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The political coordination of knowledge and innovation policies in Switzerland

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The article highlights the main problems Switzerland faces in engaging in a more encompassing knowledge and innovation policy, an objective that is widely shared by the political elites. Two 'coordination gaps' are highlighted in the context of Switzerland: the 'federal divide' that structures political governance in the knowledge space in manifold ways and the 'utilitarian divide' that is institutionalised within the federal administration. It is demonstrated that Swiss policy-makers have taken great pains to overcome the obstacles in the wake of the federal divide with some success, but have failed to do so with regard to the utilitarian divide. The lack of guiding and reflexive capacities at the cabinet level will make it difficult to overcome this divide in the future, though planned reforms at the agency level may help to build some bridges between at least basic and technological research.

THOUGH IT IS CLEAR THAT Switzerland can be grouped with the successful countries with regard to knowledge production and technological innovation (see CEST, 2003; European Commission, 2003; OECD, 2004), there is a growing concern among Swiss policy-makers and the business community that the country has begun to lose its competitive position and that other countries, above all Nordic and several Asian countries, are advancing their position at a faster pace (Message, 2008–2011). Switzerland, as a small and export-oriented country, strongly depends on the world market. As it lacks natural resources, investments in knowledge production, diffusion, and application are, as generally agreed, essential (Message, 2000–2003, 2004–2007, 2008–2011). This explains why education, research, and technological innovation have received particular attention from government, parliament, and the public during the last 15 years or so, especially after a period of economic slackness and considerable budget cuts that also affected the knowledge domains during the 1990s.

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However, in a recently conducted study on institutional aspects of political coordination of knowledge and innovation policies in Switzerland (Braun *et al*, 2007), we found general agreement among Swiss policy-makers that policies concerning the 'knowledge space'[1] — research policy, innovation policy; higher education, and professional education — are confronted with a number of problems regarding cross-sectoral policy coordination. There are above all two *coordination gaps* that cause problems: the first is the strongly institutionalised separation between basic research and higher education on the one hand and technological research and application and professional education on the other, i.e. the so-called *utilitarian divide*. The second gap concerns the split of responsibilities and competences between the federal government and the cantons, i.e. the *federal divide*.

The central question that will guide this article is therefore, *what are the chances and conditions that Switzerland can bridge the 'utilitarian divide' and the 'federal divide'?* The answer will be sought by analysing whether it would be possible *to adapt the organisation of political governance and introduce an encompassing innovation policy*. Our analytical framework to assess coordination is based on the heuristics presented in the introduction to this special issue of *Science and Public Policy*.

To better understand political coordination capacities in knowledge and innovation policy, we believe that it is important to present Switzerland's

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existing governance model related to the knowledge space in the next section, before assessing the coordination capacities in terms of the concept presented in the introduction to this special issue of *Science and Public Policy*: at the cabinet level, including coordination capacities between the federal government and member states; at the ministerial level (external and internal coordination); at the agency level, and vertically, across the multi-layered structure. In the final section we analyse ongoing reform attempts and their potential for improving political coordination capacities in Switzerland.

Political governance structures in Switzerland's knowledge and innovation policy

The fundamental feature that profoundly shaped and still influences policy-making in the Swiss knowledge space is *federalism*. We should underline that federalism structures policy-making at the governmental level by the sharing of powers between the federal government and the cantons.

Since the foundation of the federal state in 1848, the cantons have been responsible for *education*. Exceptions were first made when the federal government established the Federal Institute of Technology in Zurich (*Eidgenössische Technische Hochschule Zürich*, ETHZ) in order to promote tertiary education in the fields of engineering and sciences. Today the entire domain of 'federal universities', the ETH-domain, includes two universities, ETHZ and the Federal Technology Institute of Lausanne (*Ecole Polytechnique Fédérale de Lausanne*, EPFL) as well as four attached institutes conducting environmental, nuclear, and material research. The ETH-domain is governed by the ETH-Council, a kind of 'self-governing body' composed of the directors of the ETHZ, the EPFL, and two other people from the ETH-domain as well as representatives of industry and politics. The council is chaired by a full-time president.

In the case of *vocational training* the federal level became involved early at the beginning of the 20th century. With the introduction of the Federal Act on Professional Education after the economic crisis in the 1930s, the federal government took a leading role in the field of vocational education and has expanded its domain competence ever after. Professional education, however, is still characterised by a close collaboration between the cantons (responsible for professional schools), professional associations (defining curricula), and industry as well as other politically important associations such as trade unions. Many cantons established schools for higher studies in vocational education in different fields. Based on a federal act of 1995, the vast majority of these schools were transformed into Universities of Applied Sciences (*Fachhochschulen*, UAS), or simply polytechnics. The federal government and the cantons share the funding of the polytechnics; the cantons cover the major part (about 70%).

Research and technology funding were for a long time attributed neither to the federal nor to the cantonal level. The federal government became active in these domains after World War II but delegated the task of (basic) research funding to the Swiss National Science Foundation (*Schweizerischer Nationalfonds zur Förderung der wissenschaftlichen Forschung*, SNSF). Today the SNSF promotes applied research as well, but basic research funding remains its main preoccupation (more than 80% of its budget) (see also Lepori, 2006). For the funding of technology development, the Committee for Scientific Research (*Kommission für wissenschaftliche Forschung*, CSR) was established even earlier than the SNSF. The CSR has always been more closely attached to public administration and has served since the mid-1990s, after being renamed the Committee of Technology and Innovation (*Kommission für Technologie und Innovation*, CTI), the principal technology and innovation agency, typically fostering research and development in joint university–industry projects.

