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The making of research funding in Austria: transition politics and institutional development, 1945–2005

Michael Stampfer, Rupert Pichler and Reinhold Hofer

In many cases, the long-term development patterns of research policy still remain blurred. However, historical insights may lead to a better understanding of what makes research funding work. A perspective of 60 years on the situation in Austria exemplifies a system run by a broad set of stakeholders. Consensus among those stakeholders is necessary for the implementation of new elements. Once agreed upon, such elements remain stable for a long time as any change requires a new consensus. Thus individual stakeholders tend to add bypass solutions, while existing principal–agent relationships develop lock-ins. The system needs sufficient pressure to be built up by those factors in order to trigger substantial change.

DESPITE THE INCREASING INTEREST in research policy, little is known about its long-term historical developments. This is unfortunate as historical insights may lead to a better understanding of the structures and patterns that make research policy work. The merits of shifting attention to a long-term perspective have been pointed out by Lepori *et al*. (2007). While path dependency is a commonly used theoretical concept to integrate history into socio-economic analysis, there is also ample empirical evidence in support of that assumption (Grupp *et al*., 2002; 2004). A strong case for historical analysis in general, and in our case of the developments in Austria since 1945, can therefore be made.[1] This 60-year perspective, which places historical development in an appropriate conceptual framework, can also serve as an instrument for comparing policy developments within smaller countries. In this context, Austria has been a late mover, with modest beginnings and long transition periods. Today Austria has a fairly good international position, but history shows the long, dire path of limited resources and entrenched governance structures with highly specific features.

The present paper is based on our book (Pichler *et al*., 2007) which draws extensively on source material from archives and other public records. Archival sources include: the files of the Ministry for Education (BMU) and the Ministry for Science (BMWF) kept at the Austrian State Archives and available up to 1979, the Parliament's Archives, the Archives of the Austrian Academy of Sciences, and the Bruno Kreisky Foundation. The 1980s and 1990s are adequately covered by official publications, journal papers and book chapters.

Research questions

The historical perspective yields two basic insights: firstly, considering that the key institutions were only established in the late 1960s, efforts to build research funding organisations (RFOs) in Austria

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started surprisingly early, immediately after the Second World War. Secondly, achievement came late and was followed by a long period of parallel action and principal–agent power play. Pushing the issues raised by Lepori *et al*. (2007) further, we shall focus in this paper on two questions:

- What induces a policy system and its actors to create new institutional patterns?
- Once set up, what keeps such an institutional framework stable and path-dependent, and which factors eventually trigger change?

As a result, the Austrian case study may be of general interest: post-war Austria was a transition country with a huge public sector and research was among its lesser problems. Yet it managed, albeit over a very long time period, to catch up with the leading European countries, accompanied by an increasing political willingness to spend public money (see Figure 1).

Analytical framework

We approach the research questions by defining the key term of this paper, an RFO, as a non-ministerial institutional structure in the public domain designed to manage the allocation of government funds to research projects, individuals and/or institutions. Its governance structures enjoy considerable autonomy from the government and integrate those addressed (e.g. the scientific community) into its decision-making. RFOs are central to the understanding of research policies as their introduction is obviously a prerequisite for the successful implementation of policy measures.[2] Accordingly, we rely heavily on the concept of the 'cooperative state' which reflects the specific requirements that are inherent in research as a policy field (see Braun, 1997).

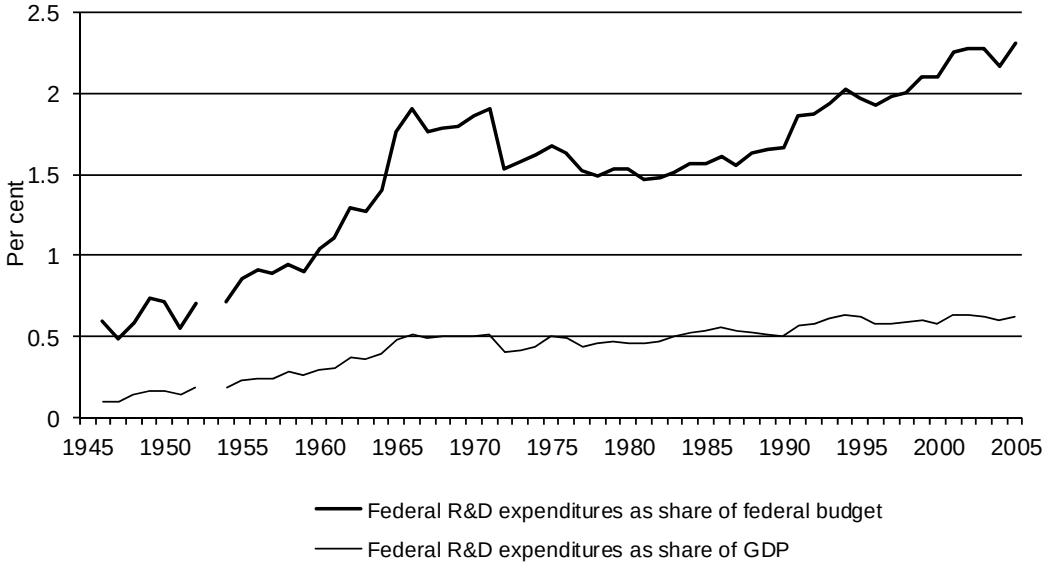

Figure 1. Share of federal R&D expenditures of budget and GDP, 1946–2005 in percent
Source: Federal budgets, Statistik Austria, own compilations (federal R&D expenditures 1946–1967 include total funds for universities, while subsequent figures accord with Frascati definition)

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These specificities have been addressed by the principal–agent approach (see Braun and Guston (2003) and for a case study van der Meulen (2003)). The principal–agent model presumes that one actor (the principal) within a system delegates tasks to another (the agent) who can carry out that specific task better. Such a 'relationship of delegation' is a particular (though not unique) feature of the implementation of research policies as:

> … the political system … needs the co-operation of scientists to overcome the implicit lack of knowledge or, in other terms, the 'information asymmetry' inherent in functional differentiation. (Braun, 2003: 310)

However, this entails a feedback loop from the agent to the principal where in fact the principal becomes dependent on the agent's information. Therefore, this balance:

> …is more likely to be stable … when both need the other. (Pollitt *et al*., 2005: 23)

In that sense, RFOs are agencies. The concept of agencification became popular as a part of the new public management (NPM) toolbox. However, this may also be misleading because according to the NPM logic, agencies are primarily meant to increase the efficiency and effectiveness of state intervention by separating the regulatory tasks from operational tasks (Christensen and Laegreid, 2006; Talbot, 2004). Yet most RFOs were established long before NPM was coined as a concept. Beyond NPM fashion and its neglect of the historical context there is also a long tradition of 'third sector bodies which were originally voluntaristically created to pursue the goals of their membership, but which subsequently became responsible for the delivery of certain public services' (Pollitt *et al*., 2005: 9). In Austria and Germany (Döhler, 2007; Kostal, 1995), for example, sickness funds, chambers of commerce and the like follow that pattern, so that was the model that was to hand when RFOs were first discussed.

When applying a principal–agent model it must also be taken into account that principals and agents do not shape their room for manoeuvre alone as they move through the 'knowledge space' which 'is formed by those sectors that are directly involved in the production, diffusion, and application of knowledge' (Braun, 2008a: 228). Instead, they partly depend on the stakeholders of the respective sectors whose interests they serve or are subject to. In Austria this framework is usually referred to as a 'social partnership' (Tálos, 2008). Table 1 shows the most relevant stakeholders in Austria and their long-term agendas.

