

SSIC Report 3/2015

The Constellation of Actors in the Swiss Higher Education, Research and Innovation Sector

SSIC Theses and Recommendations



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Schweizerischer Wissenschafts- und Innovationsrat
Conseil suisse de la science et de l'innovation
Consiglio svizzero della scienza e dell'innovazione
Swiss Science and Innovation Council

The Swiss Science and Innovation Council

The Swiss Science and Innovation Council SSIC is the advisory body to the Federal Council for issues related to science, higher education, research and innovation policy. The goal of the SSIC, in line with its role as an independent consultative body, is to promote a framework for the successful long term development of Swiss higher education, research and innovation policy.

Der Schweizerische Wissenschafts- und Innovationsrat

Der Schweizerische Wissenschafts- und Innovationsrat SWIR berät den Bund in allen Fragen der Wissenschafts-, Hochschul-, Forschungs- und Innovationspolitik. Ziel seiner Arbeit ist die kontinuierliche Optimierung der Rahmenbedingungen für die gedeihliche Entwicklung der Schweizer Bildungs-, Forschungs- und Innovationslandschaft. Als unabhängiges Beratungsorgan des Bundesrates nimmt der SWIR eine Langzeitperspektive auf das gesamte BFI-System ein.

Le Conseil suisse de la science et de l'innovation

Le Conseil suisse de la science et de l'innovation CSSI est l'organe consultatif du Conseil fédéral pour les questions relevant de la politique de la science, des hautes écoles, de la recherche et de l'innovation. Le but de son travail est l'amélioration constante des conditions-cadre de l'espace suisse de la formation, de la recherche et de l'innovation en vue de son développement optimal. En tant qu'organe consultatif indépendant, le CSSI prend position dans une perspective à long terme sur le système suisse de formation, de recherche et d'innovation.

Il Consiglio svizzero della scienza e dell'innovazione

Il Consiglio svizzero della scienza e dell'innovazione CSSI è l'organo consultivo del Consiglio federale per le questioni riguardanti la politica in materia di scienza, scuole universitarie, ricerca e innovazione. L'obiettivo del suo lavoro è migliorare le condizioni quadro per lo spazio svizzero della formazione, della ricerca e dell'innovazione affinché possa svilupparsi in modo armonioso. In qualità di organo consultivo indipendente del Consiglio federale il CSSI guarda al sistema svizzero della formazione, della ricerca e dell'innovazione in una prospettiva globale e a lungo termine.

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Adopted by the Council on the 28th of April 2015

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Summary

Zusammenfassung

Résumé

E In this analysis of the constellation of actors in the Swiss higher education, research and innovation (HERI) sector, the Swiss Science and Innovation Council (SSIC or Council) here looks back on the work it has completed in recent years and takes stock. The individual projects of the Council are evaluated cross-sectionally to determine whether the various bodies, organs, and institutions are configured in such a manner so as to fulfil their core functions in the HERI sector. On the one hand, the objective of this first effort to provide a general overview is to identify factors that have contributed to Swiss success in this sector, particularly in international comparison. On the other hand, the wish is also to identify potential gaps, dysfunctionalities, or losses in efficiency. The basis for the SSIC's theses and recommendations is given by a comprehensive and externally contracted survey of the HERI landscape. The ensemble of HERI actors that has developed over time has been shaped by a complex interlocking of functions, areas of competence, and funding structures. In this sector, intermediary actors are particularly significant as mediators between the various levels of *Wissenschaft*, policy-making, and public administration. Diversity, a small-scale environment, and a high degree of internationalization are as much part of the particular characteristics of the Swiss HERI sector as is the relatively generous funding provided. Political authorities have also been reluctant to intervene in areas where key players exercise autonomy. The consensual Swiss political culture, with its embrace of the principle of subsidiarity, has had considerable influence on the interplay between HERI actors. Yet, these aspects have ambivalent effects. The decentralization of both risk and responsibility certainly creates scope for initiative and helps defuse conflicts. But the pragmatic, negotiation-oriented concertation of differing interests also strengthens the hand of certain actors particularly close to the federal government, and this leads to a degree of opacity about the decisions that are taken. The resilience of the system as a whole has been weakened by various developments, including an increase in utilitarian orientations in the public sphere. It has also been due to a number of unwritten rules of the game with respect to HERI policy which put the conditions necessary for success in jeopardy. Although

the constellation of actors has thus far proven itself overall, the SSIC detects signs of excessive burden placed on the actors and the structures. The growing pressure to find material uses for research results threatens to delegitimize basic research, and that endangers one of the central drivers of innovation in the HERI sector. Dysfunctionalities also exist in the support given to junior researchers, and in the support for cost-intensive research infrastructures. The SSIC recommends that the actors involved, in particular the national and cantonal governments, should together address these problematic constellations.

The SSIC would like to use the occasion of its 50th anniversary to initiate a discussion both with its partner institutions in Switzerland and with its European sister organizations about the conditions necessary for *Wissenschaft* and innovation to continue to thrive. From these colloquies, the SSIC hopes to gain new insights, including from internationally comparative perspectives, into the cultural, institutional, and financial conditions which facilitate a dynamic and sustainable development of HERI sectors.

D Mit der vorliegenden Analyse der Akteurskonstellationen im Schweizer Bildungs-, Forschungs- und Innovations-(BFI-)System blickt der Schweizerische Wissenschafts- und Innovationsrat (SWIR) auf die eigenen Arbeiten der letzten Jahre zurück und zieht Bilanz. In einer Querschnittsbetrachtung werden die abgeschlossenen Einzelprojekte des Rates dahingehend ausgewertet, ob die verschiedenen Gremien, Organe und Institutionen so eingerichtet sind, dass sie die zentralen Aufgaben im BFI-System erfüllen. Ziel dieses ersten Versuchs einer übergreifenden Zusammenschau ist einerseits, Faktoren für den Erfolg des Systems im internationalen Vergleich herauszuarbeiten, und andererseits mögliche Lücken, Dysfunktionalitäten oder Effizienzverluste zu identifizieren. Eine umfassende Bestandsaufnahme der BFI-Akteurslandschaft, die extern in Auftrag gegeben wurde, bildet die Grundlage für die Thesen und Empfehlungen des SWIR.

Das historisch gewachsene Ensemble der BFI-Akteure ist durch eine komplexe Verzahnung der Funktionen, Kompetenzen und Finanzierungsstrukturen geprägt. Den intermediären Akteuren, die zwischen den verschiedenen Ebenen der Wissenschaft, Politik und Verwaltung vermitteln, kommt in diesem System eine besondere Bedeutung zu. Vielfalt, Kleinräumigkeit und ein hoher Internationalisierungsgrad gehören ebenso zu den besonderen Strukturmerkmalen des Schweizer BFI-Systems wie die relativ gute finanzielle Ausstattung und die Zurückhaltung der politischen Behörden, steuernd in den Autonomiebereich der Leistungsträger einzugreifen. Einen wesentlichen Einfluss auf das Zusammenspiel der BFI-Akteure hat die politische Konsens- und Subsidiaritätskultur der Schweiz. Sie ist in ihren Wirkungen ambivalent: Die Dezentralisierung der Risiken und Verantwortungen schafft zwar Freiräume und entschärft Konflikte, die pragmatische und verhandlungsorientierte Konzertation der unterschiedlichen Interessen stärkt aber zugleich die Position bestimmter, bundesnaher Akteure und hat eine gewisse Intransparenz der Entscheidungen zur Folge.

Eine Reihe von Entwicklungen wie die Zunahme utilitaristischer Orientierungen, insbesondere aber auch einige ungeschriebene Spielregeln, denen die BFI-Politik folgt, schwächen tendenziell die Resilienz des Gesamtsystems und stellen dessen Erfolgsbedingungen

zunehmend in Frage. Obgleich sich die Akteurskonstellationen in ihrer bisherigen Form insgesamt bewährt haben, sieht der SWIR Anzeichen für eine segmentäre Überfrachtung bestehender Akteure und Strukturen. Unter dem steigenden Verwertungsdruck droht der freien Grundlagenforschung ein Legitimitätsverlust, was einen der zentralen Innovationsmotoren des BFI-Systems gefährdet. Dysfunktionalitäten bestehen zudem bei der Förderung des wissenschaftlichen Nachwuchses und der kostenintensiven Forschungsinfrastrukturen. Der SWIR empfiehlt den zuständigen Akteuren, namentlich dem Bund und den Kantonen, sich dieser Problemkonstellationen gemeinsam anzunehmen.

Aus Anlass seines 50-Jahre-Jubiläums möchte der SWIR mit den Partnerinstitutionen in der Schweiz und den europäischen Schwesterorganisationen über die Voraussetzungen, unter denen Wissenschaft und Innovation gedeihen können, ins Gespräch kommen. Er verspricht sich von dieser Diskussion neue Einsichten in die kulturellen, institutionellen und finanziellen Faktoren, welche eine dynamische und zugleich nachhaltige Entwicklung von BFI-Systemen im internationalen Vergleich ermöglichen.

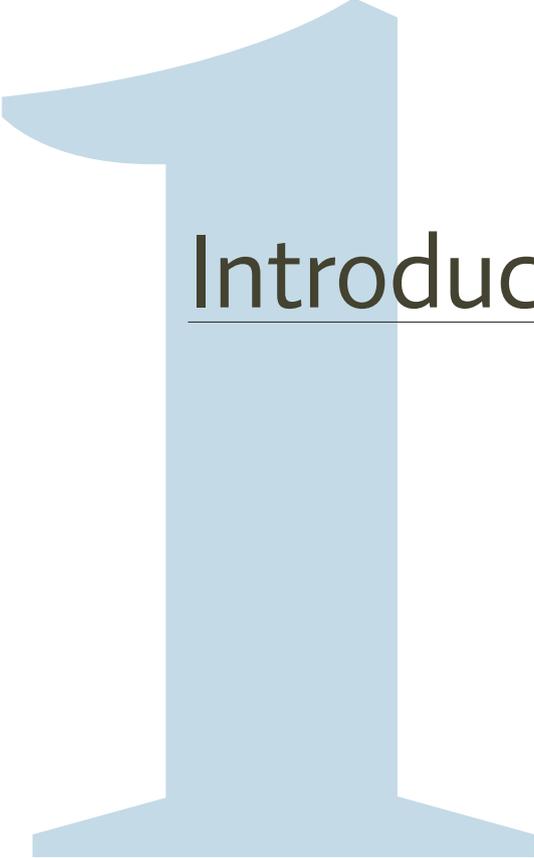
F Pour la présente analyse des constellations d'acteurs du système suisse de la formation, de la recherche et de l'innovation (FRI), le Conseil suisse de la science et de l'innovation (CSSI) s'est appuyé sur ses propres travaux des années précédentes et en a fait le bilan. Il a procédé au dépouillement transversal de ses projets clos en se demandant si la structure des organes, organismes et institutions permet au système FRI de remplir ses grandes missions. Cette première tentative de vue panoramique vise, d'une part, à dégager les facteurs de la réussite du système par rapport à ses homologues étrangers et, d'autre part, à identifier d'éventuels dysfonctionnements, lacunes ou pertes d'efficacité. Le CSSI fonde ses thèses et recommandations sur l'inventaire complet des acteurs FRI auquel il a fait procéder.

La mécanique des acteurs FRI s'est mise en place au fil du temps; elle se caractérise par des fonctions, des compétences et des structures de financement aux rouages complexes. Les acteurs intermédiaires assurant l'interface entre l'économie, la classe politique et l'administration jouent un rôle très important dans le système, qui présente aussi des traits structurels remarquables: diversification, échelle réduite, internationalisation très prononcée, dotation financière relativement abondante et prudente réserve des pouvoirs politiques, lesquels évitent de s'ingérer à des fins de pilotage dans l'autonomie des prestataires. La culture politique suisse du consensus et de la subsidiarité marque les interactions entre les acteurs FRI, avec des effets à double tranchant: la décentralisation des risques et des responsabilités ouvre des espaces de liberté et désamorce les conflits; la concertation pragmatique fondée sur la négociation entre les divers intérêts consolide en même temps la position de certains acteurs proches de la Confédération et trouble un peu la transparence des décisions.

