Age	0.026	0.031	0.860	0.3911	
Research team size					
less than 5 persons	-0.098	0.583	-0.169	0.8661	
5 to 9 persons	-0.690	0.607	-1.136	0.2579	
10 to 49 persons	Intercept				
50 or more persons	17.523	1.704	10.285	0.0000	***
Mathematics, Natural- and Engineering Sciences	0.792	0.573	1.383	0.1690	
Biology and Medicine	0.940	0.515	1.825	0.0703	.
Stokes' quadrants					
Bohr's quadrant	Intercept				
Edison's quadrant	-1.797	0.996	-1.804	0.0734	.
Pasteur's quadrant	-0.479	0.685	-0.699	0.4857	
Interdisciplinary application	0.375	0.196	1.918	0.0573	.
No. of functions in firms throughout career	-0.093	0.162	-0.572	0.5683	
Importance of activities					
Basic research	0.215	0.201	1.068	0.2877	
Applied Research	0.368	0.230	1.600	0.1119	
Experimental development	-0.069	0.186	-0.369	0.7130	
Education & training staff	0.296	0.161	1.834	0.0689	.
Technical work related to innovation	-0.199	0.199	-1.000	0.3191	
Commercial, legal, financial work related to innovation	0.004	0.248	0.016	0.9872	
Any kind of other routine work	0.516	0.224	2.305	0.0227	*
Technology readiness levels					
Technology readiness level 1	-0.128	0.480	-0.266	0.7907	
Technology readiness levels 2-4	0.466	0.467	0.997	0.3204	
Technology readiness levels 5-6	0.007	0.430	0.016	0.9873	
Technology readiness levels 7-9	0.346	0.537	0.645	0.5199	
Technology readiness level: no answer	Intercept				

Error probabilities: *** 0.1%, ** 1%, * 5%, . 10%

Appendix 15. Estimation results for ufin2, all applicants

Dependent Var.: ufin2, Model 3 (363 obs.)	Estimate	Std. Error	t value	Pr(>|t|)	Sig.
(Intercept)	-2.213	1.308	-1.691	0.0918	.
Group leader	1.543	0.595	2.591	0.0100	*
Head of (e.g. institute, department, center, clinic)	1.662	0.642	2.590	0.0101	*
Lecturer, Senior Scientist, Principal Investigator	1.060	0.626	1.693	0.0915	.
Other function	1.556	0.874	1.781	0.0759	.
Type of organization					
Cantonal university	Intercept				
ETH Domain	-0.137	0.333	-0.411	0.6812	
Other organization	-1.086	0.323	-3.359	0.0009	***
University of applied sciences UAS or University of Teacher Education UTE	-0.117	0.298	-0.392	0.6951	
Age	-0.020	0.017	-1.217	0.2246	
Research team size					
less than 5 persons	-0.981	0.428	-2.291	0.0227	*
5 to 9 persons	-0.264	0.456	-0.579	0.5632	
10 to 49 persons	Intercept				
50 or more persons	-0.716	0.615	-1.164	0.2455	
Mathematics, Natural- and Engineering Sciences	-0.299	0.332	-0.902	0.3679	
Biology and Medicine	0.154	0.296	0.519	0.6040	
Instrument NCCR	0.951	0.543	1.752	0.0808	.
Instrument NRP	0.155	0.443	0.351	0.7258	
Instrument UIBR	1.460	0.480	3.044	0.0025	**
Instrument Bridge	Intercept				
Stokes' quadrants					
Bohr's quadrant	Intercept				
Edison's quadrant	-1.033	0.568	-1.820	0.0697	.
Pasteur's quadrant	-0.655	0.376	-1.745	0.0820	.
Interdisciplinary application	-0.115	0.104	-1.104	0.2703	
No. of functions in firms throughout career	-0.143	0.103	-1.385	0.1671	
Importance of activities					
Basic research	0.192	0.130	1.478	0.1405	
Applied Research	0.153	0.161	0.951	0.3424	
Experimental development	0.105	0.111	0.952	0.3418	
Education & training staff	0.059	0.099	0.598	0.5504	
Technical work related to innovation	0.152	0.118	1.286	0.1994	
Commercial, legal, financial work related to innovation	-0.157	0.129	-1.215	0.2253	
Any kind of other routine work	0.217	0.143	1.512	0.1317	
Technology readiness levels					
Technology readiness level 1	-0.510	0.278	-1.831	0.068	.
Technology readiness levels 2-4	0.002	0.276	0.006	0.9950	
Technology readiness levels 5-6	0.063	0.325	0.196	0.8450	
Technology readiness levels 7-9	0.579	0.326	1.777	0.0766	.
Technology readiness level: no answer	Intercept				

Error probabilities: *** 0.1%, ** 1%, * 5%, . 10%

Appendix 16. Estimation results for ufin2, UIBR applicants

Dependent Var.: ufin2, Model 3 (155 obs.)	Estimate	Std. Error	t value	Pr(>|t|)	Sig.
(Intercept)	3.090	2.080	1.486	0.1399	
Group leader	-1.468	0.927	-1.584	0.1158	
Head of (e.g. institute, department, center, clinic)	-1.290	0.958	-1.347	0.1806	
Lecturer, Senior Scientist, Principal Investigator	-1.651	0.871	-1.896	0.0604	.
Other function	-17.975	1.624	-11.068	0.0000	***
Type of organization					
Cantonal university	Intercept				
ETH Domain	-0.719	0.662	-1.087	0.2792	
Other organization	-1.462	0.391	-3.735	0.0003	***
University of applied sciences UAS or University of Teacher Education UTE	0.448	0.440	1.018	0.3107	
Age	-0.037	0.031	-1.200	0.2326	
Research team size					
less than 5 persons	-0.454	0.559	-0.812	0.4185	
5 to 9 persons	-0.141	0.696	-0.203	0.8394	
10 to 49 persons	Intercept				
50 or more persons	2.275	1.381	1.648	0.1020	
Mathematics, Natural- and Engineering Sciences	0.084	0.497	0.169	0.8662	
Biology and Medicine	0.296	0.462	0.641	0.5230	
Stokes' quadrants					
Bohr's quadrant	Intercept				
Edison's quadrant	-0.975	0.915	-1.066	0.2887	
Pasteur's quadrant	0.170	0.648	0.262	0.7934	
Interdisciplinary application	-0.267	0.207	-1.288	0.2001	
No. of functions in firms throughout career	-0.062	0.169	-0.369	0.7131	
Importance of activities					
Basic research	0.173	0.177	0.981	0.3286	
Applied Research	-0.149	0.292	-0.510	0.6113	
Experimental development	0.100	0.159	0.626	0.5327	
Education & training staff	0.066	0.147	0.451	0.6531	
Technical work related to innovation	0.347	0.176	1.967	0.0514	.
Commercial, legal, financial work related to innovation	-0.134	0.212	-0.631	0.5291	
Any kind of other routine work	0.021	0.220	0.095	0.9244	
Technology readiness levels					
Technology readiness level 1	-1.042	0.433	-2.406	0.0176	*
Technology readiness levels 2-4	0.335	0.440	0.760	0.4486	
Technology readiness levels 5-6	0.087	0.451	0.193	0.8471	
Technology readiness levels 7-9	0.869	0.549	1.582	0.1162	
Technology readiness level: no answer	Intercept				

Error probabilities: *** 0.1%, ** 1%, * 5%, . 10%

Appendix 17. Estimation results for ufin3, all applicants

Dependent Var.: ufin3, Model 3 (371 obs.)	Estimate	Std. Error	t value	Pr(>|t|)	Sig.
(Intercept)	0.083	1.303	0.064	0.9492	
Group leader	0.030	0.498	0.060	0.9525	
Head of (e.g. institute, department, center, clinic)	0.116	0.535	0.218	0.8279	
Lecturer, Senior Scientist, Principal Investigator	-0.900	0.512	-1.758	0.0797	.
Other function	-0.823	0.788	-1.045	0.2970	
Type of organization					
Cantonal university	Intercept				
ETH Domain	0.144	0.334	0.432	0.6663	
Other organization	0.382	0.325	1.176	0.2405	
University of applied sciences UAS or University of Teacher Education UTE	0.328	0.285	1.150	0.2508	
Age	0.029	0.016	1.849	0.0654	.
Research team size					
less than 5 persons	-0.819	0.449	-1.825	0.0689	.
5 to 9 persons	-0.116	0.451	-0.258	0.7964	
10 to 49 persons	Intercept				
50 or more persons	-0.240	0.744	-0.323	0.7468	
Mathematics, Natural- and Engineering Sciences	0.026	0.329	0.080	0.9361	
Biology and Medicine	0.466	0.298	1.565	0.1185	
Instrument NCCR	0.058	0.523	0.111	0.9116	
Instrument NRP	-0.185	0.456	-0.406	0.6848	
Instrument UIBR	0.467	0.457	1.021	0.3080	
Instrument Bridge	Intercept				
Stokes' quadrants					
Bohr's quadrant	Intercept				
Edison's quadrant	-0.841	0.528	-1.593	0.1122	
Pasteur's quadrant	-1.249	0.403	-3.098	0.0021	**
Interdisciplinary application	-0.152	0.100	-1.521	0.1294	
No. of functions in firms throughout career	-0.021	0.099	-0.211	0.8332	
Importance of activities					
Basic research	0.060	0.125	0.483	0.6293	
Applied Research	-0.105	0.164	-0.641	0.5223	
Experimental development	0.349	0.105	3.313	0.0010	**
Education & training staff	-0.141	0.094	-1.496	0.1358	
Technical work related to innovation	-0.017	0.132	-0.127	0.8992	
Commercial, legal, financial work related to innovation	0.066	0.125	0.528	0.5981	
Any kind of other routine work	0.028	0.142	0.201	0.8410	
Technology readiness levels					
Technology readiness level 1	-0.086	0.272	-0.316	0.7523	
Technology readiness levels 2-4	0.024	0.289	0.084	0.9332	
Technology readiness levels 5-6	0.203	0.300	0.676	0.4996	
Technology readiness levels 7-9	0.832	0.310	2.687	0.0076	**
Technology readiness level: no answer	Intercept				

Error probabilities: *** 0.1%, ** 1%, * 5%, . 10%

Appendix 18. Estimation results for ufin3, UIBR applicants

Dependent Var.: ufin3, Model 3 (158 obs.)	Estimate	Std. Error	t value	Pr(>|t|)	Sig.
(Intercept)	12.562	2.087	6.019	0.0000	***
Group leader	-14.678	1.050	-13.973	0.0000	***
Head of (e.g. institute, department, center, clinic)	-15.591	1.294	-12.052	0.0000	***
Lecturer, Senior Scientist, Principal Investigator	-16.194	1.113	-14.550	0.0000	***
Other function	-34.604	2.382	-14.525	0.0000	***
Type of organization					
Cantonal university	Intercept				
ETH Domain	-0.684	0.613	-1.115	0.2668	
Other organization	0.534	0.471	1.134	0.2588	
University of applied sciences UAS or University of Teacher Education UTE	0.384	0.480	0.800	0.4251	
Age	0.117	0.033	3.576	0.0005	***
Research team size					
less than 5 persons	-1.262	0.666	-1.895	0.0604	.
5 to 9 persons	-0.872	0.793	-1.098	0.2741	
10 to 49 persons	Intercept				
50 or more persons	16.182	0.991	16.334	0.0000	***
Mathematics, Natural- and Engineering Sciences	0.263	0.526	0.500	0.6182	
Biology and Medicine	0.283	0.455	0.622	0.5354	
Stokes' quadrants					
Bohr's quadrant	Intercept				
Edison's quadrant	-0.756	0.954	-0.792	0.4296	
Pasteur's quadrant	-0.935	0.733	-1.275	0.2047	
Interdisciplinary application	-0.323	0.190	-1.700	0.0917	.
No. of functions in firms throughout career	0.009	0.160	0.054	0.9574	
Importance of activities					
Basic research	0.174	0.191	0.909	0.3653	
Applied Research	-0.279	0.243	-1.149	0.2529	
Experimental development	0.308	0.205	1.500	0.1362	
Education & training staff	-0.090	0.154	-0.584	0.5602	
Technical work related to innovation	0.050	0.178	0.281	0.7793	
Commercial, legal, financial work related to innovation	0.254	0.214	1.185	0.2383	
Any kind of other routine work	-0.078	0.307	-0.253	0.8009	
Technology readiness levels					
Technology readiness level 1	-0.844	0.450	-1.875	0.0632	.
Technology readiness levels 2-4	-0.233	0.479	-0.486	0.6279	
Technology readiness levels 5-6	0.020	0.530	0.038	0.9695	
Technology readiness levels 7-9	0.681	0.719	0.947	0.3454	
Technology readiness level: no answer	Intercept				

Error probabilities: *** 0.1%, ** 1%, * 5%, . 10%

Appendix 19. Availability of sources for pre-financing SNSF applications in approved applications by organization type in %

Approved applications	Cantonal university	ETH Domain	UAS	UTE	Other	Total
Not funded, no funding available	21.1%	8.5%	16.7%	19.2%	15.4%	16.2%
Basic endowment of the research group	51.5%	74.4%	37.2%	53.8%	57.7%	55.9%
Internal start-up funding (organization)	28.1%	17.9%	43.6%	42.3%	19.2%	27.9%
Start-up funding from other funders	12.9%	12.0%	10.3%	3.8%	13.5%	11.7%
Follow-up/cross-financing	21.6%	22.2%	10.3%	3.8%	21.2%	18.7%
Services/contract projects	5.3%	2.6%	7.7%	3.8%	7.7%	5.2%

Appendix 20. Availability of sources for pre-financing SNSF applications in rejected/withdrawn applications by organization type in %

Rejected/withdrawn applications	Cantonal university	ETH Domain	UAS	UTE	Other	Total
Not funded, no funding available	27.8%	10.6%	26.1%	24.4%	21.8%	22.8%
Basic endowment of the research group	46.5%	67.3%	33.9%	46.3%	36.4%	47.1%
Internal start-up funding (organization)	19.7%	15.0%	40.0%	34.1%	29.1%	25.3%
Start-up funding from other funders	16.2%	9.7%	5.2%	4.9%	18.2%	11.7%
Follow-up/cross-financing	16.7%	23.0%	18.3%	0.0%	3.6%	15.7%
Services/contract projects	4.5%	14.2%	6.1%	2.4%	9.1%	7.3%

Appendix 21. Questionnaire and response frequencies of survey 1

Survey 1 of SNSF applicants on research funding by the SNSF

Fachhochschule Nordwestschweiz (FHNW), Hochschule für Wirtschaft on behalf of the Swiss Science Council

Why do we collect and process your data?

This survey serves to evaluate the Swiss National Science Foundation (SNSF) in accordance with the Research and Innovation Promotion Act, Art. 54 RIPA. It is carried out by the School of Business at the University of Applied Sciences and Arts Northwestern Switzerland (FHNW) on behalf of the Swiss Science Council (SSC. Participation in the survey is voluntary and can be discontinued at any time. If the survey is interrupted, then it can be continued at a later date on the last page that has not yet been answered. The answers are only evaluated and presented in anonymised and aggregated form, so that it is not possible to draw conclusions about individual persons.

How can you contact us?

Fachhochschule Nordwestschweiz (FHNW), Hochschule für Wirtschaft, Riggenbachstrasse 16, CH-4600 Olten

Project management: Prof. Dr. Franz Barjak, +41 62 957 26 84, swr-survey.business@fhnw.ch

☐ I agree to the processing of my personal data in accordance with the information provided herein.

☐ I don’t want to participate.

1. Questions about yourself

1. In welcher Sprache möchten Sie die Fragen beantworten?
Dans quelle langue souhaitez-vous répondre aux questions?
In which language would you like to answer the questions?

	Obs.	In %
Deutsch	462	47.9
English	283	29.3
Français	220	22.8
Total	965[a]	100

a The difference to 966 is due to rounding errors in the weighted data.

2. What is your **year of birth**?
Age groups

	Obs.	in %
Under 40	130	13.5
40-49	343	35.5
50-59	346	35.8
60 or older	147	15.2
Non-responses	0	0
Total	966	100

3. In which year did you obtain your **doctorate**?

If you have more than one doctorate, please indicate the year of the first doctorate.

	Obs.	in %
Before 1990	79	8.2
1990-1999	259	26.8
2000-2009	374	38.7
2010-2021	219	22.7
No doctorate	31	3.3
Non-responses	3	0.3
Total	965[a]	100

a The difference to 966 is due to rounding errors in the weighted data.

4. In which **country** did you complete your **doctorate**?

Please select the country of the university from which you obtained the doctoral degree. Please answer for the first doctorate if you obtained more than one.

	Obs.	in %
Switzerland	484	50.1
EU member country	346	35.8
Other country worldwide	105	10.9
Non-responses	31	3.3
Total	966	100

Questions about the application always refer below to the application «u_title_project» in the year «u_decision_year».

5. Have you **changed the organization** (university, research organization, etc.) after submitting the application?

	Obs.	in %
Yes	96	9.9
No	864	89.5
I don't know any more.	3	0.3
Non-responses	3	0.3
Total	966	100

6. Which **organization** did you work for when submitting the application?

Please enter the organization listed in the application.

	Obs.	In %
AO Research Institute - AORI	a)	
Berne University of Applied Sciences - BFH	26	2.7
Cantonal hospital of St.Gallen - KSPSG	a)	
Cardiocentro Ticino - CT	a)	
Centre Suisse d'Electronique et de Microtechnique SA	5	0.5
CERN	a)	
Companies/ Private Industry - FP	8	0.8
Eastern Switzerland University of Applied Sciences - OST	6	0.6
Ecole d'art du Valais (ECAV-edhea)	a)	
Ente Ospedaliero Cantonale - EOC	a)	

EPF Lausanne - EPFL	83	8.6
ETH Zurich - ETHZ	88	9.1
Facoltà di Teologia di Lugano - FTL	a)	
Graduate Institute of International and Development Studies - IHEID	7	0.7
Haute Ecole Pédagogique des cantons de Berne, du Jura et de Neuchâtel - HEP-BEJUNE	a)	
Haute école pédagogique du canton de Fribourg/Pädagogische Hochschule Freiburg - HEP-FR	a)	
Haute école pédagogique du canton de Vaud - HEPL	5	0.5
Haute école pédagogique du Valais/Pädagogische Hochschule Wallis - HEP-VS	a)	
Hopitaux Universitaires de Geneve	a)	
Idiap	7	0.7
Inselspital, Universität Bern	a)	
Inspire AG	a)	
Institute Friedrich Miescher - FMI	6	0.6
Interkantonale Hochschule für Heilpädagogik - HfH	a)	
Kalaidos University of Applied Sciences - FHKD	a)	
Kantonsspital Aarau - KSPA	a)	
Kantonsspital Baden - KSPB	a)	
Kantonsspital Baselland	a)	
Lucerne University of Applied Sciences and Arts - HSLU	19	2.0
Non-profit organizations (libraries, museums, foundations) and administration - NPO	9	0.9
Other Hospitals - ASPIT	a)	
Pädagogische Hochschule Bern – PH Bern	8	0.8
Pädagogische Hochschule der Fachhochschule Nordwestschweiz - PH-FHNW	12	1.2
Pädagogische Hochschule Graubünden - PHGR	a)	
Pädagogische Hochschule Luzern - PHLU	5	0.5
Pädagogische Hochschule Schwyz - PHSZ	a)	
Pädagogische Hochschule St. Gallen - PHSG	7	0.7
Pädagogische Hochschule Thurgau - PHTG	a)	
Pädagogische Hochschule Zug - PHZG	a)	
Pädagogische Hochschule Zürich - PHZH	9	0.9
Paul Scherrer Institute - PSI	25	2.6
Physikal.-Meteorolog. Observatorium Davos - PMOD	a)	
Research Institute of Organic Agriculture - FiBL	5	0.5
Research Institutes Agroscope - AGS	10	1.0
Swiss Federal Institute for Forest, Snow and Landscape Research - WSL	9	0.9
Swiss Federal Institute for Vocational Education and Training - EHB	5	0.5
Swiss Federal Institute of Aquatic Science and Technology - EAWAG	9	0.9
Swiss Federal Laboratories for Materials Science and Technology - EMPA	20	2.1
Swiss Institute of Allergy and Asthma Research - SIAF	a)	
Swiss Institute of Bioinformatics - SIB	a)	
Swiss Integrativer Center for Human Health	a)	
The University of Applied Sciences of Grisons - FHGR	a)	
Università della Svizzera italiana - USI	15	1.6
University of Applied Sciences and Arts Northwestern Switzerland (without UTE) - FHNW	36	3.7
University of Applied Sciences and Arts of Southern Switzerland - SUPSI	7	0.7
University of Applied Sciences and Arts Western Switzerland - HES-SO	43	4.5
University of Basel - BS	46	4.8
University of Berne - BE	61	6.3
University of Fribourg - FR	16	1.7
University of Geneva - GE	73	7.6

University of Lausanne - LA	50	5.2
University of Lucerne - LU	10	1.0
University of Neuchatel - NE	16	1.7
University of St. Gallen - SG	9	0.9
University of Zurich - ZH	76	7.9
Wyss Center for Bio and Neuro-Engineering	a)	
Zurich University of Applied Sciences - ZHAW	38	3.9
Zurich University of the Arts - ZHdK	7	0.7
NA	14	1.4
Other (from organizations with a)	56	5.8
Total	966	100

a) Fewer than 5 observations, not shown due to privacy reasons.