Once established, the RFOs themselves are also stakeholders defending their realm. In order to categorise the function of RFOs within research policy we refer to existing typologies. Braun's functional approach (Braun, 2003) differentiates between the modes of delegation: delegation-by-trust versus delegation-by-contract, where the first predominated up to the late 1960s and was then increasingly replaced by the latter. Skoie (2000) and Slipersaeter *et al*. (2007) differentiate according to whether the initiative for funding priorities originates in science or in politics. Combining these approaches we can summarise two basic categories of RFOs in order to analyse the developments:

- The council, which manages its funds with considerable autonomy and is run by members of the communities that it addresses.
- The agency, which provides the government with efficient administrative structures, expertise and managerial capacities. It manages its funds on behalf of the government.[3]

The following six sections of this paper chronologically describe the development of research policy governance and the setting up of RFOs. They move from: (i), the first surprisingly modern attempts in the late 1940s; via (ii) two decades of deadlock and 'no policy'; to (iii) the creation of two highly autonomous RFOs in the 1960s. This period was followed by: (iv) more than 15 years of parallel lines between the two RFOs (the Industrial Research Fund (FFF) and the Science Fund (FWF)); and a third

Table 1. Stakeholders of research policy and their respective interests in RFOs

Stakeholders	Function of interest in RFOs
General politics	Seizure of new spheres of influence while disposing of detailed management tasks
Ministries (e.g. Ministry of Science)	Extending operational scope; renouncing strong RFO governance by establishing parallel internal/external structures
Universities	More money and comprehensive claims, capturing science RFO as exclusive realm
Social partners (e.g. Chambers of Commerce or Labour)	Extending social partnership, mainly to industrial RFO, claiming it as associated domain

parallel world of the Ministry of Science which was created in 1970. That was a stable setting that started to change: (v) in the late 1980s with the advent of technology policy, more ministries and agencies and with a quest for integrated policy-making. The disequilibrium grew with Austria's accession to the EU and related new policy instruments in the second half of the 1990s. Finally, (vi) this led to a stronger agencification of the industrial RFO, with the FFF becoming part of a larger organisational set-up. FWF remained autonomous but underwent changes in governance.

A window of opportunity: 1945–1949

It has to be noted that Austria was not able to develop an institutional basis for research funding in the interwar period before it became a part of Nazi Germany. Interestingly, efforts began almost immediately after the Second World War. The first initiative was launched by a small group of *émigré* scientists upon their return to Austria. The physical and intellectual devastation of the Austrian universities called for action (Grandner *et al*., 2005). One result was a declaration that called for the creation of a Research Council, which was soon followed by a parliamentary resolution (*Nationalrat*, minutes of 17 December 1948).

The challenges of the process that followed must not be underestimated because at that time nobody in the Austrian bureaucracy had a proven concept, let alone experience, of how to set up an RFO in legal terms. Nonetheless, what happened already reflected the principles inherent in research policy: an expert committee constituted itself in November 1948 with the task of drafting a law. Members of that committee represented universities, research institutes, ministries, and the Chambers of Commerce, Agriculture, and Labour. By acknowledging that approach, the Government had accepted that it could not solve the problem by itself (Oberkofler and Rabofsky, 1989: 49–51).

What followed over the next year was a sometimes cumbersome process of negotiation (Pichler *et al*., 2007: 72–96) during which the crucial issues (money, scope, autonomy, governance, and instruments) were sorted out, thus already outlining the major trajectories of future discussions and solutions. These issues were the focal points in relation to which the interests of the stakeholders were positioned. As a result, lasting solutions were found but at the same time problem areas emerged where the contradicting interests of different actors became permanent sources of trouble. With the Government bill titled 'On the erection of the Austrian Research Council' of 31 May 1949 (*BMU*, 34.796-III/9/49) it became clear on which elements of a principal–agent relationship consensus could be reached. That said, we examine how the key issues outlined above were dealt with by the stakeholders involved.

Money – the Government's commitment in budgetary terms – proved to be the most intractable problem. In the end the bill did not provide for a stable budgetary environment. This was largely owing to the Treasury's intervention, which aimed at avoiding any lasting financial commitment, and also dismissed the option of an earmarked tax (*BMU*, 20.110-III/9/49).

The intended *scope* exceeded mere research funding and comprised advice to the Government on research policy matters. Funding was to include a broad range of research, from industrial to fundamental research, but that was not without quarrels between the Ministries of Education and Trade, which resulted in parallel legislative proposals. While the Ministry of Education tried to satisfy the universities, the Ministry of Trade went along with the Chamber of Commerce. Of course, this also reflected their different competences (*BMU*, 7.783-III/9/49).

Autonomy was a trickier point as it was essential for making a principal–agent relationship work. Thus the Research Council had to be endowed with autonomous decision-making power. However, existing institutional models could hardly serve as a blueprint so that eventually the Research Council would have been a tailor-made entity, specifically created for its purpose by legislation (*BMU*, 18.045-III/9/49).

On *governance* issues it remained unchallenged that representatives of the stakeholders of research policy should be in the driving seat of the council. Notwithstanding the legal form chosen, the approach was similar to that used for self-governing bodies. Debates developed about whether or not the universities should delegate a majority of the representatives to the board of trustees. The final 1949 proposal defined a two-thirds–one-third split of the vote between academic institutions on the one hand and the Chambers of Commerce, Agriculture and Labour on the other (*BMU*, 9.843-III/9/49).

The crucial question about the design of the *instruments* was whether funding should go primarily to individual projects within the universities, or whether the council should fund separate research institutes. At that time, the universities and the Academy of Sciences wielded considerable power. Therefore, a realistic chance to regain scientific competence could possibly be seen only by adding a new institutional input. The first draft of the 1949 bill tried to capture both angles, yet slightly favoured non-university/Academy institutions (*BMU*, 7.783-III/9/49). In the end, however, all specifications on the instruments were removed from the bill and left for the Research Council itself to decide upon at a later stage.

We see that by mid-1949 almost all the relevant issues had been discussed by the stakeholders. However, the proposal failed as it was never passed to Parliament. Shortly after its adoption by the Council of Ministers that parliament was terminated by

general elections after which the bill was not relaunched. It seems that a number of conflicts persisted that made the eventual realisation of the project unlikely. Below the surface, the compromises on scope and instruments were weak, although the approaches to autonomy and governance stood on comparatively secure ground. The scope and instruments were challenged by two groups of actors whose commitment was indispensable: the industry stakeholders (by way of the Ministry of Trade) wanted more influence on the Council's mission; universities rejected the idea of not defining themselves as the primary recipients of funding.

As a result, lacking also money, the initial momentum was lost. However, the concept of 1949 was very much state-of-the-art as a council-type model. Even if it did not become reality it had lasting merits in determining many principles of RFO institutionalisation previously unknown to the Austrian political system.

How not to fund research: 1949–1966

In the years that followed, it became evident that the weaknesses of the fragile 1949 compromise were deeply rooted in opposing ideologies and partisan politics within the 'grand coalition' government of the People's Party (Christian Democrats, OeVP) and the Social Democrats (SPOe, then called Socialists).

There were two obvious facts: the few politicians who kept on pursuing the Research Council project were Social Democrats.[4] But the research community which tried to capture what was left from the 1949 achievement was predominantly conservative, thus their interests shaped the approach of the People's Party. After 1949 the Social Democrats rapidly launched parliamentary interpellations on the fate of the Research Council, and the Academy of Sciences, the Rectors' Conference and the Notring (emergency ring) of scientific associations proposed new plans in 1950 and 1952 suggesting that the Swiss or German models be adopted. OeVP followed that line of action and in 1954 the Education Minister presented a project for a research foundation, which obviously imitated the Swiss National Science Foundation (SNF). The SPOe was taken by surprise. Lacking its consent, the foundation was doomed (Pichler *et al*., 2007: 97–105).