Certains changements – comme la montée de l'utilitarisme, et particulièrement aussi l'apparition de règles du jeu non écrites auxquelles se plie la politique FRI – auraient tendance à éroder la résilience de l'ensemble du système et risquent de plus en plus de compromettre ses facteurs de succès. Les constellations d'acteurs du système ont certes fait leurs preuves sous leur forme actuelle, mais le CSSI détecte des signes de surcharges segmentaires de certains acteurs et structures. La pression des impératifs de valorisation me-

nace la recherche fondamentale dans sa légitimité, mettant en danger l'un des grands moteurs de l'innovation au sein du système FRI. On observe en outre des dysfonctionnements dans l'encouragement de la relève scientifique et des infrastructures de recherche particulièrement onéreuses. Le CSSI recommande aux acteurs concernés, à savoir la Confédération et les cantons, d'aborder ensemble ces problèmes.

A l'occasion de son cinquantenaire, le CSSI souhaite lancer avec ses organismes partenaires suisses et ses homologues européens un dialogue sur les conditions propices à l'épanouissement de la science et de l'innovation. Il attend de cette comparaison internationale des idées nouvelles sur les facteurs culturels, institutionnels et financiers susceptibles de nourrir le développement dynamique et durable des systèmes FRI.



Introduction

The SSIC understands the “constellation of actors” to mean the interaction or cooperation between various institutions in carrying out the needed tasks in a national system of higher education, research and innovation (the “HERI sector”). That interaction follows particular formal and informal rules of the game. Sketching the distinctive features of this constellation can contribute to understanding the cultural, institutional, and financial parameters which contribute to making the Swiss system distinctive.

In the theses and recommendations presented here, the SSIC undertakes a first effort to examine the entire ensemble of HERI actors and their reciprocal interactions. It would thereby like to give impetus for a broader discussion of the future architecture of the relations between *Wissenschaft*, society, politics, and economics. In particular, it would like to pursue the question whether the central functions in the HERI sector are associated with institutions appropriate to these tasks, and whether performing these functions also corresponds to the mission, perception, and self-image of these actors.

The Council declared “the constellation of actors” as a cross-sectional topic of the SSIC’s Working Program for 2012–2015. The Council’s intent was to evaluate the individual projects it had completed regarding the roles of HERI actors, and to have the insights thereby gained flow into a comprehensive synthesis. This overview, presented here for the first time, provides an opportunity to investigate the reciprocal interactions between individual institutions, and to examine their accomplishments relevant to the sector. Both topics the SSIC itself had initiated, including “supporting young researchers”, the “tertiary education system” and the “economization’ of science”, were to be included, as were the results of projects contracted out by national agencies, such as the evaluation of overhead models or of the Swiss National Science Foundation (SNSF). The present cross-sectional overview gives the SSIC an opportunity to look back on the work it has done in recent years and to take stock.

In its reflections on HERI sector constellations, the Council draws both on the expertise and experience of its own members as well as on a study of “The Constellation of Actors in Swiss Higher Education, Research, and Innovation” that it contracted externally.¹

The national government established the Swiss Science Council (SSC) on March 26, 1965. 2015 marks its 50th anniversary. Over the course of its history, the SSC became the advisory body to the Federal Council in matters of science and research policy, and was given a broad legal mandate. The analysis of the constellation of actors in the Swiss HERI sector undertaken on the occasion of this anniversary intends to give an overview of the entire landscape of institutions, committees, boards, agencies, and organs active in the higher education, research, and innovation sector. The interest lies in briefly describing their interaction and cooperation in fulfilling central functions in this system.

In terms of its own needs, this overview helps give the SSIC more precise knowledge of its place and function in this system. The 50th anniversary gives the SSIC an occasion to invite its fellow institutions both domestic and international to a round of discussions as well as to a festive and celebratory event. This study provides the impetus for a joint consideration of how HERI sectors should be structured in order to grant optimal conditions for *Wissenschaft* and innovation to flourish.

1 Pasternack & Maue (2015).



Issues and Premises

The Swiss HERI sector features a differentiated structure of governmental, intermediary, and civil society organizations. In this respect, it resembles such sectors in other advanced industrial societies. In carrying out their legally designated mandates, the organizations engage in a broad spectrum of tasks in the domain of higher education, research, and innovation. They formulate policy objectives and the instruments to implement them, they make decisions, allocate financial resources, impart and create new knowledge, give birth to innovations, coordinate and consult, and they regulate procedures or implement funding measures. It is decisive for the ability of the Swiss HERI sector to perform and continue to develop that all the functions needed in this system be carried out and that the actors involved work together.

In analyzing the constellation of actors, the SSIC wishes to obtain an overview of the actors, functions, and structures in the country's HERI sector, and the interdependencies within it. In sketching out – and where necessary, simplifying – the complex interactions among these actors, the Council also wants to identify potential gaps, dysfunctional aspects, or losses in efficiency.

The question whether the political authorities, funding agencies, and the various coordinating and consultative bodies are properly positioned to address the sector's particular tasks and problems, especially when external conditions are unfavorable as during political and economic crises, is of eminent practical significance. The SSIC expects this approach to yield insights into cultural, institutional, and financial factors that help explain Switzerland's internationally recognized leading position in this sector.

A series of assumptions and differentiations serve both as a starting point for the approach used here and help demarcate the scope of the investigation. The premises are as follows:

– **Higher Education, Research and Innovation** are three interwoven functional domains, which perform in a manner society desires, each according to a unique and yet interlocking logic. An internal division of labor exists between the three: courses of study are offered in the first (higher education), new knowledge is created in the second (research), and research-generated knowledge is transferred

to contexts and applications outside its origins (innovation). In practice, numerous overlaps exist between these domains, for example in the linkage of teaching to research at the universities. An integrated view of these three domains that sees them as a “system” is justified in part by their actual interdependence. It is also justified by a formal political linkage, as the Swiss national government uses multi-year funding requests in the same document (the ERI Dispatch)² that encompass all three domains. Characteristic for the overlap is the differing use, yet common reference, to *Wissenschaft* (see Diagram 1), a term denoting scholarship, research, and knowledge that both provides explanations for natural phenomena and seeks an understanding of the meanings given to human affairs.

- The domain of **Higher Education**, as used here, refers primarily to the tertiary level of the public education system, though it also encompasses continuing education options that are generally privately organized. Tertiary education is composed of the universities (Tertiary A) and advanced vocational education (Tertiary B). University education is supplied by a variety of institutions (cantonal universities; the two Federal Institutes of Technology (ETHZ; EPFL); universities of applied sciences and arts; teacher training colleges) which offer a broad spectrum of academic qualifying degrees and certifications. These institutions have an explicit or implicit focus on the cultivation or development of the person (one connotation of *Bildung*) or an orientation to vocationally relevant practice (one connotation of *Ausbildung*), and they are characterized by a genuine connection between teaching and research. Advanced vocational education, by contrast, aims to provide clearly defined specialist skills and managerial competencies directly anchored in the labor market and the professions.³

² The first multi-year, domain-spanning funding request of this kind (for 2000–2003), the Federal Council Dispatch on Higher Education, Research, and Innovation, was introduced in Parliament on 25 November 1998. In doing so, the Federal Council responded to a repeated demand since the 1980s for a comprehensive national overview of the HERI sector, to counteract the many scattered individual measures and *ad hoc* financing that existed.

³ SWIR (2014a); Baumeler et al. (2014).

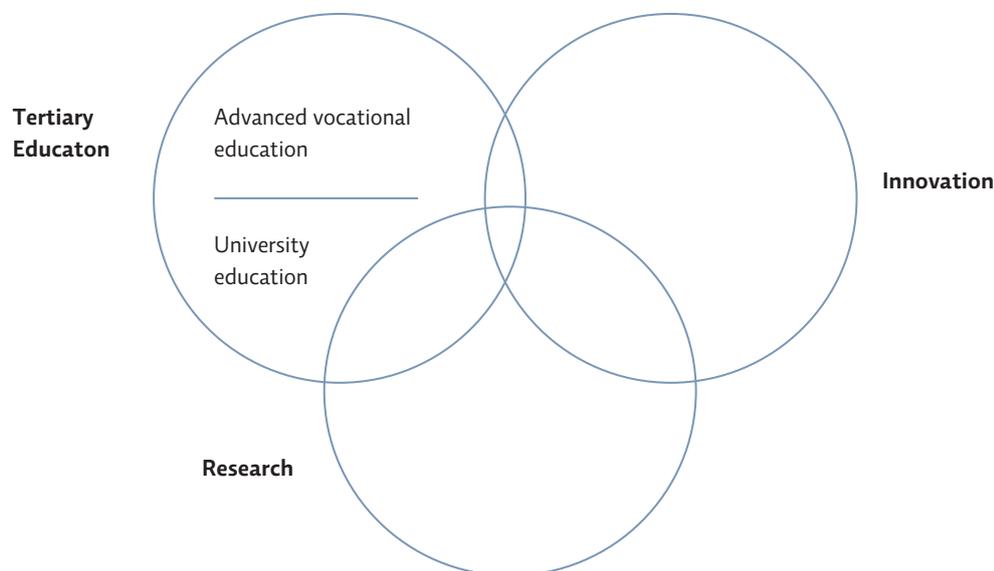


Diagram 1 **HERI functional domains**

- The domain of **Research** is devoted to the principle of truth, and only obeys the dictates of scientific reasoning. Research intends to generate new and methodologically grounded insights, and make cognitive claims as to their validity. Where research is “endogenously” motivated, it develops a logic of its own, one oriented to fundamental values such as universalism and organized skepticism.⁴ Where the activity is initiated “exogenously”, expectations of practical utility and application are in the foreground.⁵
- The **Innovation** domain, in a narrower sense, structurally connects research with economy and society, following the dominant “Science-Push”-model used at the national level. In the broader understanding of innovation the SSIC favors, innovative achievements can be ascribed to numerous actors and contexts.⁶ Given its transverse character, “Innovation” can also be understood as a basic cultural disposition (e.g., “being open to the new”) and in that sense, it forms an overarching structural component of the HERI sector.

⁴ Merton (1985).

⁵ For this distinction, see SWTR (2013c), p. 12. For more details, see SWIR (2014a), p. 10. Universities (e.g., cantonal; ETH) primarily conduct endogenously-motivated research. This denotes work “primarily oriented to the current state of scholarly knowledge in an area researchers wish to advance. Other institutions (e.g., universities of applied sciences and arts; teacher training colleges) are more oriented to exogenous research and development endeavors whose initial questions are directly connected to occupational practice.”

⁶ See SWTR (2009). See also Polt et al. (2014).

- As all three domains – higher education, research and innovation – are ultimately based on *Wissenschaft*, public policy-making here can be understood as an institutionalized search for interfaces and synergies between HERI sector concerns and the public sphere.
- A close relationship and constant exchange between *Wissenschaft* and politics are constitutive for the HERI sector in modern knowledge societies.⁷ Higher education, research, and innovation depend both on public resources and on private enterprises. Seen the other way around, society, politics, and the economy would not be able to develop further without the accomplishments in the higher education system, the achievements of scholarly research, and advances in technology.
- The SSIC is primarily interested here in public policy aspects of the HERI sector.⁸ The key question is whether, and how, political decision-makers can ensure the optimal environment for an open, explorative, risk-friendly *Wissenschaft* to evolve. The Council assumes the best conditions are created by having a long-term planning horizon, transparent decision-making processes, and a clearly defined, regulated division of tasks and competencies between the various involved actors. Only in this manner can the evolution of a genuinely open higher education, research, and innovation sector be ensured – though its development is difficult to steer in a formal manner, and its achievements remain uncertain.