7. Which **function** best describes your role in the organization for which you entered the application?

	Obs.	in %
Head of (e.g. institute, department, center, clinic)	272	28.2
Lecturer (Lehrbeauftragte/r, Chargé/e de cours)	67	7.0
Group leader, Senior physician	368	38.1
Senior Scientist, Principal Investigator	147	15.2
Postdoc, Research associate, Resident physician	77	8.0
Doctoral student	15	1.5
Visiting scholar	3	0.3
Other, please specify	15	1.6
Non-responses	1	0.1
Total	965[a]	100

a The difference to 966 is due to rounding errors in the weighted data.

8. Which **position** did you have when you submitted the application?

If more than one, please answer on the position at the organization for which you submitted the mentioned application.

	Obs.	in %
Full professor	273	28.2
Associate professor	116	12.0
Assistant professor with tenure track	40	4.1
Assistant professor without tenure track	30	3.2
Professor at a university of applied sciences or university of teacher education	118	12.2
Honorary professor or Titular professor	44	4.5
Visiting professor	1	0.2
No professorship	343	35.5
Non-responses	1	0.1
Total	966	100

2. Questions about your research

9. What was your **main research area** in the reference period 2017-20?

Please choose the answer that covered most of your research. You can indicate other areas in the follow-up question.

	Obs.	in %
Human and Social Sciences		
Theology & Religious Studies, History, Classical Studies, Archaeology, Prehistory and Early History	14	1.4
Linguistics and Literature, Philosophy	21	2.2
Ethnology, Social and Human Geography	13	1.3
Art Studies, Musicology, Film and Theatre Studies, Architecture	34	3.5
Psychology, Educational Studies	74	7.6
Sociology, Social Work, Political Sciences, Media and Communication Studies, Health	51	5.3
Economics, Law	71	7.4
Mathematics, Natural- and Engineering Sciences		
Mathematics	15	1.5
Astronomy, Astrophysics and Space Science	11	1.1
Chemistry	56	5.8
Physics	56	5.8
Civil Engineering	10	1.0
Mechanical Engineering	23	2.3
Electrical Engineering	24	2.5
Materials Science	40	4.1
Information Technology, Computer Science	65	6.7
Other disciplines of Engineering Sciences	33	3.4
Environmental Sciences	34	3.6
Earth Sciences (Geology, Geophysics, Geochemistry, Mineralogy, etc.)	15	1.5
Biology and Medicine		
Basic Biological Research (Biochemistry, Molecular Biology, Genetics, Biophysics, etc.)	64	6.6
General Biology (including Forestry and Agricultural Sciences, Environmental Research, Ecology, Animal Breeding)	18	1.9
Basic Medical Sciences (Anatomy, Physiology, Pharmacology, etc.)	43	4.4
Experimental Medicine (e.g. Pathophysiology, Immunology, Nutritional Research, Ethology, etc.)	54	5.6
Clinical Medicine (including Dentistry and Veterinary Medicine)	68	7.0
Preventive Medicine (Epidemiology/Early Diagnosis/Prevention)	17	1.7
Social Medicine (Rehabilitation, Human Ecology, Environmental Toxicology, Dietetics, Occupational Medicine, Ergonomics, Health Education etc.)	14	1.5
Other research area	4	0.4
Non-responses	27	2.8
Total	966	100

10. In addition, in which other areas do you conduct research?

Multiple answers are possible.

	Obs.	in %
In no other field of research	227	23.5
Human and Social Sciences		
Theology & Religious Studies, History, Classical Studies, Archaeology, Prehistory and Early History	12	1.3
Linguistics and Literature, Philosophy	12	1.3
Art Studies, Musicology, Film and Theatre Studies, Architecture	20	2
Ethnology, Social and Human Geography	19	2
Psychology, Educational Studies	49	5.1
Sociology, Social Work, Political Sciences, Media and Communication Studies, Health	82	8.4

	Obs.	in %
Economics, Law	32	3.3
Mathematics, Natural- and Engineering Sciences		
Mathematics	28	2.9
Astronomy, Astrophysics and Space Science	7	0.8
Chemistry	50	5.1
Physics	69	7.1
Civil Engineering	7	0.8
Mechanical Engineering	29	3
Electrical Engineering	43	4.5
Materials Science	84	8.7
Information Technology, Computer Science	76	7.8
Other disciplines of Engineering Sciences	66	6.8
Environmental Sciences	48	5
Earth Sciences (Geology, Geophysics, Geochemistry, Mineralogy, etc.)	17	1.7
Biology and Medicine		
Basic Biological Research (Biochemistry, Molecular Biology, Genetics, Biophysics, etc.)	79	8.2
General Biology (including Forestry and Agricultural Sciences, Environmental Research, Ecology, Animal Breeding)	32	3.3
Basic Medical Sciences (Anatomy, Physiology, Pharmacology, etc.)	72	7.4
Experimental Medicine (e.g. Pathophysiology, Immunology, Nutritional Research, Ethology, etc.)	74	7.6
Clinical Medicine (including Dentistry and Veterinary Medicine)	62	6.4
Preventive Medicine (Epidemiology/Early Diagnosis/Prevention)	57	5.9
Social Medicine (Rehabilitation, Human Ecology, Environmental Toxicology, Dietetics, Occupational Medicine, Ergonomics, Health Education etc.)	36	3.7
Other research area	115	11.9
Non-responses	70	7.2
Total	966	100

11. To what extent does your research depend on the acquisition of **third-party funding**?

If this has changed recently, then please take the time of submission of the application as the reference period for the response.

	Obs.	in %
I am very dependent on third-party funding.	588	60.9
I am rather dependent on third-party funding.	291	30.2
I tend not to depend on third-party funding.	63	6.5
I am not dependent on third-party funding at all.	17	1.7
Non-responses	6	0.7
Total	965[a]	100

a The difference to 966 is due to rounding errors in the weighted data.

12. Please rank the following **funders** according to their importance for funding your research in the reference period 2017-20.

Funders can be dragged and dropped into the field on the right. The most important funders should be at the top. Irrelevant funders remain in the left-hand window.

	Rank							Non-
	1	2	3	4	5	6	7	responses[a]

Own university/organization (internal funds)	Obs.	277	201	180	81	38	18	6	166
	in %	28.6	20.8	18.6	8.4	3.9	1.8	0.6	17.2
Swiss National Science Foundation (SNSF)	Obs.	408	255	83	39	19	12	8	140
	in %	42.2	26.4	8.6	4.1	2	1.3	0.9	14.5
Innosuisse (formerly CTI)	Obs.	65	79	79	57	41	32	30	583
	in %	6.7	8.2	8.2	5.9	4.3	3.3	3.1	60.4
EU, European funding organizations, other international public funders	Obs.	83	106	122	65	53	28	26	483
	in %	8.6	10.9	12.7	6.8	5.5	2.9	2.7	50
Public funders in Switzerland (e.g., research contracts from offices of the federal government, cantons, municipalities)	Obs.	48	96	96	68	54	40	30	534
	in %	5	10	9.9	7.1	5.6	4.2	3.1	55.2
Companies, business organizations	Obs.	28	74	97	80	55	49	36	547
	in %	2.9	7.7	10.1	8.3	5.7	5	3.7	56.6
Foundations at home or abroad	Obs.	42	103	104	111	50	39	47	469
	in %	4.4	10.7	10.8	11.5	5.2	4.1	4.9	48.6

a All non-responses were recoded for the analyses by subtracting the rank sum of the ranked items irs from the total rank sum trs (trs = 28) and dividing it by the number k of non-responses: $rank_{nr}$=(trs-irs)/k.

13. What significance do the following **factors** have for you when deciding whether to carry out a research project?

	Very high importance		High importance		Medium importance		Low importance		Very low or no importance		Non-responses		Total
	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.
I would like to contribute to the fundamental understanding of phenomena in my field of research.	590	61.1	271	28	82	8.5	16	1.7	5	0.5	2	0.2	966
I want to contribute to the immediate fulfilment of a social need or generate a practical benefit.	530	54.9	301	31.2	90	9.3	35	3.6	10	1.0	0	0	966
Other factors, please specify:	62	6.4	30	3.1	8	0.8	1	0.1	7	0.7	858	88.8	966

a The difference to 966 is due to rounding errors in the weighted data.

14. How good is your research group's equipment or access to research **equipment** or infrastructure compared to similar research groups in Switzerland?

If this has changed recently, then please take the time of submission of the application as the reference period for the response.

	Obs.	In %
Much better.	135	14
A little better.	199	20.6
About the same.	427	44.3
A little worse.	102	10.6
Significantly worse.	47	4.9
The equipment is not relevant to my/our research.	50	5.2
Non-responses	4	0.4
Total	964[a]	100

a The difference to 966 is due to rounding errors in the weighted data.

3. Questions about your professional experience outside of science

15. What functions in and for **business enterprises** have you already held in your professional life?

Multiple answers are possible.

	Obs.	in %
Employee	348	36.0
Management function	198	20.5
Founder of a company	190	19.7
Member of a board of directors or supervisory body	143	14.8
Member of a Scientific Advisory Board	273	28.3
Other function	67	7.0
No function in a commercial enterprise	357	37.0
Non-responses	0	0
Total	966	100

16. What functions in and for **government institutions**, **non-profit organizations** or other organizations **outside academia** (excluding companies) have you already held in your professional life?

Multiple answers are possible.

	Obs.	in %
Employee	274	28.4
Management function	245	25.3
Founder of an organization	78	8.1
Member of an advisory or supervisory body	256	26.5
Member of a Scientific Advisory Board	321	33.2
Other function	88	9.1
No function in such organizations outside of science	301	31.2
Non-responses	0	0
Total	966	100

4. Questions regarding the funding application

In addition to your person and your organization, the survey refers in particular to the following application that you have submitted to the SNSF for funding: «u_title_project» (Submission year: «u_decision_year», Program: «u_funding_instrument»).

17. How many **research applications** had you submitted to the SNSF or other comparable research funding institutions abroad (e.g. DFG, NSF, Research Councils) throughout your career before the above-mentioned application?

	As principal applicant		As participating researcher	
	Obs.	In %	Obs.	In %
None	103	10.7	114	11.8
One	105	10.9	100	10.4
2 to 5	353	36.6	340	35.2
6 to 9	158	16.3	116	12.0
10 to 19	133	13.8	78	8.0
20 or more	63	6.6	43	4.4
Non-responses	50	5.2	175	18.2

Total	965[a]	100	966	100

a The difference to 966 is due to rounding errors in the weighted data.

18. Experience in the subject area of the application: How much do the following statements apply to this research application and the applicants?

	Totally true.		More likely to be true.		Rather not true.		Not true at all.		Non-responses		Total
	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.
Within this field, the application continues and furthers our research, which is highly recognised in the scientific community.	569	58.9	267	27.6	99	10.3	25	2.6	6	0.6	966
When we submitted our application, we were newcomers in the subject area.	63	6.6	243	25.2	261	27.0	395	40.9	4	0.4	966
When we submitted our application, we were among the leading researchers in this field in Switzerland.	483	50.0	338	35.0	110	11.4	29	3.00	5	0.5	965[a]
When we submitted our application, we were among the leading researchers in this field in Europe.	322	33.4	391	40.4	173	17.9	76	7.9	5	0.5	967[a]

a The difference to 966 is due to rounding errors in the weighted data.

19. From which sources did you **pre-finance** the application and submission?

Please indicate all that apply.

	Obs.	In %
Not funded, no funding available	197	20.4
Funding from the basic endowment of the research group	497	51.5
Internal start-up funding for research projects from your organization	240	24.9
Start-up funding for research projects from other funders	116	12.1
Follow-up or cross-financing from funded research projects	185	19.2
Financing via services or contract projects	60	6.2
Other source	2	0.2
I don't know any more.	8	0.8
Non-responses	8	0.8
Total	966	100

20. Approximately how many **working days** did you (you personally and other contributors in your organization) spend on preparing the application in question?

Please consider only the direct work on the application (e.g., putting together the research consortium, developing the research plan, compiling and submitting the application documents, etc.).
For multi-stage applications, please include all stages. However, preparatory work in pre-projects or previous research projects does not count towards this.

	Obs.	In %
less than 10 working days	75	7.8
10 to 19 working days	321	33.2
20 to 59 working days (1 to under 3 months)	400	41.4
60 to 119 working days (3 to under 6 months)	111	11.4
120 or more working days (6 months or more)	21	2.2
I don't know.	34	3.5
Non-responses	5	0.5

Total	967[a]	100

a The difference to 966 is due to rounding errors in the weighted data.

5. Questions regarding the application or the resulting project

21. What was the **project duration** in the application?

	Obs.	In %
less than 1 year	11	1.2
1 to under 2 years	140	14.5
2 to under 3 years	166	17.1
3 to under 4 years	333	34.5
4 to under 5 years	231	23.9
5 years or more	36	3.7
I don't know any more.	40	4.1
Non-responses	8	0.8
Total	965[a]	100

a The difference to 966 is due to rounding errors in the weighted data.

22. How many people were on the research team for the research project described in the application?

Please include all persons involved in the research from your own organization and other organizations involved in the project (headcount).

	Obs.	In %
less than 5 persons	532	55.0
5 to 9 persons	290	30.1
10 to 19 persons	55	5.7
20 to 49 persons	38	4.0
50 or more persons	29	3.0
I don't know any more.	15	1.6
Non-responses	6	0.6
Total	965[a]	100

a The difference to 966 is due to rounding errors in the weighted data.

23. According to the SNSF documents, in your application you indicated the following main research area: «u_discipline». Were or are **other research areas** involved?

Multiple answers are possible.

	Obs.	in %
No further research areas involved.	153	15.8
Human and Social Sciences		
Theology & Religious Studies, History, Classical Studies, Archaeology, Prehistory and Early History	18	1.9
Linguistics and Literature, Philosophy	30	3.1
Art Studies, Musicology, Film and Theatre Studies, Architecture	21	2.2
Ethnology, Social and Human Geography	28	2.9
Psychology, Educational Studies	79	8.2
Sociology, Social Work, Political Sciences, Media and Communication Studies, Health	96	9.9
Economics, Law	63	6.5
Mathematics, Natural- and Engineering Sciences		

	Obs.	in %
Mathematics	50	5.1
Astronomy, Astrophysics and Space Science	10	1.0
Chemistry	91	9.4
Physics	102	10.6
Civil Engineering	11	1.1
Mechanical Engineering	39	4.0
Electrical Engineering	66	6.9
Materials Science	115	11.9
Information Technology, Computer Science	184	19.0
Other disciplines of Engineering Sciences	57	5.9
Environmental Sciences	72	7.5
Earth Sciences (Geology, Geophysics, Geochemistry, Mineralogy, etc.)	26	2.7
Biology and Medicine		
Basic Biological Research (Biochemistry, Molecular Biology, Genetics, Biophysics, etc.)	102	10.6
General Biology (including Forestry and Agricultural Sciences, Environmental Research, Ecology, Animal Breeding)	18	1.9
Basic Medical Sciences (Anatomy, Physiology, Pharmacology, etc.)	66	6.9
Experimental Medicine (e.g. Pathophysiology, Immunology, Nutritional Research, Ethology, etc.)	83	8.6
Clinical Medicine (including Dentistry and Veterinary Medicine)	72	7.4
Preventive Medicine (Epidemiology/Early Diagnosis/Prevention)	68	7.0
Social Medicine (Rehabilitation, Human Ecology, Environmental Toxicology, Dietetics, Occupational Medicine, Ergonomics, Health Education etc.)	35	3.7
Other research area	89	9.2
Non-responses	51	5.3
Total	966	100

→ *Filter on rejected/withdrawn applications according to address data from SNSF.*

24. According to the information provided by the SNSF, the application was rejected. Have you nevertheless **realised** this project without the SNSF funding?

	Obs.	In %
Not yet	451	46.7
Yes	97	10
Non-responses	418	43.3
Total	966	100

→ *Filter on 24 "yes"*

25. From which **sources** did you finance the designated project?

Please indicate all sources that contributed to the funding.

	Obs.[a]	In %
Own university/organization, private self-financing	52	5.4
Swiss national Science Foundation SNSF (new submission, other funding instrument)	14	1.4
Innosuisse (formerly CTI)	11	1.1
EU, European funding organizations, other international public funders	12	1.3
Public funders in Switzerland (e.g., research contracts from offices of the federal government, cantons, municipalities)	8	0.8
Companies, business organizations, business angels, other private financiers	14	1.5

Foundation at home or abroad	22	2.2
other	13	1.3
Non-responses	869	90.0
Total	966	100

a Multiple responses possible.

26. According to your recollection, what was the significance of the following **activities** in the application?

Basic research is experimental or theoretical work carried out primarily to gain new knowledge about the fundamentals of phenomena and observable facts, without a specific application or benefit in mind.
Applied research is independent research conducted to gain new knowledge. It is primarily directed towards a specific practical goal or purpose.
Experimental development is systematic work directed, on the basis of findings from research and practical experience, towards producing new materials, products and devices, installing new processes, systems and services or substantially improving those already produced or installed. It produces, for example, prototypes and pilot plants.
Education and training of staff: doctorates and post-docs are excluded and count as research
Technical work related to innovation is work that may be required for the transfer of scientific knowledge into innovations, e.g., routine tests, work on approval, toolmaking, engineering, industrial design, acquisition of equipment and instruments, production start-up, routine software development, etc.
Commercial, financial or legal work related to innovation are, for example, market studies and advertising, drafting a patent specification, acquiring financing.
Any kind of **routine work** is, e.g. routine examinations of specialist care, interviews, surveys, observations for general purposes in the public interest, routine testing for standardisation purposes.

	Very high importance		High importance		Medium importance		Low importance		Very low or no importance		Non-responses		Total
	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.
Basic research	325	33.7	257	26.6	198	20.5	106	11.0	64	6.7	15	1.6	965[a]
Applied research	436	45.1	344	35.6	123	12.7	37	3.8	16	1.7	10	1.1	966
Experimental development	208	21.5	297	30.7	165	17.1	107	11.1	160	16.6	28	2.9	965[a]
Education and training of staff	182	18.8	235	24.4	182	18.9	195	20.2	161	16.6	11	1.1	966
Technical work related to innovation	160	16.6	258	26.7	173	17.9	152	15.7	199	20.6	24	2.5	966
Commercial, financial or legal work related to innovation	41	4.2	82	8.5	133	13.8	204	21.1	489	50.6	18	1.8	967[a]
Any kind of routine work	20	2.1	49	5.1	151	15.7	252	26.1	449	46.5	44	4.5	965[a]
Other	16	1.6	10	1.1	7	0.7	10	1.0	26	2.7	897	92.9	966

a The difference to 966 is due to rounding errors in the weighted data.

27. Research projects can be affected by **underfunding** if necessary expenses (for research, preparations for implementation, etc.) are only partially covered by the budget of the application. The application was entered in the funding programme: «u_funding_instrument». Do any of these circumstances apply to the application?

	Applies		Does not apply		I don't know any more.		Non-responses		Total
	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.
The specific funding guideline excluded funding for certain necessary activities altogether or provided only partial funding.	204	21.1	560	58	186	19.2	16	1.7	966
The specific funding guideline excluded funding for certain necessary equipment or	175	18.1	578	59.8	194	20	20	2.1	967[a]

consumables altogether or provided only partial funding.									
Budget cuts were made in the course of project approval.[b]	149	15.4	221	22.8	31	3.2	565	58.5	966
The funding in this programme does not completely cover costs.	450	46.6	366	37.9	131	13.6	19	1.9	966

a The difference to 966 is due to rounding errors in the weighted data.

b Filter on applicants with approved applications.

→ *Filter on 27 "Applies" in one of the items.*

28. Which **activities** in the application were particularly affected by underfunding or funding gaps?

	There was underfunding.		There was no underfunding.		I don't know any more.		Non-responses		Total
	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.
Basic research	188	19.4	212	21.9	46	4.7	521	53.9	967[a]
Applied research	243	25.2	190	19.7	62	6.4	471	48.8	966
Experimental development	175	18.1	175	18.1	44	4.5	573	59.3	967[a]
Education and training of staff	122	12.6	167	17.3	44	4.6	633	65.5	966
Technical work related to innovation	140	14.5	143	14.8	54	5.6	629	65.2	966
Commercial, financial or legal work related to innovation	45	4.7	63	6.5	34	3.5	824	85.3	966
Any kind of routine work	48	4.9	51	5.2	26	2.7	841	87.1	966
Other	8	0.8	7	0.8	3	0.3	948	98.1	966

a The difference to 966 is due to rounding errors in the weighted data.