Yet bipartisan disagreement alone is not the point here. The SPOe still called for legislative action and presented a new bill immediately after the failure of the foundation project. Examining this bill we see that diverging views on scope and instruments, feeding back also to governance, were matters of partisan affiliation. The SPOe wanted a broad scope, including planning competencies, reaching out to applied research; a broad set of instruments, focussing on its own institutes; and that the board of trustees should have had a majority of delegates from the Government and even Parliament, whereas only the general assembly was to have a majority of academics (*Parliament*, Nationalrat VII.GP 123/A).

Opposed to that, the OeVP voiced the preferences of the universities according to which the Research Council should merely be a source of additional money for them. This situation of permanent dissent even began to be absurd, as from 1955 onwards the Federal budget included 5–7 million Schilling (about €0.5 million) overall each year for research funding which could not be spent because there was no legal and institutional basis on which to spend it. Faced with such folly, Members of Parliament, both Social Democrats and Christian Democrats, began to negotiate a compromise on their own initiative. Since they had little weight in the actual dealings of government it was simply another futile effort (*Parliament*, Nationalrat VIII.GP 10/A).

However, this constellation allowed things to begin to move, although in a direction where the capabilities of the system to arrange its actors in a stable principal–agent relationship deteriorated rather than improved. By then, contradictary OeVP and SPOe logics had been established: the first wanted to put a distinct group of beneficiaries (the universities) in the agent's driving seat; the latter wanted a strong political influence on the agent whose own room for manoeuvre would thus have been limited.

Instead of making another attempt to reconcile the two approaches, OeVP now actively supported the foundation of an association by the Rectors' Conference and the Academy of Sciences in 1960. This association was meant to provide the legal entity for an RFO and was called the Austrian Research Council. Once put in place and having safeguarded the interests of the academic stakeholders, the assumption went, its opponents would surrender for the sake of spending the money that was already available (Pichler *et al*., 2007: 123–131).

This was not going to be the case, though, as the SPOe developed a twofold strategy: on the one hand, it blocked the release of the above-mentioned money to the Research Council; it continued to launch legislative proposals in Parliament. On the other hand, the SPOe supported the foundation of an association: the Ludwig Boltzmann-Gesellschaft (LBG) was created in 1960. Now the SPOe was only prepared to make the money available to the Research Council if the LBG also obtained a fair share of it (Pichler *et al*., 2007: 131–133).

Beyond that, a look at the bylaws of both organisations reveals that each reflected the priorities of its godfather: while the Research Council limited itself to project funding and restricted its constituency to the universities and the Academy of Sciences, the LBG's scope also included the foundation of institutes, based on a much broader membership, which reached beyond the academic sector (*Academy*, 231/60; 84.003-4/60-BMI). The following wheeling and dealing resulted in a compromise: the Research Council obtained 78–88% of the money, simply because the LBG was not capable of generating a

Research funding had finally started in Austria, although on a painfully small scale. In 1961, the Swiss National Science Foundation had 20 times more money available

sufficient number of projects (Pichler *et al.*, 2007: 134–143).

Finally, research funding in Austria had started, yet on a painfully small scale: in 1961, the SNF in Switzerland had 20 times more money available (Fleury and Joye, 2002). Even so, some key principles of research funding were first codified, primarily by the Research Council, however embryonic its stage of development. By and large, this first Austrian RFO adopted the international mainstream of 'delegation-by-trust' (Braun, 2003, 1997).

In parallel, efforts to reach a legislative solution continued. In 1963, the coalition parties asked university professors they trusted to draft a proposal in order to break up the lock-in (*Academy*, 2430/63-Forschungsrat). But soon, this project was also jeopardised. The essential weakness of the 1963 draft bill was its academic focus, the result only being a slightly adapted version of the Research Council's bylaws. This was a challenge not the only for SPOe, since pressure from industry had been building up on the OeVP. In 1960, supported by the Chamber of Commerce, the Ministry of Trade had launched a proposal for an industrial RFO while the Social Democratic Vice-Chancellery had indeed begun to spend small amounts on research projects within the nationalised industry by way of an advisory committee (Pichler *et al*., 2007: 144–148).

It had also become obvious that there were internal tensions, the People's Party's stance on research funding was not universally accepted within that party. SPOe took another chance by presenting a new version of their earlier proposals in 1964 (*Parliament*, Nationalrat X.GP 103/A) which only deepened the Government's and the stakeholders' inability to establish a working principal–agent setting (Pichler *et al*., 2007: 152–160). This also kept budget appropriations (and also actual amounts spent) at a very low level in the early days of research funding (see Figure 2).

The beginnings of organised research (funding) policy: emerging agents, absent principal, 1966–1970

After nearly 20 years of inertia, political deadlock and insufficient bypass solutions the mid-1960s can be seen as a first phase of change towards organised research funding and policy processes. It should be noted that, at this stage Austria had a 0.3% R&D ratio of R&D to gross domestic product; with an industrial structure depending on low-tech sectors and imitation strategies and a small and inefficient university sector (OECD, 1963; Goldmann, 1990; Tichy, 2009: 259). Among the reasons leading to the installation of RFOs and the allocation of more money, economic and political triggers were of equal importance. In the economic realm firms had to approach more sophisticated and R&D-based strategies to remain competitive and presumably (as data for that period are lacking) a steady rise of business enterprise R&D began in the 1960s. In

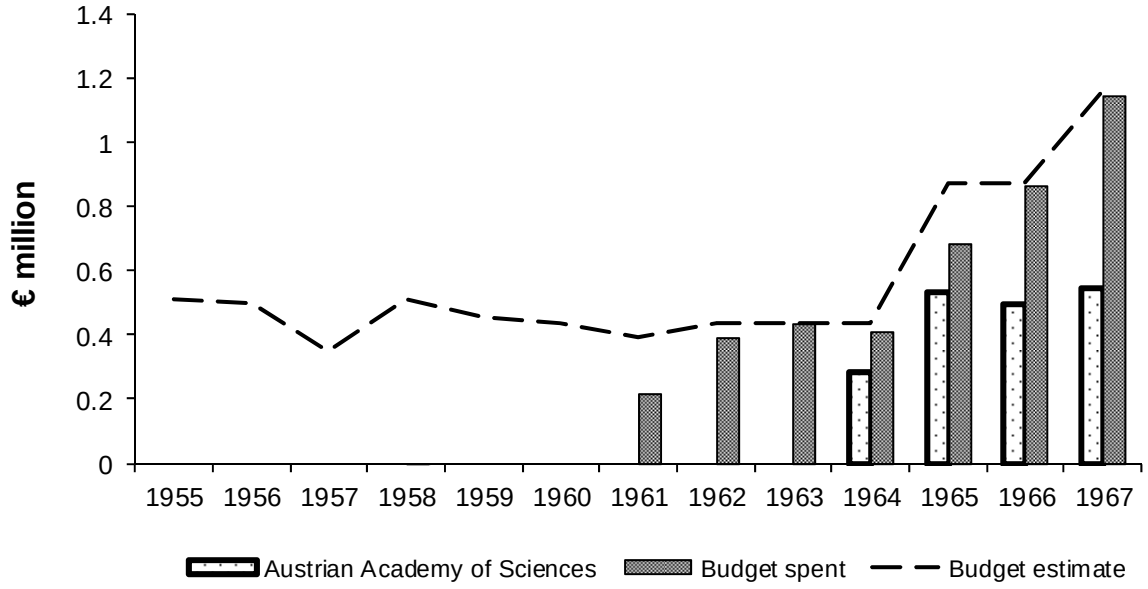


Figure 2. Early federal research spending 1955–1967: Academy of Sciences, planned and spent funding budgets in € million
Source: Budget estimates, 1955–1969

politics 30 years of bipartisan 'grand coalition' governments came to an end with the OeVP as the sole party in power with an overall parliamentary majority in the period 1966–1970. As a result the pressure to create appropriate R&D funding mechanisms increased and the inter-party deadlocks described above fell away.

