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**Monitoring and analysis of policies
and public financing instruments
conducive to higher levels of R&D investments
The “POLICY MIX” Project**

Country Review FRANCE

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Introduction and Policy mix concept

The policy mix project

This report is one of the 31 country reviews produced as internal working papers for the research project “Monitoring and analysis of policies and public financing instruments conducive to higher levels of R&D investments” (Contract DG-RTD-2005-M-01-02, signed on 23 December 2005). This project is a research project conducted for DG Research, to serve as support for policy developments in Europe, notably in the framework of CREST activities. It does not form part of the ERAWATCH project, but the working documents are made available on ERAWATCH webpages for the purpose of steering a debate on the policy mix concept.

The “Policy Mix” project is run by a consortium of 7 partners:

- UNU-MERIT (The Netherlands), consortium leader
- Technopolis (The Netherlands)
- PREST – University of Manchester (United Kingdom)
- ZEW (Germany)
- Joanneum Research (Austria)
- Wiseguys Ltd. (United Kingdom)
- INTRASOFT International (Luxembourg).

Each country review is produced by an individual author, and provides expert’s view on the policy mix in the country. This report is not approved by the Commission or national authorities, and is produced under the responsibility of its author.

The role of country reviews is to provide an exploratory analysis of the current policy mixes in place in all countries and detect the most important areas of interactions between instruments as well as new modes of policy governance that are particularly adapted (or detrimental) for the building of policy mixes. They provide analytical material for the analysis of the policy mix concept and its implementation in Europe. This material will be used as background for further reports of the project and for the construction of a tool for policy-makers (to be made available in late 2007 and 2008).

The policy mix concept

The country reviews are based on the methodological framework produced by the consortium to frame the “policy mix” concept. They have been implemented on the basis of expert assessments derived from the analysis of National Innovation Systems characteristics and policy mix settings, using key information sources such as Trendchart and ERAWATCH reports, OECD reviews, and national sources, among which the National Reform Programmes.

In this work, the “policy mix for R&D” is defined by the consortium as: **“the combination of policy instruments, which interact to influence the quantity and quality of R&D investments in public and private sectors.”**

In this definition, policy instruments are: “all programmes, organisations, rules and regulations with an active involvement of the public sector, which intentionally or unintentionally affect R&D investments”. This usually involves some public funding, but not always, as e.g. regulatory changes affect R&D investments without the intervention of public funds.

Interactions refer to: “the fact that the influence of one policy instrument is modified by the co-existence of other policy instruments in the policy mix”.

Influences on R&D investments are: “influences on R&D investments are either direct (in this case we consider instruments from the field of R&D policy) or indirect (in that case we consider all policy instruments from any policy field which indirectly impact on R&D investments)”.

Structure of the report

The report is structured along the following questions.

First, in section 1, and in order to place the policy mix in context, the general challenges faced by the National Innovation System (NIS) are analysed by the expert. The view is here not restricted to the challenges with regard to raising R&D investments, but rather encompasses all the conditions that directly or indirectly affect the functioning of the NIS and R&D expenditures. These context conditions are very important for the discussion of the relevance of the policy mix later on.

Second, the stated main objectives and priorities of R&D policy in the country are spelled out in section 2, as well as their evolution over the last ca. five years. This discussion is based on White Papers and official documents, i.e. on published policy statements. The reality of these objectives compared to actual working of policy instruments will appear in section 5.

The third section provides an expert assessment and critical analysis of a possible gap or convergence between the NIS challenges and the main policy objectives and priorities stated before.

Section 4 presents the policy mix in place, following the above definition, i.e. policy instruments affecting R&D activities in the private and in the public sector, either directly for instruments from the R&D policy domain, but also indirectly for instruments outside the R&D domain which are of particular relevance to R&D activities. A typology of instruments is used, to categorise the R&D-specific and non-R&D specific instruments. A short description of each instrument is provided: aim, nature, target group, budget.

Then, section 5 discusses whether there is a gap between the main policy objectives and priorities stated in section 2, and the instruments in place. This is done by

comparing the set of objectives with the set of instruments at work. When individual evaluations of programmes or policy instruments are available, their results are used if they shed light on contribution of these instruments towards the policy objectives.

Section 6 discusses the orientation of the policy mix, indicating priorities amongst various possible routes to increase R&D investments. Policy instruments are categorised under 6 different routes according to their relevance, and this categorisation is followed by a discussion on the range of instruments affecting each route, missing instruments, routes that are not addressed by instruments, possible redundancies or overlaps, etc.

Section 7 provides another view on the policy mix, focusing on the relative importance of each types of instruments. The aim is to get a picture of the policy mix, the balance between (sets of) instruments, and the relative weight between them.