The paper is organized as follows: Part 3 provides an overview of the relevant actors in the HERI sector, and also presents a formal typology of these actors with respect to the policy functions they perform. This is followed by a description of how competencies are formally regulated as well as the financial framework the HERI sector functions in. The following sections address structural characteristics of the sector (Part 4), as well as its dynamics and the rules of the game (Part 5).

These dynamics and rules have considerably influenced recent developments, and serve as a backdrop for a discussion of the problematic constellations that have resulted. Part 6 presents the SSIC's theses, and based on the constellation of actors, discusses both what sheds light and what remains in the shadows in the Swiss HERI sector. It is from this assessment, in the final chapter, that the Council derives its recommendations.

⁷ See Bora (2012), p. 347. In this context, Bora speaks of “dual performance relationship” between *Wissenschaft* and politics.

⁸ The question how research results inform the political decision-making process or how impact assessment can serve as a basis for legislative activity is not the focus here. But see Freiburghaus & Zimmermann (1985); Klöti & Schneider (1989); Balthasar (2007).



The Swiss HERI Sector: Actors, Functions, and Structures

The Swiss HERI landscape is a conglomeration of public and private institutions that have evolved over time and that operate in a complex environment. The following sections examine this complexity from four vantage points: historical development, functional differentiation, legal powers and responsibilities, and financial resources. Switzerland's political culture and the country's underlying (con)federalist structure permeate the HERI sector, and these influences need to be taken into account, as they have, and have had, a profound influence on the actors themselves and on their interactions.

3.1 The Development of the HERI Landscape

The HERI institutions that are important today show considerable continuity over time, as a brief historical summary makes clear. Roughly speaking, one can discern three phases:

– The institutional foundations for the constellation of actors were laid in the 19th and early 20th centuries. Industry, trade, and technical schools which provided vocational education were established, and were subsidized early on by the national government.⁹ In the domain of higher education, several cantons established their own universities. The national government opened the doors of the Federal Polytechnical School in 1855, renaming it the Swiss Federal Institute of Technology (ETH) in 1911.¹⁰ Natural scientists joined together at the national level to found the Swiss Society of Natural Sciences in 1815, which since 1988 has been known as the Swiss Academy of Sciences (SCNAT). The

beginnings of the major research-based chemical and pharmaceutical companies, which today are among the most significant drivers of innovation in the Swiss economy, are also to be found in this era.¹¹ A “triangular constellation of politics, research, and industry”¹² was established early on, and it decisively shaped later developments.

– A further functional differentiation and expansion of the HERI sector took place after the Second World War, particularly in the domain of higher education.¹³ Switzerland laid the groundwork for a modern science and research policy then, partly in the spirit of combating the war-induced crisis and defending the country's spiritual values, and partly as a response to the atomic age and Cold War that followed it. A number of HERI actors who remain significant today emerged during this era: the Swiss Academy of Medical Sciences in 1943, the Commission to Promote Scientific Research in 1944¹⁴, which in 1996 became the Commission for Technology and Innovation (CTI), the Swiss Society for the Humanities in 1946, which later became the Swiss Academy of the Humanities and Social Sciences, and the Swiss National Science Foundation in 1952.¹⁵ Since the late 1960s, the national government has increased its funding for the cantonal universities, and an amendment to the Constitution in 1973 gave it the right to promote research. Since 1983, thanks to the Federal Law on Research, it has also done so. In the 1960s, the national government also created the requisite consulting and implementing organs: the SSC in 1965, and the Science and Research Section of the Federal Department of Home Affairs in 1968, the precursor organization of the current State Secretariat for Education, Research, and Innovation (SERI). The national government also took over the technical and engineering school associated with the University of Lausanne, separated it from the university in 1969, and made it the basis for the second Swiss Federal Institute of Technology (EPFL). In terms of Swiss HERI poli-

9 See *Berufsbildung* (2012).

10 Of the 10 research universities in Switzerland, five were founded in the course of the 19th century: Zurich (1833), Bern (1834), Geneva (1873), Fribourg (1889), and Lausanne (1890). Precursor institutions included academies and theological seminaries founded in the Early Modern era. The University of Basel, founded by papal bull already in 1460, was reinvigorated in the 19th century. While the University of St. Gallen only formally became such in 1995, its history can be traced back to a business and administration academy founded in 1898. An academy created by Prussian kings (1838 and 1866) was transformed into the University of Neuchâtel by 1909. The country's newest universities include the Università della Svizzera Italiana (1996) and the University of Lucerne (2000). See Brändli (2013).

11 See Straumann (1995).

12 Stuber & Bolzern (2012). This has also been called a “triple helix”. See Etzkowitz & Leydesdorff (1997).

13 For the following, see in particular Benninghoff & Leresche (2003).

14 Fleury & Joye (2002).

15 See Joye-Cagnard (2010); Stuber & Bolzern (2012).

tics, initiatives launched by the OECD, among other organizations, as well the creation of large international research organizations (CERN in 1954; ESO in 1962; ESRO in 1964; EMBL in 1973) also became increasingly important.¹⁶

- Economic stagnation in the 1990s led to reforms in a sector that was increasingly shaped by international influences. The sector as a whole became more structurally “unbundled”, which meant existing actors were refashioned, newly positioned, or merged. The most significant of these structural changes was the elevation in 1995 of select technical colleges and commercial schools to the university level, and designating them as *Fachhochschulen* or universities of applied sciences and arts. Advanced vocational education was also integrated into the international Tertiary B level (ISCED 5B) with passage of the new Vocational Education Law in 2002. As part of governmental and administrative reforms in 1997, and the integration of technology and innovation policy into the research policy responsibilities of the national government, the SSC was first reorganized and renamed the Swiss Science and Technology Council (SSTC) in 2000, and then renamed again as the Swiss Science and Innovation Council (SSIC) in 2014. The Swiss Center of Accreditation and Quality Assurance has existed since 2001 as an institution run jointly by the national government and the cantons. In 2011, the Swiss Federal Council, the national executive, decided to completely reorganize HERI administration. The newly created Federal Department of Economic Affairs, Education and Research (EAER), as part of its effort to consolidate scattered competencies, placed responsibility for HERI sector issues in SERI. In enacting the new Higher Education Act (HEdA) in 2015, several higher education policy organs also were reorganized. The three existing Rectors’ Conferences were integrated into an umbrella organization named *swissuniversities*; the Swiss University Conference (SUC), in response to a 2006 constitutional amendment on education, was refashioned into a common coordinating body of both the national and cantonal governments; and the special law that had governed the universi-

ties of applied sciences and arts was abolished and along with it the consultative national commission for such universities. The national government has also – thus far successfully – worked to integrate the HERI sector into the European Higher Education Area. Swiss universities also implement the principles contained in the Bologna Declaration, and researchers in Switzerland apply for ERC funding from EU Framework Programs.

3.2 Actors and Functions in the HERI Sector

A tension exists in the HERI sector between *Wissenschaft*, politics and public administration. Each fulfills a different function, and as a result has developed different interests and forms of legitimation:

- Those who pursue *Wissenschaft* are primarily interested in increasing insight and knowledge, a pursuit which requires both autonomy and resources guaranteed over a longer term.
- Those who make political decisions about the HERI sector in Switzerland are primarily involved in shaping the conditions for research activities. At the same time, political actors have an interest that the results of such research remain relevant to economy and society. Political decision-makers legitimate their decisions to the tax-paying public by auditing how effectively and efficiently resources expended on HERI have been used.
- Those involved in administering the HERI sector are answerable to those at the apex of the executive branch, though these executives do change over time. At the same time, administrators ensure the continuity of administrative acts irrespective of political changes. They are confronted with basic issues of federalism and orient themselves following the principles of resource availability, feasibility, and conformity with the rules for implementing policy measures. The tendency here is to be risk-averse, to ensure continuity with existing HERI policies.

In depicting the HERI sector in terms of its basic functions, one can assign *Wissenschaft*, with its functions and logic, to the primary level of “performance”, and

¹⁶ See Gees (2006); Papadopoulos (1996).

Performance level	Policy level	
“WISSENSCHAFT”	POLITICS	PUBLIC ADMINISTRATION
<ul style="list-style-type: none"> • Increase in knowledge (the “endless frontier”) • Autonomy (“freedom”) • Resource endowment 	<ul style="list-style-type: none"> • Steering and coupling HERI achievements to economy and society (“affluence and growth”) • Performance and cost control (“accountability”) 	<ul style="list-style-type: none"> • Resource availability • Feasibility and ability to link with implementation measures • Rule conformity • Effectiveness audit

Diagram 2 **Performance and policy levels: The functional logic of *Wissenschaft*, politics and public administration**

policy and administration to the secondary “policy” level (Diagram 2).

On this basis, HERI actors can be placed in three different categories (Diagram 3):

1. **Providers:** These are primarily the institutions of advanced vocational education, the various university types (cantonal universities; ETHs; universities of applied sciences and arts; teacher training colleges), research institutes and facilities outside the universities (e.g., as specified in Art. 15 of RIPA, the Research and Innovation Promotion Act) and private R&D enterprises. In educating individuals, creating new knowledge, and giving impetus to innovation, these institutions provide the necessary HERI achievements for economy and society.
2. **Intermediary actors:** These actors negotiate between *Wissenschaft* and political actors and are located at the intersection between the two systems of thought and action. They carry out tasks that support the ability to function at the performance level and that meet the demands for legitimacy at

the policy level, yet they cannot be assigned exclusively to either. In this category, one finds various agencies close to *Wissenschaft* that the national government delegates to fulfill certain tasks, such as to support and promote research and innovation. Examples include the SNSF, the Academies, the SSIC, and swissuniversities, but also the ETH-Board and the Swiss Center of Accreditation and Quality Assurance.

3. **Policy actors:** These actors at the national and cantonal levels make decisions relevant to HERI and also implement them. They deliberate over higher education, research, and innovation policy, engage in planning, secure the needed funding, and transfer this, directly or indirectly, to the providers. They are anchored in public policy and administrative organs of government. The two parliamentary Committees for Science, Education and Culture (CSEC) and the EAER, or more specifically SERI, are found here, as is the SUC, the Swiss Conference of Cantonal Ministers of Education (EDK), and the Cantonal Departments of Education and Finance.

