Government R&D funding: new approaches in the allocation policies for public and private beneficiaries

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ABSTRACT. The objective of this paper is to perform a first experiment of quantitative assessment on changes in allocation mechanisms and in their underlying delegation models, using the quantitative information and the descriptions of national funding systems produced in the PRIME project funding activity. Delegation has been explored through changes in instrument portfolios and in evaluation modes, as proofs of an evolution in research governance. Some common trends can be identified: the reinforcing of both priority setting and peer review processes. The general result of our analysis is that some change in delegation modes took place, but there is not a simple transition from one delegation regime to another, while a "contract" delegation model (the NPM reform) is not detectable through project funding analysis.

KEYWORDS: R/D funding, allocation policy, project funding, research governance, evaluation modes, delegation models

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INTRODUCTION

The aim of the paper is to give an empirical basis to the analysis of changes in the Government R&D funding allocation policy, using in a comparative way indicators on project funding[1]: we look at the evolution of R/D project funding along thirty years, since 70's to to-day's, in four countries, i.e. Italy, Switzerland, Austria and Norway. Countries have been chosen on the basis of data availability, but their institutional and historical variety allows us to get interesting results. The theoretical basis for analysing changes in the Government funding allocation is the distinction of different delegation modes between State and the scientific community over time (see D. Brown, 2003), including different instruments and changes in the R/D project selection and evaluation modes. The beneficiaries of R/D project funding are both private and public agents, but the theoretical frame we refer to has been developed in relation to the scientific environment and its transformations. The general assumption we tested is that in the long run the relevance of Government R/D project funding grows up in accordance with a change in the relation between Government and scientific institutions, from a trust based mode to "directed" funding. According to D. Brown this "directed" funding or incentive based delegation more recently (since 90's) evolved in two directions: a "nested delegation", i.e. the embedment of the incentive mode into a contract delegation between the State and the scientific institutions and/or a sort of delegation to networks, i.e. the support to the scientific community for self organising networks of cooperation with the user systems. Our empirical test, based on types of instruments and types of process of selection and evaluation of R/D projects, cannot fully control for the institutional change (the NMP reform), which should modify the authority relation between policy makers and scientific institutions, therefore we have to be more cautious in dealing with these last changes. We mainly refer to free grants and investigator initiated projects, "directed" or top-down programmes and projects, and R/D networks and we use the combination of types of instruments with the selection and evaluation procedures for understanding the Government allocation policy evolution. The result of our analysis shows that the trust-based mode, where external criteria (for priorities or performance) don't play a relevant role in the allocation process, didn't disappear, even if in some country it has been strongly reappraised. It characterises with a more or less large share the portfolio of public R/D project funding instruments and the selection/evaluation procedures. In countries where the scientific intermediary body has maintained its strength, such as Switzerland or Austria, the trust-based relations have kept an important role also within an on going change of the scientific institutional environment.

The organization of the paper is the following: the first paragraph deals with the presentation of the theoretical basis of the analysis of the evolution of the funding allocation policy. The second paragraph deals with the data and methodology. The third paragraph shows the main changes in the types of instruments used for the R&D funding allocation; the fourth paragraph develops the analysis of the R/D project evaluation processes by country; finally there is a discussion and conclusion.

1. THEORETICAL BACKGROUND

Funding policies evolution can be analysed on the basis of a conceptualisation, i.e. in terms of delegation modes, proposed for studying science policy and the implicit paradox faced by policy makers of matching two potentially conflicting issues: "to guarantee maximum welfare benefits, without violating the independence of scientists and their organization "(Braun, 2003)". According to Braun (Braun, 2006), in research policy the interactions between policy makers and scientific community can be analysed on the basis of two types of relationship: trust and delegation. Some commonalities can be detected between the two, namely:

- both are social structures, that derive from decisions under risk taken by policy makers;

[1] These indicators were developed by the authors and other partners for the ENIP project within the European PRIME network of excellence.

- both entail resources invested on the base of an hope and expectation about other actors' behaviour;
- both face uncertainty about the future and use some control mechanisms.

Some basic differences can be detected: delegation[2] is an authority relation, which use some type of contract for defining the discretion space, while trust is not enforceable by law and the risk is "incorporated into the decision of whether or not to engage in the action" (Braun, 2006).

Braun puts into evidence four options available to policy makers for reducing the risk of the research investment (adverse selection and moral hazard risk)[3] and finally for better integrating scientific world with the other worlds: to find a balance between conflicting interests, by creating consensus and interaction spaces (one example is the creation of new institutions, such as public-private networks), changing career patterns (reputation and career mechanisms), using intermediaries of trust (peer review, where scientific experts are chosen as adviser for the principal, and research institutions which settle procedural requirements for addressing the scientists' behaviour), and funding agencies, where an explicit delegation is settled out and where the higher is the uncertainty about the preferences, objectives and outcomes (like in basic research for instance) the higher is the autonomy given to the funding agency[4]. These different options have been introduced in different periods of time and sometimes the last ones co-exist with the older ones.

Science policy originally was a matter for the scientists and their institutions, which used an internal price or value signals based on peer review and publications, while State allocated funds to free projects (and granted funds to the research institutions) without external conditions.

Later on an allocation based on external price signals, given by priorities and specific research objectives, defined by the political system, joined the first mode. Control is still based on the peer review system, with some special conditions attached. This is, for instance, the case of a relevant bundle of scientific programmes in Italy (called "Finalised projects"). These were resources (programme funding) added to the pre-existing un-conditioned R/D funds. As Brown underlines this incentive mode was not strongly constraining and scientists were free of choosing under which kind of funding to work. Moreover, as underlined by a large literature, since the scientific career and the institutional environment were unchanged, working within research programmes could represent a cost for scientists in terms of time and outcome.

Since the half of '70s, but in some countries later, the presence of an "austerity period" modified the situation: the causes were first of all economic (oil crisis), but some policy makers used them strategically for re-orienting the scientific activities and other policy makers followed. It has been in fact a rather general political change[5]. The relation between State and scientific community was unchanged, but the undirected and unconditioned funds were reduced and the political price signals reinforced. As Brown points out, the costs for scientists increased and therefore the risk of moral hazard too.

90's are the period when institutional transformations, following the NPM[6] discourse,

[2] The relation between State and scientists can be seen as a relation of delegation when policy makers ask the agent of doing something that they cannot do by themselves for lack of capabilities and knowledge. The principal can hardly observe what the agent does, while the last one has interest to reduce its effort.

[3] The first is related to the choice of the scientists and the second to the possibility that scientists do their best for answering to the tasks delegated to them.

[4] The characteristics of delegation are determined by: a) the amount of discretion policy makers grant to funding agencies, b) the procedures of control they have (i.e. procedural requirements like ex-ante evaluation), c) how funding agencies position themselves between the principal and the agents, and the dynamics of this positioning.

[5] See the literature on "steady state", the constraints that characterized research policy. (Ziman, 1987; Cozzens, 1990).

[6] The New public management, the reform applied to the public administrations and civil services during the nineties in Europe, is based on a specific type of contract between Principal and agent: a relational contract, which structure the relation between the contracting parties. This is an agreement on the processes and procedures more than about specific actions and contents (Milgrom and Roberts, 1994).

are tried in almost all the European countries. In a few words, this reform points to give more autonomy and governance capacity to the scientific institutions to which scientists are subordinated (with a principal-agent relation), while policy makers invest in decision making in a very general sense; the steering on scientists is un-direct. Fixing priorities in research programmes is no more the leading way to steer scientists. These reform should allow scientific institutions to have a more strategic management of research priorities and introduce an ex-post evaluation (delegated or not to scientific institutions) and conditioned funds granted to scientific institutions. The implementation of the reform is still very jeopardised (see Bleiklie, Ferlie, Paradeise, Reale, forthcoming), and it leaves room to hybrid solutions.

At the same time there is a revision of the Principal-Agent relation, since, even if the State is still the main funding institution, there is a cut of public resources and a differentiation of sources of funding, which allow various scholars (Rip and van der Meulen 1996, Brown, 2003) to elaborate on a multi-principal situation. "State is more and more one actor among the others" (Brown, 2003, p. 15).

Finally a different from NPM rationale drives another institutional innovation, that of promoting network initiatives, where economic and social stakeholders are represented and a horizontal coordination between different (public and private) R/D performers is in place.

Trust and Delegation: type of relationships between Government and R/D fund beneficiaries.