At the end of the 1960s, when student numbers increased considerably and cantons started to put pressure on the federal government to participate in the financing of the cantonal universities, the federal level could not stay absent from higher education policy any longer. Because universities remain the principal places where publicly funded research is conducted in Switzerland (extra-university research institutes are few in numbers), the involvement in university governance also opened the possibility for the federal government of developing more ambitions in research policy in general. A first step was the attribution of competences concerning research

in the constitution to the federal government in 1973 and the adoption of a Research Act in 1983. The increasing involvement of the federal government culminated in a new constitutional article in 2006 that clearly acknowledged the joint responsibilities of the federal government and the cantons in (higher) education matters. The constitutional amendment strengthens the leading role of the federal government in education policy, but binds it at the same time to the interests of the cantons.[2]

Hence, the federal government is clearly the main actor in vocational education and innovation as well as in research policy, though the prominent role of the cantons in professional schools, polytechnics, *and* universities constrains federal decisions in these areas in various ways.

The governance structure in the knowledge space is summarised in Figure 1.

Collaboration between the federal government and cantons was established between 1964 and 1968, resulting in the Federal University Promotion Act, which allowed the federal government to assist cantonal universities with financial contributions. The Swiss University Conference (SUC), comprising federal and cantonal representatives, has served ever since as a platform for coordination activities between the federal and cantonal levels. Up to the end of the 1990s it also included actors from policy fields such as the SNSF, the ETH-Council and science academies, as well as representatives from industry and trade unions. Early studies described the governance mode at this time as *corporatist steering* with a 'spontaneous concertation' in the relationship between state actors and stakeholders (OCDE, 1971: 16). In this initial setting of federal coordination, no systemic approach for a coherent science polity and policy was institutionalised in Switzerland; the rather incremental approach was then widely acknowledged (OCDE, 1971: 16).

The delegation of competences from the federal and cantonal level to a common governing body for one policy field was an unprecedented endeavour in constitutional engineering at that time

In 1998, a revision of the University Promotion Act was undertaken. Inspired by new public management concepts, a stratification in the political organisation of higher education was introduced. The SUC became the main intergovernmental strategic political body, in which only government officials meet (today the State Secretary for Education and Research and the members of the cantonal governments responsible for higher education) in order to steer the development of higher education institutions. The revised institution was intended to overcome the 'old' complicated and inefficient corporatist structure. The delegation of competences from the

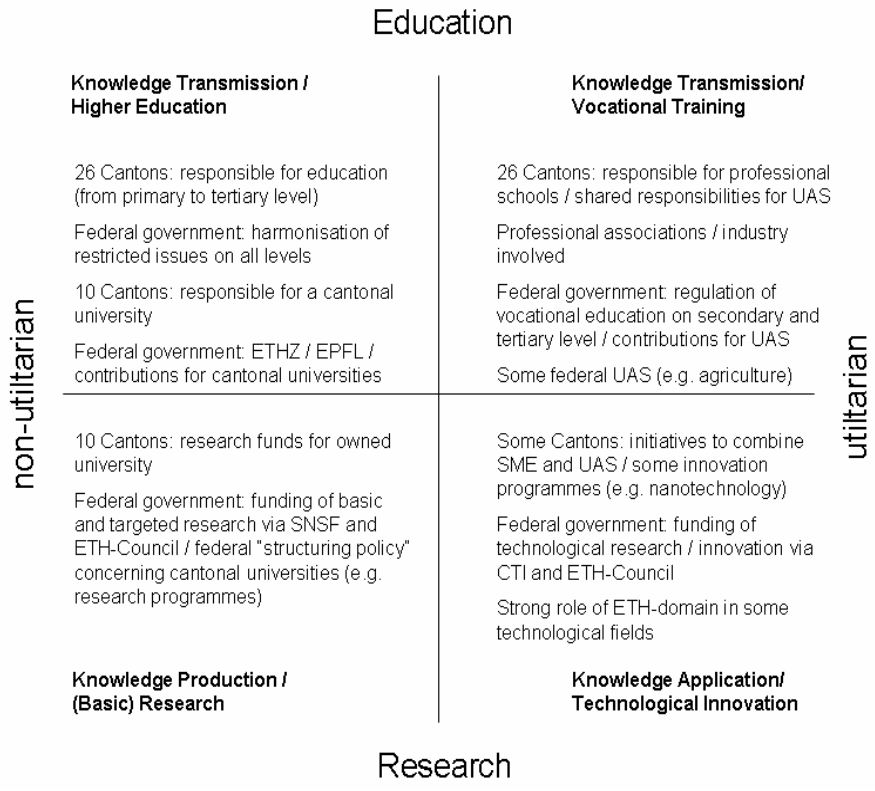

Figure 1. Political governance structure in Switzerland's knowledge space

federal and cantonal level to a common governing body for one policy field was an unprecedented endeavour in constitutional engineering at that time — in fact, it meant the official acknowledgment of a *joint task* as it had existed in Germany until recently in the field of higher education (see Edler and Kuhlmann in this special issue of *Science and Public Policy*).

Finally, we have to mention the Swiss Science Council (SSC) that has, especially in the early stage of Switzerland's science policy, marked its development in close interaction with the Swiss University Conference and the federal government (OCDE, 1971). We will discuss the development of the SSC, today called the Swiss Science and Technology Council (SSTC), in more detail in the section concerning the role of strategic intelligence.