From section 8 onwards, the review turns to the crucial question of policy governance. That section discusses the emergence of the policy mix through examination of the following question: how did the set of R&D policy instruments arrive ? What is the rationale behind them, what were the driving force behind their establishment, and how is this evolving recently. A crucial question relates to the existence of some consideration of possible interactions when establishing new or suppressing existing instruments. The section tries to establish whether the policy design process is incremental or radical, analytical or non-analytical. From this, that section discusses if the policy mix is a “construct” or an “ex post” reality.

The next section, section 9, focuses on the governance of the system of R&D policy instruments take place. It examines the key question of interactions, i.e. whether there is a form of co-ordination between R&D policy and policy instruments from outside the R&D domain, and the existing mechanisms that favour or hinder such interactions.

The final section, section 10, deals with the core question of the policy mix concept: it endeavours to discuss interactions between policy instruments to affect R&D expenditure. The section discusses possible positive, neutral and negative effects of R&D policy instruments; both within the R&D policy domain, but also with instruments from other policy domains. In most cases, this takes the form of hypotheses rather than hard evidence.

Feedback welcome

Feedback on this report is gladly received. Individual country reports will not be updated but discussion on policy mixes is welcome during the timeframe of the study (2006-2008). Please send your comments to:

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1. National Innovation Systems Challenges

The main challenges that the French NSI has to cope with are:

1. The increase in private R&D expenditures
2. The reinforcement of the role of SMEs in the NSI
3. The strengthening of the links between research and innovation actors
4. The increase in the number of researchers.

The increase in private R&D expenditures

With respect to the Lisbon agenda, the increase in R&D expenditures that has to be funded by the industry is substantial. In 2005, BERD in France reached 1.32% of the GDP¹. Taking a realistic annual GDP growth rate into account (around 2%), BERD would have to grow by 50% in three years in order to reach the target.

This, along with the fact that a large share of private R&D funds comes from outside, shows of the insufficient efforts made by domestic companies as regards R&D expenditures. To be short, the share of the GERD funded by domestic enterprises (50.8% in 2003) is rather low in comparison with the main industrialised countries (66.3% in Germany, 74.7% in Japan or 63.8% in the USA for example).

The breakdown of private R&D expenditures by the size of the companies in 2004 was the following: companies with up to 500 employees, whose share in the industrial structure reaches at nine tenth (90.4%) performed one quarter (24.2%) of the total business R&D expenditure. More than one half (53.9%) was realised by companies with more than 2000 employees, which represented 2.2% of the population. These companies captured two thirds (69.6%) of public funds. The distribution of public funds is strongly distorted in favour of the largest companies to the detriment of the smallest ones: companies with up to 500 employees received 16.1% of public funds whereas they performed 24.2% of companies' R&D expenditures. This situation is complementary to the previous one: French companies do not fund enough R&D (according to what the government expects) and this statement is particularly true for SMEs. Since they have a large share of the industrial structure, an increase in the overall private R&D intensity necessarily goes through a significant increase in the SMEs' R&D intensity.

The reinforcement of the role of SMEs in the NSI

In addition with the issue of the relative low level of SMEs' R&D expenditures, traditionally, SMEs do not have a strong culture of innovation. This is testified by the results of the 4th Community Innovation Survey²: 63% of large companies were classified as innovative in product or process, compared with 42% of companies from 50 to 249 employees and 21% of small companies.

The previous issue is related to the lack of innovation culture within SMEs in general. There is another issue as regards SMEs and innovation, which is related to the small number of high-growth SMEs. In 2006, the Council of Economic Analysis (which is

¹ Estimate by the Ministry in charge of Research (<http://cisad.adc.education.fr/reperes/public/chiffres/default.htm>).

² SESSI (2006), *Le 4 pages des statistiques industrielles*, no. 222

an advisory body reporting to the Prime Minister) published a report pleading for *A SME Strategy for France*³. The starting point idea is that France does not have enough middle-size companies, from 50 to 500 employees, and in particular suffers from an insufficient number of high-growth SMEs that have higher level of job creation, of exports and of R&D than their counterparts. A higher pool of high-growth SMEs would enable a higher level of employment, of exports and of R&D at the industry level.

The strengthening of the links between research and innovation actors

By tradition, research and innovation were two distinct spheres with little relations between actors. The linear model perfectly characterised the French NSI until recently, in the sense that research and innovation were strongly separated.

After WWII, the main Public Research Organisation, the National Centre for Scientific Research (CNRS) was in charge of conducting fundamental research independently from industrial considerations. In 1982, a major reform was conducted in order to restructure the public research system. The main point was the reaffirmation of the independency of fundamental research carried out by public actors (HEIs or PROs) from economic objectives. In the past years, several attempts were initiated in order to increase the links between science and industry but fragmentation is still a problem. The starting point of the renewal of the public view of the role of the public research base in the economy corresponds to the Law for Research and Innovation that was voted in 1999. The rationale was to close the gap between research and innovation actors.