DEFINITION OF TYPE OF DELEGATION
BLIND DELEGATION**:** Policy makers trust the scientific community. Scientists establish their own peer-review system of control. Scientific quality is accepted as a sufficient standard for using public money in research. Science is trusted to deliver in the medium and long term what society needs.
INCENTIVE DELEGATION: The incentive model comes near to the genuine Principal-Agent features: the principal (the policy maker) is attempting to formulate priorities that should serve as instruction to the agent in the execution of research. Scientists maintain relatively high independence in executing the instructions.
AUSTERITY: it identifies a period of public budget reduction, which had an impact on R/D project funding, producing many sectoral and institutional consequences. To differentiate the political phenomenon from an economic trend we should need evidences on the political awareness /choices about funding reduction, i.e. aimed at enhancing institutional capabilities to survive and/or concentrating resources on specific priorities. In Italy, for instance, late '80s have been a period of reduction of public resources devoted to R/D funding. This was due first of all to a negative economic cycle, but Governments did not compensate for that and in some cases there was a true political choice of pushing public institutions (i.e. mainly public non academic research institutions in Italy) towards alternative sources of funds (such as private contracts).
CONTRACT DELEGATION: It is the "relational contract" between State and scientific institutions, which structures the relation between the contracting parties. It is an agreement on the processes and procedures more than about specific actions and contents (Milgrom and Roberts, 1994, p. 206). The New public management framework has given rise to reflection on a more efficient use of public money and a more effective delivery of public service. The principal pays the agent and defines in broad terms what she/he wants, while the agent promises to use her/his labour power and organisation to implement the wishes of the principal.
NETWORK DELEGATION**:** the State is mostly a facilitator; it means that Government wants to organise/develop knowledge sharing and thus gives the means to research institutions and scientists to self organise innovation networks with user systems, while it looses pretensions of instrumental guidance.

Changes in the evaluation processes go with changes in the delegation models, from ex-ante to ex-post evaluation, and from peer review to more largely elaborated evaluation procedures. Different types of delegation modes can coexist and consequently they can more or less condition the performers' behaviour and choice. The presence of hybrid situation is underlined by the literature:

- science policy makers have to deal with an increasing heterogeneity of actors and networks, and heterogeneity makes it more difficult to impose their own goals on the research system (Rip and van der Muelen, 1996);
- the P-A relation is written into institutions and policies which together don't constitute a coherent contract; moreover the relation is mediated by several institutions (van der Meulen, 2006);
- in the application of the delegation relation, research funding organizations (funding intermediaries) are often able of excluding the principal from the contract process (Caswill, 2003);
- in specific case, such as research programmes, the P-A theory is not able of capturing the cumulative and collective consequences of the relation it wants to describe. The analysis of the "programme in action" should show that the long term shaping of research priorities is co-produced by the interdependent relations between researchers and their funding organizations (Shove, 2003).

2. METHODOLOGY AND EMPIRICAL BACKGROUND

Studies on S/T policy, especially comparative studies, in the past could not be based on suited indicators, since official statistics on R/D have been traditionally based on performer R/D expenditures, accompanied by the performer based indication of the source of fund of R/D expenditure. An important limitation of R&D statistics is in fact the lack of categories and classifications needed for policy analysis[7]. The present paper is an application of new indicators, produced in a European project[8] mainly collected at the administrative source of funding[9], and concerning the specific instrument of public project funding as distinguished from general funds attributed to the public performers for the development of their institutional tasks (Lepori *et al*., 2006). Project funding is defined as "money attributed to a group or an individual to perform a research activity limited in scope, budget and time" (Lepori *et al*., 2006), distinguished from recurrent funding, and it is a central policy category, since it is supposed to be an instrument for steering public and private R/D activity towards policy goals.

The focus of the paper is on the changes in Government policy of resources allocation to R/D, taking into account the type of relationships between Government and R&D fund beneficiaries embedded in the instruments and in the selection/evaluation processes of R/D projects. As to the funding instruments, while it is possible to identify funding instruments corresponding to the ideal type of delegation for the first two types (Blind and Incentive delegation. Institutional reforms (contract delegation) is more directly represented through procedural changes such as the evaluation processes. We analyse changes in funding instruments and evaluation processes separately, but only their combination give a representation of how delegation modes evolved in the various countries.

The central hypotheses to be tested are the following:

Hp 1: The relation between Government and fund beneficiaries evolved from a low demanding to a more oriented and monitored one: from a "blind delegation" ('70s) to a period of a classical incentive-based relation and then, from the economic crisis and the "steady state" period, to a relational contract, where the focus is on processes and ex post evaluation, counterbalanced in some way by some network delegation mode.

Hp2: The evaluation processes of Government project funding evolved from an ex-ante selection process, based on an internal to the beneficiary's community judgement, towards a double (ex-ante and ex-post) evaluation process, where external actors are involved, economic impact criteria are included and the ex-post evaluation has an effect on future Government allocation choices.

We regrouped the funding instruments in the following categories (type of instruments):

[7] This is a "structural limitations of the Frascati system" (Lepori, 2006a).

[8] Enip Project Funding, PRIME Network of Excellence, www.enip-europa.org.

[9] Project funding is distributed by a number of different agencies – intermediaries, ministries, international organizations- directly to private and public beneficiaries.

FREE PROJECTS AND GRANTS: grants attributed to individuals and investigator- initiated projects
R/D PROGRAMMES**:** We take into consideration also projects included in large framework, where horizontal and/or sectoral priority are identified]. The programmes have longer time horizon than R/D projects.
R&D CONTRACTS: they are totally different from the "relational contract" between State and public institutions, and correspond to more practical oriented contracts, where the object of research is predefined. Contracts have short (1-3 years) time horizon. They are mostly contracts for answering to public procurement
RESEARCH CENTRES, S/T DISTRICTS AND PARKS: Funds to Research centres have been included within project funding typologies and identified with fund to "temporary" R/D infrastructures.

As to the Processes of selection/evaluation, they can be connected with the different types of delegation, even if it is not possible to identify a full exemplification of delegation ideal type.

The selection/evaluation processes can be described through four types of indicators:

Who: Composition of the evaluation Committee: presence of external members; members from abroad; stakeholder representatives. Temporary or permanent structure of the evaluation Committee.

How:

a) Methodologies: external peer review; bibliometrics; econometric models; cost/benefit analysis; case studies, a mix of instruments;
b) Criteria: scientific quality; economic impact; social impact; internationalisation.

When: Ex-ante, intermediary, ex-post evaluation

Effects of evaluation on:

a) funding
b) priority settings

These qualitative information are often available in the legislative/administrative norms on which fund is based. Anyway, an improvement of the empirical data on content of delegation and evaluation procedures was developed, with the support of national correspondents, in order to analyse the processes[10].

3. TYPES OF INSTRUMENTS

The increase in the volume of the project funding instrument (PF) is immediately visible if we look the PF evolution at constant value (see Lepori *et al*., 2006, Fig. 5).

Notwithstanding this common trend, countries have different evolution: the ratio PF/GDP is relatively stable, even if slightly growing, in Switzerland, where the instrument is largely adopted since the '70s; it had a low role thirty years ago in Austria and it grew up mostly during the 90s, while its growth decelerated at the end of the 20th due to the introduction of other types of policy instruments (such as funds devoted to innovation and infrastructures, which cannot be included in R/D project funding). PF in Norway started early and had a relevant growth during 90s. In Italy the ratio PF/GDP grew up since '80s and it had an acceleration at the beginning of 2000. Italy and Austria started later. If we consider the ratio PF/GDP at the end of the examined period (2002) Austria and Switzerland show a similar value, while Italy remain behind them and Norway show a much higher value[11].

Here we examine the evolution of PF by instrument and country: in tables and figures below the project funding total amount by year (1970, 1980, 1990 and 2002) is distributed by instrument, regrouped also by type. Figures 1, 2, 3, and Tables 1, 2 and 3 allow to build and to visualize the Government allocation policy in terms of instruments and main beneficiaries.

[10] The authors wish to thank Michael Dinges, Benedetto Lepori and Stig Sleperseater for their support to the paper as to, respectively, Austria, Switzerland and Norway.

[11] See Fig. 5, Lepori *et al*., 2006.

Switzerland

Two main agencies are in charge of the project funding allocation in Switzerland: the Swiss National Science Foundation (SNF[12]) for academic research, and the Commission for Technology and Innovation (CTI) for applied research, a commission in the Government Department of Economy[13]. Federal and Cantonal administrations attributed also direct research contracts, mainly spot and defence-oriented contracts. PF evolution is characterised by an increasing differentiation, but the free funding instruments still accounts for the largest share of funds. The institutional configuration of the system, which was built essentially in the '50 and '60, remained very stable. The country is characterized by a limited role of Government in research policy and funding, a dominance of the universities, a strong self-financed private R&D and a clear separation between public and private sector (there is no public funding to private R&D). The dominance of the universities in PF becomes even stronger through time, given the reduction of contract funding to private companies in the defence sector.

During 70s National Research Programmes are introduced, including practical relevant and academic research and where Federal Government participated to the selection of research team and of programmes, together with SNF, but their weight is relatively low (see Tab. 1). During 90s, Priority Programmes were introduced, funding strategic-oriented research, they also have a very low weight and are now abandoned. National Competence Centres, which are large cooperation networks, started in 2000.