→ *Filter on 28 "There was underfunding" in one of the items and the project application was approved by SNSF.*

29. Have you received **other funding** for these activities underfunded in the application?

	Obs.	In %
Yes	112	11.5
No	131	13.6
Non-responses	723	74.9
Total	966	100

→ *Filter on 29 "Yes".*

30. From which **funders** did you receive funding for this work that was underfunded in this application?

Please list all sources from which you have received funding.

	Obs.	In %
Own university/organization, private self-financing	81	8.4
Swiss national Science Foundation SNSF	12	1.2
Innosuisse (formerly CTI)	8	0.9
EU, European funding organizations, other international public funders	22	2.3
Public funders in Switzerland (e.g., federal, cantonal, municipal offices)	12	1.2
Companies, business organizations, business angels, other private financiers	14	1.4
Foundation at home or abroad	26	2.7
other	13	1.3
Non-responses	854	88.4
Total	966	100

6. Questions on the planned results of the application

31. Please recall the planned results of the application. What **results** are or were intended in the project according to the application?

Multiple answers are possible.

	Obs.	in %
(a) New data	622	64.3
(b) New knowledge and insights	855	88.5
(c) New technology	386	39.9
(d) Further development of an existing technology	399	41.3
(e) New application	445	46.0
(f) Marketable or almost immediately applicable innovation (new good, service, process or similar that is used).	337	34.9
(g) Other result	76	7.9
Non-reponses	7	0.7
Total	966	100

32. Which of these is the **main result**? (Please complete the letter from the previous question.)

	Obs.	in %
(a) New data	34	3.5
(b) New knowledge and insights	504	52.2
(c) New technology	94	9.7
(d) Further development of an existing technology	52	5.4
(e) New application	55	5.7
(f) Marketable or almost immediately applicable innovation (new good, service, process or similar that is used).	113	11.7
(g) Other result	24	2.5
Non-reponses	90	9.3
Total	966	100

33. Which **scientific or technological maturity level (TRL)** would correspond best to the planned results in this application? (Multiple responses possible)

	Obs.	In %
Basics should be observed and documented in writing. (TRL 1)	259	26.8
The applicability of a scientific finding or technology should be demonstrated experimentally/in the laboratory (proof-of-concept). (TRLs 2-4)	315	32.6
The applicability of a scientific finding or technology should be demonstrated in a relevant application environment (prototype, demonstrator). (TRLs 5-6)	328	34
The knowledge/technology (prototype, demonstrator) should be integrated into a relevant system, tested and applicability in the system context demonstrated. (TRLs 7-9)	238	24.7
I can't answer that. (non-responses)	168	17.4
Total	966	100

TRL Explanations (Question 33) have been used for many years in space research and engineering to assess the state of development of technologies/knowledge. For some years now, European funding has also been using them in other research areas.

TRL1	Basic principles observed and reported
TRL2	Technology concept and/or application formulated
TRL3	Experimental proof of concept provided
TRL4	Technology validated in the laboratory
TRL5	Technology validated in relevant environment
TRL6	Technology demonstrated in relevant environment
TRL7	Demonstration of the system prototype in operational environment
TRL8	System complete and qualified
TRL9	System has proven itself in operational environment

34. What **level of use-related or commercial maturity** of the results did you plan in the application? (Multiple responses possible)

	Obs.	In %
An implementation outside of science or commercialisation of the results was not envisaged in the application.	293	30.3
Possible implementations outside science or commercialisation of the results were planned and described in the application.	351	36.4
Initial market analyses, surveys of user/customer needs, feedback from users on parameters of the technology, or involvement of key customers were included in the application.	116	12.0
More extensive testing with pilot users, preparatory work or test runs of production, or partnerships with key customers were envisaged in the application.	153	15.9
In the application, uses of the results in the real environment, production, or pilot sales to early customers were planned.	104	10.7
Other	41	4.3
I can't answer that. (non-responses)	139	14.4
Total	966	100

35. Did you plan to collaborate with **practitioners or users** of the results?

	Obs.	in %
No.	165	17.1
Yes, during the regular project duration.	573	59.3
Yes, following the project (follow-up projects).	340	35.2
I don't know any more.	36	3.7
Non-responses	13	1.3
Total	966	100

36. Did you plan to cooperate with **implementation/business partners** in the application in question?

Realisation partners can be identical to the practitioners/users, but can also perform other functions, e.g. applied R&D on sub-areas, application or product development, system integration, establishing market access, etc.

	Obs.	in %
No.	165	17.1
Yes, during the regular project duration.	573	59.3
Yes, following the project (follow-up projects).	340	35.2
I don't know any more.	36	3.7
Non-responses	16	1.7
Total	966	100

7. Questions about your organization at the time of application submission

37. Importance of applying and/or commercialising research results:
How high do you think this is for the following organizations and individuals?

	Very high importance		High importance		Medium importance		Low importance		Very low or no importance		Non-responses		Total
	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.
My university or research institution.	232	24.1	339	35.1	270	27.9	79	8.2	26	2.7	20	2.1	966
My organizational unit (faculty, department, division).	209	21.6	316	32.7	243	25.1	128	13.2	47	4.9	24	2.5	967[a]
My research group.	314	32.5	283	29.3	208	21.5	96	9.9	43	4.4	22	2.3	966
My research area(s) and discipline(s) in general.	270	28	328	33.9	216	22.4	94	9.8	36	3.7	22	2.3	966

a The difference to 966 is due to rounding errors in the weighted data.

38. Importance of basic research:
How high do you think this is for the following organizations and individuals?

	Very high importance		High importance		Medium importance		Low importance		Very low or no importance		Non-responses		Total
	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.
My university or research institution.	389	40.2	308	31.9	144	14.9	82	8.5	19	1.9	25	2.6	967[a]
My organizational unit (faculty, department, division).	356	36.8	307	31.8	172	17.8	87	9	19	2	25	2.6	966
My research group.	447	46.3	276	28.6	128	13.3	67	6.9	24	2.5	24	2.4	966
My research area(s) and discipline(s) in general.	429	44.4	291	30.2	153	15.8	47	4.9	21	2.1	25	2.6	966

39. How many **people** were in your research group at the time you submitted the application in «u_decision_year»?

Only state the number of people (headcount) who work with you in your organization and not any project partners who were or are also involved in the application.

	Obs.	In %
less than 5 persons	532	55.0
5 to 9 persons	290	30.1
10 to 19 persons	55	5.7
20 to 49 persons	38	4.0
50 or more persons	29	3.0
I don't know any more.	15	1.6
Non-responses	6	0.6
Total	965[a]	100

8. Final questions on research funding

40. Nowadays, there is a lot of discussion about global challenges that need research, development and innovation across countries, disciplines and sectors. Do you see an additional need for research and innovation funding in Switzerland (SNSF, Innosuisse, departmental research of the federal offices, etc.) to take up such challenges and provide more **mission-oriented** funding than before?

With the same volume of funding overall, this could mean that less funding would be available for other programmes.

	Obs.	In %
Very high need	219	22.7
High need	253	26.2
Medium need	277	28.6
Low need	133	13.7
Very low or no need	52	5.3
Non-responses	34	3.5
Total	968[a]	100

a The difference to 966 is due to rounding errors in the weighted data.

Examples of mission-oriented research funding include the Manhattan Project and Project Apollo (moon landing).

41. How high is the need for the following **principles** or **goals** to be taken into account?

	Very high need		High need		Medium need		Low need		Very low or no need		Non-responses		Total
	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.
Funding of research programmes with a very long-term time horizon (at least 12 years).	200	20.7	310	32.1	276	28.5	119	12.3	26	2.7	34	3.5	965[a]
Cooperative funding programmes by the SNSF, Innosuisse and, on a case-by-case basis, federal offices or other public agencies.	182	18.8	383	39.6	268	27.7	74	7.6	22	2.3	38	3.9	967[a]
Coordination with research and innovation funding in Europe and other world regions or globally.	315	32.6	331	34.2	195	20.2	62	6.4	23	2.4	41	4.2	967[a]
Funding interdisciplinary research and across research disciplines and fields of knowledge.	392	40.6	330	34.2	156	16.2	33	3.4	15	1.6	40	4.1	966
Focus on relatively unexplored technologies with great potential for significant and rapid improvement.	190	19.7	388	40.1	260	26.9	60	6.2	20	2.1	49	5.1	967[a]
Focus on creating the knowledge-based and technological conditions for the emergence of new markets (such as with the invention of the internet).	135	14.0	316	32.7	318	32.9	111	11.5	36	3.8	50	5.2	966
Focus on challenges defined by politics and society.	191	19.7	288	29.8	301	31.2	97	10.0	46	4.7	43	4.5	966
Coordination of public research and innovation funding with business enterprises.	126	13.0	260	26.9	344	35.6	137	14.2	56	5.8	43	4.5	966
Funding of research programmes with a very long-term time horizon (at least 12 years).	200	20.7	310	32.1	276	28.5	119	12.3	26	2.7	34	3.5	965[a]
Cooperative funding programmes by the SNSF, Innosuisse and, on a case-by-case	182	18.8	383	39.6	268	27.7	74	7.6	22	2.3	38	3.9	967[a]

basis, federal offices or other public agencies.

a The difference to 966 is due to rounding errors in the weighted data.

42. Do you have any other **comments** on the SNSF and its funding that you would like to share with us?

See Appendix 23.

43. Would you like to be **informed** about the key findings of this survey when the overall evaluation of the SNSF by the SSC is completed and the results are made public in 2022?

☐ Yes ☐ No

Thank you very much for your patience and assistance!

If you have any questions or comments, please feel free to contact us: swr-survey.business@fhnw.ch.

The survey is closed and you are now welcome to close the browser window.

Appendix 22. Questionnaire and response frequencies of survey 2

Survey 2 of comparison sample on research funding

Fachhochschule Nordwestschweiz (FHNW), Hochschule für Wirtschaft on behalf of the Swiss Science Council

Why do we collect and process your data?

This survey serves to evaluate the Swiss National Science Foundation (SNSF) in accordance with the Research and Innovation Promotion Act, Art. 54 RIPA. It is carried out by the School of Business at the University of Applied Sciences and Arts Northwestern Switzerland (FHNW) on behalf of the Swiss Science Council (SSC. Participation in the survey is voluntary and can be discontinued at any time. If the survey is interrupted, then it can be continued at a later date on the last page that has not yet been answered. The answers are only evaluated and presented in anonymised and aggregated form, so that it is not possible to draw conclusions about individual persons.

How can you contact us?

Fachhochschule Nordwestschweiz (FHNW), Hochschule für Wirtschaft, Riggenbachstrasse 16, CH-4600 Olten

Project management: Prof. Dr. Franz Barjak, +41 62 957 26 84, swr-survey.business@fhnw.ch

☐ I agree to the processing of my personal data in accordance with the information provided herein.

☐ I don't want to participate.

1. Questions about yourself

0. Organization of the respondents (from sample)

	Obs.	In %
AO Research Institute - AORI	7	0.8
Berne University of Applied Sciences - BFH	14	1.7
Cantonal hospital of St.Gallen - KSPSG	a)	
Cardiocentro Ticino - CT	a)	
Centre Suisse d'Electronique et de Microtechnique SA	6	0.7
Eastern Switzerland University of Applied Sciences - OST	8	1.0
EPF Lausanne - EPFL	58	7.0
ETH Zurich - ETHZ	60	7.2
Facoltà di Teologia di Lugano - FTL	a)	
Graduate Institute of International and Development Studies - IHEID	9	1.1
Haute Ecole Pédagogique des cantons de Berne, du Jura et de Neuchâtel - HEP-BEJUNE	a)	
Haute école pédagogique du canton de Fribourg/Pädagogische Hochschule Freiburg - HEP-FR	5	0.6
Haute école pédagogique du canton de Vaud - HEPL	8	1.0
Haute école pédagogique du Valais/Pädagogische Hochschule Wallis - HEP-VS	5	0.6
Idiap Research Institute - IDIAP	9	1.1
Inselspital Hospital University of Bern	a)	
Inspire AG	a)	
Institut für Virologie und Immunologie IVI	a)	
Institute Friedrich Miescher - FMI	6	0.7
Kalaidos University of Applied Sciences - FHKD	a)	
Kantonsspital Aarau - KSPA	a)	
Kantonsspital Baden - KSPB	a)	
Lucerne University of Applied Sciences and Arts - HSLU	20	2.4

	Obs.	In %
Pädagogische Hochschule Bern - PH Bern	9	1.1
Pädagogische Hochschule der Fachhochschule Nordwestschweiz - PH-FHNW	16	1.9
Pädagogische Hochschule Luzern - PHLU	a)	
Pädagogische Hochschule Schwyz - PHSZ	a)	
Pädagogische Hochschule St.Gallen - PHSG	8	1.0
Pädagogische Hochschule Thurgau - PHTG	a)	
Pädagogische Hochschule Zürich - PHZH	10	1.2
Paul Scherrer Institute - PSI	24	2.9
Physikal.-Meteorolog. Observatorium Davos - PMOD	a)	
Research Institute of Organic Agriculture - FiBL	a)	
Research Institutes Agroscope - AGS	10	1.2
Schweizer Paraplegiker-Forschung AG	a)	
Schweizerisches Idiotikon	a)	
Sportwissenschaftliches Institut Bundesamt für Sport	a)	
Swiss Federal Institute for Forest, Snow and Landscape Research - WSL	16	2.0
Swiss Federal Institute for Vocational Education and Training - EHB	a)	
Swiss Federal Institute of Aquatic Science and Technology - EAWAG	6	0.7
Swiss Federal Laboratories for Materials Science and Technology - EMPA	20	2.4
Swiss Institute of Bioinformatics - SIB	a)	
Swiss Integrative Center for Human Health	a)	
Università della Svizzera italiana - USI	16	1.9
Universität Liechtenstein	a)	
Universitätsspital Zürich	a)	
University of Applied Sciences and Arts Northwestern Switzerland (without UTE) - FHNW	38	4.6
University of Applied Sciences and Arts of Southern Switzerland - SUPSI	7	0.8
University of Applied Sciences and Arts Western Switzerland - HES-SO	34	4.1
University of Applied Sciences of Grisons - FHGR	a)	
University of Basel	38	4.6
University of Berne - BE	50	6.0
University of Fribourg - FR	14	1.7
University of Geneva - GE	74	8.9
University of Lausanne - LA	48	5.8
University of Lucerne - LU	7	0.8
University of Neuchatel - NE	12	1.4
University of St.Gallen - SG	a)	
University of Zurich - ZH	66	7.9
Zurich University of Applied Sciences - ZHAW	40	4.8
Zurich University of the Arts - ZHdK	a)	
Other (from organizations with a)	56	6.7
Total	834	100

a) Fewer than 5 observations, not shown due to privacy reasons.

1. In welcher Sprache möchten Sie die Fragen beantworten?
Dans quelle langue souhaitez-vous répondre aux questions?
In which language would you like to answer the questions?

	Obs.	In %
Deutsch	426	51.1
English	216	25.9

Français	192	23.0
Total	834	100

2. What is your **year of birth**?
Age groups

	Obs.	in %
Under 40	168	20.1
40-49	261	31.3
50-59	280	33.6
60 or older	106	12.7
Non-responses	19	2.3
Total	834	100

3. What is your **gender**?

	Obs.	in %
Female	256	30.7
Male	576	69.1
Other	2	0.2
Total	834	100

4. In which year did you obtain your **doctorate**?

If you have more than one doctorate, please indicate the year of the first doctorate.

	Obs.	in %
Before 1990	68	8.2
1990-1999	186	22.3
2000-2009	282	33.8
2010-2021	268	32.1
No doctorate	27	3.2
Non-responses	3	0.4
Total	834	100

5. In which **country** did you complete your **doctorate**?

Please select the country of the university from which you obtained the doctoral degree. Please answer for the first doctorate if you obtained more than one.

	Obs.	in %
Switzerland	417	50
EU member country	291	34.9
Other country worldwide	99	11.9
Non-responses	27	3.2
Total	834	100

6. Which **function** best describes your role in the organization (university) under which we wrote to you?

	Obs.	in %
Head of (e.g. institute, department, center, clinic)	220	26.4
Lecturer (Lehrbeauftragte/r, Chargé/e de cours)	192	23
Group leader, Senior physician	206	24.7
Senior Scientist, Principal Investigator	103	12.4
Postdoc, Research associate, Resident physician	94	11.3
Doctoral student	8	1
Visiting scholar	2	0.2
Other, please specify	9	1.1
Non-responses	0	0
Total	834	100.1

7. Which **position** do you have?

If more than one, please answer on the position at the organization under which we wrote to you.

	Obs.	in %
Professor at a university of applied sciences or university of teacher education	188	22.5
Associate professor	76	9.1
Assistant professor with tenure track	32	3.8
Assistant professor without tenure track	23	2.8
Honorary professor or Titular professor	38	4.6
Full professor	170	20.4
Visiting professor	4	0.5
No professorship	297	35.6
Non-responses	6	0.7
Total	834	100

2. Questions about your research

8. What is your **main research area**?

Please choose the answer that covered most of your research. You can indicate other areas in the follow-up question.

	Obs.	in %
Human and Social Sciences		
Theology & Religious Studies, History, Classical Studies, Archaeology, Prehistory and Early History	23	2.8
Linguistics and Literature, Philosophy	30	3.6
Ethnology, Social and Human Geography	11	1.3
Art Studies, Musicology, Film and Theatre Studies, Architecture	21	2.5
Psychology, Educational Studies	83	10.0
Sociology, Social Work, Political Sciences, Media and Communication Studies, Health	71	8.5
Economics, Law	50	6.0
Mathematics, Natural- and Engineering Sciences		
Mathematics	14	1.7
Astronomy, Astrophysics and Space Science	3	0.4
Chemistry	28	3.4
Physics	56	6.7

	Obs.	in %
Civil Engineering	9	1.1
Mechanical Engineering	20	2.4
Electrical Engineering	13	1.6
Materials Science	34	4.1
Information Technology, Computer Science	63	7.6
Other disciplines of Engineering Sciences	21	2.5
Environmental Sciences	37	4.4
Earth Sciences (Geology, Geophysics, Geochemistry, Mineralogy, etc.)	9	1.1
Biology and Medicine		
Basic Biological Research (Biochemistry, Molecular Biology, Genetics, Biophysics, etc.)	61	7.3
General Biology (including Forestry and Agricultural Sciences, Environmental Research, Ecology, Animal Breeding)	24	2.9
Basic Medical Sciences (Anatomy, Physiology, Pharmacology, etc.)	25	3.0
Experimental Medicine (e.g. Pathophysiology, Immunology, Nutritional Research, Ethology, etc.)	29	3.5
Clinical Medicine (including Dentistry and Veterinary Medicine)	60	7.2
Preventive Medicine (Epidemiology/Early Diagnosis/Prevention)	12	1.4
Social Medicine (Rehabilitation, Human Ecology, Environmental Toxicology, Dietetics, Occupational Medicine, Ergonomics, Health Education etc.)	14	1.7
Other research area	2	0.2
Non-responses	11	1.3
Total	834	100

9. In addition, in which other areas do you conduct research?

Multiple answers are possible.

	Obs.	in %
In no other field of research	188	22.5
Human and Social Sciences		
Theology & Religious Studies, History, Classical Studies, Archaeology, Prehistory and Early History	20	2.4
Linguistics and Literature, Philosophy	29	3.5
Art Studies, Musicology, Film and Theatre Studies, Architecture	18	2.2
Ethnology, Social and Human Geography	26	3.1
Psychology, Educational Studies	47	5.6
Sociology, Social Work, Political Sciences, Media and Communication Studies, Health	64	7.7
Economics, Law	24	2.9
Mathematics, Natural- and Engineering Sciences		
Mathematics	22	2.6
Astronomy, Astrophysics and Space Science	6	0.7
Chemistry	35	4.2
Physics	52	6.2
Civil Engineering	6	0.7
Mechanical Engineering	23	2.8
Electrical Engineering	19	2.3
Materials Science	50	6
Information Technology, Computer Science	38	4.6
Other disciplines of Engineering Sciences	46	5.5
Environmental Sciences	62	7.4
Earth Sciences (Geology, Geophysics, Geochemistry, Mineralogy, etc.)	16	1.9

	Obs.	in %
Biology and Medicine		
Basic Biological Research (Biochemistry, Molecular Biology, Genetics, Biophysics, etc.)	53	6.4
General Biology (including Forestry and Agricultural Sciences, Environmental Research, Ecology, Animal Breeding)	29	3.5
Basic Medical Sciences (Anatomy, Physiology, Pharmacology, etc.)	38	4.6
Experimental Medicine (e.g. Pathophysiology, Immunology, Nutritional Research, Ethology, etc.)	49	5.9
Clinical Medicine (including Dentistry and Veterinary Medicine)	40	4.8
Preventive Medicine (Epidemiology/Early Diagnosis/Prevention)	38	4.6
Social Medicine (Rehabilitation, Human Ecology, Environmental Toxicology, Dietetics, Occupational Medicine, Ergonomics, Health Education etc.)	28	3.4
Other research area	107	12.8
Non-responses	0	0
Total	834	100

10. What significance do the following **factors** have for you when deciding whether to carry out a research project?

	Very high importance		High importance		Medium importance		Low importance		Very low or no importance		Non-responses		Total
	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.
I would like to contribute to the fundamental understanding of phenomena in my field of research.	495	59.4	226	27.1	77	9.2	25	3	9	1.1	2	0.2	834
I want to contribute to the immediate fulfilment of a social need or generate a practical benefit.	401	48.1	233	27.9	124	14.9	47	5.6	27	3.2	2	0.2	834
Other factors, please specify:	50	6	18	2.2	9	1.1	1	0.1	1	0.1	755	90.5	834

11. How good is your research group's equipment or access to research **equipment** or infrastructure compared to similar research groups in Switzerland?