The issue of technological transfers is a serious challenge for the French system of research and innovation. This question which is not new has received new highlights in January 2007: an evaluation report published by the services of the Ministry of Economy and of the Ministry Education⁴ pointed out the questionability of effectiveness of new instruments aimed at strengthening the valorisation of research outcomes that were implemented during the past years. One should mention however that this report has been badly received by the scientific community. The least that can be said is that the conclusions are not consensual.

Last but not least, relations between private actors within the NSI are not necessarily favourable to the efficient creation and diffusion of new technologies. The French tradition of neo-Colbertism to support large companies performing the lion's share of national R&D effort gives little room for manoeuvre for SMEs to support research activities with high innovative potential. The State's view was that transformation of knowledge created by public research into new technological innovation is mostly in the domain of large companies. According to this view, technologies are afterwards diffused within SMEs. As a matter of fact, SMEs were not seen as a major actor of the NSI which implied in turn that there were weak interactions between SMEs and large companies regarding technology flows.

³ Betbèze and Saint-Etienne (2006), *A SME Strategy for France*, Council of Economic Analysis, Paris.

⁴ IGF - IGAENR (2007), *La valorisation de la recherche*.

Apart from these traditionally weak linkages between research and innovation, one has to underline as well that the relationships between public research actors are very loose. The place of the Universities in the research landscape is rather weak compared to their foreign counterparts. The French public system is organised around two main types of actors, the HEIs on the one hand and the scientific umbrella organisations on the other hand. As such, Universities are somewhat in research competition with the PROs and the other HEIs, of which the famous French “Grandes Ecoles”. In reality, Universities and PROs share a large number of research labs (the so-called ‘Mixed Research Units’). For instance, at present, more than 80% of the CNRS research laboratories are Mixed Research Units. Even though French research actors have increased their linkages in the past two decades, French research still suffers from the fragmentation of actors and from insufficiently coordinated research activities.

The increase in the number of researchers

The ageing of population implies that the public and the private sectors will have to recruit thousands of researchers in the coming years. Bottlenecks may occur due to a potential lack of researchers in some fields. The status of the researchers in the public sector is a real issue that will have to be taken into account in order to attract young researchers. Still regarding the public sector, in terms of work demand, the issue of the evolution of job opportunities is also very sensitive within the scientific community.

The past three years, the governments have done subsequent efforts to strengthen the public R&D budget. The number of job opportunities has significantly increased. In 2005, one supplementary billion euros (out of 9.3) was budgeted for the Civil Budget for R&D as compared with the previous year. For 2006 and 2007, the Government earmarked the same amount. In the Pact for Research, the State committed itself to put the budget for R&D in 2010 at 24 billion euros (against 18.9 billion euros in 2004). The cumulated effort from 2005 to 2010 will be equivalent to 19.4 billion euros, corresponding to an increase of one quarter (27%).

Notwithstanding these efforts, researchers and representatives from the researchers scrutinise with attention what will be done in the future as regards public researchers’ recruitment. From this point of view, the forthcoming debates for the election of the President of the Republic (April) as well as for the Deputies (May) has raised these issues amongst the ones related to the public research system.

2. Objectives and priorities of R&D policy

The current objectives and priorities of R&D policy have been designed in two Policy Documents. In 2003, the Minister in charge of research and the Minister in charge of industry defined altogether the guidelines for the government research policies in the **Innovation Plan**. In 2005, the (new) Minister in charge of research proposed the **Pact for Research**. Proposals encompassed in the Pact for Research pave the way for the Law for Research that was voted by the Parliament in April 2006. In terms of priorities, these two Policy Documents have put the emphasis on the following points:

The reorganisation of the public research governance

The changes made to public research governance lies upon four main pillars:

1) The need to identify research priorities.

In spite of reaffirming the statement that research should be performed in every scientific field, the Government wants to have an instrument to identify scientific and technological priorities. It was therefore decided to implement an ad hoc structure that would be in charge of identifying research and innovation strategies.

2) The monitoring of public research policies.

From an institutional viewpoint, the collaboration between ministerial bodies has to be reinforced. The Ministry in charge of research, which is assigned to orient the governmental research policy, does not have any influence on decisions regarding research issues taken by its counterparts, as it was pointed out by the Court of Auditors in 2003 and endorsed by the Ministry in charge of research⁵. The Pact for Research has stressed the necessity to reinforce the role of the Inter-ministerial Committee of Scientific and Technological Research, which is led by the Ministry in charge of research.

3) The increase in research excellence.