Project funding in Switzerland underwent through two phases of evolution (Lepori, 2006):

- *1973-1988*: the austerity period, when both a critical economic period and a transformation of project funding policy are envisageable. "The beginning of '70 has to be considered a watershed in the level of resources available to public research system…their rate of growth slowed down considerably and became irregular, depending strongly on the economic situation" (Lepori, 2005, p. 17). The observed evolution is explained by both general economic factors and the political world's dissatisfaction with the SNF practices, far from orienting research towards socio-economic problems, such as energy or economic crisis. Under these pressures, and the risk of a new agency creation, SNF accepted managing not directly academic research, namely the National Research Programs, and doing it jointly with the federal administration;
- *1988-2000*: an evolution towards more "incentive" delegation mode of project funding. In 1983 a Research Act "entered into force giving explicit competence to Confederation for direct support of research and thus allowed it to launch new research programs without the approval of the Cantons" (Lepori, 2005, p 17). Project funding was seen as the instrument for implementing political and technological priorities. Priority-oriented project funding didn't displace pre-existing funding, since it was based on "additional" financial means, even if small, because the change happened in a period of slow growth. The result was a "moderate differentiation", while a major change was external, i.e. the development of the European framework programme and the decision of Switzerland to participate to it.

At the end of '90s thematic programs lost their political importance and SNF redirect part of these funds towards more academic instruments (Lepori, 2005, p. 18).

In 1970, free projects were the main instruments (60%) and still are in 2002; in 1970 around 40% of PF concerned contracts with Ministries, mainly defence oriented and space contracts, in 1990 and in 2002 they represented respectively 47% and 25%, given the decrease of Federal Administration contracts devoted to military R/D. (Tab. 1). Contracts funding in 2002 can be reduced to 11% if we don't include the European Space Agency contracts.

[12] SNF manages mainly the so-called Free research projects, which fund research in Universities and support Phd students (Lepori, 2006), but since 1970 SNF managed also Programmes.

[13] CTI funds small and short time joint projects between University and Industry and it is also in charge of participation to some international programmes (EUREKA). CTI is composed by representatives of public administration, public economy, and academia. Its relevance grew up with the creation of the Universities of Applied Sciences (UAS) in 1990.

Programmes (directed fund) represented always a relatively less important driver of PF allocation policy, even if more important than the really marginal network funding. The R/D programmes under the incentive scheme were of two types: a) small thematic programs on specific issue of social or political interests. These Programs were limited to 4-5 years with a single call at the beginning. Themes were decided by the State, but the project selection was managed by the scientific intermediary body, SNF; b) large thematic programmes with a duration of 8-10 years, where again priorities were decided by State and selection operated by SNF.

In sum, funding instruments became more differentiated going from a combination of free projects and Contracts to an introduction of Programmes during 70s and more recently of Network instruments. In the last available year (2002) free projects are still dominant (48%), while incentive represents 20% and network instrument 7% (Fig. 1).

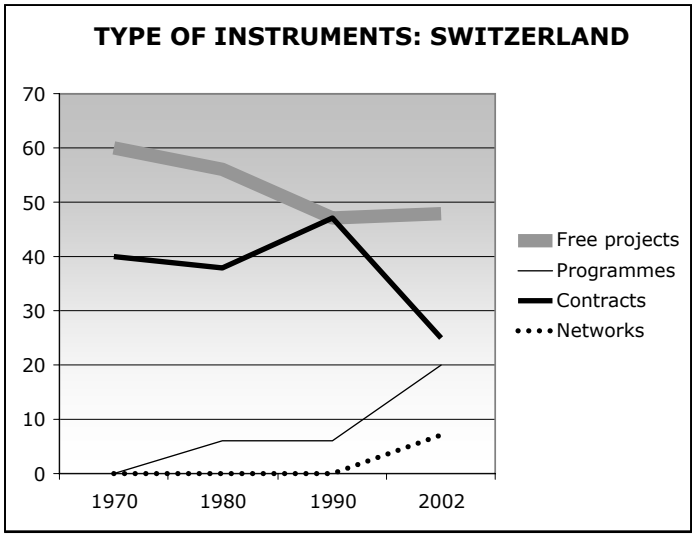

FIGURE 1: TYPE OF INSTRUMENTS: SWITZERLAND

TABLE 1a**:** TYPE OF INSTRUMENT AS % ON TOTAL PROJECT FUNDING SWITZERLAND

	1970	*1980*	*1990*	*2002*	*2002**
Free projects	60	56	47	48	48
Programmes	0	6	6	20	4
Contracts	40	38	47	25	11
Networks	0	0	0	7	7

* only national funds

If in 2002 we exclude the PF for European Framework Programme from the programme type and the ESA contract from the contract funding type, the R/D fund allocation policy in Switzerland is mainly characterised by free project funding (Table 1a).

TABLE 1b: TYPE OF PROPJECT FUNDING INSTRUMENT,
INDEX NUMBER (2000 PRICES, 2002=100)
SWITZERLAND

Type of project funding instruments	*Name of instrument*	*Years*	*% of total PF*	*Total amount (2000 prices, 2002=100)*	*Main beneficiary*
Free project	SNF free research projects	1970	50	79	Public
		1980	46	77	
		1990	36	86	
		2002	31	100	
Grant	SNF person grants	1970	8	54	Public
		1980	6	43	
		1990	5	50	
		2002	7	100	
Free project	CTI collaborative projects	1970	2	9	Public
		1980	4	23	
		1990	6	45	
		2002	10	100	
R/D programme	SNF National research programs	1970	0	0	Public
		1980	6	128	
		1990	5	152	
		2002	3	100	
R/D programme	SNF priority programs	1970	0	0	Public
		1980	0	0	
		1990	0	0	
		2002	1	100	
R/D programme	EU Framework programs	1970	0	0	Public (with a significant share of private)
		1980	0	0	
		1990	1	5	
		2002	16	100	
R/D contract	Federal administration contracts	1970	36	153	Public (with a significant share of private)
		1980	27	121	
		1990	34	220	
		2002	11	100	
R/D contract	European Space Agency contracts	1970	5	18	Private
		1980	11	40	
		1990	13	69	
		2002	14	100	
Network of Excellence	SNF National Centre of Competence in Research	1970	0	0	Public
		1980	0	0	
		1990	0	0	
		2002	7	100	

Austria

Austria has been historically dominated by two research funding institutions: FWF (Austrian Science Fund) e FFF (Industrial Research Promotion Fund) highly independent intermediary bodies aimed respectively to fund scientific research (the former) and to promote industrial research and development (the latter)[14]. They followed a bottom-up approach: projects were proposed by individual actors and selected by an in-house review system. Both funds started with small budgets, getting more money incrementally over time. One of the most important change happened in 1970, when the Federal Ministry for Science and Research (BMWF) was created. The Ministry did not touch the autonomy of the two pre-existing Funds, but many top-down programmes were designed between seventies and eighties, leading over time to a large third fund of BMWF Commission and Research[15].

Along the considered years, the incentive type instruments (top down programmes) grew up, while the weight of the contract instrument decreased (Fig. 2 and Tab. 2a).

The incentive type instruments represented around 17% in 1990 and 25% in 2002; the network instruments were only recently introduced. Contracts lost their relevance over time, representing around 23% of total PF in 1980 and 1990 and around 11% in 2002 (7% if we don't include ESA contracts).

In sum, Austria went from a 100% free research projects to a diversified range of instruments where free projects still dominate (both for the academy and for the industry), but they share place with programmes (25% in 2002) and with networks (13%).

Interestingly enough, in 2002 (the only year for which both data are available) the weight of the European Framework Programmes is 16%, the weight of European Space Agency (ESA) contract was 3%. Thus, if we exclude these international project funding instruments, the predominance of free projects still characterises the Austrian system (Table 2).

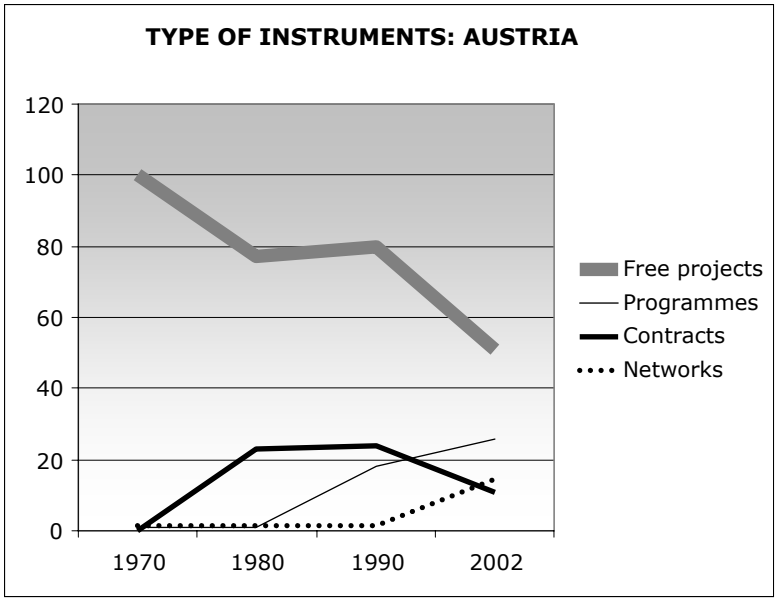

FIGURE 2: TYPE OF INSTRUMENTS: AUSTRIA

[14] Both the intermediaries "were created in 1967 ... they were given a strongly autonomous status, i.e. they were given governance structure dominated by their beneficiaries than by the Ministries". (Stampfer, 2005)

[15] In 2004 FFF was merged with three other institutions (Technology Impulse Gesellshaft-TIG, Austrian Space Agency-ASA, Bureau for International Research and Technology Co-operation- BIT) into a new innovation funding agency (Austrian Research Promotion Agency - FFG). FWF still exists as an autonomous research council.