	Obs.	In %
Much better.	96	11.5
A little better.	165	19.8
About the same.	355	42.6
A little worse.	101	12.1
Significantly worse.	41	4.9
The equipment is not relevant to my/our research.	67	8.0
Non-responses	9	1.1
Total	834	100

12. To what extent does your research depend on the acquisition of **third-party funding**?

	Obs.	in %
I am very dependent on third-party funding.	454	54.4
I am rather dependent on third-party funding.	263	31.5
I tend not to depend on third-party funding.	86	10.3
I am not dependent on third-party funding at all.	26	3.1
Non-responses	5	0.6
Total	454	54.4

13. Please rank the following **funders** according to their importance for funding your research in the reference period 2017-20.

Funders can be dragged and dropped into the field on the right. The most important funders should be at the top. Irrelevant funders remain in the left-hand window.

		Rank							Non-
		1	2	3	4	5	6	7	responses[a]
Own university/organization (internal funds)	Obs.	254	180	149	68	35	19	10	119
	in %	30.5	21.6	17.9	8.2	4.2	2.3	1.2	14.3
Swiss National Science Foundation (SNSF)	Obs.	307	212	85	44	25	17	11	133
	in %	36.8	25.4	10.2	5.3	3	2	1.3	15.9
Innosuisse (formerly CTI)	Obs.	71	62	56	41	60	46	47	451
	in %	8.5	7.4	6.7	4.9	7.2	5.5	5.6	54.1
EU, European funding organizations, other international public funders	Obs.	59	102	124	84	41	44	40	340
	in %	7.1	12.2	14.9	10.1	4.9	5.3	4.8	40.8
Public funders in Switzerland (e.g., research contracts from offices of the federal government, cantons, municipalities)	Obs.	63	84	93	81	60	44	22	387
	in %	7.6	10.1	11.2	9.7	7.2	5.3	2.6	46.4
Companies, business organizations	Obs.	24	54	61	74	50	51	65	455
	in %	2.9	6.5	7.3	8.9	6	6.1	7.8	54.6
Foundations at home or abroad	Obs.	40	95	128	100	67	52	43	309
	in %	4.8	11.4	15.3	12	8	6.2	5.2	37.1

a All non-responses were recoded for the analyses by subtracting the rank sum of the ranked items irs from the total rank sum trs (trs = 28) and dividing it by the number k of non-responses: $rank_{nr}=(trs-irs)/k$.

14. How many **research applications** have you submitted to the SNSF or other comparable research funding institutions abroad (e.g., DFG, NSF, Research Councils) throughout your career, and how many of these have been approved?

Please estimate the number.

	As principal applicant				As participating researcher			
	Submitted		Approved		Submitted		Approved	
	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %
None	145	17.4	193	23.1	96	11.5	158	18.9
One	108	12.9	128	15.3	126	15.1	160	19.2
2 to 5	258	30.9	228	27.3	311	37.3	243	29.1
6 to 9	97	11.6	78	9.4	56	6.7	22	2.6
10 to 19	90	10.8	51	6.1	39	4.7	17	2.0
20 or more	42	5.0	14	1.7	17	2.0	6	0.7
Non-responses	94	11.3	142	17.0	189	22.7	228	27.3
Total	834	100	834	100	834	100	834	100

15. Have you submitted a research application for funding to the SNSF since 2017?

Please answer yes if you were the principal investigator or participating researcher of the application.

	Obs.	in %
Yes	491	58.9
No	316	37.9
I don't know.	22	2.6
Non-response	5	0.6
Total	834	100

→ *Filter on 15 "Yes".*

16. Have you submitted an application for one or more SNSF funding instruments since 2017?

Please tick all that apply.

	Obs.	in %
Project funding		
Project funding	342	69.7
SPARK	40	8.1
Programmes		
National Research Programmes (NRPs)	83	16.9
COST - European Cooperation	31	6.3
Sinergia	85	17.3
Investigator Initiated Clinical Trials (IICT)	5	1.0
SPIRIT	9	1.8
Special Call on Coronaviruses	18	3.7
Bilateral programmes	39	7.9
ERA-NET	14	2.9
EU Enlargement contributions	1	0.2
National Centres of Competence in Research (NCCRs)	31	6.3
BRIDGE	41	8.4
Swiss Programme for Research on Global Issues for Development (r4d-Programm)	13	2.6
Careers		
Practice-to-Science	1	0.1
Ambizione	13	1.6
Eccellenza / SNSF professorships	29	3.5
Doc.CH	4	0.5
Scholarships	8	1.0
Postdoc.Mobility	21	2.5
PRIMA	6	0.7
Infrastructures		
Infrastructures	3	0.6
Funding LArge international REsearch projects (FLARE)	8	1.6
Swiss Roadmap for Research Infrastructures 2023	3	0.6
Editions	1	0.2
Research Equipment (R'Equip)	52	10.6
Science Communication		
Agora - where research meets the public	30	6.1
Scientific Exchanges	48	9.8
Open Access publications	39	7.9
Other SNSF instrument, namely …	15	3.1

→ *Filter on 15 “No”.*

17. Please state the reasons why you have not submitted any research applications to the SNSF since 2017.

	Totally true.		More likely to be true.		Rather not true.		Not true at all.		Non-response		Total
	Obs.	in %	Obs.	in %	Obs.	in %	Obs.	in %	Obs.	in %	Obs.
I have done relatively little or no research since 2017.	31	3.7	42	5.0	51	6.1	186	22.3	524	62.8	834
I did not have time to submit applications (e.g., due to very heavy workload with ongoing research projects, teaching or other tasks).	92	11.0	85	10.2	40	4.8	90	10.8	527	63.2	834
I was not sufficiently aware of the SNSF's funding opportunities.	18	2.2	60	7.2	64	7.7	163	19.5	529	63.4	834
I could not bear the expense of preparing an SNSF application.	47	5.6	79	9.5	62	7.4	120	14.4	526	63.1	834
I had other sources of funding that were well suited to my research.	94	11.3	115	13.8	26	3.1	72	8.6	527	63.2	834
I was not in the position or did not have the contacts for a promising submission to the SNSF.	80	9.6	76	9.1	53	6.4	99	11.9	526	63.1	834
I judged the chances of success of an SNSF funding application to be too low.	95	11.4	77	9.2	39	4.7	95	11.4	528	63.3	834
The SNSF's funding criteria were not a good fit for my research.	38	4.6	82	9.8	65	7.8	120	14.4	529	63.4	834
I had bad experiences with SNSF applications in the past.	16	1.9	22	2.6	42	5.0	222	26.6	532	63.8	834
Other reasons, please specify:	52	6.2	2	0.2	0	0	24	2.9	756	90.6	834

3. Questions about your professional experience outside of science

18. What functions in and for **business enterprises** have you already held in your professional life?

Multiple answers are possible.

	Obs.	in %
Employee	278	33.3
Management function	147	17.6
Founder of a company	90	10.8
Member of a board of directors or supervisory body	70	8.4
Member of a Scientific Advisory Board	143	17.1
Other function	39	4.7
No function in a commercial enterprise	398	47.7
Non-responses	0	0
Total	834	100

19. What functions in and for **government institutions**, **non-profit organizations** or other organizations **outside academia** (excluding companies) have you already held in your professional life?

Multiple answers are possible.

	Obs.	in %
Employee	253	30.3
Management function	187	22.4
Founder of an organization	52	6.2
Member of an advisory or supervisory body	166	19.9
Member of a Scientific Advisory Board	214	25.7
Other function	39	4.7
No function in such organizations outside of science	296	35.5
Non-responses	0	0
Total	834	100

4. Questions about your organization

20. Importance of basic research:
How high do you think this is for the following organizations and individuals?

Basic research is experimental or theoretical work carried out primarily to gain new knowledge about the fundamentals of phenomena and observable facts, without a specific application or benefit in mind.

	Very high importance		High importance		Medium importance		Low importance		Very low or no importance		Non-responses		Total
	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.
My university or research institution.	322	38.6	239	28.7	155	18.6	95	11.4	19	2.3	4	0.5	834
My organizational unit (faculty, department, division).	254	30.5	244	29.3	191	22.9	107	12.8	33	4.0	5	0.6	834
My research group.	329	39.4	182	21.8	175	21.0	105	12.6	35	4.2	8	1.0	834
My research area(s) and discipline(s) in general.	307	36.8	248	29.7	183	21.9	69	8.3	24	2.9	3	0.4	834

21. Importance of applying and/or commercialising research results:
How high do you think this is for the following organizations and individuals?

	Very high importance		High importance		Medium importance		Low importance		Very low or no importance		Non-responses		Total
	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.
My university or research institution.	247	29.6	309	37.1	176	21.1	69	8.3	23	2.8	10	1.2	834
My organizational unit (faculty, department, division).	196	23.5	282	33.8	203	24.3	94	11.3	47	5.6	12	1.4	834
My research group.	197	23.6	244	29.3	194	23.3	110	13.2	79	9.5	10	1.2	834
My research area(s) and discipline(s) in general.	171	20.5	281	33.7	211	25.3	103	12.4	59	7.1	9	1.1	834

22. How many **people** are in your research group?

Only state the number of people (headcount) who work with you in your organization and not any project partners.

	Obs.	In %
less than 5 persons	237	28.4
5 to 9 persons	279	33.5
10 to 19 persons	199	23.9
20 or more persons	96	11.5
Non-responses	23	2.8
Total	834	100.1

5. Final questions on research funding

23. Nowadays, there is a lot of discussion about global challenges that need research, development and innovation across countries, disciplines and sectors. Do you see an additional need for research and innovation funding in Switzerland (SNSF, Innosuisse, departmental research of the federal offices, etc.) to take up such challenges and provide more **mission-oriented** funding than before?

With the same volume of funding overall, this could mean that less funding would be available for other programmes.

	Obs.	In %
Very high need	234	28.1
High need	133	15.9
Medium need	267	32.0
Low need	132	15.8
Very low or no need	48	5.8
Non-responses	20	2.4
Total	834	100

Examples of mission-oriented research funding include the Manhattan Project and Project Apollo (moon landing).

24. How high is the need for the following **principles** or **goals** to be taken into account?

	Very high need		High need		Medium need		Low need		Very low or no need		Non-responses		Total
	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.
Funding of research programmes with a very long-term time horizon (at least 12 years).	144	17.3	305	36.6	266	31.9	79	9.5	19	2.3	21	2.5	834
Cooperative funding programmes by the SNSF, Innosuisse and, on a case-by-case basis, federal offices or other public agencies.	124	14.9	340	40.8	237	28.4	73	8.8	33	4.0	27	3.2	834
Coordination with research and innovation funding in Europe and other world regions or globally.	253	30.3	323	38.7	169	20.3	50	6.0	16	1.9	23	2.8	834
Funding interdisciplinary research and across research disciplines and fields of knowledge.	317	38.0	304	36.5	148	17.7	28	3.4	16	1.9	21	2.5	834
Focus on relatively unexplored technologies with great potential for significant and rapid improvement.	130	15.6	342	41.0	247	29.6	59	7.1	23	2.8	33	4.0	834

	Very high need		High need		Medium need		Low need		Very low or no need		Non-responses		Total
	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.	In %	Obs.
Focus on creating the knowledge-based and technological conditions for the emergence of new markets (such as with the invention of the internet).	84	10.1	236	28.3	312	37.4	125	15.0	44	5.3	33	4.0	834
Focus on challenges defined by politics and society.	161	19.3	255	30.6	247	29.6	101	12.1	45	5.4	25	3.0	834
Coordination of public research and innovation funding with business enterprises.	87	10.4	211	25.3	308	36.9	132	15.8	67	8.0	29	3.5	834
Funding of research programmes with a very long-term time horizon (at least 12 years).	144	17.3	305	36.6	266	31.9	79	9.5	19	2.3	21	2.5	834
Cooperative funding programmes by the SNSF, Innosuisse and, on a case-by-case basis, federal offices or other public agencies.	124	14.9	340	40.8	237	28.4	73	8.8	33	4.0	27	3.2	834

25. Do you have any other **comments** on the SNSF and its funding that you would like to share with us?

See Appendix 23.

26. Would you like to be **informed** about the key findings of this survey when the overall evaluation of the SNSF by the SSC is completed and the results are made public in 2022?

☐ Yes ☐ No

Thank you very much for your patience and assistance!

If you have any questions or comments, please feel free to contact us: swr-survey.business@fhnw.ch.

The survey is closed and you are now welcome to close the browser window.

Appendix 23. Selected comments on the SNSF and its funding (survey 1, question 42, and survey 2, question 25)

vcofneg: negative opinions on VCOF

Aus meiner Sicht erscheint das Erscheinungsbild des SNF zu kommerziell orientiert. Für mich entstehen Innovationen durch Forschung selbst, aber nicht, weil sie schon angesprochen gefördert werden. (2795)

Die Forschungsförderung des SNF ist (a) zu sehr auf Gruppen- und Verbundforschung ausgelegt, die in vielen Bereichen der Geistes- und Sozialwissenschaften, aber auch einigen der Naturwissenschaften eine nachgeordnete Rolle spielt. Es fehlen Programme für die Förderung individueller, nicht in Gruppen betriebener Projekte; (b) die Forschungsförderung des SNF sollte verstärkt Antragsformate fördern, bei denen Doktorierende und PostDocs selbst Projekte beantragen können, nicht die Lehrstuhlinhaber*innen oder andere festangestellte Personen; (c) die Forschungsförderung des SNF sollte Sonderprogramme für die Forschung der sogenannten kleinen Fächer umfassen, deren Erhalt in der Schweiz stark gefährdet ist, die aber von grosser wissenschaftlicher und gesellschaftlicher Bedeutung sind; (d) Die Kriterien gesellschaftlichen Nutzens und unmittelbarer Anwendbarkeit (Translation) in der Forschungsförderung sollten immer gegenüber dem reinen Erkenntnisgewinn nachgeordnet sein. Angewandte Forschung und sogenannte Innovation mit Technologiebezug sollte von Wirtschaft und Industrie finanziert werden, nicht vom SNF. (e) Die Forschungsprogramme des SNF sollten grundsätzlich internationalen Forschenden offenstehen. Kriterien der Nationalität oder bereits bestehender Anbindungen an Hochschulen in der Schweiz sollten keine Rolle im Auswahlprozess spielen; (f) Die Forschungsförderung in der Schweiz sollte sich, entgegen dem europäischen und internationalen Trend, um ein azyklisches Investment in nicht-angewandte Disziplinen, insbesondere in den Geistes-, Sozial- und Naturwissenschaften bemühen; (g) Transdisziplinäre Forschung sollte ebenso wie grundständige (fachgetriebene) Forschung gefördert werden. Strategische Erwägungen über die Verbindung von Fächern sollten ausschliesslich von Individuen aus diesen Fächern stammen, nicht aus der Wissenschaftspolitik oder der SNF-Leitung. (6448)

vcofpos: positive opinions on VCOF

Interdisziplinäre und systemintegrierende Forschung wird in Zukunft an Bedeutung gewinnen und unsere Herausforderungen lösen zu können. Es geht nicht nur um die Erforschung neuer Technologien, sondern deren Integration in Anwendungskontexten und der Bildung neuer Märkte. (4299)

Ich erachte den Transfer von Forschungsergebnissen hin zur Praxis für hochrelevant. Oft nehmen Zielgruppen die Ergebnisse nicht oder zu wenig wahr. Das liegt meines Erachtens an folgenden Punkten: - zu wenig Kontakt zwischen Forschung und Praxis - kaum verständliche Sprache für die Zielgruppen - zu wenig Anerkennung für diese Arbeit in der Forschungs-Community. (5458)

Es bestehen neben der Projektförderung, die sehr stark auf Grundlagenforschung ausgerichtet ist, nur im Rahmen der NFPs Förderungsmöglichkeiten im angewandten Bereich (und die dann nur im jeweiligen Themenfeld). Das ist ein Missverhältnis und es braucht hier mehr Möglichkeiten. Andere Länder zeigen wie es gehen kann mit zum Beispiel die NIHR: https://clahrc-wessex.nihr.ac.uk/ (5802)

We need to keep as much as possible funding for basic research, without intended applications and stay away from funding goals defined by politicians (even when they may have good intentions). At the same time, one needs to have specific funds which allow to go from a basic finding into a more applied direction. (6074)

Umsetzungsrelevante Forschung mit direktem Bezug zu Behörden, Politik, Öffentlichkeit. Umsetzungsleistung von Wissenschaftler*Innen bei Gesuchen stark gewichten. (6198)

bridgeneg: negative opinions on Bridge

In general, the review process of SNSF is very fair. In my experience, program BRIDGE did NOT have fair and competent evaluations. (1591)

Für BRIDGE unbedingt zweistufige Projekteingabe, ähnlich wie bei NFP. Der Aufwand, ein Projekt mit der richtigen Flughöhe und Partnern zusammenzustellen, war unverhältnismässig gross zur Chance auf Förderung. (2016)

Mein Eindruck ist, dass Fachhochschulen beim SNF schlechte Karten haben. Man muss sich fast zwangsläufig mit einer ETH oder einer Uni zusammentun, um einen Antrag durchzubekommen, weil sehr viel Wert auf Publikationen gelegt wird, was nicht der Arbeit an Fachhochschulen entspricht. So verfehlt zum Beispiel Bridge seine Wirkung, wenn diejenigen die am nächsten an der Anwendung sind (nämlich die Fachhochschulen) durch ungeeignete Kriterien und Massstäbe ausscheiden. Es sollte mehr Instrumente geben, die Fachhochschulen offen stehen auch ohne ETH oder Uni als Kooperationspartner. (5956)

bridgepos: positive opinions on Bridge

I used the Bridge funding to pursue my own research and attempt to found a company. Using this experience I was able to start my own laboratory at Harvard University and have now returned to the startup world, this time in Boston instead of [anon.], with [anon.]. We work on drugging phase separation from an oncology perspective and are very well funded. All of this would not have been possible without the support of the Bridge program and the Swiss government in general. (279)

Ich bin nur oberflächlich informiert, aber ich habe manchmal den Eindruck, viele der für Innovation geförderten Projekte im Bereich Bio-/Medizin geht and die gleichen, grossen Hochschulen. Aus meiner Sicht liegt das mitunter an der Bekanntheit des Professors und daran, dass diese schon viele Mittel hatten, um die Idee im Vorfeld zu entwickeln. Sehr hilfreich in meinem Fall war die Unterstützung des Bridge-Grants zur Erlangung eines Patents. Einerseits durch finanzielle Mittel und auch durch Zugang zur Patentrecherche. Es ist wichtig, dass der SNF die Forschenden in ihrer Unabhängigkeit stärkt, da die universitären Patent-stellen oft nicht unabhängig und nicht unbedingt zum Vorteil der Sache und der Forschenden arbeiten. (2342)

I am extremely grateful for receiving the Bridge PoC grant as it was an essential achievement for us because of two main reasons, one is of course the financial support that helped us to survive the valley of death in start-up development and carry-on with the product development. Second was indeed the credibility that we received. My project was related to some degree to a research project that was previously supported by SNSF for several years. And I am extremely happy that we managed to turn the developed know-how to a marketable product (indeed it's still under development, but we are getting closer). I believe Bridge PoC is one of the best designed funding programs for young researchers and innovators to take a major step and turn their research or innovation ideas to a deep-tech start-up. (2436)

nrpneg: negative opinions on NRP:

The NRP is an excellent mechanism to fund research projects that do not fit into the classical SNSF project funding mechanisms. However, it is often difficult to anticipate the SNSF and reviewers' expectations, and the evaluation criteria are less stringent. This makes it hard to prepare the research proposal, but also to conceive projects that meet the SNSF plans and intended investments through NRP. Improvements should be sought, and more detailed feedback to applicants would certainly be beneficial. (1234)