The internationalisation of research activities has increasingly modified the research landscape through greater competition between research units in different countries. In order to gain international visibility research should reach excellence. In order to raise excellence and to fund research according to identified priorities, the Government has decided to create a funding agency. This means that public funds will no longer be based almost exclusively on the basis of research structures but also on the basis of scientific and technological projects.

A second related element is the need for a stronger culture of evaluation. Research has to be more systematically evaluated. Evaluation must concern researchers, research units and research institutes. Moreover, evaluation outcomes have to better be taken in consideration. The corollary is that research would be given clear socio-economic objectives. Since evaluation will be systematic, the idea is that the impact of research activities on society and the economy will improve. Furthermore, the

⁵ Court of Auditors (2003), *Rapport pour le Président de la République, Chapitre V, Recherche*

evaluation of research outcomes actually achieved would provide the Government with recommendations for improving the research system.

4) The support of scientific employment.

According to the Innovation Plan, a specific focus should be put on recruiting young researchers in the public sector. More generally, the question of scientific careers in the public research system was considered as a main priority by the Pact for Research. The issue of a potential lack of human resources in research was reaffirmed by the President of the Republic in his introductory speech at the creation of the High Council for Science and Technology in September 2006⁶.

The reinforcement of relationships between public research actors and companies

Another priority of the reorganisation of the French research system is to reinforce relations between public research organisations and companies. Since 1999, the successive governments have emphasised the need for designing policy measures to facilitate the valorisation of research performed in the public research system. Human resources' mobility was hence identified as an important means to enable the creation of private companies. As such, administrative procedures to incite researchers to participate in the executive board of companies or even to run companies were modified accordingly.

The strengthening of public-private partnerships was also clearly identified as a core priority of research and innovation policies. Several instruments were hence identified in order to make public research actors and companies working together on research projects.

The reinforcement of companies' innovative behaviour

As far as innovation policies are concerned, the emphasis has been put on the measures needed to increase the innovative behaviour of companies, especially SMEs. Traditionally, French innovation policies were mostly oriented towards large companies, but significant efforts have been made in the last few years in favour of SMEs. In fact, SMEs often underline that the Government is increasingly taking their needs into consideration. The main measures implemented in the last years are the creation of the Young Innovative Company and the reform of the Research Tax Credit with the introduction of a volume-based scheme. Since the Research Tax Credit is seen by the Government as a tool essentially oriented towards SMEs, the increase in its budget corresponds to a supplementary financial effort of supporting SMEs.

⁶ http://www.elysee.fr/elysee/elysee.fr/francais/interventions/discours_et_declarations/2006/septembre/allocation_du_president_de_la_republique_lors_de_l_installation_du_haut_conseil_de_la_science_et_de_la_technologie-hcst.61174.html

3. Coherence between NIS challenges and R&D objectives and priorities

The increase in private R&D expenditures

The increase in R&D expenditures by industry is accepted as a serious challenge by policymakers. Ministers in charge of research and those in charge of industry have changed many times during the last couple of years, but there was continuity in terms of priorities. In 2002, the shift from a Socialist Government to a Conservative Government did not affect fundamentally research and innovation policies. There is agreement upon the fact that the gap between public research and industrial innovation has to be reduced and that industry has to drastically increase its R&D effort. (However, this does not mean that there is a consensus, since some researchers do not accept the direction taken by the research system).

The reinforcement of the role of SMEs in the NSI

The Government also considers the low level of SMEs' expenditures in R&D as a serious issue. As already underlined, SMEs do not devote enough resources to R&D and are not sufficiently involved in the innovation system. For too long, they were not targeted by the Government because of a view based on the industrialised "filieres" and the spill-overs amongst the actors within the "filieres". The focus was on the large companies and research actors within the "filieres". The SMEs were hence not directly targeted. Positive effects for SMEs were seen as the results of the spill-overs generated by the larger actors. This view motivated in a way the creation of the Agency for Industrial Innovation.

In the meantime, the need for policies oriented towards SMEs did however become increasingly popular. The **SME Pact** can be seen as a first attempt to go against the SMEs' lack of recognition of their role in the innovation system and in the creation and diffusion of new technologies. The Pact is also an implicit recognition of the SMEs' wish to increase their role in the innovation system. We have already noted that large companies do not trust enough SMEs. The SME Pact is undeniably a reply to this but seems nevertheless not ambitious enough.

The main instrument aimed at increasing private R&D expenditures correspond to the **Research Tax Credit** that was deeply modified in the past years.