Regarding the basic concept and the structure of the RFO(s) to be installed this new political situation favoured the following properties championed by OeVP, their ally, the Chamber of Commerce as well as the academic establishment: as instruments the creation of a pure project funding structure with only few policy and advisory elements at RFO level and without its own research institutes; further a high degree of autonomy in managing funds and selecting projects without government interference plus strong self-governance; and finally, the design of two parallel RFOs, one for industry and one for academia. The first two properties had always been the Conservatives' position[5] while the third one came as the result of a power play within OeVP: if the academics (insisting on a 'scientific research only' RFO for their needs) were to obtain their funding organisation, so was industry for applied research, which in the Austrian context of that time meant mostly development and engineering (OECD, 1963).

Eventually, in 1967 the FWF and FFF were set up as a part of the moderate modernisation efforts of the new government (Sandgruber, 1995: 486). In the parliamentary process, at the end of the day the SPOe voted for the Research Promotion Law (Forschungsförderungsgesetz, *BGBl.* Nr. 377/1967) which more or less reflected the conservative positions. Lawmaking prompted an extensive debate on the role of research and research policy mainly for the competitiveness of Austria as a catching-up country. For the first time in 20 years an extensive self-positioning took place and was followed by policy action. In the course of the debates in the parliamentary committee, members from all three parties (OeVP, SPOe and Freedom Party) emphasised the weak technological position of Austria regarding research investments, policy mechanisms, technology balance of payments including patents or the extensive brain drain. The reasons for this development were mostly attributed to the dire post-Second World War catching-up process which focussed on the cheap manufacturing of simple industrial goods based on imported technological know-how. Other structural factors remained outside this debate (Stampfer, 2003).

The result of this legislative process was the FWF and FFF as two stable council-type RFOs with a clear mission/scope each along the stations of the linear innovation model, with little money available but a high degree of autonomy. Within both funds the autonomy granted by the law materialised in the form of self-governing structures with board members coming from each constituency, namely universities (FWF) and Chamber of Commerce (FFF), and with a high degree of independence in all operational matters, including a rather strict refusal to define funding priorities.

There was no autonomy in terms of sources of funding. Both the FWF and FFF always depended more or less on the readiness of the Federal Government to pay: there were neither large endowments nor special purpose tax incomes. The only exception to this dependency was the ability of FFF to retain and re-use the repayments of the loan component in the funding it awarded (Pichler *et al*., 2007: 179–185; Kostal, 1995: 26–31).

Formally both organisations were, as already designed in 1949, legal entities *sui generis*. Therefore, in its basic rules and functions, the FWF bore many resemblances to research councils or similar science funding organisations around the world; and examples like the German Deutsche Forschungsgemeinschaft or the SNF had been actively studied. The largest difference, however, had been the lower funding budgets available, in absolute as well as relative terms.

In contrast, the FFF could be seen as a specifically Austrian solution. At least no major Western European country then had a 'single industrial R&D project funding only' RFO in place (Braun, 1997; Fier, 2002). This structure, governed by the truly powerful Chamber of Commerce and other actors of the Austrian post-war 'social partnership', mirrored the industrial structure and its needs for smaller short-term, mostly developmental projects as stepping stones into a more explicit research portfolio. At that time Austrian industry had a very high share of imported/adopted foreign technology (Hutschenreiter and Kaniovski, 1999).

Both RFOs had a common roof, known as the Forschungsrat (Research Council). Contrary to requests e.g. from OECD (OECD, 1971) or SPOe, this 'council' was only a small clearing instrument run by the FWF and FFF, without its own structures and with no explicit advisory or policy agenda. Over the following decades, the Forschungsrat served well to shield the funds whenever a real advisory council or a stronger top-down approach was under discussion: in such cases the 'it is here already' strategy proved successful and the Forschungsrat never displayed integrative impacts on FFF and FWF (Pichler *et al*., 2007: 187, 207, 249, 289).[6]

Therefore, we can speak of a system of parallel lines where the immediate needs of each constituency were satisfied, albeit with few interactions, with a constant gap between these organisations, and without meaningful steering or other governance from the ministerial level.

The return of politics into the arena and the principal's parallel universe: 1970–1985

In 1970, for the first time Austria got its own Ministry for Science and Research (BMWF), see

Biegelbauer (2005a). This followed a change of government from OeVP to the Social Democrats. One main effect on research policy was that the parallel lines of FWF and FFF became three, because the SPOe had changed their old research policy beliefs when coming into power in 1970. Neither a strong policy-making research council (scope), nor policy steering of RFOs (governance) remained on their agenda. Instead, the FWF and FFF remained untouched and autonomous, with growing but still modest budgets. This change was due to pragmatic rather than ideological reasons, including the small size of the new ministry with limited options available, the upholding of the post-Second World War social partnership consensus by SPOe, the preoccupation of BMWF with university reform and, a few years later, money was scarce due to the two oil crises (Pichler *et al*., 2007: 198–201; Rathkolb, 2005: 135, 193; Sandgruber, 1995: 487).

For a long time the BMWF did not engage in institution-building and budget growth remained moderate. As a main line of action the ministry developed an in-house funding instrument, the 'commissioned research' (Auftragsforschung). Essentially it had nothing to do with procurement or strategic investments but served as an internal RFO. This funding source was also directed at smaller individual research projects, essentially offering them as grants. However, the three properties that set 'commissioned research'[7] apart from FWF and FFF were:

- sloppy and opaque review, selection and other quality control procedures with (peer) review being less strict than in either FWF or FFF;
- the absence of clear target groups plus potential collusion of interests between ministry and constituency; and
- a rather self-assured top-down policy (Tichy, 2009: 261; Pichler *et al*., 2007: 233–243).

The third point resulted in targeted funding areas like environmental, energy or geological research and formed the nucleus of integrated top-down programmes launched much later. This development is reflected by the respective budgets, with BMWF's 'commissioned research' rising steeply (see Figure 3).

This compartmentalisation led to a continued series of small games along the parallel lines in Austrian research policy-making that lasted until at least the mid-1980s. The FFF, FWF and BMWF acted similarly, funding small projects by single actors. Many other, larger projects remained undone. Only very few public research organisations or institutes were created and integrated policy initiatives remained declarations of intent in numerous governmental research strategies (Tichy, 2009: 261). The public university sector, as the main provider of scientific output, though strengthened by higher budgets and growing in size, only re-emerged step-by-step with some areas of high-quality output and impact, often triggered by the FWF (OECD, 1988: 40).