HERI Sector

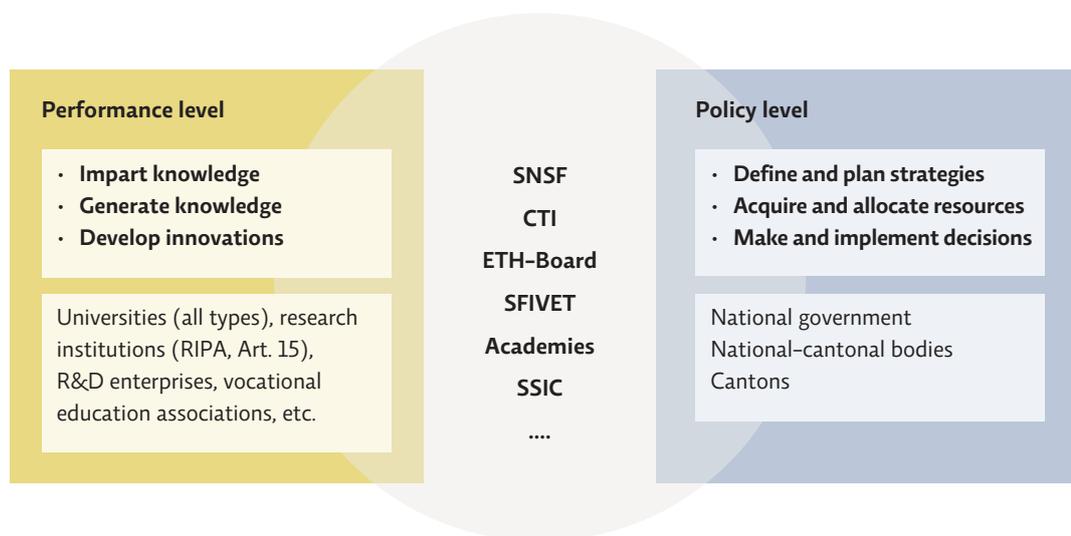


Diagram 3 Basic structure of the HERI sector

Professional organizations in the world of work (trade and industry associations; the “social partners”) play a particular, and to some extent hybrid, role in the HERI sector. At the performance level, they are active in vocational education, and they exert influence on HERI policy as interest groups representing employers and employees.¹⁷ Expression of their non-scientific concerns is institutionally guaranteed both through their representation on the permanent committee of SUC and by their legally mandated participation in HERI-relevant consultation over pending laws.

¹⁷ Such organizations include various employer (National Umbrella Organization for Health Sector Work [Oda Santé] and for Social Sector Work, Swiss Employers’ Association, Swiss Farmers’ Federation, Swiss Small Business Association) and employee (Swiss Association of Commercial Employees, Swiss Federation of Trade Unions, Travail Suisse) federations and associations.

The number and diversity of the actors reflect the complexity of the HERI sector and the various rationales, interests, and levels that need to be taken into account:

- Horizontally, HERI policy must find a balance between the various rationales and interests in the three domains – tertiary education, research, and innovation – as well as between the varying logics that underlie the actions of *Wissenschaft*, policy, and administration.
- Vertically, HERI policy must function in a (con)federalist political system which gives different decision-making powers to the national and the cantonal levels. This includes coordination and cooperation between the two, between these dual policy levels and the performance level, as well as between these functional areas both domestically and internationally (EU, international organizations, etc.).

The relationship between policy actors and institutions at the performance level can be characterized as one between principal and agent. A principal can entrust agents with the execution of certain tasks, but cannot wholly control the result.¹⁸ The agents, here the providers, have a great informational advantage with respect to fulfilling specific teaching and research tasks. Since the task contractor (the principal), can never catch up, the researchers who have been contracted have room for manoeuvre. Research processes, for example, do not lend themselves to being transformed into standardized, empirically repeatable input-output processes. The ability of a principal, or more generally of research policy, to steer HERI providers remain rather limited. Policy actors are to some degree therefore in a relationship of dependency relative to those who provide the achievements.

However, despite their potentially self-referential tendencies and their informational advantage, HERI providers are tied to policy actors. On the one hand, this is due to the necessity of securing the resources needed to pursue *Wissenschaft*. On the other hand, it occurs because an intermediary buffer zone exists where the issues and concerns of providers and policy actors are negotiated. In this buffer zone, bargaining takes place over funding objects, forms, and instruments.

The phases of policy conceptualization, consultation, coordination, and review that lead up to a decision constitute a cycle that cannot be encompassed by older notions of “steering” based on objective information and planning.

If one assigns the actors by their functions, one arrives at the following matrix (Table 1, p. 20).

¹⁸ See Voigt (2002).

Functional area / Scope	Tertiary Education		Research	Innovation	
	Advanced Vocational Education	University Education			
Providers	<ul style="list-style-type: none"> • Technical colleges • Private and public preparatory courses • Professional organizations in the world of work 	<ul style="list-style-type: none"> • Universities • ETHs • Universities of applied sciences and arts • Teacher training colleges 	<ul style="list-style-type: none"> • Higher education institutions • Art. 15 institutions • Academies • Agencies in the national administration • Private R&D enterprises 	<ul style="list-style-type: none"> • Private R&D enterprises • Universities • ETHs • Universities of applied sciences and arts • Teacher training colleges 	
Conceptualizing HERI policy	<ul style="list-style-type: none"> • Professional associations • National government • Cantons • Technical colleges 	<ul style="list-style-type: none"> • Higher education institutions: boards and administration • swissuniversities • Cantons: EDK • National government: ETH-Board, SERI 	<ul style="list-style-type: none"> • Higher education institutions: boards and administration • National government: administration, ETH-Board, SSIC, SNSF, Academies • swissuniversities • Cantons 	<ul style="list-style-type: none"> • National government: CTI, SERI, SECO, DETEC, ETH-Board • Cantons • R&D enterprise management 	
Consulting	<ul style="list-style-type: none"> • SFIVET 	<ul style="list-style-type: none"> • ETH-Board • Private consulting firms • SSIC • swissuniversities 	<ul style="list-style-type: none"> • ETH-Board • SNSF • SSIC • Academies 	<ul style="list-style-type: none"> • SSIC • Private consulting agencies 	
Decision-making	Funding	<ul style="list-style-type: none"> • Cantons • National government • Private sources • Employers 	<ul style="list-style-type: none"> • Cantons • National government 	<ul style="list-style-type: none"> • <i>Basic funding:</i> national government, cantons • <i>Project funding:</i> SNSF, SMK, ETH-Board, Academies, SERI • <i>Private external funding:</i> foundations 	<ul style="list-style-type: none"> • Private R&D enterprises • Cantons • National government: CTI, SERI, SECO, DETEC • Private foundations
	Steering	<ul style="list-style-type: none"> • Professional associations • National government • Cantons 	<ul style="list-style-type: none"> • Cantons • National government 	<ul style="list-style-type: none"> • National government: SERI, ETH-Board, agencies in the national administration • Cantons 	<ul style="list-style-type: none"> • Private R&D enterprises • National government: SERI, SECO, DETEC, CTI
Coordinating	<ul style="list-style-type: none"> • Cantons: SVTOC (EDK) • National government: SERI 	<ul style="list-style-type: none"> • Cantons: ICUA, ICUASA, IATC (EDK/CFDC) • National government: SERI • SUC • swissuniversities 	<ul style="list-style-type: none"> • National government: SERI • Academies 	<ul style="list-style-type: none"> • R&D enterprises • National government: SERI, SECO, DETEC, CTI • Cantons 	
Reviewing	<ul style="list-style-type: none"> • Technical colleges • Professional associations 	<ul style="list-style-type: none"> • Higher education institutions • National government: ETH-Board • Swiss accreditation council • Cantons 	<ul style="list-style-type: none"> • Higher education institutions • National government: SNSF, ETH-Board, SERI, Swiss accreditation council, SSIC • Academies • Private evaluation firms 	<ul style="list-style-type: none"> • R&D enterprises • National government: SERI, SECO, DETEC, CTI • Cantons 	

Table 1 The Swiss HERI sector by function and actor

3.3 The Legal Basis

The HERI sector is legally regulated in a federalist manner following the laws of the cantons and the national government. The relevant principles are enshrined in the Swiss constitution.¹⁹

In Art. 20, the Swiss Constitution guarantees the freedom of academic research and teaching, a freedom closely tied to the principle of university autonomy.²⁰ Both Constitution (Art. 63a(3)) and law (HEdA, Art. 5(1), 30(2), 36(1)) obligate both national government and cantons to take the autonomy of universities and their funders into consideration. Art. 6 of RIPA – along with many other basic principles – obligates “research organs” to “respect” the freedom of research and teaching. The provisions introduced into the national constitution in 2006 (Art. 61a) rest on the idea of a cooperative federalism that gives both the national government and the cantons joint responsibility for higher education, specifically in providing funding, coordinating, and administering, and in ensuring that Swiss higher education will be both of high quality and accessible.

In implementing Article 63a of the Swiss Constitution, the HEdA, which came into force in 2015, sets out an expanded framework for coordination and funding. It supersedes several prior laws on funding research universities and funding universities of applied sciences and arts.²¹ “Coordination” here serves to ensure coherence between higher education, research, and innovation policies and means to find a balance between the interests of the cantons and those of the national government. The wording suggests that as a rule, the national government will refrain from interfering in the HERI sector, and will not try to steer it from the top down. Only in the unlikely case that coordination fails does the Constitution (since 2006) grant the national government a subsidiary competence to regulate certain aspects of higher education (Art. 63a(5)).

The principles of coordination and cooperation are to some degree at odds with competitive imperatives, as competition can lead actors to place their own interests above system-wide HERI interests held in common. Existing provisions, particularly for obtaining funding for research, encourage competition. There is also competition for students and staff among the universities. Success in such competition affects the amounts the national government provides to the cantonal universities in additional subsidy. In creating the SUC, the Rectors’ Conference (swissuniversities), and the Swiss Accreditation Council, the HEdA has established a framework within which new rules for balancing out interests can – but do not have to – be established.

RIPA regulates the funding for research and innovation provided by the national government, and defines the functions and instruments of various actors, including the SNSF, the CTI, the academies, and the national administration.²² It also makes reference to the policy cycle of conceptualization, consultation, coordination, and review noted above. Specific laws such as the Energy Act regulate the role of the national government in policy areas where research is particularly relevant. Cantons regulate HERI issues through cantonal higher education and vocational education laws. Canton-specific economic promotion laws as well as the implementation of the “new regional policy” govern the funding cantons provide for innovation efforts. In various areas, in addition, cantons make agreements among themselves (known as concordats), an example of which is the intercantonal agreement on higher education.

The Swiss HERI sector distributes regulatory competencies following federalist principles (Table 2); jurisdiction over education through the secondary level lies with the cantons. The national government has sole competence over vocational education, the ETHs, SNSF, CTI, and international cooperation in research and innovation. National government and cantons have joint responsibility for regulating research and innovation, specifically in the universities (all types) as well as in STT, start-ups, in regional policy, and in economic promotion.

19 Bundesverfassung der Schweizerischen Eidgenossenschaft vom 18. April 1999 (BV; SR 101, as at 18 May 2014; <http://www.admin.ch/opc/de/classified-compilation/19995395/index.html>).

20 Ehrenzeller (2007), particularly p. 215: “Guaranteeing individuals the freedom to teach and do research is based on the idea that state and society are best served by a *Wissenschaft* free of political and social considerations of utility and relevance.”

21 Bundesgesetz über die Förderung der Hochschulen und die Koordination im schweizerischen Hochschulbereich vom 30. September 2011 (HFKG; SR 414.20, as at 1 January 2015; <http://www.admin.ch/opc/de/classified-compilation/20070429/index.html>).

22 Bundesgesetz über die Förderung der Forschung und der Innovation vom 14. Dezember 2012 (FIFG; SR 420.1, as at 1 January 2015; <http://www.admin.ch/opc/de/classified-compilation/20091419/index.html>).

	Education	Research	Innovation
Regulatory competence solely national	ETH domain Vocational education	ETH domain SNSF International cooperation	CTI International cooperation
Regulatory competence both national and cantonal		Research universities Universities of applied sciences and arts Teacher training colleges	STT Start-ups Regional policy Economic promotion
Regulatory competence solely cantonal	Preschool Primary school Secondary school		

Table 2 **Regulatory competencies in the Swiss HERI sector**

3.4 Funding

What the Swiss HERI sector produces is in large part publicly funded, even though private industry incurs the bulk of the expenditures for research and development. Higher education, research – particularly “endogenously” motivated basic research – and research-based innovations are understood as meritocratic goods.²³ They are desired by society but are not necessarily marketable, and for that reason the state uses tax monies, at the performance level, to carry out important functions in this sector.