The strengthening of the links between research and innovation actors

In 1999, the Parliament voted the Law for Research and Innovation that was defended by the Minister in charge of research. The Law underlined the need for stronger relationships between public research and private industry. Two instruments were created to facilitate the valorisation of research outcomes. The first tool was the creation of the status of the **Young Innovative Company**, providing tax relief for companies with a high level of R&D expenditures compared to their turnover. The second tool was changing the status of public researchers (who are civil servants) to enable them to partially work for a company or even to run a company. (It should be

noted that each year, data are presented by the Ministry in charge of research for the number of researchers allowed to participate in projects carried out by private companies. These figures are presented in the annual report on innovation and technological research policies⁷).

The emphasis placed on the ways to overcome the traditional weak links between science and industry has recently increased. In 2005, a new set of instruments was designed to reinforce these links: the implementation of the **Agency for Industrial Innovation**, the labelling of **Competitiveness Clusters** and the design of the **Carnot Awards**.

The **Agency for Industrial Innovation** supports and subsidises large programmes for industrial innovation. The focus is essentially put on large companies but the Agency is also aimed at networking SMEs, as well as public research institutions, around the large companies. Public funding is seen as a way to support pre-competitive research for long-term projects. The idea is to build industrial projects similar to Airbus.

Competitiveness Clusters place the emphasis on PROs involvement. Competitiveness clusters are a form of public-private partnership. To reinforce a territory's attractiveness, they gather on a geographical basis, public research units, training centres and enterprises working on a specific project, whether on emerging themes or on more mature ones. This governmental measure, considered to be the cornerstone of the new industrial policy, led to the establishment of 67 competitiveness clusters in 2005⁸, which gather companies, training centres and public and private research organisations around innovative joint projects. Clusters are specialised in scientific and technological fields. The competitiveness cluster measure should be seen within the framework of a new regional policy in France. While previous policy was to redistribute resources to less prosperous regions, the new revised regional policy in France focuses on competitiveness and promotes innovation and public-private partnerships in order to generate positive regional development.

The **Carnot Award** measure is also in line with the wish to develop greater links and partnerships between public and private research and business in France. The main objective is that basic research performed by public actors can be used by enterprises and SMEs to develop innovations. The principle is to identify research institutes that perform a significant share of their research activities in the frame of contracts with private actors and to provide them with extra resources.

In order to increase the relationships between the different public research actors, the Government has created two instruments:

The **Research and Higher Education Clusters** and the **Thematic Networks for Research** are aimed at fostering public research actors on scientific projects. Participants in the Clusters or in the Networks will be given extra resources. The logic is to increase research excellence and go against the fragmentation of research activities. The increasing aspiration to concentrate talents and resources to gain

⁷ Ministère Délégué à la Recherche (2006), *Mesures de soutien à l'innovation et à la recherche technologique. Bilan au 31 décembre 2005*.

⁸ Two Competitiveness Clusters have merged, so that there are now 66.

international visibility implies that the spatial planning principle that was the rule for French policies may vanish in the future.

The increase in the number of researchers

The replacement of the elder researchers in the public sector is seriously taken on board by the French governmental authorities. By the way, the main candidates for the Presidency of the Republic already consider this question as a major issue for the future. This is a sign that this point will continue to be at the top of the policy agenda in the future.

Apart from the issue of the recruitment of new researchers in the public sector, the Pact for Research has put the emphasis on the doctorate training. Employment and career of PhD holders both in the public sector and in the private sector will be systematically monitored. The objective will be to improve the assessment of future needs of researchers by scientific fields and to distribute PhD fellowships between scientific disciplines accordingly.

To reduce the gap between doctorate training and industry needs (said differently between the supply and the demand of researchers), the role of doctoral schools will be reinforced in order to improve doctorate training. Doctoral schools will have the duty to participate in the professional insertion of PhD holders. Their capacity to handle this task will be one of the criteria used for their evaluation. This statement underlines the way in which the training and the insertion of PhD holders into the NSI is considered.

4. Composition of the policy mix for R&D

As for the support for private R&D activities, there are three traditional types of instruments used by the French public authorities.

The first type corresponds to **direct measures**. OSEO innovation is dedicated to supporting SMEs in their innovative activities. One of its roles is to distribute subsidies and loans. Among the different instruments that OSEO innovation disposes of, there are also measures to increase the recruitment of researchers and technicians by companies.

The second type is **fiscal measures**. The most remarkable ones are the Research Tax Credit and the tax relief for the Young Innovative Companies. In 2004, a volume-based scheme was introduced in the Research Tax Credit (5% of the volume of R&D). In 2005 (for application from 2006 onwards), the threshold was put at 10%. In terms of budget, it is expected that the budget will go up from around 400 million euros in 2004 to 1.2 billion euros per year.