Regarding the institutionalisation of knowledge and innovation policy within the federal administration, we have to emphasise that vocational education has always been separated from general (higher) education, and the (basic) research domains have been permanently administered apart from technology and innovation policy in different ministries, called federal departments in Switzerland.

In the mid-1990s, the topic of an organisational reform of departments was on the agenda of the federal government. The situation at that time was even more fragmented than it is today. There were more departments with interests and competence in research and innovation, and no encompassing policy existed to integrate the different interests into one coherent strategy — an explicit desire of the parliament (cf. Message, 2000–2003). The options discussed at this point in time were:

1. To opt for an integration of all policy sectors into the confines of the Federal Department of Economic Affairs (FDEA) and to accentuate an economic orientation in education, research, and technology policy.
2. To concentrate most policy fields into the Federal Department of Home Affairs (FDHA), with the exception of technology policy.
3. To concentrate the 'utilitarian' knowledge fields into the FDEA and the 'non-utilitarian' ones into the FDHA.

The last option was chosen and thereby a 'linear' thinking in innovation policies was strengthened (Braun *et al*, 2007).[3] The major difference with the *status quo ante* was first, that there were now only two ministries responsible for matters of knowledge and innovation; and second, that the existing distinction between science-oriented and economy-oriented education and research policies was even more strongly institutionalised within the federal administration.

Since 1996, the FDEA administers *professional education* (including the polytechnics) and the *promotion of technology*, now called innovation. The respective policies are prepared in the Federal Office for Professional Education and Technology[4] (*Bundesamt für Berufsbildung und Technologie*, OPET). The FDHA is responsible for the funding of *basic and applied research* as well as for the financial *support* of *higher education institutions*. Since 2005, the State Secretariat for Education and Research (*Staatssekretariat für Bildung und Forschung*, SER) is responsible for both policy fields. The unit that preceded the SER, the Group for Science and Research (*Gruppe für Wissenschaft und Forschung*, GSR), was created at the beginning of the 1990s in order to better guide and coordinate higher education and research policy within the FDHA. The director of the GSR was appointed the status of state secretary in 1992, presiding over a small secretariat. With this new top-level official for education and research, federal interventions intensified in many respects (see below).

If we add to this 'dualism' of the federal machinery of government ('utilitarian divide') — both horizontally and vertically — the fragmented structure at the level of knowledge activities between three different types of higher education institutions under various authority regimes as well as the shared competencies for all matters of education between the federal government and cantons ('federal divide'), we end up with a rather complex governance matrix in the Swiss knowledge space that seems difficult to reconcile and to coordinate. Figure 2 displays the institutional setting of Switzerland's knowledge and innovation policy.

Existing capacities of coordination

Given the complex institutional matrix at the level of political governance, how can we assess the capacities of the political actors for mutual adjustment of their policies and coordinated action within and across policy fields?

We will assess the coordination capacities in Switzerland by analysing existing coordination mechanisms horizontally at different institutional layers and vertically across them.

Horizontal coordination at the cabinet level

In Switzerland's federal system, coordination of policies in knowledge and innovation faces two problematic features at the governmental or cabinet level: first, the structural disposition to achieve coordination across policy fields; second, the relationships between the federal and state levels. In this section we analyse structural limits of coordination as well as by what means coordination problems have been tackled at the level of the federal government. In the next section we analyse collaboration between the federal and cantonal levels.

What coordination needs regarding knowledge and innovation policy do we actually find at this level?

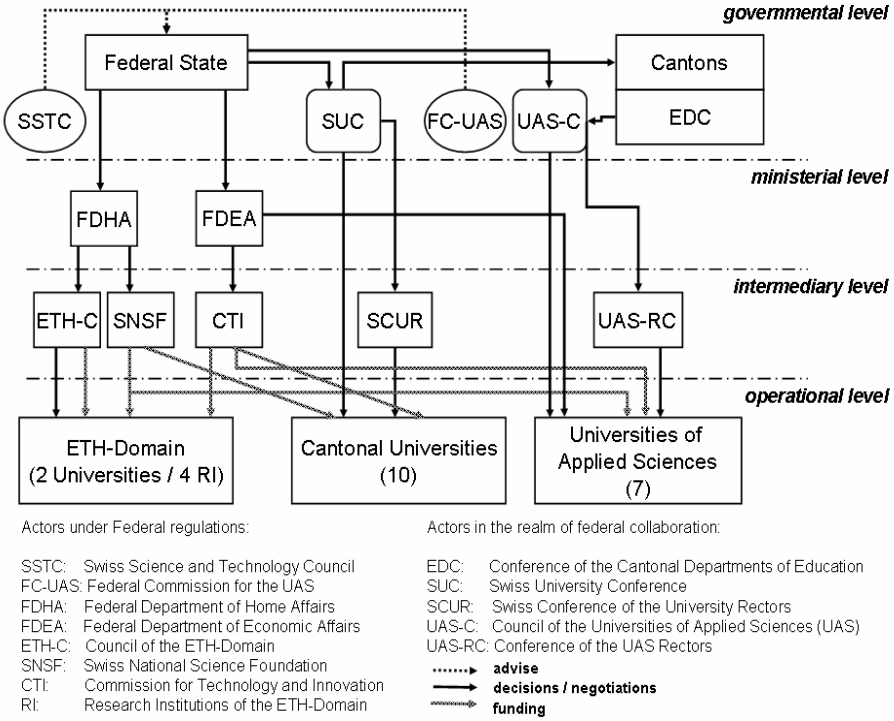

Figure 2. Institutions in Switzerland's knowledge and innovation policy at four levels

Since the Federal Research Act was enacted in 1984, policy-planning procedures have become legally defined and thus compulsory for most actors. These planning and coordination mechanisms concern both horizontal and vertical coordination and are meant to bring actors together in the preparation exercise of the *Message* of the federal government, a governmental White Paper outlining policies for a four-year period (formerly restricted to research policy). The planning procedures in the Research Act put a clear emphasis on vertical collaboration. Regarding horizontal coordination, we have to mention two procedures designed to define objectives and priorities at the top level of federal political decision-making.