TABLE 2a: TYPE OF INSTRUMENT AS % ON TOTAL PROJECT FUNDING - AUSTRIA

	1970	*1980*	*1990*	*2002*	*2002**
Free projects	100	77	80	51	51
Programmes	0	0	17	25	9
Contracts	0	23	24	11	8
Networks	0	0	0	13	13

* only national funds

TABLE 2b: TYPE OF PROJECT FUNDING INSTRUMENT, CURRENT VALUE, THOUSANDS OF EUROS - AUSTRIA

Type of project funding instruments	*Name of instrument*	*Years 1970, 1980, 1990, 2002*	*Total amountin current 1,000 Euro*	*% on Total Project Funding*	*Main beneficiary: public or private*
FREE PROJECTS	Total Austrian Science Fund	1970	4,360	48.39%	HE
		1980	11,690	24.67%	
		1990	33,700	24.82%	
	WKs/DKs	2002	2,790	0.63%	HE
	Jubilaumsfonds-Direkt	1980	3,190	6.73%	HE
		1990	4,830	3.55%	
		2002	12,400	2.82%	
	Print Costs	2002	700	0.15%	HE
	ProcurementInt.Coop.	2002	140	0.03%	HE
	Scholarship programmes	2002	4,310	0.98%	HE
	Lise Meitner	2002	2,120	0.48%	HE
	Individual Research Projects	2002	66,790	15.22%	HE
	OAW programmes	2002	8,030	1.83%	HE
	Erwin Schrodinger Grant	2002	3,610	0.82%	HE
	Erwin Schrodinger Return	2002	670	0.15%	HE
	Charlotte Buhler	2002	270	0.06%	HE
	Factory of the Future	2002	4,240	0.96%	Undivided
	AAC OAW	2002	1,350	0.30%	HE
	General Programmes	1970	4,650	51.60%	Private
		1980	21,510	45.40%	
		1990	42,760	31.50%	
		2002	118,210	26.95%	
R/D PROGRAMMES	Take Off	2002	4,900	1.11%	Undivided
	A 3	2002	6,440	1.46%	Undivided
	Biomed	2002	980	0.22%	Undivided
	EnergySystems of the Future	2002	0	0%	Undivided
	FP5 Thematic Scheme	2002	71,000	16.18%	Undivided
	ITF	2002	3,540	0.80%	Private
	FIT-IT	2002	1,610	0.36%	Undivided
	GEN-AU	2002	9,610	2.19%	HE
	House of the Future	2002	4,590	1.04%	Undivided
	IMBA OAW	2002	4,350	0.99%	HE
	ISB-Innovatives System Bahan	2002	3,480	0.79%	Undivided
	ITF	1990	22,810	16.80%	Private
R/D CONTRACTS	Direct contracts	1980	10,100	21.32%	Undivided
		1990	24,160	17.79%	
		2002	35,000	7.98%	
	ESA	1980	880	1.85%	Private
		1990	7,480	5.51%	
		2002	11,900	2.71%	
R/D NETWORKS	Kind/Knet	2002	12,300	2.80%	Private
	CD-Lab	2002	3,800	0.86%	Undivided
	SFB	2002	10,240	2.33%	HE
	Kplus	2002	24,000	5.47%	Undivided
	REGPlus	2002	700	0.15%	Private
	FSP	2002	4,200	0.95%	HE

Italy

In Italy most of the R&D project funding is under the responsibility of the Ministry for Education, University and Research (MIUR). This responsibility evolved over time. During the '70s the Minister (MRST) started to manage applied research project funding devoted to the private beneficiaries, by selecting projects to be submitted to CIPE-Interministerial Committee for the Economic Planning. The revised law (L.46/82) gave a more explicit commitment to MRST of managing the applied research fund. In 1989 the law 168/89 transformed MRST in MURST, as Ministry in charge of co-ordinating and financing the overall public and private RDI system.

CNR (National Research Council) was the main intermediary agency, under the MIUR control, with a multidisciplinary coverage. It has had a double role of research funder and performer until 2000. As funder the CNR has managed three types of projects:

- free projects: "contracts and contributes", from 1970 to 1999, which were free grants devoted to individual researchers, mainly from HE. The difference between the two is based on the duration and the content: contributes, in fact, were more limited in time and scope than the contracts. In both cases the research themes were selected by the agents, and no priorities affected the research design;
- programmes: the finalised projects (FP) were regroupments of projects within scientific chosen fields of investigation. The selection of the thematic areas and the programme designs were realised by the disciplinary Committees within CNR. They started from mid seventies, were multiyear projects, of practical relevant and academic research, based on additional and specifically devoted resources coming from MIUR. The financing of the selected projects was submitted to the approval of the CIPE. Finalised projects lasted five years on average, in some cases renewed on different five-years cycles (as for energy, chemistry and biotechnology). After the CIPE approval, CNR was in charge of the selection of the applicants (groups of public and in some cases also private researchers).
- strategic projects (PS), started from mid eighties, were multiyear academic-oriented projects with an explorative character, based on an internal-to-CNR research agenda. These projects did not represent a significant amount of funding (less than 5% of the total PF funding) so that they were not included in our analysis.

Three periods can be outlined for Italy (Fig. 3):

- from mid seventies to mid eighties there is a significant growth of project funding when policy makers began to sustain the necessity of an integration of research within the national industrial policy. An effort has been done during the '80s, with the introduction of new instruments mainly devoted to innovation (L. 46/82) and partly (National Research Programmes) based on a priority-setting activity of the MURST;
- from mid eighties to mid nineties: project funding suffers a long downward cycle due to the public budget constraints. In the same period CNR, the scientific intermediary agency, starts to reduce its funding allocation role, while there is a growing role of Government. The funding devoted to the traditional instrument managed by CNR, the Finalized projects, was cut down and MIUR started to transfer upon itself the whole responsibility of project funding allocation. In the meantime, the public research institutions were pushed towards a diversification of sources of funds;
- the turning point of the nineties: in this period R/D project funding grew up significantly, the portfolio diversified, CNR lost totally its role of intermediary and Government reinforced its role, also with the creation of special bodies in charge of activities of selection and evaluation.

In Italy the allocation policy evolution has gone from free projects funding to the prevalence of programme or incentive type funding. 100% of the project funding instruments in 1970 were free projects, with public research institutions benefiting of around 50% of the total PF amount; 70% of the PF instruments in 1980 were free projects, with public research institutions benefiting of about 44% of the total PF amount, partly through Programmes. Funding through Programmes became the prevalent one for public R/D

institutions in Italy during the eighties. In 1990, free projects concerned only 39% of total PF instruments and University received 22% of total PF.

In the last years (2002) a large internal differentiation of instruments was in place. Contracts (except for ESA) and networks have still a very low weight.

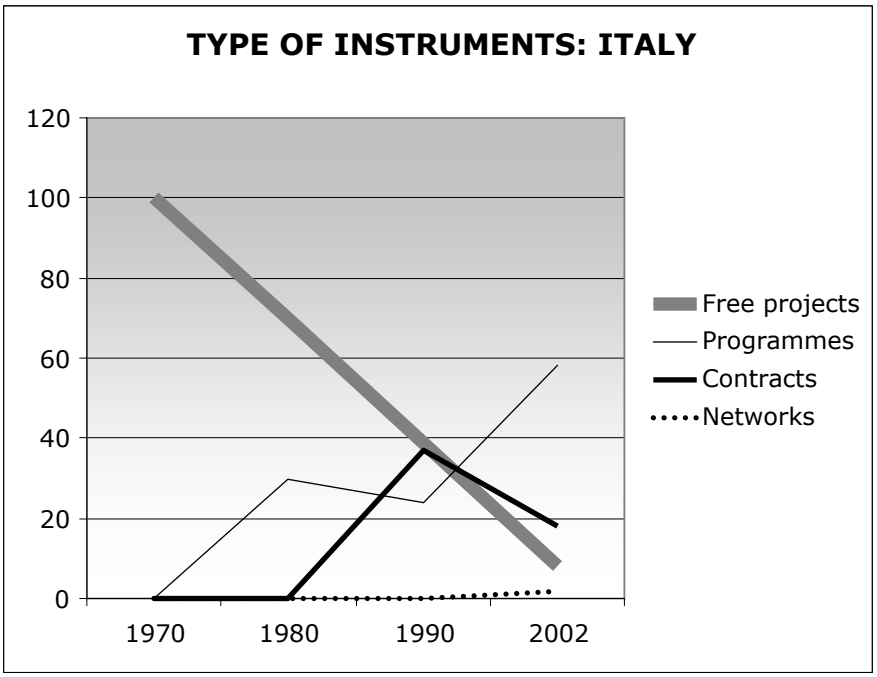

FIGURE 3: TYPE OF INSTRUMENTS: ITALY

TABLE 3a**:** TYPE OF INSTRUMENT AS % ON TOTAL PROJECT FUNDING ITALY

	1970	*1980*	*1990*	*2002*
Free projects	100	70	39	8
Programmes	0	30	24	58
Contracts	0	0	37 (5*)	18 (3.8*)
Networks	0	0	0	2