The third type consists of **indirect measures**; this includes measures that are aimed at inciting companies to have stronger links with public research institutions. The idea is to create a network with the different actors or even to build formal public/private partnerships. The targeted indirect effect is based on the economic rationale that maintains that companies have to perform their own research activities in order to benefit from the advance in knowledge made by the other actors in the research and innovation systems, including public research institutions. Because companies that do not have a sufficient knowledge basis cannot handle transfers of knowledge, increasing links between the actors would induce companies to have research activities in connection with that of the knowledge producers. Hence, if knowledge producers increase significantly their research activities and shift the research frontier, companies would have to enhance their own R&D intensity to follow them and to shift the technological frontier.

Several instruments to increase knowledge producers and knowledge users have been put in place over the past few years. Hence, public actors have a large variety of instruments to enhance public and private co-operation on technological issues.

In 1998, in order to enhance collaborative projects between the public research basis and the industrial basis, the **Research and Technological Innovation Networks** (RRITs) were designed. The choices as regards the thematic coverage were to identify those fields for which usual structures do not make sufficient efforts. Typically, research projects are jointly carried out by public research laboratories, SMEs or start-up companies and industrial groups. Since 2005, the National Agency for Research funds the RRITs. At the end of 2005, there were 18 networks, four of them were dedicated to ICT (94.4 million euro were distributed in 2005 to 163 projects), five were focused on life sciences, nine were related to energy and environment. In all, in 2005, 267 million euros have been distributed to 420 research projects.

In order to adapt the technological supply to SMEs' needs, the State has also implemented regional networks, which are based on the regional industry and technology patterns. This is the case with the over 200 **Regional Innovation and Technology Transfer Centres** (CRITTs). They are distributed over the French territory in order to increase SMEs' awareness innovation and/or to provide them with technological services according to their needs.

In the same vein, from July 2000 to December 2004, 20 **National Centres of Technological Research** (CNRTs) were created in the context of the State Region Plan Contracts, which formalised the relations between the State and the Regions. Each Centre is dedicated to a specific scientific theme corresponding to regional competences.

Still based on the idea of providing SMEs with the most adapted supply to their needs, the **Technological Development Networks** (RDTs) were created in 1990. They have the duty to support SMEs in their development through a network of public actors (regional as well as the regional delegates of government ministries).

The **Industrial and Commercial Activities Services** (SAICs) within Universities, launched in 1999, are in charge of all industrial and commercial activities that are not performed by a company or a grouping of companies.

Apart from these instruments, it is noteworthy to mention the Cancer Plan initiated in 2003 (until 2007) for which 640 million euros have been scheduled for the whole period. The ambition of the plan is to connect all the actors that are involved in the research against cancer, both public and private. The interest as far as the policy mix is concerned, is that the Plan deeply involves the Ministry in charge of health and the Ministry in charge of research. Based on societal needs, the Plan has an indirect impact on the research in health, pharmaceutical... sectors. The emphasis has also been put on the regional dimension of the Plan through the implementation of regional and inter-regional clusters (Canceropoles).

The different instruments as well as the institutions that support research and innovative activities are presented in the chart below⁹ (Figure 1). The chart shows the Governmental instruments that have been implemented in order to cover the whole spectrum of research and innovation activities from basic research to innovation through applied research.

⁹ The chart comes from the French TrendChart 2006 Report.