First, until the early 1990s, it was the Science Council that proposed objectives regarding research policy for the quadrennial funding periods that provided the basis for the federal government to develop general guidelines in research policy. Freiburghaus *et al* (1991: 39–41) are sceptical about the results of these planning and coordination mechanisms, because of their rather unspecific objectives, which are not appropriate for focusing the activities of the actors in the field. The Science Council itself appraised these coordination mechanisms as much more effective than they might appear for external observers (SSC, 1989: 21). This early effort to establish policy objectives ceased to exist in the early 1990s. We will discuss the reasons for this development in a later section.

Second, since 1968 the Federal Council has employed a more general instrument of coordination. This instrument is called legislation planning (*Legislaturplanung*). In this legislation plan, the government sets guidelines at the start of every four-year legislative period for all policy domains under federal responsibility. The document essentially lists large legislative projects, usually already well prepared, for all federal departments, groups the issues in topical categories, and serves as an offer to the parliament to debate the matters in the up-coming legislative period. The significance of legislation planning is so far limited in the domain of knowledge and innovation policy, as the so-called Message itself is a more specific plan applicable to the same period. Still, the concomitant financial planning for the entire legislation has immediate effects on the knowledge and innovation domain.

This demonstrates that strategic coordination or coordinated policy planning on the governmental level is not very well developed in Switzerland and faces several obstacles. Three structural features might explain why coordination on the cabinet level remains particularly difficult.

First, Switzerland is an example of what the OECD has denominated an *autonomy system* at the level of government (OECD, 1987; see also the introduction to this special issue of *Science and Public Policy*): The federal government, i.e. the Federal Council, is an oversized cabinet, a four-party government. Every Federal Councillor is heading one of the seven departments in the federal administration, which explains why party ideology can have a strong influence in the development of departmental policies.

Second, there is no clear and binding coalition agreement that could help to overcome differences between party or departmental programmes. Although propositions of the departments are discussed in the Federal Council, the intention of the responsible minister will usually find approval. The so-called *co-signature* during the preparation of governmental decisions remains the principal coordination

mechanism at this level: departmental propositions are subject to the criticism put forward by other departments before a certain issue is discussed in the Federal Council.

Third, both the composition of the Federal Council and the attribution of departments to its members reflect a delicate equilibrium among a multitude of criteria (such as the share of power among the departments and budgets, party politics, the balanced representation of linguistic groups, gender, as well as important cantons). Hence, organisational reforms of ministries after an election with the aim of re-arranging policy domains, quite normal in other countries, are very difficult to accomplish in Switzerland.

Given all these restrictions, one understands that the federal government is seldom the place where encompassing policies — with regard neither to parties nor to policy fields — are developed. Usually this needs to be done on the departmental level. As a result, political programs, especially in domains concerning more than one department, will often be maintained for quite a long time.

Federal coordination — the interaction between the federal government and cantons

After the former corporatist structure was abandoned, the re-established Swiss University Conference (SUC) of 2001 brought about closer interaction between representatives of the federal government and the cantons, and changed the type of collaborative patterns. Government members of both federal levels became the principal players to assume the task of *strategic decision-making* in a more closely connected higher education policy between the federal government and the cantons. The main issue of the policy is to structure the division of labour and collaboration in Switzerland's university landscape. Problems occurred because the SUC's competences are restricted to cantonal universities. This was in part related to the establishment of the polytechnics as a new tertiary education actor — attached to a different governance regime (see Figure 2).

This duplication of governance mechanisms in the field of higher education entailed many difficulties. When new curricula following the Bologna treaty were introduced in cantonal universities and polytechnics, coordination needs became more and more obvious. In addition, the mutual dependency of the two higher education fields — general and vocational education — has led to a process of organisational concentration in most cantonal administrations while authority remained dispersed at the federal government level. Therefore, representatives of cantonal governments today have to approach two federal departments for balanced funding or sensible solutions for higher education as a whole (e.g. regarding accreditation, quality assessment, etc.). This situation resulted in a major reform project that is still under way (see below).

The political will to split the responsibilities for education, research, and innovation into two departments does not mean that eventual problems of coordination linked to this dual structure were not recognised

Horizontal coordination at the departmental level

As we mentioned, a central coordination problem in Switzerland concerns the interaction between the Departments of Home Affairs and of Economic Affairs. On this level we are interested in the degree to which the 'dualism' between the more economically oriented and science-oriented policy domains can be bridged. The political will to split the responsibilities for education, research, and innovation into two departments does not mean that eventual problems of coordination linked to this dual structure were not recognised. Two institutional devices were introduced to prevent such problems.

The first attempt to bring the visions of the two ministries together has been the decision that henceforth the *Message* should be presented together by both departments. It was meant to become a strategy of the federal government for the whole knowledge policy area. To this end it was decided to establish *ad hoc* working groups in which specific topics were discussed between representatives of both departments. These working groups then draft the respective chapters of the Message. This preliminary version becomes subject to the co-signature procedure, involving other federal offices and departments. This approach was also applied in order to negotiate the budget in the four knowledge policy fields. In case the committees were not able to resolve disputes, decisions were shifted to the two Federal Councillors in charge of the FDHA and the FDEA. They were also entitled to settle the final budget proposal before the entire government voted on it.