(a) Not very confident in the NFP selection mechanisms and rejection reporting. Feels like a hit/miss sort of a thing, which is not good and does not reflect the great work and people of SNSF. (b) Involving companies, municipalities etc. keeps getting harder for NFP, as effort/return is not where it should be for them. SNSF needs to target these groups / listen to their needs rather than passing the hot potato on to researchers to form consortia which they then cannot promise funding. Super dull value proposition from a sales perspective, and seemingly a waste of taxpayer money. With research under attack from several political and social groups, that needs to change. (1993)

Bemerkungen beziehen sich auf NFP, die gesellschaftlich relevante Fragestellungen in der Schweiz aufgreifen: - Der SNF ist nicht vorbereitet, transdisziplinäre F&E-Projekte und Experimente zu fördern (real world lab). - Beim Projekt-Output werden Publikationen in internationalen Journals zu stark gewichtet im Vergleich zu Aufbereitung und Kommunikation von Ergebnissen für nationale Stakeholders (was in anwendungsorientierten transdisz. Projekten erste Priorität haben sollte). - Beim letzten NFP-Projekt, in dem ich gearbeitet habe, war das Engagement der Steuerungsgruppe sehr unbefriedigend. Auch fehlten dort WissenschaftlerInnen mit Deutsch-/Französisch-Kenntnissen, die die Forschung des transdisziplinären Projekts mit CH WirtschaftspartnerInnen hätten begleiten und beurteilen können. - Zur Steuerungsgruppe: Ihre Arbeit sollte evaluiert werden und die Forschenden sollten die Möglichkeit haben, Feedbacks zu geben. (3433)

nrppos: positive opinions on NRP:

Nous avons apprécié l'excellente gestion humaine et financière du PNR 75. Merci de votre confiance.

nccrneg: negative opinion on NCCR

Die Gutachten für das NCCR-Gesuch waren sachlich nicht fundiert und teilweise falsch, enthielten Meinungsäusserungen und stammten nur aus einer Disziplin, obwohl es sich um ein interdisziplinäres Gesuch handelte. Ungeachtet des schlussendlichen Bewertungsergebnisses (dass nur wenige NCCRs gefördert werden, weiss ich und es war mein dritter Anlauf für einen NCCR) hätte ich als Herausgeber einer Fachzeitschrift diese Gutachten nicht akzeptiert. Zukünftige Begutachtungen sollten auf ihre Qualität geprüft werden und in jedem Fall auf interdisziplinärer Kompetenz aufbauen. Es sollte möglich sein, dass ein PI im Themenbereich Healthy Aging Gerontologe oder Psychologe sein kann (und nicht, weil Gutachtende finden, Gesundheit sei zwingend ein medizinisches Thema, schon aus disziplinären Gründen abgelehnt werden). Gleiches gilt für andere Themenbereiche. (2412)

nccrpos: positive opinion on NCCR

The NCCR scheme is exemplary and one of the major assets of SNSF and Switzerland to fund long-term research. More programs in collaboration with industry would sharpen the technological edge of academic research. (2080)

Le FNS est un organisme remarquable de financement de la recherche fondamentale. Les projets viennent de la base et sont jugés purement sur des critères d'avancée du savoir, ce qui est la condition nécessaire pour une recherche de qualité et des vraies découvertes scientifiques, qui ensuite à une échelle de 20 ans conduiront à des révolutions sociétales. Il y a les programmes NCCR qui sont également extrêmement bien conçus. Il est très important de ne *pas* changer cette structure et tuer la poule aux œufs d'or en essayant d'orienter la recherche vers l'innovation, ce qui est est une méthode sure pour tuer les découvertes de fonds. Il est important qu'en parallèle avec des projets de recherche fondamentale il y ait en parallèle (mais *pas* en remplacement) des projets visant a l'innovation et au transfer de technologie. (6345)

vcofpromneg: negative opinions on how VCOF is promoted by SNSF

Es ist ärgerlich, dass Anwendungsprojekte mit Bezug zu den Schweizer Gegebenheiten von Personen evaluiert werden, welche diesen nationalen Bezug nicht haben oder schlecht kennen. (392)

My previous experiences with SNSF were that the previous records of the PI have relatively high weights in the decision-making process. This practice seemed to prioritize experienced researchers with high-level publication records. This practice seemed also to exclude researchers from applied fields, not publishing in high-rated journals, as those do not meet the target groups. Researchers who did not persuade the classical research carrier and spent years in Industry, Government or Humanitarian organisations are not able to take advantage of the SNSF funding opportunities as well. Excluding those groups with practical experiences and a deep understanding of the needs of the Society in my opinion leads to the development of the gap between practice and research. This gap generates mistrust between stakeholders, which is once developed is hard to overcome. It also supports the creation of research bubbles conducting research without any real collaborations with Practice (Government, Industry or NGOs) and only superficial understanding of their real needs. There is a big gap between SNSF and Innosuisse funding schemas, and research projects focusing on global societal problems and finding practical solutions addressing SDGs fall into this gap. (5895)

vcofprompos: positive opinions on how VCOF is promoted by SNSF

mofneg: negative opinions on MOF

I worry that top-down (mission-oriented) research programs are usually ineffective (in terms of time, costs, outcome). (112)

La recherche fondamentale désintéressée est la garantie d'applications innovantes pour l'industrie. Orienter la recherche sert les politiques mais ni la science, ni l'économie. (2439)

SNSF is THE source of funding for basic science. Great discoveries often come from unexpected observations. Putting too much pressure on a particular research topic with targeted/focussed calls might be problematic. Research results do not come always on demand (I might work on understanding X and find out Y). I would recommend not putting too much barriers, prerequisites to work on a particular topic to receive funding. (3000)

La recherche fondamentale devrait être le moins possible orientée par des contraintes administratives ou autres stratégies top-down. (3399)

It seems that this survey has a clear agenda: justifying more targeted/ directed large scale research programs. Honestly it does not look very scientific. It's a bit like asking: Would you like chocolate ice cream? Or a chocolate bar? What about small chocolates? And milk chocolate? to conclude people do want more chocolate in one form or another. Not impressed. (5074)

Whatever other initiatives the SNSF launches into or keeps, it should keep in mind that its core mission and greatest positive impact are through basic, single or 2-3 investigator, 3-4 year projects. Other funding vehicles should not negatively impact this basic research funding vehicle. (5082)

Meine Forschungsprojekte waren in den letzten Jahren vor allem Horizon-2020 gefördert, und ich sehe in diesen grossen Verbundprojekten einen enormen finanziellen und humanen Ressourcenverschleiss, der in Wirklichkeit nicht die Erkenntnistiefe fördert. In Bezug auf Ihre letzten Fragen plädiere ich deutlich für inhaltliche und geographische Weite aber auch gegen zu grosse Verbundprojekte. (5441)

I would advocate to keep a bottom-up, competitive funding scheme, where the focus is on excellence. A top-down system, where topics/challenges are pre-defined, will attract opportunistic projects, not necessarily excellent. The flood of very bad research triggered by the recent pandemic is an evidence supporting this statement. (5953)

It is very hard to score projects tagged in this survey as Mission-oriented and Focus on challenges defined by politics and society without being more specific. For example, cannot put in the same category challenges defined by politics and challenges defined by society . In a small country like Switzerland funds tagged as mission-oriented research can quickly fall in the hands of few who decide themselves on the assignation of those funds and perpetuate long-known biases (e.g. PHRT program with a very strong and unbalanced gender bias). (6034)

Der SNF muss weiterhin primär Grundlagenforschung über bottom-up vorgeschlagene Projekte finanzieren. Die Forschenden wissen am besten, welche Fragen beantwortet werden müssen, um das Wissen kumulativ voranzubringen. Ich finde einen Horizont von 4-5 Jahren produktiver als die langen >10-jährigen Programme, weil in diesen langfristigen Programmen immer viel Zeit vergeht, bis sie wirklich produktiv loslegen. (6260)

Keep politics out of science. (6466)

mofpos: positive opinions on MOF

As someone who has crossed over from basic biological research to developing, together with mostly international partners in Europe and worldwide, community standards and corresponding interoperable technological solutions that are absolutely essential for basic and applied life (and other) sciences to meet current global challenges (e.g., COVID-19, climate), I cannot overstate the importance of creating long-term, international, interdisciplinary, interdomain, strategic funding schemes that value such Enabling Sciences, as important projects are often falling in between traditional funding schemes. (121)

Il faut absolument plus soutenir les projets interdisciplinaires, coopératifs, qui mobilisent plusieurs institutions, partenaires, etc. typiquement, le fait de ne pouvoir être que dans un sinergia à la fois ne fait pas de sens. (722)

Ich begrüsse eine Mission-orientierte Forschungsförderung, sehe aber einen klaren Bedarf die Rolle der Geistes- und Sozialwissenschaften hierbei zu definieren. Welche Rolle hat beispielsweise die kritische Reflexion von Wissenschaft und Technologien vertreten durch die Geistes- und Sozialwissenschaftler:innen in interdiszplinären Forschungsverbünden? Wie kann Freiraum für diese Erkenntnisse, die teilweise nicht direkt 'verwertbar' sind, in der Forschung erhalten bleiben, wenn Projektpartner:innen z.B. einen direkten Nutzen aus der Beforschung von gesellschaftlichen Auswirkungen einer Technologie ziehen wollen? Ich wünsche mir hier ein klares Bekenntnis und eine klare Position des SNFs zur Bedeutung der langfristigen Erforschung der Wechselwirkungen zwischen Wissenschaft, Technologie, Wirtschaft und Gesellschaft; idealerweise als gewünschtes Ergebnis eines jeden Forschungsprojekts, dass blinde Flecken, kritische Aspekte beleuchtet werden (und bitte nicht gleich Lösungen eingefordert werden, diese erfordern eine andere Herangehensweise inkl. Anschlussfinanzierung). (4120)

Switzerland does not have a strategy for Artificial Intelligence. This is myopic. See: ai.gov for a serious approach to the question. No (big) money in, no competition out. (4540)

snsfneg: negative opinions on SNSF

The evaluation process has to provide more precise and detailed information to applicants. De-briefing a proposal rejection for improving future submissions could be a good action. The process seems very unwelcoming for newcomers... I fear many great ideas will be unexplored and a great innovation potential lost. (92)

Le SNF devrait financer plus les projets types high risk – high gain et pas forcement financer que des groupes déjà bien établis dans le domaine. (154)

Over the past 25 years, the world of academic research in computer science has gradually sunk into a form of navel-gazing and careerism that has led to a non-negligible waste of resources. Today, any time spent in the industry or any interest in the non-academic world is seen as a waste of time, or even a degradation of status, by young people choosing an academic career. As a consequence, it has become almost impossible for someone who spent even just a few years in the industry to become a professor: the academic world and the industry are now almost totally separate, with incompatible goals and cultural codes. The world of academic research and its funding (and the SNF is no exception) are now organized in various cliques that protect and coopt each other, and that ultimately go around in circles, since the goal is not go into uncharted territories (radically new subjects or new approaches), but to maximize the time/publication ratio and the citing index within each clique. That is, the success of the research carried out by these cliques is measured by how much members of each clique pat themselves on the back. This leads to more and more research on the same topics with minimal increments, no interest in trying out real applications (which takes time and implies uncertainty), by researchers who will spend their life recycling the same ideas since any change of topic implies a risk and a dearth of publications, in part due to the aforementioned cliques that do not easily let newcomers in. As a consequence, the lion's share of research funding goes to these cliques. This clique phenomenon is so powerful that anyone trying to criticize it ends up being designated as bitter and unfair, and is eventually discredited precisely on the basis that he did not do well enough in that system. For a world supposedly built on scientific thinking, it is amazing how few people dare to publicly question the way the system works (although many do acknowledge the depth of the problem in private). As a result, most people who could bring new perspectives into this system either eventually comply (and end up playing by the rules) or go out of the system (partially or completely), pursuing their research interests and seeking funding and/or work elsewhere. I realize my comments are harsh but this is the evolution I have observed in the past decades: most people no longer read papers to assess the originality and value of researchers, they just check their citation index or some other statistical measure (for which the best researchers have learned to optimize). In the end, this system ends up promoting conformism over courage, which is unfortunately the game the SNF has also been playing more and more over the years. (497)

Although purely scientific research is highly supported when it comes to fundamental fields like physics, biology, chemistry... in engineering research a market impact is requested. This leads to an unfair evaluation for applicants from different fields. (682)

Le FNS devrait beaucoup plus prendre en compte de nouveaux paradigmes de recherche en particulier ceux qui s'attachent à des approches collaboratives (recherche - action - formation / recherche collaborative) qui nécessitent également la mobilisation de méthodologies qualitatives ou mixtes. (895)

SNF funding does not always show transparency in its decisions. Criteria and reasoned evaluations need to be made available. (2674)

Wenn ein Gesuch abgelehnt wird, werden oft wissenschaftlich nicht stichhaltige Argumente präsentiert. Man hat den Eindruck, dass diese Texte nicht von jemand geschrieben wurden, der ausreichend Kenntnisse hat. Ausserdem besteht eine Ablehnung oft aus einer Aufzählung dessen, was alles schlecht ist. Es wäre wichtig auch anzufügen, wo die Stärken des Gesuches liegen. Es werden fast nur Gesuche finanziert, die wenig Risiko beinhalten. Ein gewisser Anteil von Projekten mit grossem Potential sollten finanziert werden unabhängig vom Risiko und von den Vorarbeiten. Als Forscher hat man manchmal gute Ideen, hat aber zu dem spezifischen Thema nicht publiziert und darum wird das Gesuch abgelehnt. Nachwuchsförderung: Ich hatte als co-applicant eine junge ausgezeichnete Wissenschaftlerin mit 25 Publikationen in den letzten 5 Jahren eingetragen. In der Ablehnung des Gesuches stand, dass die Publikationsleistung dieser tollen Nachwuchswissenschaftlerin nicht ausreichend sei. Dies war ein kräftiger Schlag ins Gesicht der betreffenden Person. Man sollte sich besser überlegen was man schreibt. (2692)

Il y a trois graves problèmes dans l'évaluation des requêtes, au moins dans la division II: 1. Le premier problème concerne le fait que les notes des évaluations des experts ne sont pas communiquées aux requérants. Cela va contre la transparence et l'ouverture que promeut le FNS. 2. Le deuxième problème vient du fait que le Conseil de la Recherche ne suit pas (nécessairement) les recommandations des expertises, et peut même faire des recommandations qui soient contre ces expertises, en ne cherchant que l'un ou l'autre élément négatif comme argument. La procédure d'évaluation est tributaire du point de vue des personnes en charge au sein du Conseil de la Recherche (c'est une black box!) et permet d'avoir des critères de décisions qui sont biaisés et potentiellement subjectifs. Ce n'est pas acceptable pour une institution de fonds publics. 3. Le troisième problème concerne la sur-représentation de certaines institutions et domaines dans la division II. Cela semblerait créer un biais dans la sélection des requêtes. En effet, une discipline comme l'informatique est sous représentée. Les Hautes Ecoles Spécialisées sont absolument sous-représentées. Cela n'est pas admissible pour une institution financée par des fonds publics. (2863)

Ich habe bisher eher negative Erfahrungen zu den Begutachtungsverfahren gemacht: Unsorgfältige Gutachten, zu wenig fachliche Kompetenz der Gutachtenden. Ich rege eine rigorose Veränderung der Begutachtungsverfahren an, z.B. Losverfahren, Bezahlung der Gutachtenden, Möglichkeit der Stellungnahme und Verteidigung etc. (3110)

Je pense que le processus d'acceptation/réjection de propositions n'est pas suffisamment transparent en Suisse. Il y a une appréciation demandée à plusieurs experts mais la décision semble parfois déconnectée de ces appréciations avec des justifications qui semblent artificielles. Je trouve que le processus des propositions Eurostars pourraient servir d'exemple, car la décision résulte d'une part d'un processus arithmétique sur la base de notes données pour chaque point par les experts (et non d'une décision d'appréciation d'un groupe de personnes autour d'une table qui se base sur une lecture diagonale des appréciations des experts et en ajoutant leurs propres critères d'évaluation à leur bon vouloir) et d'autre part par une communication du ranking global (qui donne l'information oà¹ la proposition se situe par rapport aux autres, par exemple, 20e sur 30). Seul un processus clair permet d'éviter le sentiment de conflit d'intérêts ou de décisions arbitraires. (3122)

I find the 4 year rule for PhD students very limiting. The SNF funding should allow covering the PhD salary for the time of the project without limits. (3812)

Die interdisziplinäre Forschung wie die Sportwissenschaft ist schwierig beim SNF unterzubringen. Es fehlen beim SNF auch Experten, welche diese Gesuche beurteilen können. (3915)

Die Unterfinanzierung ist ein Problem. In unserem Fall handelt es sich dabei primär um Lohnkosten, die kantonal vorgegeben sind und höher ausfallen als die vom SNF bezahlten Löhne. Daher muss dieses SNF-Projekt quersubventioniert werden (Gleiches gilt auch für ein früheres SNF-Projekt). Es wäre wünschenswert, wenn die SNF-Löhne den kantonalen Löhnen (z.B. für wissenschaftliche Mitarbeitende) entsprechen würden. Günstig ist hingegen, dass seit einiger Zeit vierjährige Projekte beantragt werden können. Gerade für Promovierende ist dies eine enorme Verbesserung. (3974)

A. We never received the reviewer's feedback for this grant B. In a previous SNF grant (2009) I got in a lot of financial trouble because the finance rules were much stricter than I was used to in the US. 2 years later SNF updated their rules and I would not have been in trouble if they had done that earlier C. For this 2017 application, only last 5 years of publications could be listed. As I had spent a lot of time in industry before, I did not have much to show for. 2 years later, the SNF again modified its requirements to follow the NIH system were most relevant publications of all years can be selected. In short: SNF always seems to lag behind European and US funding agencies with their archaic rules and it has made me very averse of applying again. I have lost faith in the integrity of SNF and I am quite certain that there are forces who prioritize the ranking of the ETH on the world stage over fair distribution of research funds within Switzerland. With the same amount of effort that I need to apply for a 250kFr SNF grant, I can apply for a $5Million NIH grant...where the NIH also puts more faith in the researchers and offers them flexibility whereas SNF seems to frantically hunt for funding abusers, making life unnecessary difficult for every researcher. (4054)

Aufgrund der Diskussion im Interview und den Anmerkungen im Verfügungstext hege ich die Vermutung, dass sich das Evaluationspanel nicht seriös mit dem Forschungsantrag auseinandergesetzt hat. Die aufgegriffenen Punkte waren entweder irrelevant oder inkorrekt. In Anbetracht verschiedener geförderter und abgelehnter Projekte bin ich der festen Überzeugung, dass in den Antragsprozessen, der Evaluation und der Mittelvergabe ein einschneidender Kulturwandel notwendig ist. (4194)

Le FNS a passé d'une vision très pragmatique et facilitatrice concernant les encouragements à une vision très dogmatique peu en phase avec le terrain. (5049)

Il est très dommage qu'on ne puisse pas engager les mêmes post-docs pendant plusieurs projets de suite. Des compétences se perdent ainsi et les équipes doivent repartir parfois à zéro. (5191)

Als Postdoc mit mehr als 5 Jahren nach dem Doktorat ohne momentane Ambitionen für eine Professur ist es für mich im Moment schwierig, Funding aus SNF-Mitteln zu bekommen. Hier würde ich mir erhoffen, dass auch Perspektiven für einen Mittelbau ohne Ambitionen für eine Professur, sondern nur für projektbezogene Arbeit entstehen. (5213)

Ich bin mir bewusst, dass dies eine bewusste Entscheidung war, aber die erlassene Restriktion, dass pro PI nur ein Projektantrag aktiv sein kann, ist extrem einschränkend und nachteilig für diejenigen, die Grundlagenforschung betreiben (und daher nicht viele andere Finanzierungsquellen aus Industrie, NCCRs, Innosuisse, etc. haben). Gerade in Zeiten, da die ERC-Finanzierung eingeschränkt ist und auf wackeligen Füssen steht, ist die Single-Project Regel der SNF eine enorme Einschränkung (welche auch nicht effektiv ist, da grosse Lehrstühle nach wie vor viele Projekte einreichen, welche anstelle des PI die Namen von dessen Oberassistenten tragen und somit die Regel umgehen). (5346)