* without ESA contracts

TABLE 3b: TYPE OF PROJECT FUNDING INSTRUMENT
CURRENT VALUE, THOUSANDS OF EUROS[16] - ITALY

Type of project funding instruments	*Name of instrument*	*Years 1970, 1980, 1990, 2002*	*Total amount in current 1000 Euros*	*% on Total Project Funding**	*Main beneficiary: public or private*
FREE PROJECTS	PRIN-COFIN	1990	55,261	7.7%	Public
		2002	133,863	7.9%	
	FAR	1971	9,684	61.0%	Private
		1980	66,003	55.5%	
		1990	182,309	25.3%	
	CNR contract and contribute	1971	6,187	39.0%	Public
		1980	17,352	14.6%	
		1990	43,257	6.0%	
R/D PROGRAMMES	CNR PF	1980	35,417	30.0%	Public
		1990	71,296	9.9%	
		2002	4,478	0.3%	
	FAR PNR	1990	29,438	4.1%	Private
	FIT	1990	72,750	10.1%	Private
		2002**	165,500	9.8%	
	MAF PF	2002	308,538	18.3%	Private
	MIS	2002	72,715	4.3%	Public
	FIRB	2002	337,576	20.1%	Public
	PON	2002	47,090	2.8%	Undivided
	FAR	2002	36,000	2.1%	Private
	FISR	2002	12,520	0.7%	Public
R/D CONTRACTS	PON	1990	38,000	5.28%	Undivided
		2002	63,932	3.8%	
	ESA	1990	226,494	31.49%	Private
		2002	240,123	14.28%	
R/D NETWORKS	Excellence R/D centres /FIRB	2002	37,508	2.23%	Public

European Framework programmes have not been included, since data on national Government contribution are not available

* The sum of the instruments by year can be below 100, since not the whole of the instruments have been considered in the table (only the instruments up the 5% of the total PF were included).

** Since 2001 an important change has been introduced: the fund (FIT) now finances also infrastructures (relocation, restructuring and so on of research centres) and at the moment it is only possible to estimate roughly a 50% for research project and a 50% for infrastructure. So we reduced the 2002 amount by half.

[16] We checked for an estimation of the real transfer of fund to business firms, for the two Funds (FAR and FIT), since both FIT and FAR includes repayable loans (low interest loans). The Italian Association for Industrial Research (AIRI) has made an estimation of the effective benefit to business firms, i.e. the amount effectively received by industrial firms after having deducted refunding. AIRI applied this calculation year by year until 2000 to the public out of pocket expenditures, since only there it is possible to do this estimation. The results are the following:

FIT: it has always had a strong component of repayable loans. AIRI takes into account the weight of this component on the total of the Fund, and the recalculation of real benefit on it. It results that on average only 25% of the total amount of FIT is the real benefit to industrial firms. Therefore, even if we deal with public appropriation and not expenses, we applied this estimation, reducing FIT values by this way.

FAR: the low interest loans have had a lower weight than in FIT and, always following AIRI, it results that on average only 50 % of the total amount of FAR is the real benefit to industrial firms. We applied this estimation and reduced FAR values by this way.

Norway

The evolution of R/D funding instruments is strongly evident (Fig. 4, Tab. 4).

R/D funding instruments in Norway underwent a relevant change around '90s when R/D programmes (National priorities programmes, Council programmes and Government projects) grew up significantly. They were allocated partly by Research (sub) Councils[17] and partly directly by the central Government (the largely funded instrument of Government projects). In all the cases, Government fixed the priorities, and the Board of each (sub) Council was composed by a mix of researchers and users.

In 2000's other new instruments went to joint the R/D Programmes: Targeted programmes, Targeted programmes, Strategic support programmes and Basic research Programmes.

As to R/D contracts, which are more on responsibility of Ministries than on Councils', they don't represent a relevant instrument and have a slight reduction through time. If we don't include international contracts (available only for 2002) their weight is around 14.6%.

Networks still don't characterise the R/D funding allocation policy in Norway

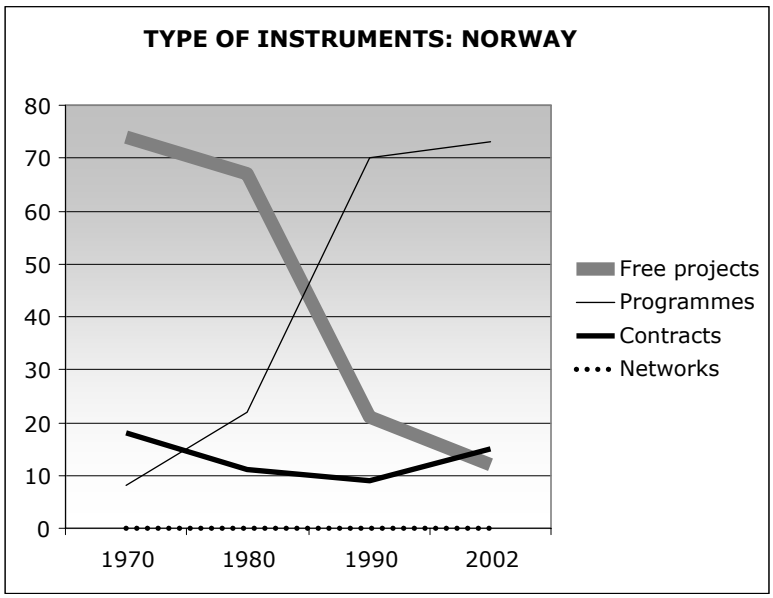

FIGURE 4: TYPE OF INSTRUMENTS: NORWAY

TABLE 4a**:** TYPE OF INSTRUMENT AS % ON TOTAL PROJECT FUNDING NORWAY

	1970	*1980*	*1990*	*2002*
Free projects	74	67	21	12
Programmes	8	22	70	73
Contracts	18	11	9	15
Networks	0	0	0	0

[17] With the reform of 1993 the existing five Research Councils were merged in one, with six sub-councils organised as mission oriented. The resulting Research Council of Norway had an executive Board with eleven government appointed members from broad segment of society, which in turns appointed the members of the six research boards. "Norway has departed from the tradition of having one or more university oriented councils". (see p. 25, Skoie, 2001, *The research councils in Nordic Countries. Developments and some Challenges*, Report 10/2001, Nordic Council of Ministers).

TABLE 4b: TYPE OF PROJECT FUNDING INSTRUMENT
CURRENT VALUE, THOUSANDS OF EUROS
NORWAY

Type of project funding	*Name of instrument*	*Funding agency*	*Years* 1970, 1980, 1990, 2002*	*Total amount in current 1000 Euros*	*Main beneficiary: public or private*	*Comments*
FREE PROJECT	Project support	NAVF (Research council)	1970 1980 1990	13,074 34,108 157,100	Public	
	Project support	NTNF (Research council)	1970 1980 1990	21,073 176,134 256,419	Public	
	Project support	NFFR (Research council)	1973 1980 1990	0,446 14,389 14,000	Public	
	Project support	NLVF (Research council)	1970 1980 1990	10,215 56,720 110,408	Public	
	Project support	NORAS (Research council)	1970 1980 1990	0 0 12,555		Council established 1986
	Free projects	NFR (Research council)	2002	321,101	Public	
	Projects basic research	NFR (Research council)	2002	59,151	Public	
	Individual grants	NAVF (Research council)	1970 1980 1990	11,951 23,365 15,300	Public	
	Individual grants	NTNF (Research council)	1970 1980 1990	2,655 7,589 0	Public	
	Individual grants	NLVF (Research council)	1970 1980 1990	1,230 3,828 36,318	Public	
	Individual grants	NFFR (Research council	1973 1980 1990	0 1,990 10,065	Public	
	Individual grants	NFR (Research council)	2002	36,786	Public	
R/D PROGRAMME	National priorities programmes	NAVF (Research council)	1970 1980 1990	0 0 122,500	Public	
	Council programmes	NAVF (Research council)	1970 1980 1990	 12,433 171,300	Public	
	Council programmes	NTNF (Research council)	1970 1980 1990	0 0 388,000	Public	1980: Included in project support
	Council programmes	NFFR (Research council)	1973 1980 1990	0 15,300 109,829	Public	