There is no doubt that the introduction of the common Message was a first step toward more coherent policies in these sectors. Government officials were quite positive when we asked them about the importance of the common Message; they especially underlined the progress with regard to the previous situation, the significance of common goals, and comprehensive financial planning for all sector policies. In fact, one should not underestimate the impact of the first governmental Message in 1998 regarding the promotion of education, research, and technology, as it introduced not only a new form in

which to present these issues to the parliament but also a new 'political era'.

A new state secretary for science and research prepared the first common Message shortly after he took office. Hence, he was able to frame the development of the respective policy fields according to his vision, which was to create a vast network of Swiss universities in which division of labour and competition takes place in parallel (Kleiber, 1999).

The SUC became the central organ for the implementation of this policy.

In this respect we have to point to another important aspect: one should not neglect the *temporal dimension* in the Swiss context. State secretaries have so far held their office longer than only one legislative period and therefore have been able to influence the content of several Messages in a row. Of course, this allows the follow-up of initiated strategies for a long time, which is not possible in most countries facing restrictions of more short-term political responsibilities.

Yet, in the often harsh political reality, the struggle for resources and differences in worldviews and strategies between the two departments have continued to prevail and so far have undermined the emergence of a common and encompassing view on knowledge and innovation policy (Braun *et al*, 2007). The Message is, as a member of parliament put it, still rather a 'bazaar of domain interests' than a sound attempt to develop a coherent strategy. The strategies for professional education and for the more technologically oriented approach to foster innovation within the FDEA are not compatible with the FDHA's focus on universities as a source of cultural and societal developments, on basic science, and on a broad notion of innovation.

An actual 'whole-government perspective' for the entire knowledge and innovation domain cannot be identified in any of the three Messages published since. In this, Switzerland confirms doubts that are brought forward in the literature about 'sociological institutionalism' (March and Olsen, 1989) and about 'purposive actor models' (Peters, 1992; see also the introduction to this special issue of *Science and Public Policy*) as well as in the studies made by the 'Technopolis-group' concerning policy coordination capabilities in political systems (Boekholt *et al*, 2002; Arnold and Boekholt, 2003) and the OECD (2005a,b,c).

The second institutional device to promote horizontal coordination at the departmental level was the creation of an inter-ministerial coordination committee between the two departments in 1998, the Steering Committee Education, Research, Innovation. The set-up of this committee has certainly contributed to the establishment of more regular contacts and an exchange of information between the two departments. According to senior government officials, the committee has had some effects on coordination of governmental research activities and is also involved in the preparation of legislation planning. There is no evidence, however, that these discussions have led to a reconciliation of the fundamental political strategies (Farago, 2006). Only overt problems of efficiency (duplication of efforts, for example) in specific research areas could be addressed in this way (Farago, 2006). Thus, the Steering Committee Education, Research, Technology was not able to establish a substantive coordination role, for example, in the development of higher education or promotion of a closer integration of research and technology policy.

It is apparently very difficult to achieve a higher degree of coordination at the level of the departments. Their coordination capacity has clear limitations, given that the major concern of the interactions between the two ministries is the distribution of federal expenditures among the policy fields.

Horizontal coordination at the intermediary level

Can we consider the agency level as an alternative to coordination capacities at the department level in Switzerland? A shifting of coordination tasks to this level is used by various governments, as the OECD reports (2005a). In the introduction to this special issue of *Science and Public Policy*, doubts were raised about the feasibility of such a step. What can Switzerland add to our understanding in this respect?

The obvious limitation of such a delegation is, of course, that agencies are not competent in all knowledge policy sectors and that, therefore, one cannot expect 'all-sector coordination'. Having this restriction in mind, it seems to us that the capacity of agencies to link different policy sectors depends largely on the delegated authority of funding agencies regarding policy formulation and implementation. The departments do not actually delegate substantive (political) tasks to the agencies (Braun *et al*, 2007). We will discuss this aspect in more detail in the sections concerning vertical coordination.

As in other countries, Switzerland uses such agencies in research, the SNSF, and technology funding, the CTI. The dualism at the ministerial level is replicated at the level of agencies, and coordination efforts have so far not been very well developed. At the level of the agencies, no institutionalised forum for collaboration or exchange of information exists, as we find it at the level of the departments in the Steering Committee Education, Research, Technology. At this point, we have to mention that the Federal Research Act foresees an obligation of self-coordination within and between the so-called research organs (especially SNSF, scientific academies, ETH-Council). The CTI, however, does not belong to the 'research organs' in the sense of the Research Act. In fact, only after an evaluation of the SNSF and the CTI (SSTC, 2002), which pointed to the lack of coordination between both agencies, has the need to overcome this problem been widely acknowledged. The evaluation re-

port even raised the issue of a possible fusion of both agencies, but they refused such a step and the departments did not push in this direction.

We currently observe repeated efforts by policy-makers to urge both agencies to intensify their contacts (e.g. Message, 2008–2011). Until now, only one common research programme has been established, and there is an observer of the CTI in the applied-oriented funding division of the SNSF. However, the Federal Council recently proposed including the legal framework of the CTI in the Federal Research Act (EVD/BBT 2007) and, thus, harmonising the legal foundations of research and innovation promotion. Whether or not such efforts are suitable for establishing closer links and strengthening coordination between the two agencies remains to be seen.