Paradoxically the small games proved vital, at least in the field of scientific research. FWF funding allowed the more ambitious, mostly university-based researchers (as individuals) to write grant applications, raise a more ambitious next generation and to establish internationally competitive research groups. Over time this led to larger FWF interventions taking the form of mainly bottom-up

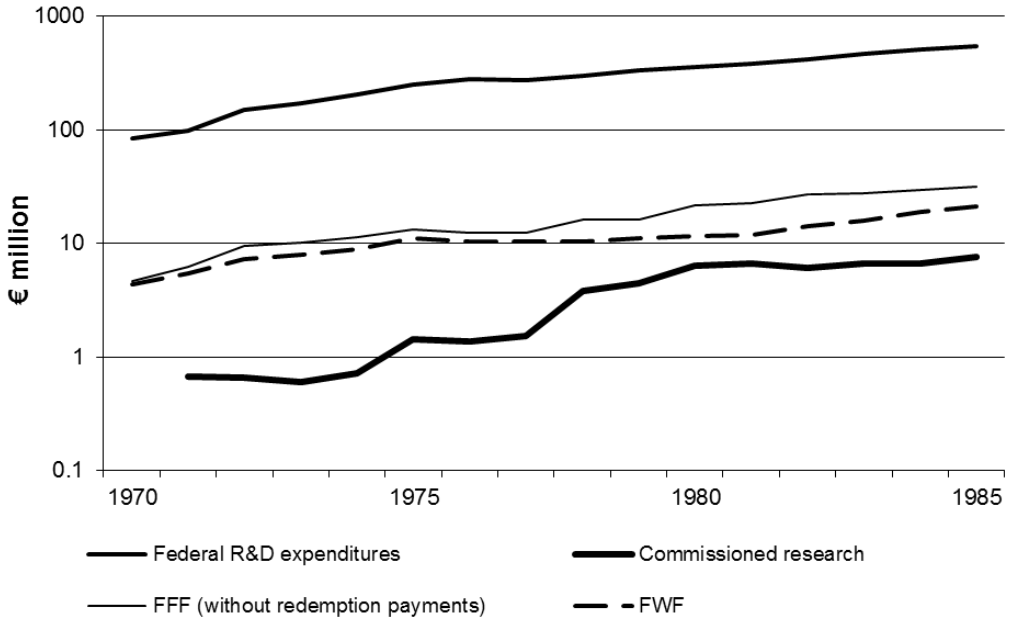


Figure 3. Development of federal R&D expenditures, BMWF-commissioned research, FFF, and FWF, 1970–1985 in € million

Source: Federal budgets, supplement T (federal R&D expenditures are represented in accordance with Frascati definitions)

cluster-, network- and scholarship-oriented funding instruments.

Over the decades, supported by a remarkable 'foreign peers only' policy from the 1980s onwards, the FWF with its limited budgets proved to be the decisive driver for greater quality in Austrian scientific research (Aichner, 2010: 50–56; Pichler *et al*., 2007: 183, 227–228, also based on annual FWF reports), mostly financing the salaries of talented young people. This happened against the backdrop of university structures with strong baronies, weak managements, detailed ministerial steering and an absence of performance incentives for scientists.

A similar but less distinct picture can be drawn for the FFF and its impact on industrial research. As in science, we can only combine different pieces of evidence in the absence of serious impact evaluations until the FWF/FFF evaluation in 2004. The comprehensive, incremental, short-term, project-by-project funding policy came as a mix of grants, loans and guarantees, covering around 30% of the direct project costs. This certainly helped smaller Austrian firms to climb the 'innovation staircase' (Aiginger and Tichy, 1984). However, the suspicion that market and other external forces formed much stronger drivers than the subsidies, was nourished by the FFF itself (Pichler *et al*., 2007: 223–227, based on annual FFF reports). Firstly, by proposing exceptionally crude 'funding levers' as impact measures, where one funding unit would levy ten units of internal R&D in the firm funded and furthermore a hundredfold turnover. Secondly, this claim was accompanied by the persistent argument as to why government should give the FFF more money. This arguement was based on the observation that intramural R&D spending in the private sector grew much faster than the FFF budgets, thus more money was requested to maintain a kind of natural subsidy equivalent. Using this reversed impact argument, the FFF did not receive all it wanted, but the organisation and its patrons remained successful.

Apart from project funding, research policy in the 1970s and 1980s concentrated on a number of research strategies and on the link between research-related and societal goals (OECD, 1971, 1988). While the two RFOs were always – sometimes co-operative, sometimes obstructive – participants in these strategy procedures, their involvement remained highly cautious as regards broader policy ambitions. The FFF adhered strictly to the bottom-up principle while, in the 1970s, the FWF experimented with some thematic focussing.[8] However, such priorities were derived from existing thematic strengths in the Austrian academic landscape rather than from top-down government decrees (Aichner, 2010: 40). This soft approach became even more bottom-up in the 1980s as the FWF switched to making grants to larger networks (Spezialforschungsbereiche (SFB)) no matter which field they came from. The BMWF and other ministries with their department-specific commissioned research came forward with numerous thematic top-down priorities during the 1970s and 1980s. The variety of motives for this set-up ranged from researcher populations feeling being left out by the FWF and FFF to missions from other policy fields like environmental protection or work life conditions. However, the gap between strategies on paper and their actual realisation was only partly closed. This was due to the instruments available, the lack of funds and the unavailability of FWF and FFF for such schemes.

While we find high hopes in the first half of the 1970s, the following decade was characterised by slow speed and Austria remained in the lower middle ranks of research performers in Europe, spending around 1% of its GDP on R&D. *Small games* and *parallel lines* found a complement in a third phenomenon, the *consensus trap*. Even small changes within the research policy arena had to be approved by all the actors, even those like FWF and FFF, which pursued and defended their own approach and defined themselves as fully autonomous councils.[9] Thus many initiatives, even those in the exclusive realm of the BMWF, became endless procedures with the lowest common denominator being the foreseeable result. The nadir of the consensus trap was a discussion lasting six years about how to create a Research Organisation Law (Forschungsorganisationsgesetz, *BGBl*. I Nr. 341/1981). The starting points included a stronger integration of both RFOs into the policy arena with more government power to run integrated priority policies (*BMWF*, 28.511/29-21/78). The law was finally passed, but nothing substantial had changed. The funds remained firmly in the hands of their constituencies and their claims fixed at different points in time. These repeated games were played by the same, small number of policy-makers from the ministry, the two RFOs and a number of organisations representing the performer's side (and not many new ones entered the field, either) (Pichler *et al*., 2007: 243–261).

Summing up, over the 1970s and the first half of the 1980s the autonomy remained untouched, the 'council' model was in place with ministry funding running in parallel.

The advent of technology policy: old agents under pressure, new agents on the doorstep: 1985–2000

Everywhere in the western world, the 1980s saw the rise of technology policy and notable attempts to replace linear models by more systemic views and policy approaches (Borrás, 2003). In Austria such change came from the fringes of the research policy arena and together with a shift in economic policy paradigms, from the so-called Austro-Keynesianism towards 'competitiveness' approaches with a touch more on

the neo-classical side. Privatising the state sector, though often under pressure, opening Austria's economy particularly towards the European Community (EC) and liberalising some markets were high on the agenda of the subsequent 'grand coalition' governments between the SPOe and OeVP (Lauber and Pesendorfer, 2006; Gottweis and Latzer, 2006).

The upcoming technology policy paradigm fitted well into this new competitiveness approach. It was brought into the research policy field first by experts from the two large social partners, the Chamber of Commerce and Chamber of Labour,[10] and was taken up by policy-makers in two ministries entering the arena with an innovation/technology agenda. The Ministry for Economic Affairs (BMwA) founded an innovation agency and introduced instruments like patent promotion or transfer centres. The Ministry for Public Economy and Transport (BMoeWV) had to deal with the modernisation of a huge public sector with public transport and telecommunications. So, from the mid-1980s onwards, BMWF was no longer alone at the government level as regards research policy-making. The two new entrants wanted a stake in a policy field that had become more attractive. However, the relevant ministerial actors remained rather sidelined and could not sufficiently link their instruments with the upcoming investment and liberalisation moves in transport, telecommunications or energy in their own ministries (Pichler *et al*., 2007: 283).

Things have evolved faster since the second half of the 1980s: more policy concepts,[11] more interplay between more actors, the appearance of regional players and finally, more funding schemes and organisations to support innovation, including equity or guarantee schemes. The buzz became louder and an ongoing discourse on this policy field was established (OECD, 1988), supported by non-university-based expert groups. The 1994–1996 technology policy concept established mission orientation and diffusion policies.