Figure 1 Organisation of R&D policy instruments

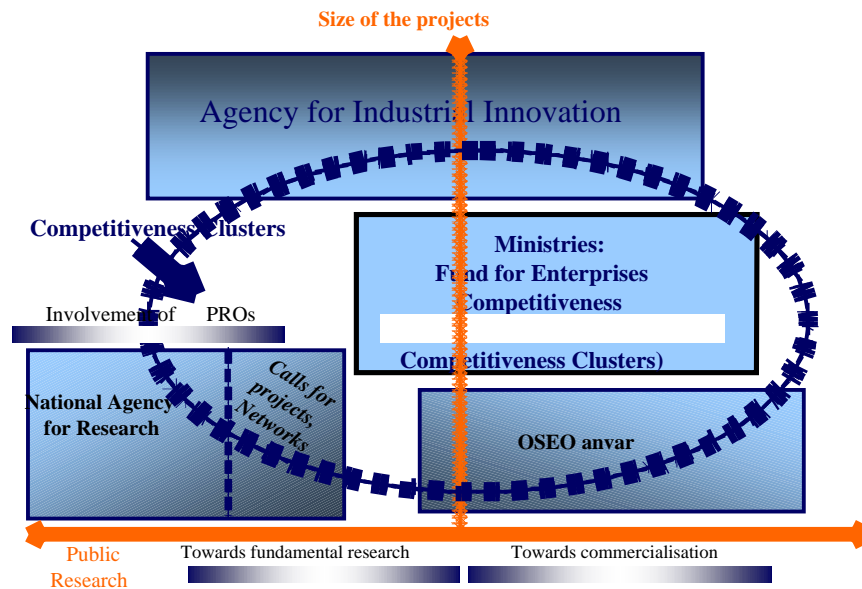


Table 1: Policy mix for R&D in France

Policy categories	Policy instruments: short description and target group
R&D Domain	
R&D policy generic	<p>Research Tax Credit. This measure benefits to large as well as to small or medium companies, but is perceived as an instrument dedicated to SMEs.</p> <p>The Research and Higher Education Clusters and the Thematic Networks for Research are part of the Law for Research voted this year. Both share the objective of bringing resources together in order to support emergence of centres of excellence and to raise visibility of French research at international level</p>
R&D policy sectoral	
R&D / Innovation policy – Linkage	<p>Competitiveness Clusters National Agency for Research Agency for Industrial Innovation Carnot Awards</p> <p>All these instruments are aimed at linking research and innovation actors. They all were implemented in the past couple of years.</p> <p>Research and Technological Innovation Networks National Centres of Technological Research Regional Innovation and Technology Transfer Centres Technological Platforms Technological Development Networks Industrial and Commercial Activities Services</p>

	These instruments are also aimed at strengthening linkages between public and private actors.
R&D / Innovation policy – IPR	
R&D specific financial and fiscal policy	<p>Young Innovative Company</p> <p>The objective of the Young Innovative Company status is to help young innovative firms overcome the difficult first years of existence by extending them tax credits in favour of R&D investment. The status is granted to independent SMEs less than 8 years old, with R&D expenses amounting to at least 15% of their total turnover. Companies that benefit from the JEI status become eligible for a series of tax rebates including exemptions on corporate earnings taxes, local taxes and social charges associated with employing highly qualified personnel.</p>
R&D specific education policy	<p>Some measures were designed to reinforce the interest of the young in science and technology. The Institute for Advanced Studies in Science and Technology has been created in July 2006 and was inaugurated in November. One of the tasks of the IHEST is to “encourage the discovery of research employment and to valorise technical and scientific careers by organising debates and meetings between secondary schools pupils and young researchers”.</p> <p>As far as the PROs are concerned, this activity is also taken on board as testified by the reform in 2005 of the CNRS and by the duty given to the Directorate for communication to promote science towards young people and to support teachers in this activity. Specific actions will be designed.</p>
R&D specific employment policy	<p>This is one element of the reform to the Research Tax Credit. From 2006, staff expenditures on PhD holders are eligible for twice their value in the first year of the recruitment (for non-fixed term work contracts and provided that the number of employees has not decreased).</p> <p>Regarding gender equality, specific actions are going to be taken in the near future. The CNRS has launched a dedicated committee to promote the place of female researchers in the research community but no actions have been implemented so far (http://www.cnrs.fr/mpdf/article.php3?id_article=2).</p> <p>In December 2006, the Committee for gender equality in higher education and presented several recommendations to the Minister in charge of research regarding gender equality in higher education and research:</p> <ul style="list-style-type: none"> - The development of attractiveness of scientific careers to women

	<ul style="list-style-type: none"> - The suppression of carriers' barriers for women - The possibility to better link maternity and carrier development.
Finance Domain	
Financial and fiscal policy	
Macroeconomic policy	The consolidation of public finance is one of the three pillars of the National Reform Programme. One objective is to stabilise public expenses. In 2005 and 2006, the public deficit was brought under 3% of the GDP in accordance with the European commitments. A second objective is to reduce the public debt (by two percentage points in 2006 from 66.6% to 64.6% of GDP).
Human Capital Domain	
Education policy	The National Reform Programme has stressed the need to reinforce investment in human capital both through training at school and at Universities and through life long learning.
Employment policy	Employment policy is one cornerstone of the National Reform Programme. One instrument is to continue the decrease of labour costs for the lower wages.
Innovation Domain	
Innovation policy generic	The new impetus given to the industrial and innovation policy relies mainly upon the Agency for Industrial Innovation and the Competitiveness Clusters .
Innovation policy sectoral	
Other policies - industry	
Other policies - trade	Several new measures were put in place to support SMEs in their export activities, including a tax credit that was implemented in 2005.
Other policies - defence	
Other policies – consumer protection	
Other policies – health and safety	The Cancer Plan was initiated in 2003 (until 2007). 640 billion euros have been budgeted for the whole period.
Other policies - environment	In February 2006, the Government created a working group bringing together representatives of several Ministries, experts and representatives of civil society. The objective is to design economic tools in favour of environment.
Other policies – regional development	Relations between the State and the Regions are contractualised in the State Region Project Contracts . The next contracts will cover the period from 2007 to 2013. The creation of the Project Contracts was coordinated with the next European Structural Funds programmes that have the same time-schedule (2007-2013). The Project Contracts will be focused on competitiveness and

	attractiveness of territories, promotion of sustainable development and territorial and social coherence.
Other policies - competition	<p>Competition has been reinforced in the distribution sector. Relations between providers and distributors were reformed in 2005 in order to favour price decreases.</p> <p>Competition policy was also very active with regards to network industries, such as electricity, gas, railways, motorways or telecommunications.</p>
Other policies – social security	This is one of the elements related to the consolidation of public finance.