The weak role of 'strategic intelligence'

The only strategic advisory body in the knowledge and innovation domain is the Swiss Science and Technology Council (SSTC). Like the SUC, it was also reorganised after 1998 to become an advisory body comprising only scientists and scientific R&D experts after it had been a more 'corporatist' body that included stakeholders, politicians, and government officials. The principal functions of the SSTC are to advise the Federal Council in all questions concerning science, research, and, since 1998, technology policies and to elaborate proposals for national approaches to innovation and knowledge policy fields.

Thus, its strategic position is quite prominent, at least *de jure*. The SSTC has, however, today *de facto* only minor influence on political decisions, although it is formally involved in policy planning procedures (Federal Research Act, Art. 5a, Art. 22). The frequently published reports by the SSTC receive some public attention, but they remain disconnected from the political decision-making process (Benninghoff and Leresche, 2003: 105–111). The SSTC has, in particular, no substantial influence during the composition of the quadrennial policy and funding propositions of the Federal Council, even though it has developed comprehensive recommendations concerning the principal issues of the most recent Message[5] (SSTC, 2006).

One reason for the weakening of the SSTC has very likely to do with the function of a state secretary; these senior government officials have so far had their own ambitions in strategy development and wanted to take the lead in matters of higher education and research policy. The same holds for the OPET that had the ambition to develop its own political identity. In addition, the SUC was also supposed to develop a more strategic view, although its authority is restricted to higher education. Thus, the SSTC has currently strong competitors in the field of strategy development, most of them closer to decision-makers than it can ever become.

Moreover, Switzerland lacks a tradition of establishing advisory bodies at the level of departments. Such bodies seem to have had a positive effect on strategy development in some Scandinavian countries (see the introduction to this special issue of *Science and Public Policy*). Most of the scientific knowledge that the Swiss administration needs is delivered in the form of mandates given to individual scientists.

Finally, Switzerland has not institutionalised any foresight procedures as most other countries have, which can again be explained by the reluctant stance in development of proactive policies. A similar problem concerns the reflexive capacity of the administration; the 'learning cycle' is not thoroughly set up in Switzerland's knowledge and innovation policy, as even administrative actors criticise the absence of systems- or meta-evaluations of entire policy fields (Hotz-Hart *et al*, 2006; SBF/CEST, 2007).

This general lack of strategic knowledge and reflexive capacity in the political decision-making process renders the formulation of coherent policies — at least in the present actor configuration — very unlikely. The SSTC does not have an explicit institutional assignment as a 'guardian' over the whole portfolio of policy instruments in higher education, research, and innovation, nor would another body assume the function of a coordinating 'clearing-house'.

Vertical relationships: political planning and modes of governance

The discussion of coordination mechanisms in Switzerland's knowledge and innovation policy so far has revealed the importance of the close interaction between the two departments and 'their' agencies. We would like to present, first, general patterns describing vertical coordination and, second, the current modes that govern the vertical relationships.

We already mentioned the procedure defining political planning set down in the Federal Research Act that exists beside the obligation of self-coordination for the 'research organs'. The procedure concerning policy planning describes these vertical interactions, and its main direction is bottom-up. The SNSF, the science academies, and the ETH-Council are obliged to submit their 'pluri-annual' policy planning once every four years to the federal government. These plans include statements as to whether funding schemes or programmes will be maintained or new instruments will be introduced as well as requests for budgets. On the basis of these documents, submitted approximately a year before the Message is finalised, the FDHA formulates its research policy — as a part of the Message.

We find similar patterns of bottom-up requests to a superior authority in the realm of higher education, where the conference of the university rectors submits its strategic plans regarding division of labour and collaboration between the universities to the

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SUC. This 'logic of application' in the multi-level context of the traditional fields of research and higher education policy might be considered as one of the most important coordination patterns. Hence, vertically oriented coordination mechanisms or collaborative schemes are, without doubt, more strongly institutionalised in Switzerland than horizontal coordination.

This bottom-up 'logic of application' has especially shaped the relationships between the FDHA and its subordinates. In the domains of the FDEA, vertical relationships are more top-down and hierarchical. The OPET, established in the course of the last ministerial reform in 1996, needed to establish its own policies and domain competence, often resulting in an effort for a clear demarcation of its domain in comparison with the related domains in the FDHA. The CTI was, in due consequence, bound into a more hierarchical governance mode, and seen as a 'sub-unit' of the OPET. The different governance modes are most striking with regard to the higher education sector. Here the polytechnics have been tightly steered by the OPET, whereas similar influence of the state secretariat on the universities would not have been acceptable.

As mentioned, the governance mode characterising the relationship between the FDHA and the SNSF and ETH-Council is rather 'at arm's length'. This means that the autonomy of these intermediary agencies concerning both the choice of topics and instruments on the one hand and their implementation on the other hand is respected in principal. With the arrival of new public management strategies in Swiss administration, the governance of the two agencies has nevertheless become more performance-oriented: in both cases, a performance contract with the state secretariat is concluded (Benninghoff and Leresche, 2003; Braun and Leresche, 2007). In the performance contract the general outlines of the 'pluri-annual' plans are concretised in clear objectives and tasks, with respective performance indications. These contracts result from negotiations between the agencies and the Department of Home Affairs; they are not unilaterally decreed. With regard to the SNSF, the federal government is more involved in policy formulation than it is in the case of the ETH-Council: The government has urged the SNSF to introduce targeted research and has the possibility of the final selection, on the basis of SNSF propositions, of targeted research programmes.

In considering the different governance modes as well as the different visions of innovation and the different clientele, one understands that the agencies have difficulties in developing a shared understanding and common initiatives in innovation policy among themselves.