A first interweaving of the parallel lines occurred when the BMoeWV and BMWF, with the support of the Ministry of Finance, tried to set up an integrated funding programme for microelectronics and data processing (ME-IV). Promising to spend considerable sums, it addressed academia and industry, the clear goal being the improvement of the weak competitive position of the Austrian industrial sector in these fields[12] (Biegelbauer, 2005a; OECD, 1988).

ME-IV served as a first blueprint for a technology funding scheme with a broader scope. Others were scheduled to follow and a proper organisational form was needed. This new funding source came in 1987 as the Innovation and Technology Fund (ITF), endowed with money raised by privatising public utilities. ITF did not have its own secretariat, but had governance and coordinating structures which integrated most of the actors in the Austrian RTD policy arena. ITF was administered jointly by the FFF (on behalf of BMWF) and the ERP fund (the Austrian Marshall Plan organisation, on behalf of BMoeWV). Other ministries, the social partners and other actors formed a difficult arrangement of continuous bargaining within the ITF setting.

For about 15 years the ITF had many top-down funding programmes as instruments. It allowed a certain learning capacity as regards programme management/evaluation, partner consortia and thematic priority setting. On the other hand, in particular, the FFF remained remarkably untouched by these experiences and captured the new instrument. Responsible for promoting ITF in large parts of industry, the FFF successfully sold it as its own top-up money without programme strings attached. This was only one of the difficult points within the tension-ridden ITF. Parts of this fund's money were used for the Austrian space engagement programme, while for the rest too many ministries advocated too many small national programmes with huge missions and ambitious goals. Nevertheless, much policy learning occurred, much to the benefit of later phases and new approaches that would follow in the second half of the 1990s (Biegelbauer, 2005b). The successful capture of the ITF by the FFF deepened the phenomenon of the parallel lines as well as the habit of playing small games; FWF had remained outside. While the ministries, though engaged in turf wars against each other, were more open to policy learning (Bayer, 1995), the two established RFOs each stayed with its own business (Pichler *et al*., 2007: 296–299; 310–314). FFF could now increase its funding budgets considerably within the established framework. FWF also saw rising budgets, plus the introduction of new instruments. SFBs were accompanied by prestigious prizes for young and established researchers. For the FWF, this 'basic research only' strategy paid off and was in line with research councils in other countries (Aichner, 2010: 43).

For a long while the FFF was again successful in renouncing technology policy, top-down approaches and networking instruments. This success eventually became a problem as the ministries and 'their' technology policy paradigm became stronger over the 1990s, adding new segments of policy action which the FFF did not want to be part of.

The growing dominance of the ministries and their approach had a national and an international element. Nationally, the three ministries (BMWF, BMoeWV and BMwA) had built up considerable numbers of staff, employed standing expert advisory structures and started to create organisations to bypass the FFF and its perceived shortcomings. One notable example was TIG, an agency founded in the late 1990s to run ambitious schemes like the Kplus Competence Centre programme (Biegelbauer, 2007) aimed at closing the science–industry gap. With the Kplus, the FWF also entered technology policy, as it was entrusted with the international peer review of the scientific aspects of the proposals. The ERP fund was also employed but not the FFF. Finally, the ministries further professionalised their thematic top-down funding programmes.

The second (international) element was EC/EU accession. Long before the formal accession in 1995 Austria took part in numerous international collaboration programmes like EUREKA and COST and could link up with the first Framework Programmes (FPs) on a shared cost participation basis (Pichler, 1990). Starting with full participation the Austrian FP performance outgrew the financing share. All types of research performers had found an additional funding source, and internationalisation and larger consortia became normal.

These new properties also included participation in European top-down priority setting and a fully developed programme approach (Gottweis and Latzer, 2006: 722). In the complex settings of planning and managing FPs, national actors always had a considerable (though changing) role. These roles of promoting European policy and programmes at home, defining national priorities for negotiations and finally participating in all types of EU steering and supervisory groups were at the same time strongly rejected by FFF/FWF (Aichner, 2010: 43) and actively taken up by the ministries. The FFF had already declined to run the national EUREKA office while the ministries, together with the Chamber of Commerce, had installed a quickly growing liaison office known as BIT.

This EC/EU engagement of the ministries had a role in reversing the national power game. Accordingly, over time their active refusal to play any role in European RTD funding instruments isolated the FWF to some extent and the FFF to a greater extent. Ministerial actors went to Brussels, gained reputation and showcases for the national debate. Many of them could use their national base to influence Brussels agendas and FP initiatives which, in turn, helped to install new programmes and practices at home.[13] This constellation first bypassed the FFF, and then triggered integration into the Forschungsförderungsgesellschaft (FFG) which became a larger agency with a broader agenda.

The remake of principal–agent power plays: towards the mainstream at last, 2000–2005

By the turn of the century, research funding in Austria presented a very diverse picture. FWF and FFF were elements of stability, but since the 1970s many bypasses had needed to be developed around them. In particular, the FFF seemed unable or unwilling to adapt to changing needs. It was also closer to the issues of industrial competitiveness and technology development which often emphasise top-down policy approaches.

Once these bypasses had gradually started to outweigh the FFF's core business in terms of political attention and even money, its reluctance to change was increasingly difficult to maintain. Avoiding a number of faults of direct ministerial interventions, new national programmes and FP participation proved that top-down programming, multi-actor projects, competitive calls for proposals, science–industry cooperation could also turn into reality for Austria.

Overall, resulting from this constellation, two crucial challenges were commonly perceived: firstly, the lack of coherence in the funding system; and, secondly, the two funds' relationship to their principals as well as other RFOs. It was generally felt that the system could no longer cope with the needs it should serve and it had become obvious that:

> …most of the innovation in Austrian innovation funding system has taken place outside FFF. (Arnold, 2004: 57)

By the end of the 1990s, the call for a substantial reform of the funding system grew louder. In 2002, the Council for Research and Technology Development[14] suggested that both the FWF and the FFF be evaluated. In 2003 an international evaluation of the funds was commissioned and, almost in parallel, the Court of Auditors also conducted an examination.

The evaluation report, which was published in 2004, links its findings persuasively back to the historical context whose repercussions on the then-present structure explained much which otherwise seemed difficult to understand. Therefore, the report acknowledged the pivotal role of the 1967 design. However, that stakeholders and beneficiaries were put in full charge of running the funds:

> …proved to be a tragic flaw, because to a considerable extent it locked the funds into their 1967 roles. (Arnold, 2004: 102)

But the underlying:

> …kind of worries about political interference and bureaucratic meddling in detail of decisions … in Austria are largely absent in other countries. (Arnold, 2004: 108, for comparison see Braun, 1997)

Derived from this analysis the evaluation report recommended:

> …that more representatives of the taxpayers and not the beneficiaries have control. (Arnold, 2004: 59, on FFF)

Also FWF's representatives should be chosen:

> …by a system of elections or independent appointments, and members of the governing committee(s) should sit in a personal, not an institutional, capacity. (Arnold, 2004: 87)

As a result, the funds would:

> …be changed from quasi-autonomous bodies to agencies of the government [where] FFF

> should be merged into a broader innovation agency. (Arnold, 2004: 113)

Alongside the evaluation, efforts to change the legal basis of research funding substantially gained pace. There were two major goals: merging existing RFOs, and adopting governance structures in line with the international mainstream. On the first issue, the debate focussed on whether or not the FWF should be included in such a scheme. With contradicting advice from the Court of Auditors (in favour) and the evaluators (against) at hand, the government's proposal opted for the latter, not least because international examples were rare[15] and consent from the scientific community was impossible to achieve.