	Council programmes	NORAS (Research council)	1970 1980 1990	0 0 104,975		Council established 1986
	Programmes basic research	NFR (Research council)	2002	170,705	Public	
	Strategic support	NFR (Research council)	2002	251,722	Public	
	Large programmes	NFR (Research council)	2002	100,135	Public	
	Targeted programmes	NFR (Research council)	2002	671,167	Public	
	Government projects	Central government	1970 1980 1990 2002	6,533 74,010 1177,243 1427,557	Public	
R/D CONTRACTS	Industrial contracts	NTNF (Research council)	1970 1980 1990	11,819 254,400	Private	
	Innovation contracts	NTNF (Research council)	1970 1980 1990	2,435 47,428 0	Private	
	Innovation contracts	NLVF (Research council)	1970 1980 1990	0 0 14,300	Private	
	International projects	NFR (Research council)	2002	24,761	Public	
	Innovation contracts	NFR (Research council)	2002	526,101	Private	
	Government Innovation contracts	Industrial fund	1970 1980 1990 2002	2,895 3,700 102,549 0	Private	
Networks	Not present in the years taken into consideration					

4. PROCESSES OF SELECTION/EVALUATION

The changes of modes of delegation in science policy (from a blind delegation to the emergence of new modes linked to contracts and networks, which co-exist with the old ones) are supposed to produce effects on the costs of policy making. Braun (2003) underlines that the blind delegation allows a complete abstention of policy makers from any action able to influence the science functioning. This implies that no costs for monitoring and evaluation purposes should be paid by the State as principal, as no problem of moral hazard and control of scientific responsiveness could arise. The new mechanism of delegation based on incentives modified the relationship between the principal and the agents, because the policy makers had new costs for priority setting, for peer reviewing organisation and for designing and funding the programs. The principal introduced monitoring procedures and measurements of the research outputs in order to gain information on the agents' activities,

but incentives remained almost ineffective in order to address the scientists' efforts towards the pursuing of the objective selected as relevant by policy makers, because they were operated by "adding program funding to the already existing global … funding", while scientists maintained "high independence in executing the principal instructions" (Braun, 2003). In both cases (blind and incentive delegation) the relationship is between the State, or intermediary bodies, as principal, and the scientists, as actors.

The delegation by contracts is seen as a real turning point, since contracts become an "indirect way or steering the behaviour of scientists … and to increase the social responsiveness of scientists". Contracts are addressed to institutions, not to scientists and institutions themselves control scientists' behaviour; thus a sort of 'nested delegation' is created, helping to avoid moral hazards. The emergent NPM paradigm, which shaped during the eighties and the nineties the relationships between the principal and the agents, allowed policy makers to overcome the problem of "incomplete contracts" by guaranteeing a large space of manoeuvre to the agents for selecting the actions to put in place, while the policy makers use of precise guidelines as mean to constraint the institutions' choices. Thus, the definition of priorities evolved toward the fixation of general objectives, which can be used as parameters for the principal's control. This new scheme implies not only an investment on decision making (for setting instruments and political guidelines) such as in the case of incentive delegation, but also high cost for monitoring and evaluation processes, as well as for continuous reporting from institutions. The expected consequence for project funding would be the reinforcement of the ex-ante evaluation processes, and the setting up of strong *in-itinere* and *ex-post* assessments, whose results are supposed to influence the resource allocation.

In the Network model decisions are delegated to the network and monitoring activities reduced, because of the "difficulty in defining adequate measures". The principal acts only as a facilitator, helping institutions to co-ordinate themselves (Braun, 2003).

Tables 5 and 6 show the test of the hypothesis 2 for Switzerland and Italy, for each type of instrument. The expected consequences would be the reinforcement of the ex ante evaluation processes (in terms of composition of the evaluation committees and the setting of permanent evaluation structures), and a diversification of criteria and methodology (from criteria mainly focused on scientific quality, to a mix of criteria including economic and social impact as well as internationalisation; from external peer review to a mix of instruments including tools such as bibliometrics, econometrics, cost-benefit analysis). In sum, evaluation is supposed to follow the general evolution of research governance predicted by the Braun's assumptions on the shift in delegation modes.

Because of the lack of direct information on selection/evaluation processes of each funding instrument in Austria, this country has been discussed on the basis of administrative sources (mainly political documents and specific surveys), which generally are more focused on the overall selection/evaluation processes applied by managing agency, than on the specificities of the single instrument.

Switzerland

In Switzerland, SNF instruments present differences between free projects and grants on the one side, and national research programs and priority programs, on the other.

Free projects started from the fifties and have been evaluated, with no major changes, by a permanent committee composed by academics (mostly international) as a peer review, without quantitative criteria and ranking. Criteria referred to scientific quality of the proposal and reputation of the proponent, and no other assessment follow after decision for individual projects. No major effects can be observed over time, apart from a self-reinforcing effect on applicants which succeeded, based on reputation. This scheme applied in the same way to the SNF personnel grants to doctoral students, advanced researchers and assistant professors, which emerged in the seventies.

National research programs and priority programs were established the former from mid seventies, and the latter from 1992. Research programs were conceived as targeted to socio-

political needs, while priority programs were aimed to promote key technologies for the economic development. The implementation of both funding instruments was characterised by a significant academic-oriented activity with a large component of basic research. The selection/evaluation processes were basically the same: temporary structure of the Committees; each program, within the instrument, had its own committee. The composition was mixed: both academics and experts from the private sector were involved. Methodology was essentially a peer review based on international experts; criteria focused on scientific quality and the relevance of the proposal for the theme of the program and for policy (as to research programs) or for economic development (as to priority programs). The time of the evaluation was limited to the *ex ante* phase, but the whole instruments have been repeatedly assessed. No major effects (see Tab. 4) are present so as in the case of free projects and grants.

A recent instrument managed by SNF was the Centre of competence, settled in 2000, aimed to fund cooperative networks between national universities and doctoral schools in specific domains. The selection process was two steps: first the qualitative selection made by a permanent Committee composed by academics, based on peer review by external mostly international experts. Scientific quality was the main criteria. The second step was the transmission of a short list of proposal to the Government for the final selection, which was based on research policy considerations, Intermediary evaluation is applied after the first four-years period and it is linked to the decision of funding the second four-years period.

In the case of the university-industry cooperation projects, managed by the Swiss Innovation Agency (CTI), innovation and potential economic exploitation are the criteria used by the internal evaluation committee, which sometimes used external experts. The committee included mixed competences: from academia, from the State, from the private sector, with the State playing a strong role. No intermediary or *ex-post* evaluation was applied. As to the Federal contracts, the officer itself generally selected them, on the basis of internal evaluation based on the relevance for policy making. Both instruments did not show any kind of evolution of the selection evaluation processes.

If we look at the SNF PF portfolio, we can see that, on the one hand, academic oriented instruments were partly characterised by selection/evaluation processes, which largely fit with the Braun's blind delegation mode, while the new instrument of national Centre of competence seems more close to the network mode of delegation. On the other hand, thematic PF (SNF research programs and priority programs) tried to adopt a more applied-oriented assessment through the enlarged composition of the evaluation Committee, including non-academic members, and criteria, which went beyond the scientific quality. In these cases elements of an incentive mode of delegation are evident.

Moreover, the selection/evaluation processes of SNF instruments, which seem more linked to blind and incentive delegation modes, although introduced in different periods, maintained the same schemes, while only the very new instrument (centre of competence) showed a different rather innovative selection process. This fact confirms the presence of strong path dependency in the way in which SNF tended to shape the instruments.

TABLE 5: EVALUATION MODES - SWITZERLAND

Type of instrument	*Who: give the composition of the evaluation Committee by member type*	*Temporary or permanent structure of the Committee*	*How: methodology by type*	*How: criteria by type*	*When: intermediary, ex post*	*Effects: only the effect with affirmative answer*	*Years**
SNF free projects	Academic only	Permanent	Peer review by external experts	Scientific quality	No evaluation after decision for individual projects	Project results relevant for new applications based on reputation)	1952-
SNF grants	Academic only	Permanent	Peer review by external experts	Scientific quality	No evaluation after decision for individual projects	Project results relevant for new applications based on reputation)	At least from the '70
SNF national research programs	Mixed (academic + state)	Temporary: each program has its own committee	Peer review by external experts	Scientific quality; relevance to the theme of the program and for policy	No evaluation after decision for individual project. The whole instrument has been repeatedly evaluated.	Project results relevant for new applications based on reputation)	1975-
SNF priority programs	Mixed (academic + economy)	Temporary: each program has its own committee	Peer review by external experts	Scientific quality; relevance to the theme of the program and for economic development	No evaluation after decision for individual project. The whole instrument has been repeatedly evaluated.	Project results relevant for new applications based on reputation)	1992-2002
SNF national centres of competence	Academic only for the evaluation. Final decision by the ministry on a short list from the SNF).	Permanent	Peer review by external experts	Scientific quality	Intermediary evaluation after 4-years period	Decision of funding of the second phase (4+4)	2000-
CTI projects	Council with a mixed composition (academics, private economy, state). State influence is well present.	Permanent	Evaluation by committee members, sometimes with support from external experts	Innovation and economic potential of the projects	No evaluation after decision for individual projects	Project results relevant for new applications based on reputation)	1944-
Federal administration contracts	Generally the officer itself (sometimes program committee)	NA	Sometimes support by external expert, normally internal evaluation	Relevance for policy-making is normally the main criterion	Normally no evaluation (non compliance to the contracts is very rare).	Project results relevant for new applications based on reputation)	

*Years are referred both to the type of instrument and to the type of evaluation model. If the same instrument went into a new evaluation typology it is possible to write it more than one time.