Recent developments and future reforms

The analysis so far does not give rise to overt optimism with regard to policy coordination capacities in Switzerland. However, we will point to three attempts to enhance coordination capacities in order to illustrate that Switzerland is not subject to immobilism concerning the coordination of the knowledge space:

1. The debate on reorganising the responsibilities for knowledge and innovation policy at the departmental level.
2. The planned reform of higher education governance.
3. The contents and possible effects of ongoing revision of the Federal Research Act.

Before we turn to these recent developments, we should mention that, in principle, there is no disagreement among political actors that the knowledge and innovation policy sectors are functionally interdependent. However, the organisation that was chosen in 1996 did not correspond to this line of thought, so it is understandable that the pressure to change the *status quo* is still there and that it is even rising.

Because the expectation of an encompassing knowledge and innovation policy has not yet been fulfilled, the parliament currently connects the claim for more coordination in education, research, and innovation again with organisational reforms, in particular with the desire to merge the respective federal responsibilities in a single department or even in a 'superministry' competent only in knowledge and innovation policy. The concentration of the respective responsibilities in one federal department would avoid lengthy negotiations between departments — that's at least the hope of many adherents of this claim (Braun *et al*, 2007). The major reason for this claim is the fact that cantonal authorities have merged their administrative units responsible for cantonal universities and polytechnics, since their introduction and homogenous administrative structure are perceived to favour coordination; thus, it is actually *not* an altered policy conception or a clear political will to establish a more interactive or systematic approach in the knowledge and innovation field that motivates the actors to claim this reform (Braun *et al*, 2007). In other words, reorganisations in the administration are often seen as the most appropriate means to achieve more coherent policies.

This brings us to the second point, the planned reform of tertiary or higher education governance. In fact, this reform induced even more pressure on the current organisation of the federal departments: the cantons want only one interlocutor of the federal government within the planned common decision-making body (an enlarged SUC), to overcome obvious failures in coordinating diverging points of view of the existing dual representation at the federal level.

This pressure has sufficed again to put organisational reform high on the agenda of the federal government. In order to establish a single governance structure in the higher education sector, combining all university types (cantonal universities, polytechnics, ETH-domain), a new Federal Act regarding promotion and coordination of all universities has recently been proposed. The new law also explicitly recognises the linkage between higher education, federal research, and innovation policies and demands a 'whole-government perspective'. Furthermore, collaboration between a new advisory board, the Swiss Science and Innovation Council (SSIC), and the enlarged SUC is designed to become somewhat stronger by a plan to invite the president of the SSIC to participate in the discussions of the politicians (see SBF/BBT, 2006). These are indicators of the willingness to think in terms of the overall knowledge space. This university promotion and coordination act should be put into effect in 2012.

Finally, a third point is the revision of the Federal Research Act. The objective of this revision is to include the CTI as an innovation agency in the research act. In doing so, the former legal basis for the CTI, intended to deal with economic crisis prevention, will be abandoned. It is proposed that the CTI autonomously decide on research and dvelopment grants-in-aid. Hence, such decisions would no longer be decisions formally taken by the responsible Federal Department of Economic Affairs. Yet, it is foreseen that the CTI will be competent only in individual grants and will be able to establish some targeted programmes, but would still be bound to federal strategies. All other domains currently attached to the CTI, especially the assistance of SMEs (fostering knowledge-driven companies, access of SMEs to international programmes) and knowledge and technology transfer programmes (consortia of polytechnics), would remain in the competence of the administration, i.e. within the OPET (BBT, 2007).

Regarding coordination between SNSF and CTI, the latter will be explicitly mandated to coordinate its activities with the former (the SNSF has already received this mandate to coordinate with the CTI with the approval of the current Message, 2008–2011). These explicit mandates concern only SNSF and CTI; the other 'research organs' are still considered under the general obligation of 'self-coordination' between these institutions.

We observed that a large majority of decision-makers endorse further efforts to strengthen the bonds between the four core sectors of the knowledge space in Switzerland

Conclusion

How can we sum up the analysis of coordination capacities in Switzerland, and what are the actual chances of bridging the two major coordination gaps in Switzerland — the 'utilitarian' and the 'federal divide'?

We observed that a large majority of decision-makers endorse further efforts to strengthen the bonds between the four core sectors of the knowledge space in Switzerland.

This intention to increase the degree of interaction in the knowledge space obviously entails 'cognitive' and structural adaptations — first and foremost, the formulation of encompassing policies and, in the long run, possibly also a structural integration of currently separated policy fields — and, thus, the dissolution of the 'utilitarian divide'. What measures and developments have we identified in this respect?

One can interpret the reform strategy of the state secretary in the FDHA since 1998 as a pragmatic long-term vision of overcoming the fragmentation of one important part of the knowledge space: its focus was directed to higher education institutions as the centrepieces of the education and research sector. The 'policy of structuring' in the FDHA is meant to strengthen the universities, by organising their division of labour and collaboration, and is to a certain extent also implemented in the realm of research policy (targeted research programmes of the SNSF). With this strategy, it was far more important to influence the level of knowledge activities in the higher education system than to immediately attack the *utilitarian divide* on the governance level.