Otherwise, the government's research funding reform bill of 2004 (Forschungsförderungs-Strukturreformgesetz, enacted as *BGBl.* I Nr. 73/2004) proposed a merger of FFF, BIT, TIG and the space agency. While this was common sense, the most heatedly debated issue were the governance structures. The new agency which was to be formed (FFG) took the form of a state-owned limited company and could employ a broad range of instruments. Contrary to the FFF, however, the FFG's management is theoretically subject to the directive of the minister(s) in charge, being less autonomous. That caused considerable opposition among many stakeholders who feared undue political influence. Yet by 2004 the structure that was now chosen for the FFG had already been operated successfully by the FFG's predecessor (TIG), based on a more timely delegation-by-contract approach. Nonetheless, the government's steering capabilities were flawed by political compromise, as the FFG's principal is two ministries[16] rather than a single one, even without equivalent budgets. Therefore, these ministries are tempted to steer FFG through money allocations rather than the joint right of ownership, thus impairing the implicit goal to compensate for fragmentation at ministerial level by integration at agency level (Aiginger *et al*., 2009; Braun, 2008b: 298, judges the fusion of agencies as a mistake when multiple ministries remain in charge).

FWF's autonomy was not challenged as such. Still, the Government's interest to make it more responsive towards the policy system remained. This was achieved primarily through two major changes to its governance by the 2004 Act. Firstly, a new supervisory board was introduced, consisting one half each of Government nominees and the FWF's assembly of delegates, with an additional member to be chosen by them. The board's task is to decide on strategic and budgetary planning. Secondly, membership of the board of trustees is now based explicitly on expertise rather than institutional affiliation, as recommended in the evaluation. Again, this can be interpreted as an aftermath of the 1960s: back then the FWF had been set up as the universities' self-governing institution, thus also limiting its potential to influence the universities' agenda. But it is the taxpayers' and not the universities' money that FWF spends so that autonomy is justified by the Government's request to ensure scientific expertise and quality rather than by a fictional claim of the universities. Without jeopardizing its autonomy, FWF has now a stronger link to the policy level.

The significance of the changes since the mid-1990s becomes immediately obvious when the financial dimension is considered. Both the growth of funds as such and the impact of the new players in particular, were bound to trigger change (see Figure 4).

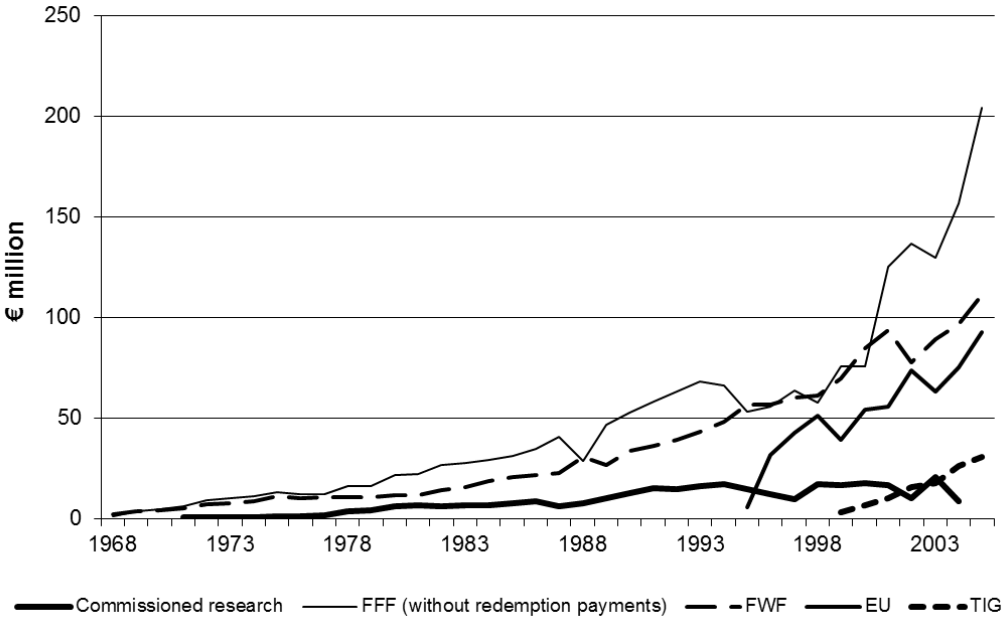


Figure 4. Developments of major public R&D funding sources: BMWF-commissioned research, FFF, FWF, EU, TIG
Sources: Federal budgets, Annual reports FFF, Annual reports FWF, Proviso, own compilation

Conclusions

RFOs in Austria were established late compared to other European countries. Founded in 1967, the FWF and FFF were overly focussed on a delegation-by-trust approach of governance, at a time when other countries had already begun to abandon that model. Because of the path-dependence creating capacity of the initial design (Lepori *et al*., 2007: 376) this mode of governance survived for a long time and co-existed alongside other stages of delegation modes that were later added to the system.[17] As a result, it took these parallel lines more than three decades to converge. Eventually, it was a mix of experiences at home and collective learning via Brussels that triggered change and brought agencification, in a more modern sense, to Austria (Gassler *et al*., 2008). Today, a high degree of autonomy applies only to the FWF, but is more closely linked to the political context. Outside basic research funding, agencification has now become the standard (with room left for improvement, see Aiginger *et al*., 2009) while direct ministerial funding has strongly decreased.

The Austrian case exemplifies a system where decisions are taken by a broad, yet exclusive set of stakeholders. Elements new to the system can only be implemented when consensus is reached among these stakeholders (c.f. Kritzinger and Pülzl, 2008). By the same token, however, once introduced such new elements remain stable over long periods of time as any change requires another consensus. In case individual stakeholders take proposals for change into the political arena and fail to obtain the others' consent it is likely that bypasses and small games emerge as solutions while existing principal–agent relationships have time to develop known deficiencies such as information asymmetry and agency capture. These combined factors can then build up sufficient pressure to induce substantial change to the system so that mere mutual adjustment can turn into concerted action (negative versus positive coordination, Braun, 2008a: 230). In the long run, however, these institutional changes do not seem to be associated with severe discontinuities of the overall development (see Figure 5). The fact that the system does not readily adapt to changing needs seems to also stabilise it. The relative institutional stability also becomes evident if it is presented diagrammatically (see Figure 6).

Notes

1. For a long-term historical comparison in Switzerland, see Benninghoff and Braun (2010).
2. As Braun and Guston (2003: 303) state:

   > Funding agencies were, since their origins, designed to work out and implement research policies, in preference to the usual public bureaucracy that lacked the necessary direct contacts with science.

   It may also be typical that substantial direct ministerial funding in Europe only survives within weak systems as in Italy (Lepori *et al*., 2007: 385).
3. Of course, other models exist and will be referred to in this paper, e.g. the in-house ministerial funding model.
4. The Minister for Education, whose responsibility it was, was always a Christian Democrat in the period 1945–1970.
5. In post-Second World War Austria the social partnership was exceptionally strong and therefore handing over of policy instruments to social partners was quite common. The OeVP had pursued the policy of low political interference in this field mainly because of the dominance of their elites in science and industry.
6. Examples include: a role mainly in reporting (p 187) from the onset; FFF, FWF and Forschungsrat together argued against a stronger role for the latter in the 1971 OECD review (p 207); or the Forschungsrat refusing a stronger role for itself as 'unnecessary' in 1976 (p 249); or lobbying against new 'competitor' ITF (p 289).
7. See Fier (2002) for the development in Germany.
8. These types of challenges to the FWF were not unique. See Lepori (2003; 2006) for information on the situation in Switzerland.
9. One can also add the strong Chambers of Commerce and Labour plus the segmented academic actors with their manifold interests (Pichler *et al*., 2007: 216–221).