Austria

Austria PF was managed mainly by FFF (Austrian Industrial Research Promotion Fund) and FWF (Austrian Science Fund), established as main funding agencies since the sixties, while in late eighties TIG was created for the Competence centres programme, which bring together industrial consortia and academic research for a seven-year period. In 2004 TIG and FFF, with other funding agencies, were merged into the FGF, a new integrated intermediary body in charge for funding innovation and industrial research, while FWF remained stable, supporting academic basic research in all fields of science through a different set of instruments. Moreover, three ministries share the policy responsibilities for PF: the Ministry for Education, Science and Culture (BMBVK), which plays a prominent role, the Ministry for Transport, Infrastructure and Technology (BMVIT) and the Ministry for Economy and Labour (BMWA). All the Ministries also managed PF instruments by themselves.

The systematic use of evaluation of PFs in Austria was substantially improved from mid nineties[18], although internal to agencies evaluation capabilities were not yet present (Jorg, 2004). A survey developed in 2000s on 110 measures developed by the Ministries, showed that 30 PFs were evaluated in the last seven years. The focus of the exercises was mainly on economic and scientific impact (73% of conducted evaluations), while processes, management and quality of work have lower rates (about 30% of cases). As to the use of evaluations, most of all have a "legitimating function" (90%), while only 30% of conducted evaluations were used for re-allocating funds or for introducing substantial change of funding policy. These results demonstrate that evaluation, although strongly implemented, did not yet enter the decisional processes driving policy choices and funding allocation (Jorg, 2004).

As to the FFF, it funded projects generally aimed to create new or improved products (54%) or processes (27%). The role performed by the agency was that of funding bottom up proposal of companies. FFF (and FWF too) underwent an evaluation process, which included also the way in which the agency assesses its project portfolio from 1992 to 2002 (Arnold, 2004). The procedure addressed the technological quality of the projects, of submitting firm, the economic value of the project and the economic and managerial performance of the company. Each project was assessed by the Agency with the support of external experts. Reporter's suggestions to the agency include, among others, the need to adopt new project evaluation and selection procedures adapted to overcome the fragmentation of the current programmes and to introduce a more pro-active and stronger programme management.

In FWF funding decisions are based on peer reviewing with the involvement of external, mostly international experts. The evaluation of FWF funding activities (Arnold, 2004) outlined that the review criteria traditionally have been scientific quality of the project and of the research team, and appropriateness of the budget. In 2003 new criteria were added (implication of the project for other branches of science, potential socio-economic impact), but they did not play a significant role. Moreover, the judgements of external reviewers in some cases were decisive, while in others were considered only as advice. In recent years, efforts on evaluation increased and intermediate and ex post assessment exercises were developed for the Networks programme. FWF adopted the standards elaborated by the Austrian Platform for Evaluation of Research and Technology for the assessment practices.

In sum, policy documents describe for Austria a mixed situation as to FFF and FWF. Both have for a long time stable practices, which seem respectively more linked to incentive mode of delegation, the former, and blind delegation, the latter. The government push toward a more effective role of evaluation procedures produced effects only in late nineties, reinforcing the attention toward priority setting, efficiency and effectiveness of results for FFF funding instruments, and toward qualitative standards for FWF funds. Networks, which are the novelty in FWF's schemes, included intermediary and ex

[18] The establishment of the Platform Research Technology Policy Evaluation is a proof of a new role of evaluation, supposed to become a "learning instrument within the policy making process" (Jorg, 2004).

post evaluation. Incentive and blind modes still coexist, and network emerged as new delegation scheme. The emphasis given to standards in evaluation practices is a signal of a tendency toward introducing the managerial paradigm in the State-scientists relationships.

Italy

Italy showed minor changes in selection/evaluation processes of funding instruments although many of them were reformed during the nineties.

COFIN, a PF instrument devoted to universities, shifted from a system based on experts' review to a formally structured peer review system. Moreover, the success rate of applicants entered in the funding formula of the university. No other modifications can be outlined: evaluation committees are temporary and composed only by academics, no intermediary or ex post evaluation was implemented and the selection remained based on scientific quality of the project proposal and of the project leader. The other historical academic-oriented project funding –contracts and contributes of CNR- did not underwent any evolution. On the contrary, they remained stable along 30 years with the selection made by the CNR disciplinary committees on the basis of scientific quality. Surprisingly enough, in mid seventies CNR launched the Finalized projects as funding instruments of programs linked to themes interesting the socio-economic development. Although Finalized projects were supposed to be more policy-oriented than contracts and contributes, the selection processes were organised more or less in the same way.

CNR funding instruments ended in 1999, and were replaced by two new schemes managed by the Ministry of University and research. One is FIRB for oriented and non-oriented basic research; the other was a thematic-oriented instrument, FISR, devoted to fund projects dealing with research priorities identified by the Government. Both selection/evaluation processes were driven by temporary committees, with a mix composition (academics plus representatives of the economic sector). The Committees adopted a peer review methodology, using criteria, which included the relevance to the theme of the program and scientific quality. In sum, there was a passage from criteria based on scientific quality to a more diversified set of criteria, according to the supposed cogent characteristics of the instruments. We note, on the one hand, the opening to external experts of the peer committees in charge for evaluation, in order to acquire reviews from specialised scholars, thus assuring more precise and independent judgements. On the other hand, the enlargement of instruments did not go with the implementation of ex-post evaluation

As to the innovation-oriented funding instruments (FAR and FIT) they had more or less the same selection/evaluation processes until 1999: mixed and temporary committee, internal evaluation, no assessment after decisions on individual projects. After 1999, FAR was reformed while FIT remained stable. No major changes are really visible for evaluation in both cases, except for the inclusion in FAR of a formal peer review system for the selection of proposals. The reform foreseen by law remained largely ineffective. Lastly, the PON instrument was created in order to integrate the EU Structural Funds with other national funding for regions characterised by a low economic development. In this case the main differences with the other innovation instruments do not lay in the selection process, but in the presence of intermediary and final evaluation on the compliance of objectives established in the contract.

Although modifications occurred in the Italian PF instruments, no significant shift emerged in evaluation processes. Free projects and grants, which seemed more linked to a blind delegation, have been substantially reduced, and were replaced by schemes, which integrated aspects of an incentive mode of delegation (mostly priority setting). Peer review with the participation of external, mostly international, experts was widely introduced, and efforts have been done to push the agents toward pursuing the principal research aims, by introducing criteria which made reference to the relevance of the proposal for policy making. Contract mode of delegation did not concretely emerged in the nineties reforms, as it was not practically implemented. Basically the PF selection/evaluation processes developed along paths, which largely maintained the existing characteristics.