Unfortunately, Switzerland is suffering from rather unfavourable structures for the development of a more encompassing knowledge and innovation policy, which can be summarised as follows. First, a reorganisation of the federal administrative structure was conducted in 1996 and in the aftermath of the reform the 'utilitarian divide' was even more cultivated at departmental and agency levels; in addition, the emphasis on distributive questions at the departmental level makes a more substantive policy coordination rather unlikely. Second, the creation of the Office of Professional Education and Technology (OPET) and of the polytechnics undermined a coherent development of tertiary education, since the

OPET took great pains to demarcate its sphere of influence by focussing on the utilitarian side of knowledge space. Third, Switzerland faces a structural problem in exerting political leadership at the level of the cabinet and a lack of strategic intelligence and reflexive capacities at all institutional levels.

Nevertheless, structural reforms and adaptations in the orientation of knowledge and innovation policies have been conducted and are still in progress. The first reform of higher education governance in 1998 (which reformed the SUC) as well as the proposal of the new Federal Act on Promotion and Coordination of the Universities demonstrate a willingness to adapt higher education institutions to global challenges by organisational reforms and to think of higher education as one 'integrated system' that needs close interaction with research and innovation policies in the future. This does not yet make an encompassing knowledge and innovation policy but it expresses a willingness to think in relational terms and to organise linkages in the knowledge space.

What this new reform of higher education governance actually aims to do is to take care of the *federal divide*. Such an objective has needed the consent of the cantons; therefore, most of the reform energy during the last ten years has been invested in it. In the future, the new law should allow the federal government and the cantons to steer and plan the entire higher education system in close collaboration, on the basis of common agreed-upon principles, and also to link higher education to research and innovation policy as well. We are sceptical, however, about the possible success of this endeavour. The cooperation among federal actors, as well as a still subdued role of strategic intelligence in the construction, might make it difficult to use this governance structure to effectively establish more cohesion in policy-making; the demand to find large majorities and the veto-power of the federal government bear the risk of non-decisions or of a policy of the lowest common denominator (Scharpf, 1988).

Yet, the reform of higher education governance has an interesting repercussion for the problem of the institutionalised 'utilitarian divide': because the cantons wish that only one Federal Department would be competent in the realm of higher education, the separation of universities and polytechnics in the federal administration is strongly challenged. It is foreseeable that Switzerland will merge the responsibilities, at least for the higher education sector, in one department. If a 'superministry', responsible for the four policy sectors in the knowledge space, were to be created, this could mean a true step towards more encompassing policies in the knowledge space. However, the *core problem* — to overcome 'utilitarian divide' thinking — remains: there are no political leaders who seem able and willing to develop an encompassing vision of the knowledge space and to build bridges between the non-utilitarian and the utilitarian sectors. If this situation persists, any organisational fusion of the four policy sectors may lead only to the continuing existence of the 'utilitarian divide' on the level of subunits within the 'superministry'.

The revision of the Federal Research Act, i.e. the inclusion of the innovation promotion agency CTI in this law, seems in fact quite promising in several respects; first, regarding political coordination at the level of the intermediary agencies and, second, because the CTI gains more autonomy; third, because this revision will be the end of the legal separation between (basic) research and (technological) innovation and, thus, it attaches the CTI closer to the 'non-utilitarian' side of the knowledge space and, finally, because of the reduction of laws that claim authority in the knowledge space. Hence, it is most likely that a future adaptation of this law — it will certainly be necessary when the new higher education governance is implemented — would lead to a clearer and more coherent definition of the horizontal interactions between basic research and technological innovation. Such a revision would be a most favourable opportunity to adapt the procedures for policy planning in research and innovation to the strategic planning mechanisms in the realm of higher education.

In short: while Switzerland has taken measures to strengthen linkages at the level of knowledge activities and to enhance federal collaboration, it has been less successful in overcoming the 'utilitarian divide' within the federal machinery of government. Policy adaptations are observable in all sectors of the knowledge space, and even across them, but structural reforms have so far been limited to the institutional realm of higher education policy. Adaptations of policies and structure occur in a 'pragmatic' and incremental way in Switzerland; big political visions or overarching political strategies are more difficult to establish.

Notes

1. Defined as the 'core' of national innovation systems, i.e. all activities directly linked to the production, diffusion, and application of knowledge (see the introduction to this special issue of *Science and Public Policy*).
2. For the institutionalisation and development of science policy in Switzerland, see Benninghoff and Leresche (2003), Fleury and Joye (2002), Freiburghaus *et al* (1991), Lepori (2007); regarding vocational education, the universities of applied sciences, and innovation policy, see Good (2005), Hotz-Hart *et al* (2005, 2006), Pätzmann (2005).
3. This 'linear' thinking also became visible when, in 1995, the polytechnics were created as a new actor group of higher education institutions. The rationale for their formation was clearly to have organisations that could translate fundamental knowledge into application — something that was missing in the research landscape of Switzerland. The image was the 'value chain (of innovation)' in a linear but not interactive way.
4. Federal departments in Switzerland are quite large and heterogeneous in composition, as the seven seats in government correspond to the number of departments that are available. In order to cope with the limited number of departments, their size, and functional fragmentation, Switzerland uses so-called Federal offices (*Bundesämter*). These are functionally organised subunits responsible for one domain or a small number of

related policy fields within a department. It is possible to combine several offices into one group (*Gruppe*) and to introduce the position of a State secretary (as a kind of junior minister) subordinate to the responsible minister of the department. This happens especially if a State secretary has to represent a large administrative domain in international negotiations.

5. In the Message for the period 2008–2011, not even an entire page is devoted to a very succinct summary of these recommendations (Message, 2008–2011: 1254). Moreover we find no explicit linkage in this Message between the recommendations of the SSTC and actual policy objectives – the SSTC evidently lacks the authority to make itself heard more prominently among representatives in government and parliament.

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