As there is potentially unlimited demand for public funding, it falls to political decision-makers to regulate the distribution of public funds to this sector. The public HERI sector is primarily financed by the national government, the cantons, private enterprises, and private foundations. The basic decisions about levels and use of funds are made by the national and cantonal parliaments. The relevant or specialized parliamentary committees take the lead here.

²³ On the difference between “public” and “meritocratic” goods from an economic perspective, see EFV (2012), p. 16.

The most significant funding instrument at the national level is the Federal Council’s ERI Dispatch, which it presents to the national parliament every four years. It lists funding decisions and draft laws for areas in which the national government has sole responsibility: the two ETHs, vocational education, research and innovation promotion, and international cooperation in education and research. It also lists amounts the national government will pay to those institutions and domains in the HERI sector that are primarily a cantonal responsibility: the cantonal universities, the universities of applied sciences and arts, student scholarships, and common education policy projects. The calculated amounts are based on the Higher Education Act.

National funding for participation in EU framework programs and in international research organizations are applied for in separate dispatches.

The ERI Dispatch is prepared by the EAER and by SERI, the responsible authority in EAER. The dispatch process is embedded within larger budgeting processes which set out the funding goals for the various sectors and domains before the legislative session begins, which means the potential growth rate

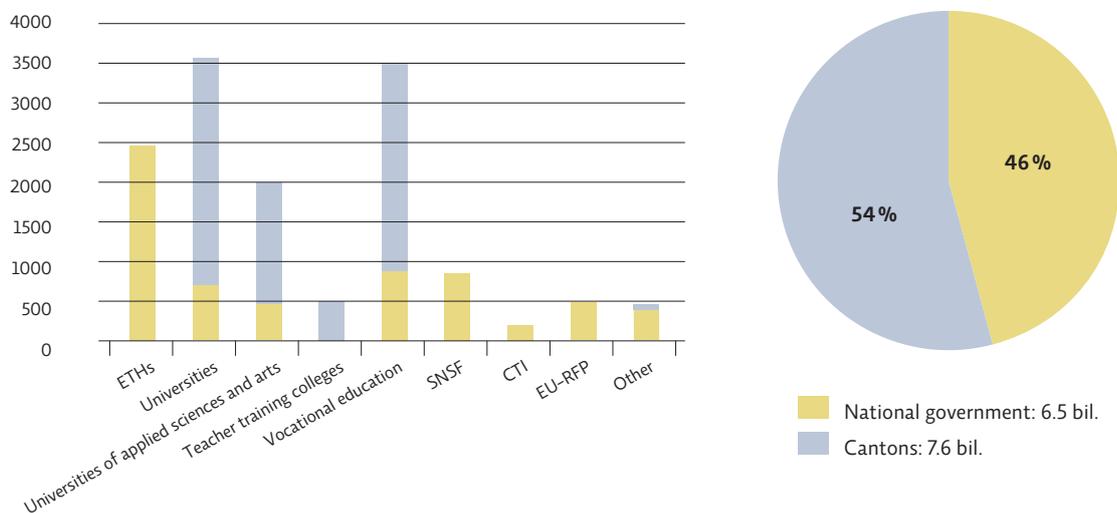


Diagram 4 Public expenditures for the HERI sector (2012, in million CHF)²⁴

for the entire HERI sector is set in advance. It is then up to SERI to organize the distribution of the existing resources among the various stakeholders.²⁵ Preparing an ERI Dispatch takes about three years, with the result that the national parliament receives a compromise package to consider that is broadly politically supported and that has emerged from a consensus among the stakeholders. This helps explain why ERI Dispatches thus far have been approved by parliament with only very minor changes.

In 2012, about 14.1 billion CHF in public monies flowed into the HERI sector (Diagram 4), more than half of which came from the cantons. Their funding focused primarily on vocational education, the cantonal universities, the universities of applied sciences and arts, and the teacher training colleges. The Confederation invested the largest part of its share into the

two Federal Institutes of Technology (ETHZ and EPFL). One can distinguish between four basic types of funding instruments: (i) lump sums provided to the cantons for vocational education, or basic institutional funding amounts provided to the cantonal universities and the ETHs, granted for a four-year period, (ii) project-related funds, competitively-awarded on a three-year cycle, (iii) funding for construction and building maintenance, and (iv) amounts provided for specific inter-university projects of national importance.²⁶ It is not possible to exert influence over the basic financing that the national government provides to the cantonal universities. The national government can, however, exert longer-term structural influence through the National Centers of Competence in Research (NCCR), one part of the SNSF's competitively-awarded research grants.²⁷ For that reason, the national government has preferred investing its resources into competitively-awarded research funding.

24 Source: EVD; BBT, *Beiträge des Bundes und der Kantone an den Bereich "Bildung, Forschung und Innovation" 2004–2016*, Bern, p. 12 (2012).

25 Lepori (2007): "Les organisations administratives mènent ainsi le jeu et, en effet, la procédure du message FRT peut être interprétée comme un instrument pour renforcer le pouvoir de l'administration et, notamment, du Secrétaire d'Etat, mais en même temps elles ont une possibilité limitée d'imposer une redistribution des moyens, puisqu'un accord doit être trouvé avec toutes les parties en même temps."

26 For the first time, in the coming funding period (2017–2020), all types of higher education institutions can apply for such project-related funds, following Art. 59 HEdA. The total sum is projected to be around 300 million CHF.

27 See CSSI (2014).

In the last cycles, this has led to above-average increases in SNSF and CTI budgets.²⁸ Through its investments to help pay for buildings and equipment, the national government has contributed to the infrastructure of cantonal universities as well.²⁹

The political perception is that the basic financing provided reinforces structurally conservative tendencies in the area of higher education. The more cantonal universities depend on competitively-awarded funding, the more they will focus their efforts on profitable activities and thereby shift their emphases, as this perception has it.

In 2014, the national government spent 6.9 billion CHF (10.9% of regular federal expenditures) in the “Education and Research” sector.³⁰ Since the 2000s, the HERI sector has been the fourth largest area of expenditure after social welfare (33.5%), finance and taxation (14.8%), and transportation (13.2%). In the federal budget, it is one of the sectors, along with agriculture and transportation, whose resources are only weakly committed. Weakly committed or uncommitted funds have been slowly but steadily displaced by strongly committed expenditures (such as those for social welfare purposes), the result of which is to concentrate cost-saving or consolidation measures among the less strongly committed expenditures.³¹ The common responsibilities and division of tasks between national and cantonal governments make one-sided cost-cutting by the former relatively unlikely, but the HERI sector faces growing competition in Switzerland for

funds, now particularly from the transportation sector which is in a stronger position as its infrastructure needs were recently secured, over the longer term, by the creation of a new fund.

Research and innovation sector funding is characterized in Switzerland by a high share of private investment. According to R&D funding statistics for 2012, the private sector contributed about 60% (11 billion of the 18.5 billion CHF total) of the investments in research and development in Switzerland (Diagram 5).³² Large enterprises (e.g., more than 250 employees, particularly in the chemical and pharmaceutical branches) were responsible for 70% of the R&D expenditures.³³ The national government and the cantons fund about one-quarter of R&D. Of the 4.7 billion CHF in public funding for research projects, 4.2 billion went to the universities – 2.34 billion from the national government, and 1.83 billion from the cantons. Foreign funding of R&D efforts in Switzerland stood at about 2.2 billion CHF. Of that, 2 billion went to the private sector, largely in the form of research contracts from subsidiaries of particular enterprises, and 250 million went to the universities via EU research programs.³⁴

Overall, a marked aspect of Swiss HERI funding is the large role played both by the private sector and by the cantons. The national government plays a subsidiary role, investing its resources primarily in those areas over which it can exercise control, meaning in the ETH domain as well as in competitively-awarded funding for research and innovation, with contributions to the SNSF many times higher than those to the CTI. This reflects the dominant basic orientation in publicly-funded research. As a rule, public monies do not flow to HERI providers through ministerially-guided, thematically-oriented major programs. Even the Swiss

28 See EVD; BBT (2012), as well as BFS (2012), p. 22–23, and Lepori (2007), p. 110. When compared to the 2000–2003 funding period, SNSF and CTI support has grown by 46% and 52%, respectively. For the 2008–2011 period, the SNSF, at 2.8 billion CHF, had about 1.1 billion CHF more available (+64%). The CTI’s budget rose in the same time period from 390 to 607 million CHF (+55%). From 2013–2016, the annual growth rate of SNSF (3.7%) and CTI (5.7%) credits were higher than those of HERI credits (3.5%) overall.

29 Botschaft vom 22. Februar 2012 über die Förderung von Bildung, Forschung und Innovation in den Jahren 2013–2016, BBl 2012 3099f., p. 4579: Since 1968, the national government has paid 4.2 billion CHF in real terms as [investment] contributions, which in specific cases covered between 30% and 60% of the costs.

30 EFV (2015), p. 3.

31 35 billion CHF (2012), or about 55% of all national expenditures, are strongly committed. The lion’s share (about 90%) of these expenditures go to the social welfare remit as well as the finance and taxation remit, both of which have grown considerably since 1990. Then, their share was about 35%, but it rose to 46% by 2000, and in 2015 will probably account for half of all expenditures – a share likely to rise further. See EFV (2012), p. 82.

32 BFS (2014), pp. 10, 25. Switzerland has continued to increase its R&D investments, from 2.47% (2000) to 2.87% (2008) and 3.13% (2012) of GDP. While this is over the OECD average (2.4%), it remains significantly below the values for South Korea (4.36%), Israel (3.93%), and Finland (3.55%).

33 In Japan, Germany and the U.S., the share large enterprises contribute to private sector R&D expenditures lies at over 80%. OECD (2013).

34 BFS (2014), p. 27. In 2012, foreign R&D funding largely went into the pharmaceutical branch, which received somewhat more than 800 million CHF, followed by “research and development” with somewhat over 450 million CHF. Foreign funding, compared with 2008, has more than doubled from 970 million to 2.2 billion CHF.

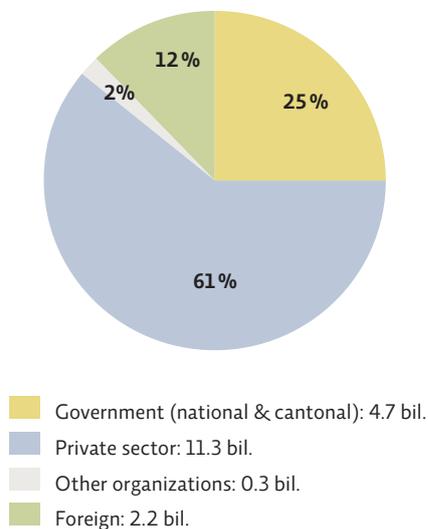
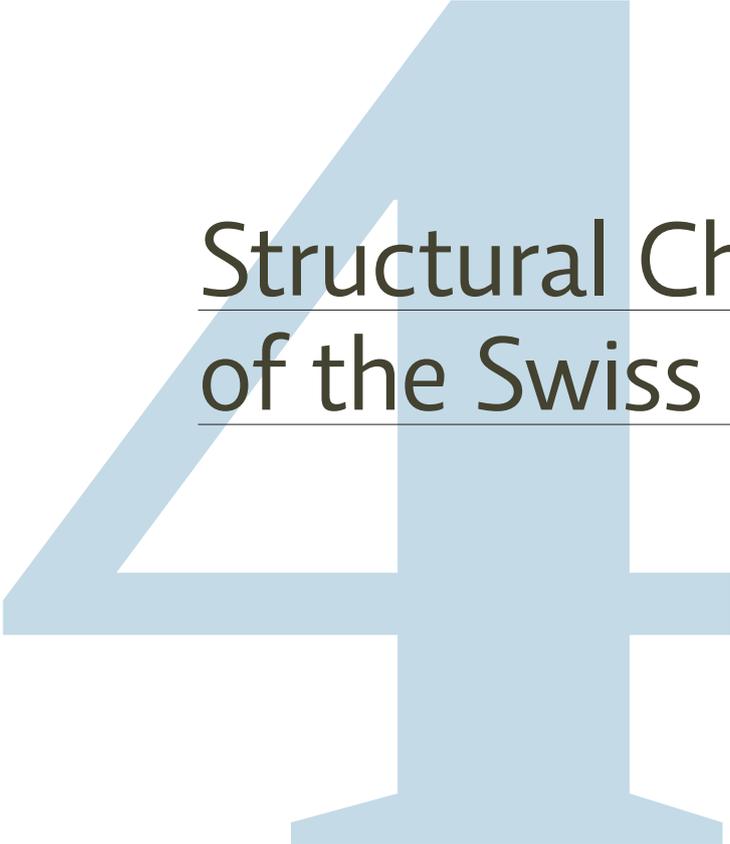


Diagram 5 **R&D funding in Switzerland (2012, in billion CHF)³⁵**

National Science Foundation's NCCRs forgo a politically or strategically motivated top-down prioritizing of certain disciplines. Instead, they encourage existing bottom-up research developments. National and cantonal governments also hold no shares in research-intensive large enterprises, nor do they provide direct promotional subsidies to private enterprises. They also do not indirectly support private sector R&D activities through special tax breaks, as is often the case in other countries, even though ongoing R&D expenditures in firms can be deducted as part of their operating costs and thereby reduce their tax burden.