TABLE 6: EVALUATION MODES

ITALY

Type of instrument	*Who: give the composition of the evaluation Committee by member type*	*Temporary or permanent structure of the Committee*	*How: methodology by type*	*How: criteria by type*	*When: intermediary, ex post*	*Effects: only the effect with affirmative answer*	*Years**
PRIN COFIN	Academic only	Temporary	Review by experts	Scientific quality	No evaluation after decision for individual projects	None	1982-1996
PRIN COFIN	Academic only	Temporary	Peer review by external experts	Scientific quality	No evaluation after decision for individual projects	Project results relevant for funding allocation to the institutions	1997-2002
FAR	Mixed (academic + economy)	Temporary	Evaluation by committee members, sometimes with support from external experts, from surveys and site visits	Innovation and economic potential of the projects	Intermediary	Possibility to stop the project funding	1968-1999
FAR	Mixed (academic + economy)	Temporary	Evaluation by committee members, with support from external experts	Innovation and economic potential of the projects	Intermediary foreseen by law	Possibility to stop the project funding	1999-2002
FAR PNR	Mixed (academic + economy)	Temporary	Evaluation by committee members	Relevance to the theme of the program, relevance of the public-private partnership	No evaluation after decision for individual projects	NA	1990-2000
CNR Contracts and contribute	Academic only	Permanent	Evaluation by committee members	Scientific quality°	No evaluation after decision for individual projects	NA	1968-1999
CNR PF	Academic only	Permanent	Evaluation by committee members	Scientific quality Relevance to the theme of the program	No evaluation after decision for individual projects	NA	1975-2002
FIT	Mixed (academic + economy)	Temporary	Evaluation by committee members	Relevance to the theme of the program	No evaluation after decision for individual projects	NA	1982-2002
l.64/1986	Mixed (academic + economy)	Temporary	Evaluation by committee members, with support from external experts	Scientific quality	No evaluation after decision for individual projects	NA	
PON	Mixed (academic + economy)	Temporary	Evaluation by committee members, with support from external experts	Relevance for policymaking and scientific quality	Intermediary and Final	Possibility to stop the project funding	2002
FIRB^	Mixed (academic + economy)	Temporary	Peer review by external experts	Scientific quality, Relevance to the theme of the program	Final foreseen by law, Intermediary recommended by the Evaluation Committee	Possibility foreseen by law to stop the project funding	2002
FISR	Mixed (academic + economy)	Temporary	Peer review by external experts	Relevance to the theme of the program, Scientific quality, economic potential of the projects	No evaluation after decision for individual projects	Possibility foreseen by law to stop the project funding	1999

* Years are referred both to the type of instrument and to the type of evaluation model. If the same instrument went into a new evaluation typology it is possible to write it more than one time.
° Scientific quality of both the project proposal and the project leader
^ Excellence centres and R&D centres also included
NA=negative answer

Norway

Before 1993, selection and evaluation processes of the three mission-oriented councils were mostly organised according to scientific disciplines, Sub-committees were in charge of funding decisions for each area. The committees had a mixed composition (members from academia, industry, public institutions and government), which was decided partly in order to represent stakeholders' interests and partly in order to have scientific competences (individual merit). The committees were also relatively free to define their own evaluation procedures, and the extent of use of external referees was different between disciplines and councils. Selection criteria were scientific excellence for NAVF (the research council devoted to academic research), while the other Councils applied partly scientific and partly industrial or economic relevance.

Since the establishment of the Research Council for Norway (NFR) in 1993, the evaluation procedures have become more streamlined, as use of international peer reviews and scientific merit as selection criteria have become widespread. For innovation-oriented instruments and projects dedicated to political problems, relevance criteria seems to have played a larger role in some areas.

For instruments directly funded by government, relevance has been more significant, than for most of the funding allocated by research councils. Government officials have been in charge for decisions, often in close collaboration with the researchers performing the projects.

Although information on Norway cannot be referred to the single funding instrument, it seems quite clear that the selection/evaluation processes of the Councils remained stable along the considered period, adopting mainly a blind mode of delegation, which was challenged in mid nineties by the will to give more room to criteria which refer to political priority setting or to economic added value. Anyway these changes did not seem so deep and the overall system just added an incentive mode of delegation to the blind one. Nor contract relation mode neither network mode can be detected.

5. DISCUSSION AND CONCLUSION

The study of the R/D funding policy and of its change needs data on the fund side and it finds an important instrument of measurement in project funding data, that represents 100% of the direct funding devoted to private beneficiaries, and a growing share of the R/D funds of academic and R/D public institutions.

Some scholar found out that the rationale of public R/D funding allocation went from one based on a linear process to a national system of innovation based rationale. On this view, the more relevant turning point as to the purposes and means of allocating public funds to S/T research came during the '90s and was characterised by the discourses on "national economic competitiveness" and responsibility of public fund managers towards the electorate (David, 1998). From another point of view (Braun, 2003), that we followed in our analysis, '90s was a period of transition from a direct steering (the attempt of the State as principle to have the scientific community working towards some goals) to a more indirect steering, where a "relational" contract and a "new public management" orientation should allow a deployment of the State power of control on scientific institutions. Network delegation can be seen (see Braun, 2003) as a counterbalance of the scientific community steering, where heterogeneous, bottom up or multilevel, types of control and coordination can coexist, while State is a facilitator of cooperation and trust building.

Starting from this theoretical background, our paper wanted to answer the question: which patterns of delegation can be detected by integrating quantitative indicators on Government PF with qualitative information on the processes of selection and evaluation of the funding instruments.

We tested the hypothesis that, along the thirty year period considered by the analysis, the relevance of the Government R/D project funding grew up in accordance with the changes in the delegation mode and the evaluation processes were generally reinforced and extended, including strong ex-post controls. The empirical test of these hypothesis showed that there is a risk of oversimplification. We looked

only to four countries (where data are available), but we got enough evidence that the transition among delegation modes was not so linear, neither an homogeneous process.

In Switzerland some pressure for funds to innovation and thematic policy appeared, but as data show, the funding policy concerned mainly the participation to the European R/D Framework Programme. As to national R/D fund, the weight of free projects remained dominant and the historical scientific intermediary (SNF) didn't loose its role in allocation policy. Evaluation practices followed the evolution of the two types of delegation, blind and incentives, being different one from the other, but without other changes over time. No push toward the settlement of stringent ex-post evaluation practices was present. Periodical evaluations of the instruments as a whole seem to have been the mean for implementing R/D funding. R/D networks are the emerging new funding instruments (13% in 2002), with an evaluation practice near to the network delegation mode.

The Austria PF system was characterised by the prominent role of two funding intermediaries, one devoted to scientific (FWF) and the other to applied (FFF) research; they shared the basic feature of a large autonomy (room of manoeuvre), but the evaluation processes were targeted, respectively on blind and on incentive delegation mode. The FWF adopted scientific quality criteria as main criteria of evaluation, while within FFF the Committee was not discipline oriented and new criteria of socio economic impact were adopted. A certain stability of funding allocation policy was assured by the capability of the intermediaries to succeed in their role of mediating between the principal and both public and private beneficiaries. Government choice was to add new intermediary bodies, managing new PF instruments, instead of replacing the existing ones. Among incentive and blind funding modes any way the first one result to be more relevant in terms of national resources allocated, while recently (2000s) is emerging the funding of a new instrument, the R/D network (13% on total PF), which include new (intermediary and ex post) evaluation processes. Moreover in Austria the emphasis given since mid '90s to standards in evaluation practices is a signal of a tendency toward the introduction of the "managerial paradigm" within the State-scientists relationships[19] even if at present evaluation practices have an impact only in terms of improving future programmes management.

In Italy, project funding was mainly an instrument to fund private R/D and went from a coexistence of free projects/grants and R/D programmes ('80s are characterised as such) to a progressive reduction of the formers in favour of a more pronounced incentive type R/D funding, both towards private and academic beneficiaries. Free projects and R/D programmes (whose forerunners were in mid '70s CNR scientific finalised projects) followed different evaluation processes, respectively blind and incentive delegation oriented. But over time Italy does not show an evolution of evaluation practices going towards the "relational" contract delegation mode; funding evaluation do not still affect fund allocation or priority settings.

In Norway before '93 R/D funding policy was mainly characterized by trust oriented processes of selection/evaluation, while after '93 targeted R/D programmes were strongly implemented, the Committees of the sub councils are organised by application areas and have a mixed composition. Other types of evolution concerning project funding are not visible. R/D networks funding is still not emerging neither a new evolution within PF selection/evaluation practices (such as ex post evaluation).

Our empirical evidences do not seem to confirm the hypotheses we intended to test. Evaluation processes at present show a change in the evaluation Committees' composition, in the criteria and methodology of selection, aimed to reinforce the adjustment of scientists to priorities, but these new practices often remain

[19] Two recent events go in that direction namely: the new University Act of 2002, introducing autonomy for University and the steps toward the establishment of a system of ex-ante and ex-post evaluation, such as the definition of a catalogue of criteria and guidelines for the impact analysis of R/D funding, in July 2002. Moreover, we can mention the merging of FFF and other intermediary bodies managing PF instruments for innovation into the new FGF.

ineffective. The new evaluation practices in most case don't have any effect on fund allocation policy, then the ambiguity between given external priorities and scientists' freedom, with risk of moral hazard and with high costs on both sides (State and scientific community) has not been solved. On average free projects correspond to a blind delegation type (instrument and evaluation processes), while R/D programmes correspond to the incentive delegation type; the quantitative analysis allowed us to find out that the change towards an R/D incentive funding policy (R/D programme) at national level of resource allocation, was not always so strong and did not replace the trust oriented instruments (Switzerland and Austria).

The funding of R/D networks seem to be the emerging phenomena, although in comparison with the political discourses on R/D networks and collaborations (often in a national system of innovation style) the reality is still small sized.

Changes in the selection and evaluation processes going towards a more "contract" delegation model (or New public management regime), which should have to solve the paradox between welfare objectives and scientific freedom, are very poor: only in Austria we found out some signs of change.

Certainly our evidences should have to be controlled through other case studies, but as a first result it comes out that Government project funding seems to be a weak instrument for steering the scientific community.

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