Lorsqu'on fait de la recherche orientée sur des questions historiques, les résultats ne sont pas toujours commercialisables mais augmentent les connaissances, permettent mise en perspective nécessaire, sont intégrés à l'enseignement - cet aspect non lucratif n'est pas abordé dans le questionnaire. Aussi, les recherches en design ne sont pas toujours immédiatement applicables. Les critères qui régissent le FNS sont basé sur la recherche académique (université) et en tant que prof HES, il y a un sentiment de disqualification car les méthodes pragmatique, R&D, practice based research, ne sont pas valorisée. Enfin, j'ai été pendant 12 ans responsable filière, et n'avait pas de temps pour monter un projet de recherche à cause de la charge de travail, et parce que mon école n'octroie que 180 heurs pour montage de projet, avec aide de personne responsable de la recherche, mais on n'a pas d'assistant de recherche si on n'a pas trouvé un financement. Ce manque de temps est un frein, même si le soutien l'établissement des requêtes, formulation des projets d'une personne dédiée à la recherche au sein de l'école pour est maintenant mise en place et bienvenue. Enfin, en tant que femme, avec carrière interrompue par l'arrivée des enfants, c'est aussi difficile de trouver sa place après un certain âge. (5375)

Funding of emerging young scientists is compromised by absurd and unfair 'rules' based on position of scientist's name on a paper. I have multiple direct experiences where young scientists who I had selected and set up as independent junior group leaders in our Institute were refused SNSF grant funding because they did not have a publication where they were the last (i.e. 'senior') author. Since these young scientists were post-docs in their previous lab, they had no chance to be senior author because the lab head took that slot. Its a catch 22: they can't be a 'senior' author until they have their own lab, yet SNSF will not fund them until they have a publication where they are senior author. This reliance on author position, instead of e.g. the fact that their host institute has done due diligence and set them up as independent group leaders, is arbitrary and wrong. The result is that the very people who need it most are not eligible for SNSF funding. (5732)

1) Die Fragen in dieser Umfrage sind aus meiner Sicht teilweise mit einer zu stark vordefinierten Meinung/Haltung formuliert, z.B. zur Missionsorientierung. Es fehlt die Möglichkeit, Kommentare zu den Fragen einzutragen. 2) Ganz häufig ist eine gute und ausgewogene Lösung nicht ein entweder/oder , sondern ein sowohl/als auch , z.B. zu Grundlagenforschung und angewandter Forschung. Ich weiss nicht, ob es bei der Beantwortung der Fragen ausreichend zum Ausdruck gebracht werden konnte. 3) In der Schweizer Forschungsförderung fehlt die Förderung der vorwettbewerblichen Technologieentwicklung, einem Gebiet zwischen Grundlagenforschung und angewandter Forschung. Bislang wird diese vor allem durch EU-Programme abgedeckt. Die BRIDGE Programme decken nur einen Teil des Förderbedarfs ab, die Innosuisse Flagship Programme sind thematisch stark begrenzt. Die Schweiz könnte als Ersatz oder alternative zu den EU-Rahmenprogrammen bereiter angelegte Forschungsförderprogramme aufsetzen, die vorwettbewerbliche Technologieentwicklung in interdisziplinären grösseren Konsortien ermöglicht. 4) Für mich sollten zwei Förderprinzipien des SNF kritisch hinterfragt werden: a) Die ausschliessliche Förderung von PIs, die bereits auf dem Gebiet veröffentlicht haben, für das sie ein Gesuch stellen. Dies kann zu einer Nischenkultur,

weniger neuen Ideen und Lösungsansätzen sowie zu weniger Interdisziplinarität führen. Man sollte hier stärker darauf achten, ob ein PI grundsätzlich die Kenntnisse und Fähigkeiten mitbringt, auf diesem Gebiet erfolgreich zu forschen, nicht ob er dies schon getan hat. b) Die Beschränkung, dass in der Regel jeder PI nur ein SNF-Projekt gleichzeitig haben kann. Dies hört sich für mich nach einer Art Giesskannenprinzip, Fördermittel breit zu verteilen. Das Prinzip entspricht nicht dem Grundsatz, die besten Gesuche auszuwählen. Es verhindert zudem, Schwerpunkte zu setzen und schnell umfangreichere Forschungsaktivitäten in neuen Themen- oder Forschungsgebieten zu starten. (5751)

snsfpos: positive opinions on SNSF

In my experience to date, SNF funding applications are relatively well streamlined, in comparison to some other national funding agencies. I would strongly urge the SNF to maintain this situation, and to request only information from applicants that is essential for reviewers/boards to making funding assessments/decisions (as the ERC does for example). In some other countries, applicants are increasingly required to submit large amounts of additional peripheral information that is not critical to the funding decision - since often only a minority are subsequently funded, this represents a colossal waste of valuable public resources. (279)

This may not be relevant for this survey, but I would like to say that the feedback I have received on my SNF submissions has been incredibly valuable. I highly appreciate the time and effort that goes into reading projects and providing detailed feedback, from external reviews as well as the SNF Board. (328)

Le SNSF est excellent. Je vous prie de changer de manière à conserver cette excellence, mais à ne pas trop changer ni changer trop vite. (1011)

Ich bin Fan von der SNF-Förderung sowohl von der individuellen Betreuung als auch der Anpassungsfähigkeit entsprechend des Projektverlaufes. Vor allem schätze ich sehr, dass die Förderung mir eine interne Unabhängigkeit im Rahmen meiner akademischen Festanstellung gibt, da der SNF mein direkter Ansprechpartnerin ist und meine intellektuelle/akademische Position innerhalb der überaus bürokratischen und hierarchischen Strukturen innerhalb der Universität stärkt. Folgende Kritikpunkte: (1) Es wäre aus strategischen und Transparenz-Gründen sehr hilfreich, das Overhead-Budget zu kennen auch wenn ich keinen Anspruch darauf habe; (2) für transdisziplinäre Forschung, die im Feld der zeitgenössischen Kunst vor allem auch praxis-bezogen ist, wäre ein Budget für Produktion / künstlerisches sowie kuratorisches Experimentieren extrem wichtig: das könnte durch ein Limit % vom Gesamtbudget geregelt werden; (3) es muss einfacher sein, für die Beteiligung an Workshops / kleine bzw. kurze Auftrags-Recherchen ein Budget für Honorare planen zu können: das betrifft vor allem involvierte Menschen, die (a) keinen permanenten akademischen Job haben wie Künstler*innen oder unabhängige Forscher*innen und (b) ausserhalb Europas sehr wichtige Arbeit in NGOs oder anderen extra-staatlichen Netzwerken arbeiten - und für Arbeit aus ethischen-politischen Gründen bezahlt werden müssen. Gerade letzterer Punkt ist wesentlich für den Versuch einer Struktur-kritischen und dekolonialen Praxis in der Forschung. Möglicherweise könnte der Bezug zur Kunst auch durch eine Kooperationsmöglichkeit mit einer anderen Schweizer Fördereinrichtung mit Fokus auf Kunst erfolgen, die für SNF-Forscher*innen zugänglich wäre. (1113)

Je salue la grande qualité des expertises, a la fois pertinentes d’un point de vue scientifique et redigées de manière respectueuses. (2223)

SNSF is an amazing funding agency. Perhaps very unique in the world. It is generous, has diverse options one can apply for and very considerate when the results may not be available in the first few years. The last point is important, as sometimes good research takes a couple more years to develop. Giving researchers this flexibility with time is great. I also like the call to fund 3R research. I hope SNSF is going to announce a replacement call for ERC AdG in 2021. When I joined [anon.] in 2016, I had brought an ERC Consolidator grant, which I had to give up (due to exit of CH in 2014 round of applications), but was kindly funded by SNSF. Thank you for that. SNSF has also shown flexibility in extending the period of this grant (at no additional cost), allowing flexibility with hiring etc, as there was a slowdown during the 2020 pandemic start-year. The possibility to apply for a 2nd Project grant is a very positive move. It provokes researchers to be very creative in launching new ideas and directions in their groups. The staff at SNSF are always welcoming on the phone, and super helpful. The postdoctoral fellowships, junior PI awards are all excellent instruments for furthering personal research careers. Since the footprint of this funding scheme (especially postdoctoral) is large, it is having an amplifying effect by fostering hundreds of new research elsewhere in the World. Please continue this wonderful service to the research community of Switzerland, and the world at large. (3498)

Ich halte es für extrem relevant, dass die bottom-up Grundlagenforschung weiterhin im Zentrum der SNF Förderung steht. Zudem ist die Flexibilität des Einsatzes der erhaltenen Mittel eine grosse Stärke und sollte beibehalten werden. Entscheidungen im Losverfahren sollte man vermeiden. Das wissenschaftliche CV der Gesuchsteller und frühere Forschungserfolge sollten bei der Begutachtung weiterhin sehr relevant bleiben. (3723)

I have been an SNSF Professor and now I am an associate professor (with tenure) at a Swiss University. I would like to thank SNSF for the opportunity that it has given me through the SNSF Professorship: It has been a keystone in my scientific career and allowed me to return to Switzerland to do scientific research after a research period abroad of four years. Moreover, I find the SNSF a very reliable and researcher friendly funding institution that really helps scientists to conduct their research, limiting the time spent on bureaucracy and on fine tuning research proposals that are already very good (EU, I am looking at you and your acceptance rates!). Finally, I have always had a fantastic experience with the employees of SNSF, who have given me crystal clear explanations and helped with the success of my projects. So, a very big and warm thank you for the amazing work that SNSF is doing for science in Switzerland and beyond. (5131)

I think it's one of the major benefits, currently, that the SNSF is able to fund a significant number of projects in a broad fashion bottom-up for projects from the Swiss Universities. It should be one of the highest goals to be able to sustain a significant acceptance rate on the level of bottom-up standard project support. To support a wide variety of project and covering a broad range of research groups this should not become overly competitive in terms of acceptance rate. (6055)

SNSF has a great organizational culture in that project officers take on a supportive role in facilitating researchers to deal with administrative issues as they arise. Communicating with SNSF is always a pleasure. This eases the administrative burden, by making sure we get the administrative parts right the first time, and allows us to focus more on the research. (6182)

fhphneg: negative feedback on SNSF funding to UAS or UTE

In our view, the rejection was due to two factors: - Interdisciplinary nature between Ecomomics (Volkswirtschaftslehre) and Administrative Sciences (Verwaltungswissenschaften), the latter not being represented in the Swiss Science Council - Strong reservations in Economics (Volkswirtschaftslehre) against Universities of Applied Sciences (Fachhochschulen) (234)

Die Gutachten waren ausgesprochen professionell und gut formuliert, auch hilfreich im Hinblick auf eine mögliche Neueingabe. Trotz Absage habe ich mich über dieses wissenschaftliche Niveau der Gutachter:innen gefreut. Das Problem des Antrags bestand darin, dass ich a. als 'Quereinsteiger', nämlich als ausgewiesener Fachwissenschaftler (eher theoretisch-analytisch orientiert) in der Forschungskultur einer PH, d.h. empirisch-praktisch orientiert Fuss zu fassen versuchte und b. dass der SNF m.E. zu sehr auf meinen CV und hier die bisherigen Publikationen geachtet hat und nicht die Idee selbst, die in allen 4 Gutachten als grundlegend und forschungswürdig anerkannt wurde, fokussierte. (748)

Uns fehlt häufig eine Förderung von Mini-Projekten : Als Fachhochschule habe wir viele angewandte Projekte, aus denen manchmal spannende Forschungsideen entstehen. Dies sind keine grossen Projekte über mehrere Jahre, sondern eher eine konkrete Idee, die man in 2-4 Monaten untersuchen kann. Die aktuellen Förderinstrumente sind dafür zu gross , wir bräuchten einen einfachen Prozess wo man z. B. für so ein Miniprojekt bis zu 50'000 Franken in einem einfachen Prozess (One-Pager) beantragen kann. (845)

Die erwähnte Unterfinanzierung im Projekt bezieht sich auf die Nicht-finanzierung der Aufwände von PIs in SNF-finanzierten Projekten. Fachhochschulen erwarten, dass Forschungsarbeit grundsätzlich drittmittelfinanziert wird, auch Projektverantwortung, -koordination und Anleitung von Mitarbeitenden. Zudem bedingt Forschung mit angewandtem Fokus meiner Erfahrung nach (zumindest in den Sozialwissenschaften und im Bereich Gesundheit) ein hohes Mass an Involvierung und Präsenz der PIs gegenüber Partnern und Forschungsteilnehmenden. Das heisst auch, dass der Aufwand für PIs, für welchen Fachhochschulen keine Grundfinanzierung vorsehen, in solchen Projekten sogar höher ist. Im Falle des hier im Fokus stehenden Projektes übernimmt die Fachhochschule meine Leistungen als PI bis zu einem gewissen Grad, macht aber auch deutlich, dass dies aus finanztechnischer Sicht problematisch sei. (1315)

Wenn mangelnde Forschungs-Grundfinanzierung an Fachhochschulen durch staatliche Fördermittel kompensiert werden muss, erzeugt dieser künstliche Wettbewerb um staatliche Mittel zwar Leistungsdruck (möglicherweise aber nicht bessere Leistungen), verhindert aber zugleich langfristiges Forschen und nachhaltige Mittelbau-Förderung sowie stabile Karrieren allgemein. Dieser Mangel an Sicherheit und Perspektive führt dazu, dass hervorragende Mitarbeiter abwandern und längerfristige Planungen und Entwicklungen behindert werden. (2127)

1: Fokussierung auf die Schaffung der wissensbezogenen und technologischen Voraussetzungen zur Entstehung neuer Märkte (wie z.B. bei der Erfindung des Internets) das ist ja gar nicht möglich, niemand hat sich auf CRISPR CAS, DARPANET fokussiert, auch die Bedeutung monoklonaler Antikörper wurde von der SNF anfangs unterschätzt: man kann nicht voraussehen , welche Entwicklungen neue Märkte bedingen, denn dass sind 20 Jahres-Horizonte. Die mR Technologie, die uns jetzt die COVID Vakzine beschert hat, ist vor mindestens 20 Jahren initiiert worden, und ForscherInnen wie Katalin Kaliko - wäre die vom SNF unterstützt worden? in den USA an Columbia hat sie grösste Mühe beim funding gehabt. 2. Zweck und Sinn der Fragen, bleibt unklar. Bei BRIDGE wird suggeriert, als wären Anträge von FH's willkommen. Die implizite Empfehlung, dass FH's bei BRIDGE Programmen doch mit richtigen Universitäten zusammengehen sollen, ist herablassend. Die FHs sind wirtschaftsnah und anwendungsnah, und doch gehen die BRIDGE Discoveries etc nicht an FHS. BRIDGE ist ein verkapptes ETH Förderinstrument. 3. Wenn ich gewusst hätte, wie schwer es Forschungsgesuchen an den SNF aus einer FH heraus haben (das ist komplett bekannt in der gesamten Schweizer FH Szene, nur ich wusste das nicht beim Herzug), wäre ich vermutlich nicht in die Schweiz übersiedelt. Ich komme aus der Akademie, meine besten Doktoranden kamen aus FHs, einige sind jetzt ProfessorInnen in Asien und USA, ich habe keine Vorurteile. Umgekehrt schien das nicht zu gelten. Ich muss mich mit meinem track record nicht verstecken, aber sobald man aus der FH heraus ein Gesuch stellt, scheint das egal zu sein. Vergabe von Fördermitteln per Lotterie macht immer mehr Sinn. (3477)

Ich habe bisher drei SNF Gesuche eingereicht. In allen drei Fällen waren die Empfehlungen der Experten sehr positive. Der Fachrat hat aber die Gesuche stets abgelehnt auf Grund der Tatsache, dass wir eine Fachhochschule sind und meine Gruppe stets darauf bedacht ist Grundlagenforschung und Angewandte Forschung zu verknüpfen. Sind sehr gut verknüpft mit Firmen. Wir sind aber auch sehr darauf bedacht Grundlagenforschung zu betreiben, welche einmal in Zukunft wichtig werden könnte für die Anwendung. (4505)

SNF fördert FHs praktisch nicht, trotz Beteuerungen. Andere Arbeitsbedingungen werden nicht gewürdigt (Stunden rapportieren, Saläre von Mitarbeitern etwa 40-50 % höher als an Uni/ETH); hohe Lehrbelastung wird nicht gewürdigt; Beurteilung orientiert sich zu stark an wissenschaftlichem Output obwohl ganz andere Bedingungen als an Uni/ETH; da nur ein Gesuch laufen darf, werden Zusammenarbeit mit Uni/ETH verunmöglicht (zu grosses Ablehnungsrisiko wg. Beteiligung von FH bei gemeinsamem Gesuch); fragwürdiges Konzept für Anträge (Reviews spät verschickt, sodass bei abgelehntem Antrag ein Jahr verlorengeht); Reviewer nicht in Kenntnis von FH und der Arbeitsbedingungen. (5689)

fhphpos: positive feedback on SNSF funding to UAS or UTE

Ich schätze den SNF sehr und bin froh, dass Sie die (schwierige) Situation der Forschung an Fachhochschulen zunehmend besser verstehen und immer besser auf unsere Bedürfnisse und Profile eingehen. Weiter so! Danke. Meine FH freut sich mittlerweile nicht mehr so über meine beim SNF akquirierten Gelder, da die Kosten vom PL nicht vom SNF übernommen werden und die finanzielle Situation immer prekärer wird. Mittlerweile gibt es sogar einen internen

Plan, wer von den Forschenden wann einen SNF-Antrag stellen darf, da die FH nicht mehr alle SNF-Projekte finanziell tragen will/kann. Die FHs bräuchten hier eine bessere Grundlagenfinanzierung (und auch ein bessere Verständnis der Leitenden für Forschung), damit ich als FH-Forscher gegenüber Uni-Forschenden nicht künstlich zurückgebunden werde. Dies dient niemandem. (264)

Ich begrüsse die Schritte des SNF in Hinblick auf die Öffnung für Forschende an Fachhochschulen und die Berücksichtigung der (gerade auch administrativen) Unterschiede im Vergleich zu Forschungsuniversitäten, u.a. in Hinblick auf die Anstellung von Personal. (4470)

humsocneg: negative feedback on SNSF funding to humanities and/or social sciences

Das NFP Digitale Transformation , zu dem wir die genannte Skizze eingereicht haben, hat in erster Linie Technologie-fokussierte Projekte finanziert. Digitale Transformation betrifft jedoch die gesamte Gesellschaft, so auch auf der sozialen Ebene. Diese Aspekte wurden in der Förderung dieses NFP leider nicht berücksichtigt. Es ist zu wünschen, dass in Zukunft die Sozialwissenschaften bei diesen gesellschaftlichen Themen stärker berücksichtigt werden. (634)

Die Förderung im Bereich künstlerischer Praxis beim SNF wird nach wie vor vorwiegend nach Massstäben der Geisteswissenschaften beurteilt. Ein tiefergreifendes Verständnis künstlerischer Praxis sollte im Reviewprozess (Panel und Gutachten) viel stärker vertreten sein. Die Künste dürfen nicht einfach unter den Geisteswissenschaften subsummiert werden. Ihre Anliegen, ihr Zugang zur Theorie und ihre Forschungsmethoden basieren auf Expertise, die unmittelbar aus der Praxis hervorgeht. Im internationalen Kontext hat die Schweiz hier zunehmenden Aufholbedarf. (1553)

I'd love to see the founding covering also exhibition projects, which in my area is a highly relevant medium of research dissemination. (1695)

Dieser Fragebogen wie auch das Programm zu digital lives ist/war sehr stark auf technische Erkenntnisse ausgerichtet. Die gesellschaftliche und soziale Komponente von technologischen Entwicklungen ist ebenso wichtig. Es stellen sich derzeit ausgesprochen wichtige gesellschaftliche und ethische Fragen. Die Sozial- und Geisteswissenschaften haben diesbezüglich viel zu bieten. Entsprechende Fragen fehlen im Fragebogen. So wird u.a. nach dem Bedarf einer verstärkten Kooperation und Koordination von Wissenschaft und Wirtschaft gefragt. Braucht es allenfalls auch eine verstärkte Kooperation und Koordination von Wissenschaft und Politik? Und eine ebensolche zwischen Wissenschaft und zivilgesellschaftlichen Akteur:innen? Die Verstärkung der Ansprache der Bürger:innen selbst? Die aktuell vorliegenden Konzepte der Citizen Science sind schwergewichtig auf Mitarbeit, jedoch nicht auf Mitsprache ausgerichtet. Gerade die Coronakrise offenbart eine deutliche Wissenschaftsskepsis bei der Schweizer Bevölkerung und bei Politiker:innen. Hier braucht es neue Konzepte. Eine engere Kooperation zwischen Wissenschaft und Wirtschaft kann die Krise zusätzlich befeuern, wenn der Eindruck entsteht, dass hier zwei machtvolle Teilsysteme der Gesellschaft unter Ausklammerung der Öffentlichkeit ihre Strategien koordinieren und umsetzen. Werden diesbezügliche Änderungen anvisiert, so sollten auch die weiteren gesellschaftlichen Teilsysteme in den Blick genommen werden. Es braucht auch hier neue Kooperationsmassnahmen. (2960)

Es ist dringlich nötig, dass die letztmalig 2016 ausgeschriebene Förderlinie Editionen vom SNF wieder als Grundlagenforschung angesehen wird und entsprechend wieder Finanzierungen auch für neue Editionsprojekte durch den SNF angeboten werden. Ende Juni 2021 gab es einen offenen Brief des SAGW-Generalsekretärs Flavio Eichmann an den SNF, der diese Problematik klar benennt und dem wir uns alle angeschlossen hatten. Das tue auch ich jetzt noch einmal eindrücklich. (5159)