³⁵ Source: BFS (2014).



Structural Characteristics of the Swiss HERI Sector

Based on the forgoing depiction of the HERI landscape, one can identify various structural characteristics of the Swiss HERI sector at both the performance and policy levels:

4.1 Performance Level

High quality and diversity among HERI providers

Evaluating the quality of education, research, and innovation, complex processes that resist formalization, is methodologically difficult. Standard indicators limit themselves to statistically measurable and internationally comparable dimensions. The explanatory power of such quantitative measures is correspondingly low.³⁶ Bearing this proviso in mind, which is one the SSIC regards as an important limitation, the standard indexes and rankings yield a very positive overall picture and attest to the outstanding performance capacity and quality of the Swiss HERI sector. Since 2008, Switzerland has been ranked No. 1 in the Global Competitiveness Report in terms of university education, research, and the innovative capacity of its economy. It achieves high rankings in the areas of “education”, “research systems” and “economy” in the EU Commission’s Innovation Union Scoreboard. The country has a high ranking in the Global Innovation Index as well. Swiss research and innovation also sets standards both in its proportion of publications in top academic outlets and in the number of registered patents *per capita*.³⁷ A further indicator of the excellent quality of the educational system is that 70% of all students

36 Meissner (2015), p. 17: “Composite indicators do not cover all the dimensions relevant to STI and innovation. This is partly due to lacking data and partly because certain STI-related issues are not measurable. [...] Innovation indicators are characterized by a weakness in the quality dimension. So far, indicators mainly express quantities, and even the innovation efficiency indicator is a pure input/output ratio. Hence, STI policy measures run the danger of being developed based on quantitative measures with no or limited consideration given to a dimension which is especially important for education, research, and science.” OECD (2011).

37 SBF (2014); SBF (2015), p. 6. Switzerland, with 16.4% of its total publications (from 2007 to 2009) in the top 10%, is in second place, immediately behind the U.S. with 16.6% publications.

at Swiss universities study at institutions globally ranked among the top 200.³⁸

The SSIC assumes that the variety of HERI institutions, and their differentiation, is an overall strength of the system. Diversity creates the conditions for innovations. The educational system also has a highly permeable dual structure, allowing movement between vocational and academic tracks, even though the effects of social selectivity are noticeable at all educational levels.³⁹ Practice-oriented vocational education is highly regarded, and at the same time is an educational sub-system conceptualized as separate from the universities.⁴⁰

Higher education institutions (all types) as core elements of the HERI sector

Switzerland essentially concentrates publicly-funded research in the universities and the ETH domain. With a few exceptions, extra-university research institutions are relatively small, primarily regionally supported, and play a largely complementary role in public funding. This structural feature sets the Swiss sector apart from the HERI sectors found in other countries. For many years, SERI has pursued a policy of preventing the number of non-university research institutes it supports (under RIPA, Art. 15) from proliferating, and where possible, to tie existing institutes to the universities.⁴¹

The great significance of private sector R&D activities

Two-thirds of R&D financing in Switzerland comes from the private sector. However, the growth rates in such investments has been declining in the last years, and given the strength of the Swiss Franc, could decline still further. Nevertheless, the considerable commitment shown by private R&D enterprises testifies to the attractiveness of Switzerland for knowledge-intensive industries.

38 SKBF (2010), p. 196.

39 Egger (2011).

40 SWIR (2014a).

41 In the period from 2013 to 2016, the national government (following RIPA, Art. 15) spent about 300 million CHF in support of the 30 or so non-university research institutes, including CSEM (Neuchâtel), SIAF (Davos), and FORS (Lausanne).

A small scale and a high degree of internal networking

Due to the financial support provided by the cantons, the cantonal universities have remained relatively strongly rooted in their respective regions. Despite rapid growth in the recent past, universities have remained relatively small: a Swiss university with 20,000 students is regarded as large. That 70 % of the students in Switzerland are educated in high quality institutions, as noted above, together with the separation of academic from vocational education, indicates there has been little shift to mass higher education. Such expansion as has occurred has not come at the cost of quality. The relatively small number of universities comprise a dense network; many are an hour or less from one another by train. While Swiss universities do compete with one another for funding as well as for students, since the number of students enrolled influences the size of the basic financing provided by the national government, individual research groups cooperate closely with one another across institutional boundaries. Cooperation is also common in teaching, particularly in educating doctoral students.

A relatively high level of provision (resources; infrastructure)

Since 2000, the national government has ensured that the HERI sector, as compared to other policy sectors, has experienced above-average growth rates. The indirect and direct support it provided to innovation efforts was meant to counteract the problems brought on by economic recession. Over the last 12 years, HERI expenditures have grown by 4-5 % per year, a healthier growth rate than in other policy areas. Infrastructure in Switzerland is kept at a high, modern standard, which is a significant factor not only for higher education institutions but is also a significant locational factor for private R&D enterprises. Despite the four-year political cycle, the relatively stable funding framework favors a high degree of dynamism in research activity over the longer term.

A high degree of internationalization in the HERI sector

The share of foreigners in the higher education sector is particularly large in Switzerland, both among instructors (teaching) and among doctoral students (research). One reason for Switzerland's high ranking in international indicators lies in the strong and long-standing ties Swiss researchers have to the international scientific community. The relative scarcity of future Swiss researchers also necessitates being open to the international community.⁴² A high mobility among personnel was taken for granted – that is, until the “mass immigration” popular initiative passed in February 2014. Swiss university employment was attractive not just due to the high standards of provision, but also due to comparatively generous funding provided to personnel and for facilities, easy access to funding from national and international sources (owing to Switzerland's integration in the European research area), as well as the high value placed on “endogenous” research activity not bound to programs following political agendas.

4.2 Policy Level

An historical alliance between the HERI sector and the state

The Swiss government, in responding to international developments in the wake of the Second World War, elevated the promotion of research to a national task of the highest priority. Yet it did so without dictating the focus or setting other parameters for providers that would have kept their creativity from blossoming. This historical alliance between the HERI sector and the state still echoes today in the high priority that Federal Council and Parliament continue to give this sector almost as a matter of course.

42 Stuber & Bolzern (2012).

A strong orientation in HERI policy to guidance by context

HERI policy in Switzerland has traditionally and consistently been oriented to subsidiarity and self-management principles. Subsidiarity calls for locating responsibility for a task as far down a hierarchy as possible, and therefore – ideally – at the level where decisions, funding, and application in fulfilling tasks converge. The strong adherence to bottom-up principles is part of the Swiss political culture of consensus. Central state power was established relatively late, and in comparison with other countries, has remained weakly developed. Switzerland lacks the kind of ministerial system which exists in other countries and which claims a monopoly on interpretation and decision-making. This means there is a need to engage in cooperative federalism. The result is a very complex system with a high degree of intertwining between the competencies of nation and cantons, a side-by-side nature of individual and joint funding, and high demands placed on coordination between the various levels and stakeholders.⁴³ HERI policy formation is characterized by formalized communication requirements (a culture of consultation) and a strong, often legally mandated, obligation to engage in concerted action.

The function of the national government is reduced to approving subsidies (usually worked out with the recipients) and a strategy that largely forgoes pursuing what would otherwise be “strategic” goals. This can be especially clearly seen in the national government’s innovation policy, which, as part of the fundamentally economically liberal orientation to Swiss economic policy, largely confines itself to funding higher education and research. Political decisions therefore focus on the (concerted) design of the framework conditions (“contexts”) for supporting university instruction, research, and innovation, as well as the rules for obtaining public funding for them. The conviction at the political level is that the state should respect academic freedom in teaching and research as well as the autonomy of the providers (universities and central

fundors like the SNSF, and in the future, the CTI).⁴⁴ The result is a HERI policy that is pragmatic and oriented to negotiation and intermediation, and that works with performance agreements. The national government, and to some degree the national parliament, thereby position themselves primarily as hubs for the distribution of resources. They also deconcentrate and devolve, both outward and downward, the risks and responsibilities associated with making strategic decisions.

The particular significance of intermediary actors

A considerable, but manageable, number of actors in Switzerland specialize in carrying out intermediary functions. These actors create an intermediating buffer zone between policy levels directly connected to research performance and the levels unconnected to such research. Even if their effects are not always readily evident in the HERI sector, such actors play a central role in developing policy, making decision, and in implementation. They are also important for the structural linkage between *Wissenschaft* and society, not least because the concerns and specific logic(s) used in the HERI sector can be difficult to communicate, especially when compared to policy areas such as agriculture or transportation. The peculiarities of what HERI actors provide makes it functionally necessary to delegate specific tasks to intermediary actors. Seen from without, the result appears to be a multiplicity of needs and interests that can readily be taken as a lack of efficiency in HERI processes. However, such apparent “redundancy” is a structural feature of the HERI sector. It should be seen positively, as it functionally increases the ability of the respective actors to communicate, to learn, and to reflect. In this manner, mistakes or risks (such as a loss in knowledge) can be avoided, and this makes the HERI sector more stable overall.

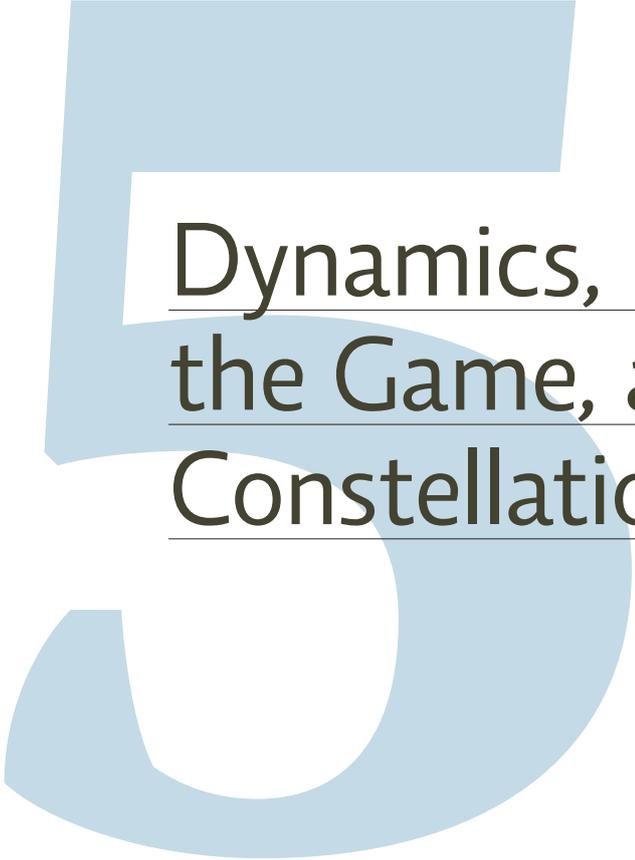
⁴⁴ See SWIR (2014b).