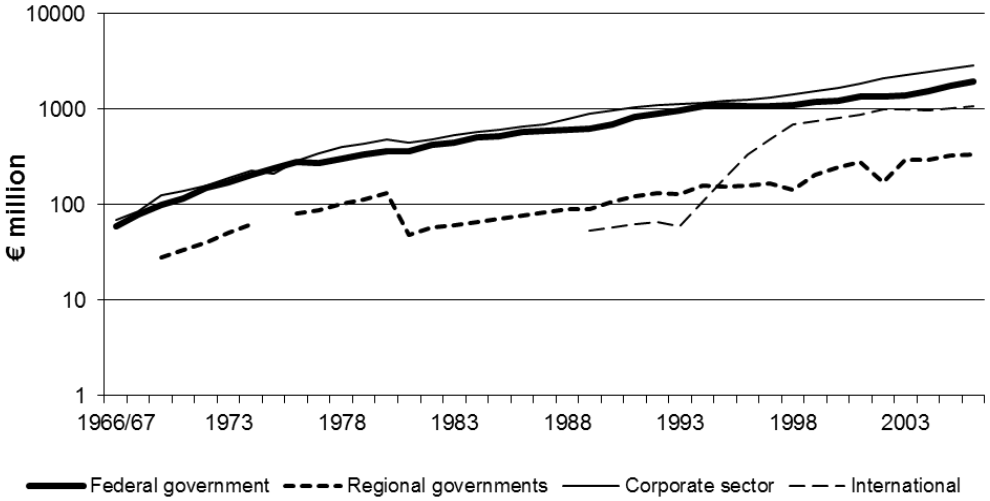
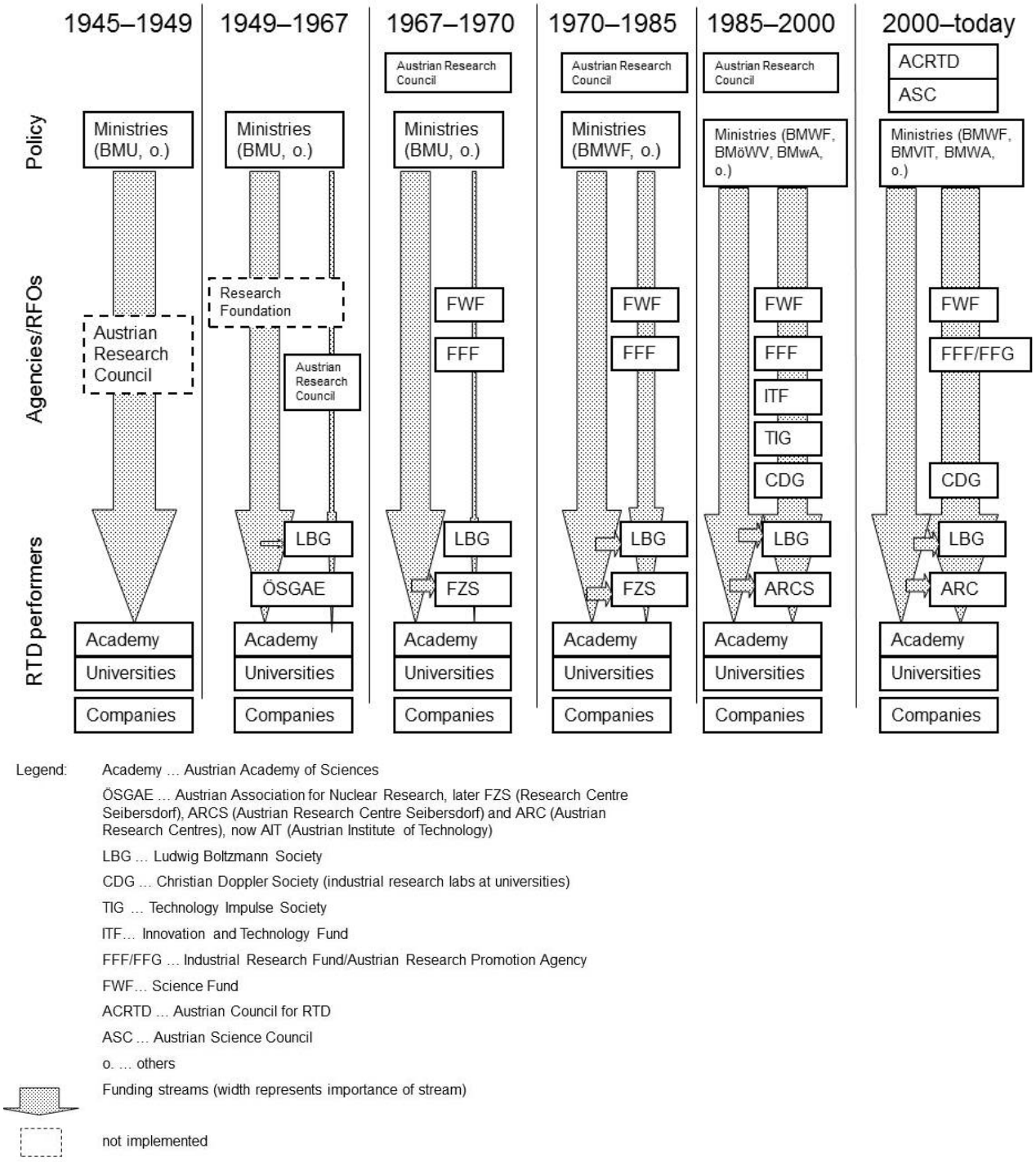


Figure 5. R&D expenditures 1967–2006, in € million
Source: Statistik Austria, own compilations



Legend:

Academy … Austrian Academy of Sciences

ÖSGAE … Austrian Association for Nuclear Research, later FZS (Research Centre Seibersdorf), ARCS (Austrian Research Centre Seibersdorf) and ARC (Austrian Research Centres), now AIT (Austrian Institute of Technology)

LBG … Ludwig Boltzmann Society

CDG … Christian Doppler Society (industrial research labs at universities)

TIG … Technology Impulse Society

ITF… Innovation and Technology Fund

FFF/FFG … Industrial Research Fund/Austrian Research Promotion Agency

FWF… Science Fund

ACRTD … Austrian Council for RTD

ASC … Austrian Science Council

o. … others

Funding streams (width represents importance of stream)

not implemented

Figure 6. Institutional developments in Austrian research funding, 1945 to the present

10. These experts tried to establish a modernisation path (Goldmann, 1990) based on evidence and examples from abroad, partly against their organisations' main policy approaches. For a long while the Chamber of Commerce and the Chamber of Labour and their respective political allies, the OeVP and SPOe, favoured traditional industrialisation and a moderate wage policy as instruments for growth. Therefore the more progressive experts from the social partners joined force with some ministerial actors who had originally been on the fringes of their respective organisations.
11. In 1983, 1989, 1991, 1994–1996, 1997, 1999, hardly any of them were then formally adopted by the Government or Parliament.
12. Note that the central industrial partner in the programme steering group was VOEST, the large state-owned steelmaker. This tells us something about the relative technological position of Austria not only at that time as trajectories normally tend to be long.
13. Before Austria's membership of the EU, the OECD took the role of an influential observer. More research is still needed to establish the detailed influence of EC admission on Austria's RTD policy settings.
14. This 'real' and comparatively strong advisory body to the government was newly introduced in 2000.
15. The example of Norway proved particularly influential, partly because the same evaluators were involved (Arnold *et al*., 2002).
16. The Ministries for Transport, Innovation and Technology, and for Economic Affairs.
17. It is a general pattern that can also be observed internationally, as was pointed out by Potì and Reale (2007: 419).

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