Es wäre sehr gut, wenn die Schweiz auch in den Geistes- und Sozialwissenschaften stärker Langzeitvorhaben zu Grundlagenforschungen mit Laufzeiten von bis zu 15 Jahren fördern würde, wie es etwa in Deutschland schon seit langem mit grossem Erfolg üblich ist. (6242)

humsocpos: positive feedback on SNSF funding to humanities and/or social sciences

Zum Glück versteht der SNF unter Forschung nicht nur die naturwissenschaftlich-technologische Forschung, an der Sie den Fragebogen ausrichten. Bei der Auswahl der Forschungsbereiche fehlt zum Beispiel die historische Forschung / Geschichte. Ohne einen reflexiv-kritischen und eben historischen Zugang wird aus Forschung unreflektierte Innovationsentwicklung. (643)

other_fund: other opinions on research funding

There is a need for funding instruments that are a sweet spot between NCCR's (large organizations) and individual researchers (the basic single PI SNF program). Innosuisse only partially covers the space and does so with the constraint of getting industry involved. In Switzerland not all branches of technology are well represented by industry (for instance most IT companies have sales offices but do not have strong centers of R&D in Switzerland). Having funding instruments for groups of fewer than half a dozen PI's with a focus on basic research (and not immediate tech transfer) is missing in Switzerland. (456)

5 points that I find important - For basic research the most efficient way (investment vs return) is to fund individual lab grants. Good scientists will find key collaborators according to their needs (not required to plan this ahead & often unexpected findings occur) - The large consortia are great for politicians to show that they support science. However, they take up lots of resources that are diverted from actual research to various administrative and PR tasks. I am not convinced that they are the most efficient way to move science ahead. - Talking about science (popularization) is really important but should be supported independently of such large grants. Define a number of key issues (e.g. infectious disease, climate change, agriculture....) and build up communication task forces with the existing scientist pool to help them diffuse key information on these topics. I'm quite convinced that many scientists would agree to participate. - Make sure we get access again very soon to EC science programs or we will pay it dearly - Funding small groups (2-4 groups) doing interdisciplinary research is an excellent idea. thank you for your attention (707)

Research Infrastructures are paramount for competitive science, and we have too few mechanisms for large RI competitive at global level. None of your questions was on this, which shows that we have a problem. (1118)

Une meilleure coordination selon le degré de maturité de la recherche entre Innosuisse et le FNS (1445)

The new developments regarding the participation of Switzerland in Horizon Europe worry us all. SNSF should try to minimise the damage by promoting long-term, collaborative European research. (1532)

Il serait peut-être intéressant d'organiser une pré-sélection pour l'ensemble des projets soumis au FNS sur la base d'un document de 5 pages au maximum par exemple. Effectivement, la rédaction d'une demande de financement est actuellement un exercice très long et qui se solde encore trop souvent par un refus par manque de budget et non pas parce que la qualité de la demande est trop faible. Cette pré-sélection permettrait de significativement augmenter les chances d'obtenir un financement au second et dernier tour et éviterait aux requérants déboutés au premier tour de passer beaucoup de temps à rédiger une demande plus conséquente qui n'aurait pas été financée dans une procédure en un tour. Merci pour votre considération. (1652)

Der SNF sollte verstärkt Research on Research finanzieren um die Qualität der Forschung zu steigern. Er sollte bereits bei Antragstellung Fragen zur Reproduzierbarkeit der Forschungsergebnisse stellen. Er sollte vermehrt Replikationsstudien finanzieren. (2330)

Förderung von Forschungsprogrammen mit einem sehr langfristigen Zeithorizont (mindestens 12 Jahre). --> die langfristige Sicherstellung und Finanzierung der Teilnahme an ERICs ist in keinem Fördergefäss abgebildet (weder SNF noch SBFI fühlen sich finanziell zuständig). Förderung von F&E wie im Eurostars für CH Industriepartner (und ihre Forschungspartner) gibt es in der Schweiz nicht (auch nicht Innosuisse). Durch die Probleme im Zusammenhang mit Horizon Europe wird dieses Förderinstrument vollständig fehlen. (2393)

Funding in applied sciences for domains without needs for developing payed services or goods is difficult. Special funds are missing to support academic development in allied health professions other than in social science. (3273)

Es bräuchte für das Bridge Discovery Programm eventuell noch ein Anschlussprogramm für eine Weiterförderung. Für viele Wissenschaftler, die für Ambizione zu alt sind und für eine SNF Professur zu jung sind, passen nur wenige Förderprogramme. Und auch für Frauen, die nicht mehr für das Prima Programm zulässig sind, sollte es Fördermöglichkeiten geben, denn gerade 35-40 Jährige sind im Spagat zwischen Familie und Forschung und sollten mehr gefördert werden. (3418)

Die Projektförderung in meinem Fachgebiet sieht keine Infrastrukturbeiträge für IT und Software vor. Bei unseren Projekten, die moderne Verfahren wie maschinelles Lernen auf grosse Datensätze anwenden, handelt es sich aber um Projekte mit hohen Anforderungen an Rechenkapazität, Speicherkapazität und Datenschutz (sehr beschränkte Zugriffsrechte für Drittpersonen). Für diese Kombination standen an den Hochschulen - selbst hier an der ETH - bis vor Kurzem keine pfannenfertigen Lösungen bereit. Die neue Lösung, die es nun gibt, ist sehr teuer (jährlicher Umfang: 1/3 bis 1/2 eines Doktorandensalärs) und damit a) nicht Teil der IT-Grundausstattung eines sozialwissenschaftlichen Instituts und b) nicht einfach so mit vorhandenen Forschungsgeldern zu stemmen. In den zwei Fällen, in denen mich das konkret betraf, habe ich die jeweilige IT-Lösung (konkret: eine Serverbeschaffung) mithilfe eines anderen Drittmittelprojektes querfinanzieren können. Die Projekte wären ohne die Querfinanzierung aber schlicht nicht durchführbar gewesen. Es sollte überlegt werden, dass in gut begründeten Fällen Beiträge an projektkritische IT-Infrastruktur via SNF finanziert werden kann - gerade um die Anwendung fortschrittlicher Verfahren aus dem Data Science-Bereich auf die Sozialwissenschaften zu fördern. (3866)

The main problem is Swiss research funding is the extreme disparity between ETH/EPFL and university funding, especially when it comes to expensive equipment. There needs to be a way that universities can compete for support for expensive multi-million equipment. (5034)

Disparity of research funding (total) between federal and cantonal research institutions persists, despite some improvements over the past decade. (5055)

Je ne suis pas convaincu par cette enquête pour trois raisons: - Beaucoup de questions sont guidées! en effet, qui dirait que la recherche sur des sujets pertinents pour la société n'est pas importante? - Le gros dilemme actuelle est le conflit entre d'une part la nécessité de postes stables pour la relève et d'autres part les incitations à des levées de fonds externes qui par définition sont limitées à quelques années et ne peuvent donc en aucun cas donner lieu à des postes stables. - Lié au point précédent, le problème de la surproduction de doctorant dans de nombreux domaines engendrés par les financement FNS, en particulier dans les domaines où les doctorants ont peu d'options de carrières non-académiques (il suffit de comparer le nombre de doctorats obtenus par an au nombre de poste se libérant chaque année!). (5099)

1. SNF should enforce full publication of the research that it funds. There is still no stringent monitoring of projects until academic publication or other types of sharing results with the public. 2. SNF should start to fund evidence syntheses, which represent a critical type of research activity between primary research and policy making (e.g. for climate reports or health technology assessment). (5392)

It would be nice to have some seed funding programme dedicated for young researchers at the early stage of their independent career. (5415)

Dans mon domaine de recherche en particulier (Ecologie aquatique, notamment problématique d'assainissement des ouvrages hydroélectriques par rapport aux altérations hydrologiques, sédimentaires et de la continuité écologique), je trouve que le FNS devrait davantage encourager les collaborations entre organismes de recherche suisses, et notamment entre les parties francophone et germanophone de la Suisse. Pour l'instant, il y a une vraie scission en matière de projets et de financement de la recherche entres ces deux parties, l'essentiel allant côté germanophone. (5451)

Le FNS en recueillant les requêtes des différents acteurs en Suisse pourrait avoir un rôle pro-active pour proposer des collaborations entre des projets. En terme de nouveaux projets. il peut arriver que des acteurs dont les sujets de recherche ou les techniques utilisés sont proches ne se connaissent pas nécessairement. Le FNS devrait encourager la collaboration plutôt que la compétition systématique entre les groupes au niveau fédéral et rendre ainsi la recherche suisse plus compétitive face aux groupes internationaux. (5617)

Der Verlust des Zugangs zu EU Fördermitteln ist ein schwerer Schlag für die Schweiz als Wissenschaftsstandort. ERC Ausgleichsprogramme helfen hier nur begrenzt. Es braucht dringend mehr kollaborative Projektförderung für

Partner im gleichen Themenbereich. Sinergia ist ein gutes Konstrukt, aber die Fokussierung auf Interdisziplinarität lässt andere Bereiche aussen vor. Es gibt in der Schweiz exzellente Forschungsgruppen innerhalb der Disziplinen, die Fantastisches erreichen könnten, wenn man deren Zusammenarbeit aktiv fördern würde. (6103)

Förderung länderübergreifend (insbesondere im deutschsprachigen Raum) ermöglichen. (6450)

other: other comments

Many comments - I write regularly about the improvement of instruments in Switzerland. The questionnaire was not really adequate for the kind of research we do at the University in social and human sciences. The impact of our research is often underestimated because of the many channels of transmission that exist and the long term consequences of this kind of research, in particular historical or socio-anthropological research can contribute during years to the increase of knowledge and the improvement of the strength, innovation and resilience of a society. This kind of research is fundamental for economics and innovation in the sense that it contribute to the knowledge of how societies construct reflexivity and trust or mistrust. (3766)

Sie fordern sehr viel Toleranz! Sämtliche letzten Argumente hätten für das eingegebene Projekt gesprochen, es wurde aber wegen fehlender Mittel abgelehnt. Dazu jetzt noch einen Fragebogen in extenso zu beantworten ist eher anstrengend. Denn offenbar wissen Sie ja, wo der Schuh drückt - sonst könnten Sie die Fragen so nicht stellen. (3954)

Ich hätte sehr gerne eine Universität als Forschungspartner gehabt. Leider war ich bei meiner Suche nicht erfolgreich. (4320)

Missing questions about why I left Switzerland and what are the plus and cons of my new place of work and how it compares to where I was. Ie., how is CH comparing to other places? (4375)

It is important for the SNF and other funding bodies to realize that traditional publications are only part of the (measurable) research output. Publication of open source software for example may have a very large impact, too. Though the SNF starts to account for this more needs to be done. Australia's Di Cook Award for Statistical Software is great pioneering example: https://www.statsoc.org.au/Di-Cook-Award (5134)

In drei Dingen glaube ich, dass der SNF es in der Hand hätte, einen massgeblichen Beitrag zur Lösung von Strukturellen Problemen im Wissenschaftsbereich beizutragen: 1) Angestelltenverhältnisse in der Wissenschaft sind enorm ineffizient. Im Mittelbau verbrauchen wir einen Grossteil unserer Zeit damit, uns in unsicheren Positionen von der einen Position zur nächsten zu hangeln, anstelle Forschung zu betreiben. Auf der anderen Seite sind unkündbare Professoren grösstenteils mit administrativen Arbeiten beschäftigt. Der SNF sollte mehr längerfristige (nicht ewige) Forschung ermöglichen, die von agilen Teams ausgeführt wird, anstelle eines auf Professuren beruhenden Systems, welches aus dem vorletzten Jahrhundert stammt. 2) Die Wissenschaft könnte enorm von Wissen über Arbeitsprozesse ausserhalb der Wissenschaft profitieren (beispielsweise Projektmanagement), aber dies passiert nicht, da der Weg von Wissenschaft in die Praxis eine Einbahnstrasse ist. Der SNF sollte es stärker ermöglichen, dass innerhalb eines Berufslebens zwischen Wissenschaft und Praxis hin- und hergewechselt werden kann. Auch dies würde heissen, die Verankerung des Systems an fixen Professuren zu überdenken. 3) Es ist schlicht beschämend, wie über die Finanzierung von Open Access Gebühren öffentliche Mittel von gewinnorientierten Verlagen in private Gewinne mit riesigen Profitmargen transferiert werden. Der SNF sollte den Aufbau von non-profit Journals mit geteilter IT-Infrastruktur fördern. Der meiste Teil der Arbeit in der Wissenschaftspublikation geschieht ohnehin schon unbezahlt (Autoren, Reviewer, Editors teils), die grossen Verlage monetarisieren schlichtweg Prestige und bieten sonst relativ wenig. (5857)

Principal applicants for SNF projects generally do not participate in ideation and writing proposals, beyond reading them. Yet, they take all the credit and maintain ownership if the participating applicant leaves the group. This is utterly unethical! (6469)

Annexe VII

Research infrastructures

Federal Department of Economic Affairs,
Education and Research EAER

Swiss Science Council SSC
Secretariat

Coordination of research infrastructure funding in 16 countries

A. Context

Since the foundation of CERN in 1953, Europe has a history of intergovernmental collaborations in the area of research infrastructures (RI), but these collaborations remained sporadic. Following the shift towards 'innovation' in the European Research Framework Programmes in the 1990s, the founding document of the European Research Area, which was created in the year 2000, observed that RI "play a central role in the progress and application of knowledge in Europe" and that it was now time "to go a step further and develop a European approach to infrastructures, covering both the creation of new installations, the functioning of existing ones and access to them."[1]

To implement this initiative, the European Strategy Forum for Research Infrastructures (ESFRI) was created in 2002. Its aim is to develop and implement a coherent European approach to RI policy. The ESFRI is therefore a discussion forum and is composed of national delegates from all EU member states and one representative from the European Commission. Given the size, cost, and technological complexity of RI, international coordination is key for an effective, long-term engagement with the issue. In 2006, the ESFRI launched 'a strategic Roadmap for Europe' – an instrument designed to consolidate resources of EU member states and orchestrate a plan with a 10 to 20 year foresight.[2] The roadmap was reissued in 2008, 2010, 2016, and most recently in 2018.[3] To date, over 60 RI have been listed in the five roadmap iterations.

The EU's interest and investment in RI has led to renewed attention to this policy area. Aside from orchestrating large RI, the ESFRI also urged members states to develop their own national RI roadmaps. In the 15 years since the ESFRI's first roadmap, many European and non-European countries have launched similar mechanisms. Exactly how this is organised varies significantly. In some countries, the government is in charge of the process; in others, it may be a science council or research funding organisation. Some countries' roadmaps are discussing both national RI and participations to international RI, while others list only one or the other. Not all countries have a national process for coordinated decision-making in place, such as Belgium and Singapore. For a better understand of how national roadmaps differ, please see the following chapter.

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[1] European Commission (2000). *Towards a European Research Area*, p. 10-11.
[2] ESFRI (2006). *European Roadmap for Research Infrastructures*, p.5 https://www.esfri.eu/sites/default/files/esfri_roadmap_2006_en.pdf (03.06.2022).
[3] ESFRI (2018). *Roadmap 2018: Strategy Report on Research Infrastructures*. http://roadmap2018.esfri.eu/media/1066/esfri-roadmap-2018.pdf (03.06.2022).

B. General overview

National coordination process (roadmap or similar) orchestrated by:

1. Government	**2. Science council or advisory committee** integrated within the government	**3. RFO affiliated to the government** (with intermediate degree of autonomy)	**4. Independent RFO**	**5. Independent organization** dedicated to funding RI only
Germany	USA	UK	Netherlands	Canada
France	Denmark	Norway		
Italy		Sweden		
Austria				
Czech Republic				
Ireland				
Australia				

1. Government (the government itself establishes the roadmap)

Germany	Federal Ministry of Education and Research of Germany (BMBF)
France	Ministry for Higher Education, Research and Innovation
Italy	Ministry of University and Research
Austria	Federal Ministry of Education, Science and Research (BMBWF)
Czech Republic	Ministry of Education, Youth and Sports
Ireland	Dept of Jobs, Entreprise and Innovation, and Dept. of Education and Skills[4]
Australia	Dept of Education, Skills and Employment

2. Government via an integrated science council or an advisory committee

USA	National Science and Technology Council (presided by the U.S. President)
Denmark	National Committee for Research Infrastructure, as part of the Ministry of Higher Education and Science

3. Government via a research funding organization (with intermediate degree of autonomy)

UK	UK Research Innovation (an executive non-departmental public body sponsored by the Dept for Business, Energy and Industrial Strategy)
Norway	Research Council of Norway, as part of the Norwegian Ministry of Education and Research
Sweden	Swedish Research Council, as part of the Swedish Ministry of Education

4. Independent research funding organization

Netherlands	Dutch Research Council (NWO), as an independent administrative body

5. Independent organization dedicated to research infrastructure funding

Canada	Canada Foundation for Innovation

6. No national process for coordinated decision-making on RI funding

Not every country chose to develop a roadmap for RI. In Singapore, for instance, the National Research Foundation (attached to the Prime Minister's Office of Singapore) develops five-year plans for research and innovation, without a specific RI strategy. Developing core capabilities in universities and A*STAR Research Institutes is an important pillar of the plan (29% of the budget for research and innovation, or $7.3 billion out of $25 billion).[5] In April 2015, the National Research Foundation developed the National Research Institute Framework, designing criteria for organizations to be designated

[4] The only edition of the Irish Roadmap was done in 2007 by the government agency Fortàs.
[5] National Research Foundation (2020). Research, Innovation and Enterprise 2025 Plan. (https://www.nrf.gov.sg/docs/default-source/default-document-library/rie_booklet_fa2021_pages.pdf).

as national research infrastructures.[6] Other countries, like Belgium, are planning a national RI roadmap.

C. Case studies

The 5 case studies explore national processes for coordinated decision-making of major RI (‘roadmap process’ – even though the word roadmap is not always used, as in the USA). The aspects addressed are the role of the government, the role of the main research funding organization (RFO) and whether the entity in charge of the process (if distinct from government and RFO) was independent.

1. Germany

Role of the German government. The coordination and funding of RI in Germany lies with the government. The Federal Ministry of Education and Research (BMBF) prepares RI policy decisions in a systematic way and has developed the roadmap process for new RI projects to be evaluated according to a uniformly structured procedure. The roadmap process is a strategic tool for the prioritization of future, long-term investments.

The evaluation process is carried out in a three-part peer review process.[7] (1) The German Science and Humanities Council (WR) is responsible for the scientific assessment, which encompasses the scientific potential, the national importance, and the feasibility and scientific usability of the proposed RI, and also makes an international comparative evaluation. (2) Independent experts from industry and science are appointed to undertake a financial evaluation with regards to the appropriateness and proportionality of the funds. They also examine the estimated operating costs and planned implementation. (3) Specialist departments in the BMBF assess the socio-economic, social and research policy implications of the projects, especially the consequences on and contributions to societal challenges and maintaining the sustainability of the research landscape. **Taking all these evaluation results into account, the BMBF prioritizes the projects in terms of research policy. Including projects within the roadmap means that the Ministry intends to fund them.**

Role of the Deutsche Forschungsgemeindschaft (DFG). As the main research funding organization of Germany, the DFG is basically independent from the BMBF (very similar to the SNSF in this respect). It does not play a major role in the roadmap process. With regard to RI, the DFG funds several research ships on which scientists, as well as the European Liaison Office of Research Organisations, can book research time. Major research instrumentation at universities can receive up to 50% funding from the DFG after being evaluated by the Committee on Scientific Instrumentation and Information Technology. In addition, proposals for major instrumentation funded by federal states for training, teaching, and clinical care purposes can be reviewed by the DFG. For many instrumentation categories and infrastructure measures, statements and recommendations are available. **Since 2016, the DFG runs RIsources, an information portal listing institutions and platforms providing research services.[8] The DFG sets criteria for inclusion in the list and verifies that all RI fulfil the criteria.**

2. USA

The coordination and funding of RI in the USA lies with a science council or advisory committee that is integrated within the government. The most recent coordinating document on RI is the **National Strategic Overview** for research and development infrastructure from 2021.[9] It is set up by the Subcommittee on Research and Development Infrastructure, which acts under the Committee on Science and

[6] National Research Foundation (2021). *National Research Infrastructure*. (https://www.nrf.gov.sg/programmes/national-research-infrastructure). So far, only one organization, the St. John’s Island National Marine Laboratory, appears to have received this designation.
[7] BMBF (2016). *Der Nationale Roadmap-Prozess für Forschungsinfrastrukturen: Investitionen für die Forschung von morgen*, 17-19. (https://www.bundestag.de/resource/blob/428350/e241f2cd785d4ccd79db1097a53374a9/217-adrs-data.pdf).
[8] See the DFG website for a description of RIsources (https://risources.dfg.de/home_en.html).
[9] Subcommittee on Research and Development Infrastructure (2021). *National Strategic Overview for Research and Development Infrastructure*. National Science and Technology Council, Committee on Science and Technology Enterprise.