⁴³ The literature on the sociology of science refers to this as “participative” or “reflexive” models of governance. See Bora (2012).

An extensive, informal culture of communication

The small-scale environment noted above, and the intertwining of functions, result in a relatively limited number of influential individuals repeatedly meeting one another in the most varied contexts. They use this to informally communicate the positions and interests of the institutional actors they represent, and thereby help initiate the needed reductions, compromises and understandings necessary in complex systems.

The cumbersome nature of formalized communication among so many actors, as reflected in prescribed consultation processes, are more than compensated for through such informal ties. The culture of informal communication is necessary for the system to function across all levels and between the various functional groups – though it does give the system the air of not being transparent.



Dynamics, Rules of the Game, and Problematic Constellations

5.1 The Dynamics of “Economization”

Switzerland continues to accord the HERI sector high priority, reflected in relatively constant and high growth rates of HERI expenditures in the last few years, as noted above. Nevertheless, the SSIC has observed a change in the relationship between *Wissenschaft* on the one hand, and politics, society, and economy on the other. An increased level of educational attainment in the population has meant a corresponding increase in expectations placed on *Wissenschaft*, which has itself acquired a different connotation. Higher education, research, and innovation are now supposed to increasingly create assets that yield tangible financial benefits in the short term. This can be seen particularly clearly at the intersection of university-based basic research and applied research in industry, particularly in biomedicine.⁴⁵ This “economization” of the discourse about higher education and *Wissenschaft* has accentuated the inherent tension between an existing orientation to quality within academic research, and the demands for utility, relevance, and efficiency that exist outside it.⁴⁶ It can also be seen generally as a sign of the loss of trust in *Wissenschaft* on the part of politics, society, and economy, and more specifically as a growing mistrust in the ability of *Wissenschaft* to manage itself.

The appreciation of *Wissenschaft*-specific logic and developments, and the possibilities, limitations, and complex mechanisms in how *Wissenschaft* is pursued, has diminished. Rather than granting them freedom and autonomy based on trust, providers are now instead expected to provide accountability and reporting in empirically verifiable forms.⁴⁷ The high public expectations are in and of themselves legitimate. However, a too shortsighted utility-based view fails to acknowledge the long-wave nature of HERI accomplishments and the many immaterial uses *Wissenschaft* generates in its cultural practices. It is difficult to communicate to outsiders that one cannot establish empirically demonstrable input-output relations in the domain of publically-funded basic research. Functionally, research is necessarily “wasteful” since

its breakthroughs cannot be planned in advance: the search for knowledge and insight is by definition characterized by uncertain success. This “wasteful” character is what makes it so valuable for the ability of a society to continue to develop.

There have been attempts since the 1990s to organize HERI policy, the science system, and its actors in more competitive ways, as well as to establish measurable efficiency as its leading criterion. Using instruments from outside HERI and the science system, incentives for research performance are to be offered. Carrying out this new policy has triggered a series of dynamics:

- The strong expansion in competitively-awarded research funding has increased the degree of external determination in (and of) the research system.⁴⁸ Awarding funding competitively has led to a “project-determined” fragmentation, turning research into an evaluable process of asking close-ended questions that can be fully answered in a comparatively brief time. This competitive logic, alien to older *Wissenschaft* practices, rewards brief funding periods and an expansion of research in a purely quantitative sense, paired with an increase in proposal writing and evaluation activities that push *Wissenschaft* to the limits of its capacity.
- The introduction of an incentive-oriented performance component into university funding has intensified the dynamics of competitively-awarded external funding.
- Making universities more “autonomous”, following New Public Management principles, has primarily led to strengthening the hand of university administrators and to an expansion in managing *Wissenschaft*. It has not noticeably reduced the burdens at the level of performance. Higher education institutions increasingly act as enterprises engaged in managing their own reputations, accompanied by a rise in external communication efforts.
- The prioritizing of innovation (CTI, STT, start-ups), application-oriented research and advanced vocational education, as well as the increased attention given to STEM disciplines in education and university policies accentuates thinking primarily in material or short-term utility categories (“an orientation to relevance”).

45 See CSSI (2015a).

46 SSTC (2013).

47 See SWTR (2013a).

48 See Elzinga (2012).

5.2 Unwritten Rules

In addition to these dynamics, there are a set of unwritten rules that decisively influence HERI policy in Switzerland, particularly that at the national level:

Quieta non movere, or: don't stir up what is settled!

This rule functions, in practice, in a context where a culture of debate about science and research policy is lacking. HERI decisions are often prefigured by pragmatic compromises, so fundamental questions are deferred, avoided, or implicitly resolved. Fundamental reforms, such as the constitutional amendment in 2006 giving national and cantonal governments joint responsibility for the HERI sector, are transformed in practice into a concertation based on existing distributional and balancing mechanisms and quotas. In this way, conflicts – which would only be regarded as friction-induced losses – are avoided.

What has proved itself need not be reinvented, or: resolve problems using existing structures!

The Swiss HERI sector is structurally conservative. There is a widespread anxiety that new organs, committees, or institutions will only complicate matters even more, as well as generate additional costs, and neither can be readily reversed. This orientation leads to trying to address new tasks or resolve problems with the help of existing and proven structures – and over the longer term, to therefore overload them.

Just the figures, please, or: science policy decisions are based on numbers!

An important criterion for justifying HERI decisions is to be able to point to the evidence. However, the reduction of “evidence” to a few indicators and parameter approximations, and the tendency to rely on those figures which are readily at hand, makes “evidence” an unreliable basis for decisions. Belief in numbers and a penchant for empirical-sounding arguments are widespread. There is little understanding of the con-

tingent and non-formalizable nature of HERI processes, or of the degree to which such processes follow their own rules.

5.3 Problematic Constellations

If we summarize these observations about the structure of the HERI landscape, the dynamics in the last few years, and the informal rules of the game, we find the following problematic constellations:

A strong influence of certain actors on national HERI sector policy formation

Policy formulation in the HERI sector does not take place in parliament, and rarely in the CSECs, but instead in public administration offices, in consultation with the most significant stakeholders. Unlike in the 1990s, when it was largely the (then) SSC which suggested “objectives” for the national government to pursue in planning HERI activities, nowadays policy formulation is a process of negotiation which involves many actors: their primary function is not to provide advice but instead to represent interests or deliver services.

Some of this results from a very Swiss “culture of consultation”. The national government is legally obligated to include stakeholders in many policy formulation processes and implementation decisions. On the other hand, some providers also use their particular knowledge of research and economic processes to try to establish themselves as privileged advisors to the national government who will be listened to even outside of the formal consultation processes. As privileged “agents”, they bring their informational advantage into the decisions made by the “principal”. Examples of such agents include institutions which support research (such as the SNSF) and strategy management bodies of larger universities (such as the ETH-board). In vocational education, of course, professional organizations in the world of work serve not just as advisors but are also the direct partners of the national government. The interests of research-intensive industries are represented by organizations

such as Scienceindustries, Interpharma or Swissmem, which perform hybrid functions and both advise and lobby.

The result is a situation in which the voice of the SSIC, the only actor that – following its legal mandate – is free of particular interests and is specialized in providing system-spanning advice, appears to be only one actor among many. Still, RIPA accords it a special place, as the SSIC does not disburse funds and is the only consultative body which concerns itself with all types of universities, as well as with research and innovation policy, and thus covers the entire HERI spectrum.

A culture of debate about science and research policy in Switzerland is only weakly developed

Policy is conceived of as an iterative process of trial and error, of learning and of assessing, one in which relevant stakeholders are involved as soon as possible. A discussion of basic principles, or the working out of strategic objectives, has been largely dispensed with, as has the more problematic aspiration of trying to “steer” science and research. This pragmatic way of finding solutions is expedient, but only under the assumption that the primary role of the national government is to fulfill subsidiary functions. It does mean, however, that what is rather lacking in Switzerland is a high-level, content-rich debate culture about science and research policy.

An increasing tendency towards routinization in the area of quality assurance

The proportion of external research funding has increased since the 1990s, and correspondingly, so has the time and effort needed for internal quality assessment of research accomplishments as well as to meet reporting and controlling demands made by funders, politicians, and the public at large.⁴⁹ This abets tendencies towards a bureaucratization which tends to curtail the initiative taken by researchers, along with

49 For greater detail, see SWTR (2013a).

their productivity and creative freedom. The SSIC fears that quality assurance and accreditation procedures, intended to serve an intermediary supporting function in the HERI system, will expand still more and that the actors entrusted with such procedures will – dysfunctionally – take too much on themselves.⁵⁰ In the meantime, the view has come to prevail that in light of these problems, an accreditation process that is as lean as possible should be employed for the established institutions of higher education.

Overloading the SNSF with tasks lying outside its core purpose to provide funding for research

In the last few years, the SNSF has been increasingly entrusted with new special tasks. These divert it from its core purpose and tend to overstretch its capacities. A similar tendency exists to assign special tasks, on top of its core purpose, to the CTI.

Convergence of institutional profiles within the tertiary level of the Swiss system of higher education

The variety and differentiation of the elements that make up the tertiary level of education – understood as a unit composed of Tertiary A and Tertiary B – are one of the strengths of the Swiss HERI sector and an important precondition of its ability to perform.⁵¹ Yet there is a tendency towards convergence, both nationally and internationally, between them that increasingly waters down their distinctive profiles. Advanced vocational education, upgraded by the national government, is increasingly moving into the domain of the universities of applied sciences and arts, and the differing types of universities are growing increasingly similar. Neither development is what was intended by the division of labor between these separate parts of the system of higher education. A levelling of the diverse courses of studies offered will result in a loss of the signaling functions different types of tertiary institutions have for those who hire their graduates.

50 See SWIR (2014c).

51 For more detail, see SWIR (2014a).

Lacking ability to plan a research or academic career, and longer-term status insecurity

Ensuring a continuing supply of future instructors and researchers is a key task in the HERI sector. RIPA assigns the fulfillment of this function to the “research organs”, meaning the universities and the SNSF. The problematic constellation here, however, is that while the SNSF funds young researchers, the decision of whether they stay in or leave the system is up to the universities to decide themselves.

Given the present pressure to work more efficiently, and in light of the hitherto ready availability of academic and research personnel from countries with worse conditions for engaging in academic research work, Swiss universities have taken too little responsibility for their own future researchers. The SNSF supports young researchers largely in the context of funding projects. The volume of projects and of publications are significant both as evidence of a researcher’s achievements and for universities more generally. Yet it has led to a strong increase in the number of research personnel who are hired for an only brief period, and a corresponding worsening in their mentoring as well as in their prospects, if qualified, to take the next steps in their academic or research careers.⁵² The national government, the SNSF, and university administrations are now working on trying to improve the situation by creating more tenure-track positions.

The support for research infrastructures lacks contours and clear definitions

For some time now, it has been unclear who should bear the responsibility for financing cost-intensive research infrastructures.⁵³ Also unclear is what the definition of infrastructure includes, as recent negotiations between SERI and the Academies over critical editions and research secretariats have shown.⁵⁴ To what extent infrastructures, as “particularly cost-intensive areas”, can be funded under HEdA has also not been clarified.

52 SWTR (2013b).

53 See SWIR (2015).

54 CSSI (2015b).

Yet infrastructures are decisive for the future ability of the Swiss HERI sector to perform. The SNSF is only to a limited extent a suitable actor here, as infrastructures need to be evaluated strategically rather than in the more typical manner in which peers evaluate the scientific quality of a project or program.⁵⁵ For other reasons, the academies are also not suited for making decisions about larger infrastructure proposals, much less run them. Since the informal rules largely preclude creating a new institution, it is difficult to find an adequate answer for the new task of responding appropriately to the growing importance of infrastructures.

That the national government forgoes pursuing explicit strategies and prefers *ad hoc* solutions is appropriate in situations where risks and responsibilities really can follow the subsidiarity principle and be delegated downwards. But where this is not readily possible, as in cost-intensive research infrastructures that call for a strategic decision at the national level and that also need long-term financing, dysfunctions are created when the national government does not take the lead.

Regulatory uncertainty also exists with respect to the role of the cantons here. As the political institution responsible for funding the cantonal universities, they play an important structural role in supporting research. What remains underdeveloped is the crafting of a common research policy across cantons. They are also not included in an overall research policy strategy.

Unsustainable HERI sector funding

HERI sector funding has two problematic constellations:

1. The priority the national government places on competitively-awarded research funding fuels a competition between providers over external funding that creates more problems than it resolves. The increase in indirect research costs, for

55 SNSF (2013), p. 3: “Efforts to clarify funding modalities and criteria are hampered by an unclear division of tasks with other stakeholders and a poor match between the SNSF’s portfolio and competencies and the requirements of infrastructure funding: Whereas SNSF funding policy revolves around recurrent competition based on scientific quality, infrastructure funding requires long-term decisions based mainly on strategic considerations.”

example, is one of these problems; the situation of future researchers noted above is another.⁵⁶ Increasing indirect costs are only partly covered by the funding for overhead costs provided by the SNSF and the CTI, and it reinforces the dynamics and effects of relying on external funding. Furthermore, success at obtaining competitively-awarded external funding eases the financial burdens on the cantons by unloading some of their university costs onto the nationally-funded SNSF. Project overhead costs increase the budget of the agencies providing funding, but at the cost of reducing their relative freedom of action, since part of the overall budget (about 10%) is blocked by a purely autonomic distribution process. For the universities, by contrast, overheads in their current form are an only minimal part (1%) of their overall income.

2. The HERI sector has come increasingly into competition with other policy areas whose resources can show a clearer connection to expenditures. In the case of unexpected austerity measures, there is a risk at the national level that weakly committed HERI resources will be displaced by more strongly committed resources. The HERI sector is primarily in competition over resources with the transportation sector, one which is better organized and acts more skillfully politically to secure its own financial needs over the longer term, particularly with respect to infrastructure.

⁵⁶ CSSI (2013).

6 Theses: Light and Shadows

Based on the results of the foregoing analysis, and on the expertise and experience of its own members, the SSIC has arrived at the following theses:

- A relatively clear division of labor and tasks exists in the Swiss HERI sector: there are few overlaps or gaps between the functions and the actors that fulfill these functions. Diversity, an international orientation, a small-scale environment, and functional differentiation bring advantages for economy and society as well as for the development of providers in higher education, research, and innovation.
- The many actors in the area of policy formation and consultation, as well as the national government's forgoing of discussions about basic issues and not explicitly defining objectives and formulating corresponding strategies to reach them, makes finding consensus and reaching compromise easier as well. It allows conflict management to take place at lower levels. This does lead to a certain lack of transparency in how decisions are actually made, however, and tends to magnify the influence of those actors and interest group representatives who stand particularly close to national-level decision-makers. The influence of intermediary actors who fulfill purely consultative functions seems in comparison to be minimal.
- Gaps exist where overarching tasks exceed the capacities of the individual actors. This is particularly true in funding cost-intensive research infrastructures and in supporting future academics. The negative consequences of these gaps are reinforced by a reluctance to define new functions or in naming responsible new actors.
- A balanced, tried and tested complementarity exists between university research oriented to acquiring basic knowledge and research conducted by industry, both with respect to the providers and to the funding arrangements. The ability of the HERI sector to innovate profits particularly from the dual educational system as well as from the high level of education offered at the universities.
- The competitively-awarded research funding provided by the SNSF has proven itself in the last decades. Private foundation support for freely-chosen basic research plays a subordinate role in Switzerland. However, the monopoly position of the SNSF can, if there are unexpected financial or political crises, strain the resilience of the system as a whole. In addition, efforts to expand the SNSF's role beyond that of coordinating peer review and responding to proposals brought to it run the danger of overloading it as well as diverting it from its core mission.
- There is an increasing loss of respect among policy actors for the inherent logic of *Wissenschaft* and its internal orientation to quality standards. The increase in utilitarian orientations questions the balance between providing basic institutional funding and competitively-awarded project funding. In the past it has also tended to increase the burdens on instructors and researchers, as well as on the institutions of higher education, through its quality assurance procedures. The increasing pressure to produce applications threatens to delegitimize basic research, and thereby also threatens one of the drivers of innovation in the HERI sector.
- To date, public funding for HERI activities has been generous and has had a high priority both nationally and cantonally. It has allowed for well-equipped facilities and a good quality of education despite rising numbers of students. Compared with policy areas whose resources are more strongly committed, however, the longer-term financing of the HERI sector is only relatively weakly secured.



The SSIC's Recommendations

Based on its many earlier studies and discussions, the SSIC has reached the conclusion that the ensemble of actors and the constellation that has developed over time in the Swiss HERI system has proven itself. It makes the general recommendation that HERI processes should not be more strongly regulated or structured than they are already. Those who provide the achievements, whose room for creativity is so key to the ability of Switzerland to innovate, should not be unnecessarily or unduly constrained. The recommendations that the Council addresses to individual actors are intended as suggestions for optimizing the system overall, not only in a sustainable manner but also to make it more resilient and reduce particular weaknesses. They should also be considered in light of the practical implementation of the new HEEdA.

7.1 National Government and Cantons

The SSIC recommends these actors to ...

- ... maintain the stability and long-term perspective of the HERI framework conditions.
- ... continue with existing self-management and coordination paradigms in HERI policy-making.
- ... work together to ensure a balanced relationship between basic institutional funding and competitively-awarded project funding.
- ... maintain, in the face of the international trend towards greater convergence, the differences between the elements of the tertiary education system, and to structure the new allocation formula (following HEEdA) in such a manner as to sharpen their differing profiles.
- ... create framework conditions for a lean, goal-oriented quality assurance system (accreditation, evaluation).
- ... together clarify the role of the cantons, as the bodies financially and legally responsible for their universities, with respect to funding research and funding infrastructures.

- ... work together, by restructuring university staffing structures, to ensure that individual careers of young, up-and-coming scholars can be made more predictable.
- ... improve the cooperation between the national government (SECO, SERI) in innovation policy.

7.2 SERI, SNSF, and CTI

The SSIC recommends ...

- ... that SERI continues to respect the autonomy of the SNSF and the CTI and does not overload either with special or additional tasks which are difficult to reconcile with their core missions.
- ... that the SNSF focus on competitively-awarded research funding, and that it underscores the principles of quality utilized in academic research contexts *vis-à-vis* the expectations of relevance that come from outside such contexts.

7.3 Private Foundations

The SSIC recommends that private foundations place competitively-awarded research funding on a broad basis by creating a Donor's Association (*Stifterverband*) for Swiss Research whose aim would be to safeguard freely-chosen basic research efforts in the face of growing utilitarian demands coming from politics and society.

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Abbreviations

English abbreviations and Meaning [with German equivalent abbreviations]

CERN	European Organization for Nuclear Research [CERN]
CFDC	Conference of Cantonal Finance Directors [FDK]
CHF	Swiss Francs
CSEC	Parl. Committee for Science, Education and Culture [WBK]
CTI	Commission for Technology and Innovation
DETEC	Federal Department of the Environment, Transport, Energy and Communications [UVEK]
EAER	Federal Department of Economic Affairs, Education and Research [WBF]
EDK	Swiss Conference of Cantonal Ministers of Education [EDK]
EMBL	European Molecular Biology Laboratory
EPFL	Swiss Federal Institute of Technology Lausanne
ERC	European Research Council
ESO	European Southern Observatory
ESRO	European Space Research Organisation
ETHZ	Swiss Federal Institute of Technology Zurich
HEdA	Higher Education Funding and Coordination Law / Higher Education Act
HERI	Higher Education, Research and Innovation
IATC	Intercantonal Agreement on Technical Colleges [HFSV]
ICUA	Intercantonal Commission on University Access [KIUV]
ICUASA	Intercantonal Commission on Universities of Applied Sciences and Arts [KFHV]
ISCED	International Standard Classification of Education
NCCR	National Centers of Competence in Research [NFS (SNF)]
OECD	Organisation for Economic Co-operation and Development
R&D	Research & Development
RFP	Research Framework Programme
RIPA	Research and Innovation Promotion Act [FIFG]
SCNAT	Swiss Academy of Sciences
SECO	State Secretariat for Economic Affairs
SERI	State Secretariat for Education, Research and Innovation
SFIVET	Swiss Federal Institute for Vocational Education and Training [EHB]
SNSF	Swiss National Science Foundation
SSC	Swiss Science Council
SSIC	Swiss Science and Innovation Council [SWIR]
SSTC	Swiss Science and Technology Council [SWTR]
STEM	Science, Technology, Engineering, Mathematics [MINT]
STT	Science and Technology Transfer
SUC	Swiss University Conference
SVTOC	Swiss Vocational Training Offices Conference [SBBK]

German and French abbreviations [in footnotes and bibliography] and **Meaning** [with English translation]

BBI	Bundesblatt [Federal Register]
BBT	Bundesamt für Berufsbildung und Technologie [Federal Office for Vocational Education and Technology]
BFS	Bundesamt für Statistik [Swiss Federal Statistical Office]
BV	Bundesverfassung [Swiss Constitution]
CSEM	Centre Suisse d'électronique et de microtechnique [Swiss Center for Electronics and Microtechniques]
CSSI	Conseil suisse de la science et de l'innovation [Swiss Science and Innovation Council SSIC]
EFV	Eidgenössische Finanzverwaltung [Federal Finance Administration FFA]
EVD	Eidgenössisches Volkswirtschaftsdepartement [Federal Department of Economic Affairs, Education and Research EAER]
F&E	Forschung und Entwicklung [Research & Development R&D]
FIFG	Forschungs- und Innovationsförderungsgesetz [Research and Innovation Promotion Act RIPA]
FORS	Fondation suisse pour la recherche en sciences sociales [Swiss Center of Expertise in the Social Sciences FORS]
FRT	Formation, recherche, technologie [education, research, technology]
HFKG	Hochschulförderungs- und -koordinationsgesetz [Higher Education Funding and Coordination Law or Higher Education Act HEdA]
HLS	Historisches Lexikon der Schweiz [Historical Lexicon of Switzerland]
PRN	Pôles de recherche nationaux [national research poles]
SBFI	Staatssekretariat für Bildung, Forschung und Innovation [State Secretariat for Education, Research and Innovation SERI]
SEFRI	Secrétariat d'Etat à la formation, à la recherche et à l'innovation [State Secretariat for Education, Research and Innovation SERI]
SIAF	Schweizerisches Institut für Allergie- und Asthma-Forschung [Swiss Institute of Allergy and Asthma Research SIAF]
SKBF	Schweizerische Koordinationsstelle für Bildungsforschung [Swiss Coordination Center for Research in Education SCCRE]
SR	Systematische Sammlung des Bundesrechts [classified compilation of federal laws and acts]
SWIR	Schweizerischer Wissenschafts- und Innovationsrat [Swiss Science and Innovation Council SSIC]
SWTR	Schweizerischer Wissenschafts- und Technologierat [Swiss Science and Technology Council SSTC]

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