Technology Enterprise of the National Science and Technology Council.[10] All these bodies are part of the federal government. Their aim is “to optimize Federal Research and Development Infrastructure investments and planning over the next 20 years”.[11]

The scope of the National Strategic Overview is limited to federally-funded RI only. Decadal surveys set the broad vision for scientific discovery for the coming decade in a given scientific field, including the infrastructure and research capabilities needed to reach the desired outcomes. The National Strategic Overview sees a role for the National Academies in conducting decadal surveys to inform agencies’ goals, research priorities, and opportunities for collaboration. Strategic partnerships between U.S. agencies and other nations is viewed as one way of addressing long-term needs in areas where the scientific mission is **discovery science** – which does not have strong economic or national security implications – such as astronomy or nuclear and/or elementary particle physics. These ‘discovery-oriented’ RI are distinguished from those with economic or national security implications: “For such ‘discovery-oriented’ research, the United States may not be able to address those needs alone and should seek to share costs through international partnerships, such as the international partnership with CERN in elementary particle physics. For RDI with economic and/or national security implications, the United States should plan for and construct those facilities to meet U.S. needs: collaborating, coordinating, or sharing information as appropriate”.[12]

Role of Research Funding Organisations. The National Institutes of Health (NIH) and the National Science Foundation (NSF) operate as government agencies whose budget is regulated by Congress. They respond to White House or administration priorities but have some autonomy – for instance programme/centre directors can launch new initiatives when they spot new trends. The NIH is part of the U.S. Department of Health and Human Services, which is made up of 27 centres or institutes, each with its own research agenda and mix of intra-muros research and extra-muros funding. They do not appear to play any role within the National Strategic Overview.

The National Science Foundation (NSF) is an independent agency of the U.S. government. The NSF provides support for the design, construction, operation, and upgrade of RI, including instrumentation, mid-scale projects and major facilities. Proposers may submit two types of mid-scale projects ‘Implementation’ (e.g., acquisition/construction, project cost ranging $6–100 million) and ‘Design’ (project cost ranging $600 000–20 million). The Design track is intended to facilitate progress towards readiness. The threshold for a Major Facilities Project is currently $100 million The NSF’s Large Facilities Office is its primary resource for all policy or process issues related to the development, implementation, and oversight of all large-scale facility projects. Its website publishes the list of all NSF funded major facilities and edits a RI guide.[13]

The NSF director is part of the consultation process on the National Strategic Overview for Research and Development Infrastructures. The director is advised by a Chief Officer for Research Facilities and a Major Facilities Working Group. The director is responsible for the implementation of NSF policies and practice for agency oversight of major facilities, and for proposing new major facility projects to the National Science Board, the Office of Management and Budget, and Congress. The National Science Board (25 members, appointed by the U.S. president) establishes agency policy for major facilities, and reviews and authorizes the advancement of major facility projects.

3. United Kingdom

Role of UKRI (and relationship with the government): The coordination and funding of RI in the UK lies with research funding organisations that are affiliated to the government, but which have an intermediate degree of autonomy. The ERI system in the UK recently underwent major reforms, the latest

[10] A description of the National Science and Technology Council can be found on the White House website (https://www.whitehouse.gov/ostp/nstc/).
[11] Ibid. iii.
[12] Ibi., 11.
[13] NSF (2022). *Large Facilities Office (LFO)*. (https://www.nsf.gov/bfa/lfo/).

being the creation of UK Research and Innovation (UKRI) in April 2018. UKRI acts as an umbrella organization to nine specialized Research Councils.[14] The individual Research Councils do not have separate legal entity. Academic researchers have an advisory role rather than a formal say in Council-level decision-making processes. Despite this, UKRI is considered, as an 'Arm's Lengths Body', to have some level of autonomy from the government.[15] UKRI describes its own autonomy in the following: "We are a non-departmental government body, sponsored by the government's Department for Business, Energy and Industrial Strategy. Our funding decisions are made independently from government, as per the Haldane principle."[16] The 'Haldane Principle' states that science-funding decisions should be left to scientists and is mentioned in practically every science policy document, although its historicity is controversial.[17]

Since the Higher Education and Research Act 2017, it is the British government that decides the amount of a grant given to a particular Research Council within UKRI and can give directions with regards to the grant's allocation (sections 101 and 102). The Secretary of State takes decisions on overall strategic priorities and budgets on the advice of UKRI, approves the overall strategy and corporate plan for UKRI, and takes specific spending decisions if these are above delegated limits or have significant policy implications.[18] Thus, the 'Haldane Principle' is recognized to have limits, as mentioned in the strategic document that lead to the creation of UKRI: "**It is accepted that there must be ministerial input into high level allocations between research themes, for national infrastructure and broader sector sustainability** but that more granular decisions, for example the awarding of grants to specific research activities, should not be taken by Ministers or central government."[19]

The government's role is explained in more detail in the national 2019 Roadmap: "Individual Councils within UKRI have delegated responsibility to manage the infrastructure portfolio within their domains taking advice from their Councils, but many investments are of a cost that cannot be accommodated within these budgets, cut across multiple domains or are of a scale that requires approval from government. **Business, Energy and Industrial Strategy (BEIS) Ministers will guide the strategic direction of this process, agreeing major strategic priorities, approving spending decisions on major capital projects and steering the balance of funding between UK Research and Innovation Councils**."[20] For the purpose of the roadmap, the UK employs a dedicated Advisory Board, operating within the context of the government's 'UK Industrial Strategy'.[21]

Role of the Wellcome Trust. The Wellcome Trust is the largest private funding charity in the U. In 1998, it observed a gradual decline in the funding of university research infrastructures and argued that the government should fund basic research infrastructure.[22] The Wellcome Trust does not appear to play any role in the establishment of the roadmap.

[14] Among the Research Councils is Research England, the new Council responsible for block funding of English universities. A real-time survey published in November 2021 revealed that a majority of researchers have a mixed view of the current form of national evaluation system. The Research England Framework (REF) is appreciated for increasing openness and the public relevance of research, but criticized for decreasing novelty and authenticity and increasing "game-playing", defined as staff recruiting and embellishment of impact. See, Rand Europe (2021). *Understanding perceptions of the Research Excellence Framework among UK researchers: The Real-Time REF Review.* (https://repository.jisc.ac.uk/8542/1/understanding-perceptions-of-the-research-excellence-framework-among-uk-researchers.pdf).
[15] UK Government Investments (2020). *UK government arm's length bodies: the case for them in specialised delivery and how to optimise their use: A view from practitioners.* (https://www.ukgi.org.uk/wp-content/uploads/2020/03/UK-Government-Arms-Length-Bodies-A-View-from-Practitioners-January-2020_WEB.pdf)
[16] UKRI (2022, May 9). *Our relationship with the government.* (https://www.ukri.org/about-us/our-structure/our-relationship-with-the-government/).
[17] Edgerton, D. (2009). The 'Haldane Principle' and Other Invented Traditions in Science Policy. *History & Policy.* (https://www.historyandpolicy.org/policy-papers/papers/the-haldane-principle-and-other-invented-traditions-in-science-policy)
[18] Department for Business, Energy & Industrial Strategy (2018). *UKRI Framework Document*.(https://www.ukri.org/wp-content/uploads/2020/10/UKRI-111020-UKRIFrameworkDocument.pdf).
[19] Department for Education & Department for Business, Energy and Industrial Strategy (2016). *Higher Education and Research Bill: UKRI Vision, Principles & Governance.* p. 5. (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/559210/Higher_Education_and_Research_Bill-UKRI_Vision_Factsheet.pdf)
[20] UKRI (2019). *The UK's research and innovation infrastructure: opportunities to grow our capability.* p. 157. (https://www.ukri.org/wp-content/uploads/2020/10/UKRI-201020-UKinfrastructure-opportunities-to-grow-our-capacity-FINAL.pdf)
[21] Department for Business, Energy and Industrial Strategy (2017). *Industrial Strategy: building a Britain fit for the Future*. (https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future)
[22] https://publications.parliament.uk/pa/cm199798/cmselect/cmsctech/1040/8102802.htm

4. Netherlands

The coordination and funding of RI in the Netherlands lies with an independent research funding organization. The Dutch Research Council (Niederlandse Organisatie voor Wetenschappelijk Onderzoek, **NWO**) is the national funding agency of the Netherlands. It also operates 9 in-house research institutes employing more than 1800 collaborators in total (similarly to the National Institutes of Health in the USA and to the Research Council of Norway).

The NWO is an independent administrative body of the central government, but it does not come under the jurisdiction of a government minister. It has a legally established mission and tasks. In the Netherlands, independent administrative bodies are said to be 'cloaked in public authority' – that is to say, authorized to perform certain tasks and equipped with the necessary tools to accomplish them. The president and members of the Executive Board are appointed by the Ministry Education, Culture and Science. For each instrument of the NWO, the Executive Board appoints a selection committee. The Board usually adopts the selection committee's advice in its funding decisions. It may, however, deviate from the advice if it states its reasons for doing so. According to its mission statement, the first ambition of NWO is to play a 'nexus' role ("increased coordination in Dutch science so that a national research strategy can be developed, including a regularly updated Dutch National Research Agenda").[23] Funding RI is also part of the mission statement.

In 2015, based on its report *Science Vision 2025*, which argued that strategic choices in the area of large scale RI should no longer be left to ad hoc committees, the Dutch government asked the NWO to appoint a Permanent Committee for Large-Scale Scientific Infrastructures (hereafter: **GWI Committee**).[24] Although roadmaps had been drafted in 2008 and 2013, the mission of the GWI Committee was broader. In addition to drawing up the Dutch RI roadmap, the GWI Committee's mission also encompasses general advising duties and providing a landscape analysis with both availability of and need for RI (including facilities abroad). There is a subcommittee that maps out research needs for digital infrastructures.

Process. The GWI Committee presented the 2016 Roadmap containing 33 proposals.[25] The Roadmap 2021, published in August of that year, contained 9 new proposals.[26] The GWI Committee presents the roadmap to the NWO Executive Board, which consults the Ministry of Education, Culture and Science, as well as the Ministry of Economic Affairs and Climate Policy, before adopting the Roadmap. The relevant scientific disciplines (clustered into 'groups') figuring on the roadmap can then submit their application to roadmap grants. The Roadmap 2021 indicates that the success rate for the applications from the previous roadmap was 'reasonable'.[27] Assessments of RI then takes place by a separate committee appointed by NWO. Within the National Roadmap Programme, NWO organizes several funding rounds. The overall resources (40 million Euros per annum, which the Ministry asks NWO to set aside for RI, plus an additional 20 million Euros for digital research infrastructures) are allocated by NWO in coordination with the GWI committee.

Roles of HEIs and other research institutions. The National Roadmap 2021 deals with the design and realisation of new RI, substantial updates of existing RI, and operation costs for a limited start-up period. Meanwhile, maintenance and exploitation is, according to the roadmap, "mainly the responsibility of the universities and national research institutes. These should also reserve the necessary funds and make an effort to recognise and allot the necessary technical and personnel support."[28]

[23] NWO (2022). *Strategy NWO 2019-2022.* (https://www.nwo.nl/en/strategy-nwo-2019-2022).
[24] Ministry of Education, Culture and Science (2015). *Science Vision 2025: Choices for the Future*. (https://www.nwo.nl/sites/nwo/files/documents/Wetenschapsvisie%202025.pdf)
[25] GWI Committee, NWO (2016). *National Roadmap Large-Scale Scientific Infrastructure*. (https://www.nwo.nl/sites/nwo/files/documents/Roadmap_UK_2016_2020_lowres.pdf).
[26] GWI Committee, NWO (2021). *2021 National Roadmap for Large-scale Research Infrastructure*. (https://www.nwo.nl/sites/nwo/files/media-files/National%20Roadmap%20for%20Large-scale%20Research%20Infrastructure%202021_0.pdf).
[27] Ibid. 8.
[28] Ibid. 8.

Role of the Dutch government. In 2014, the Dutch Government published its *Science Vision 2025: Choices for the Future*, in which it asked the NWO to create the GWI Committee and described its role. The government also approves the overall roadmap and fixes the budget for the roadmap funds. In August 2021, the chairman of the GWI Committee was quoted in the preface to the roadmap 2021 as follows: “The Committee therefore calls on the new Cabinet to allocate additional funding to the Roadmap 2021, as the current budget is insufficient. In the long run, a research infrastructure is the engine for economic and social development and ultimately for prosperity in the Netherlands.”[29] The Dutch government does not appear to be involved in priorisation.

5. Canada

Role of the Canada Foundation for Innovation (CFI). The coordination and funding of RI in Canada lies with an independent organization that is dedicated solely to funding RI. The CFI was founded in 1997 by the Canadian government as an independent organization to provide universities, colleges, not-for-profit research organizations, and research hospitals with the necessary funding to acquire RI and to support the ongoing operation and maintenance costs. The CFI funds up to 40% of a project’s RI costs, which are assessed by external reviews and expert committees. This funding is then leveraged to attract the remaining investment from partners in the public, private, and non-profit sectors. Even though funding decisions are taken by the CFI, the Canadian government publicly announces the list of funded projects. In 2020, the OECD used the CFI’s Major Science Initiatives Fund as a case study to develop a policy paper on *Optimising the Operation and Use of National Research Infrastructures*.[30] The CFI is the sole author of the Strategic Roadmap 2012-2017 and of the current edition 2018-2023.[31] This strategic roadmap lays out the directions the CFI will take over the next five years.

Role of the Canadian government. In 2017, the federal government commissioned the Fundamental Science Review (also known as the ‘Naylor’ report), a review of Canada’s fundamental science and research system.[32] In response to the recommendation to enhance collaboration between the CFI and the three granting councils (funding agencies), the Canada Research Coordinating Committee was established as a strategic forum within the government. The Naylor report also recommended the government to mandate and fund CFI to increase its share of the matching ratio for major national-scale research facilities from 40 to 60% – which did not happen – and to implement a new independent organization in charge of a new Digital Research Infrastructure (DRI) strategy, which is currently in force. Over the course of 2022, a new organisation is gradually taking over some of the funding activities previously held by CFI, such as Data Management, Research Software, and Advanced Research Computing at the national level.

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[29] Ibid. 4.

[30] OECD/Science Europe (2020). Optimising the operation and use of national research infrastructures. *OECD Science, Technology and Industry Policy Papers, 91*. (https://www.oecd-ilibrary.org/docserver/7cc876f7-en.pdf?expires=1652443932&id=id&accname=guest&checksum=4F1FD37A909ED39F1D7B6B17671917F1).

[31] CFI (2011). *CFI Strategic Roadmap 2012-2017*. (https://www.innovation.ca/sites/default/files/pdf/2011%20CFI%20Strategic%20Roadmap%20final%20English%202012-04-04.pdf).
CFI (2017). *CFI Strategic Roadmap 2018-2023. (https://www.innovation.ca/sites/default/files/pdf/strategic-roadmap/cfi-strategicroadmap-2018-2023-en.pdf).*

[32] Advisory Panel for the Review of Federal Support for Fundamental Science (2017). *Investing in Canada’s Future: Strengthening the Foundations of Canadian Research* (http://www.sciencereview.ca/eic/site/059.nsf/vwapj/ScienceReview_April2017-rv.pdf/$file/ScienceReview_April2017-rv.pdf).

Annexe VIII

Definitions

Evaluation of the Swiss National Science Foundation Definitions

Applied research: Research, the main goal of which is to contribute solutions to practical problems (art. 2 RIPA).

Basic research: Research, the main goal of which is to gain knowledge (art 2. RIPA).

Bottom-up mode of research funding: Mode of funding in which funders do not predefine or specify research topics or questions. Researchers are free to choose the research questions (investigator-initiated research, curiosity-driven research). This funding mode is also called responsive or reactive mode of research funding.

Challenge-driven research: Research which tackles societal challenges (Rosa 2021).

Innovation: See science-based innovation.

Interdisciplinary research: Research that involves several unrelated academic disciplines in a way that forces them to cross subject boundaries to create new knowledge and theory in achieving a common goal (OECD 2020, p. 79).

Mission-oriented innovation policy: A cross-sectional approach to achieving ambitious and clearly formulated goals that address pressing societal challenges via the production and application of knowledge and innovation. The goals must be clearly defined, measurable, and verifiable, as well as implemented within a binding timeframe (Fraunhofer 2021). (It is the SERI's understanding that missions should be offered in a coordinated manner by the SNSF and Innosuisse.)

Multidisciplinarity: Research that involves several different academic disciplines working in parallel on one theme or problem, often with a common goal, yet following their individual disciplinary precepts and ways of working. Participants exchange knowledge, but do not aim to cross subject boundaries to create new, integrated knowledge and theory (OECD 2020, p. 79).

Research culture: Research culture encompasses the behaviors, values, expectations, attitudes and norms of our research communities. It influences researchers' career paths and determines the way that research is conducted and communicated (Royal Society, 2018).

Research infrastructure: Facilities providing resources and services for the research communities to conduct research and foster innovation in their fields. These include major sets of instruments, knowledge-related facilities such as collections, archives or scientific data, and e-infrastructures such as data and computing systems and communication networks. They may be single-sited or distributed (EC 2018).

Roadmap for research infrastructures: Coordinated overview of future needs and planned developments in the various research fields (EC 2018).

Science-based innovation: Development of new products, methods, processes and services in industry and society through research, particularly applied research and the exploitation of its results (art. 2 RIPA).

Scientific research: Method-based search for new knowledge (art. 2 RIPA).

Targeted research: Funding aimed at stimulating the research and innovation community to address a specific pre-defined area or areas of focus identified as a national priority (Jacob 2013, p. 12).

Technology Readiness Levels: Technology Readiness Levels (TRL) describe the degree of maturity of a technology on a scale from 1 to 9 (from basic research to market entry). The concept originates from space research, but is now used, for example, for the EU's research framework programmes.

Top-down research: Research directed towards specific goals and purposes often with a societal, technological or economic focus (Meirmans 2019, p. 759).

Transdisciplinarity: Research that integrates both academic researchers from unrelated disciplines – including natural and social sciences- and non-academic participants to achieve a common goal involving the creation of new knowledge. Transdisciplinary research is necessarily interdisciplinary (OECD 2020, p. 79).

Translational research: A process-oriented discipline that aims to translate new findings and products resulting from industrial development and basic research into clinical applications (Frey 2017).

Use-inspired basic research: Research that seeks to extend the frontiers of understanding but is also inspired by considerations of use (Stokes 1997, p. 74). See Pasteur's quadrant below.

		Considerations of Use?	
		No	Yes
Quest for Fundamental Understanding?	Yes	Pure Basic Research (Bohr)	Use-inspired Basic Research (Pasteur)
	No		Pure Applied Research (Edison)

Value chain: From a business perspective, "value chain" can be defined as the sum of all economic outputs and incomes produced in each firm or industry (Porter 1985). In the context of research and innovation, "value chain" is widely understood as a linear model which starts at basic research, then leads to applied research and entrepreneurial R&D, and finally to commercialisation.

References

European Commission (2018), “ESFRI roadmap 2018. Strategy report on research infrastructures”, European Strategy Forum on Research Infrastructures, August 2018.

Federal Act on the Promotion of Research and Innovation (RIPA) of 14 December 2012 (Status as of 15 April 2021).

Fraunhofer ISI (2021): Mission-Oriented Innovation Policy. From Ambition to Successful Implementation (Policy Brief).

Frey, Felix J. (2017): Swiss institute for translational and entrepreneurial medicine (sitem-insel). In: Clinical & Translational Neuroscience January–June 2017: 1–3.

Jacob, Merle (2013). Research funding instruments and modalities: Implication for developing countries. Programme on Innovation, Higher Education and Research for Development (IHERD) Background document. Draft report. OECD.

Meirmans et al. (2019): Science policies: How should science funding be allocated? An evolutionary biologists' perspective. In: Journal of Evolutionary Biology 32 (8):754-768.

OECD (2020), "Addressing societal challenges using transdisciplinary research", OECD Science, Technology and Industry Policy Papers, No. 88, OECD Publishing, Paris, https://doi.org/10.1787/0ca0ca45-en.

Porter, M.E. (1985): Competitive Advantage: Creating and Sustaining Superior Performance.

Rosa, Aaron B. et al. (2021): Sensemaking and lens-shaping: Identifying citizen contributions to foresight through comparative topic modelling. In: Futures 129.

Royal Society. (2018). Research culture. https://royalsociety.org/topics-policy/projects/research-culture/ (accessed 2 May 2022).

Stokes, D. E. (1997): Pasteur's Quadrant – Basic Science and Technological Innovation.