5. Coherence between main policy objectives and priorities, and policy instruments

The increase in private R&D expenditures

In order to increase companies' expenditures devoted to R&D, the Government has reformed the Research Tax Credit in 2004. The most important change is the introduction of a volume-based scheme along the incremental-based scheme (that started in the 1980s).

An evaluation study of the reform of the Research Tax Credit highlighted that the measure has three types of impact (without mentioning the distribution within the population of companies):

- A direct impact meaning that the level of tax credit is explicitly taken into account by the companies when they prepare their R&D budget and which positively influence the effort of the companies
- No impact on the level of expenditures but on the choice of projects actually launched
- An indirect impact that is more difficult to measure. This impact is part of the creation of an environment favourable to R&D. Companies' managers have the feeling that the new set of measures that the Government has put into force contributes to raising the emphasis put on R&D and innovation. Since these managers now consider that Government and regional authorities have understood the importance of R&D and innovation for the competitiveness of the French industry and companies, they are keener on making a larger effort as far as R&D expenditure is concerned. From this point of view, the adequacy of challenges and instruments has certainly diminished the past years.

Overall, it seems to us that the objectives and priorities are in line with the challenge but are not sufficient. A stronger effort should be placed on SMEs since they are the weakest link in the national system of innovation as regards R&D intensity. The focus on SMEs is not sufficient to really give a new impetus to SMEs' R&D culture and to drastically incite them to raise their R&D investment. The most important tools oriented towards SMEs are the **Research Tax Credit** and the **SME Pact**. The **Research Tax Credit** seems to be efficient in that it has an overall impact on companies' R&D investment, including SMEs. However, even if the impact is real, there is no way of knowing to what extent another measure with the same budget would have.

The reinforcement of the role of SMEs in the NSI

As regards the **SME Pact**, one can state that its ambitions do not reach the SMEs' expectations. The SME Pact is a voluntary commitment taken by large companies, Ministries and public companies to reinforce their relations with SMEs. From discussions with directors of innovative companies, it appeared that SMEs often have the feeling that they suffer from a lack of confidence from large companies. SMEs are

often associated with a risk of failure and in order to avoid any problems, large companies prefer to work with other large companies, even if their products or services are less efficient/competitive than the ones of some SMEs. The problem for SMEs is not to be visible but to be credible. On the other hand, innovative companies also often mention their willingness to have a share of the public demand devoted to them. Innovative SMEs have been asking for a long time for an equivalent to the US Small Business Act to help support their growth. From this point of view, the SME Pact is definitely not sufficient.

Furthermore, according to the SMEs, even if they acknowledge the fact that the Government has increased the support it provides them with innovation and R&D, policies remain largely distorted in favour of the large companies. Traditionally, French industrial and innovation policies were oriented towards supporting national champions with the idea that the large firms will pull the whole industry in terms of innovation through spill-overs. For SMEs, it is clear that this model is still valid from the Government's point of view. For instance, the Agency for Industrial Innovation is often perceived as a tool that will almost only be beneficial for large companies. SMEs are convinced that their points of view, expectations and needs will not have a sufficient weight in comparison with large companies for the design of the projects.

The strengthening of linkages between research and innovation actors

As already mentioned, the need to reinforce links between research actors has seriously been taken on board in the past few years by the Government. As regards the implementation of the Competitiveness Clusters, the OECD¹⁰ underlines that in contrast with the previous measures, this programme displays outstanding characteristics:

- It is enshrined within regions
- It is an ambitious measure regarding the budget
- Projects are identified by local actors with a bottom-up approach
- It takes explicitly into account the systemic dimension of innovation by involving a large variety of actors.

These positive statements are however counterbalanced by negative comments on the French tradition of spreading financial resources rather than concentrating them on fewer projects in order to raise excellence. For instance, the funding of the 38 projects which were not selected is seen as the willingness to spread money amongst the largest number of participants.

Besides, one can underline the leverage effect of the Agency for Industrial Innovation and of the Competitiveness Clusters which testifies in a way the reply of the private actors as regards the public effort.

As far as the Competitiveness Clusters are concerned, from 2005 to August 2006, 540 million euros of public funding were distributed to support 165 projects. 230 million euros came from the State budget, 80 million euros from the Agency for Industrial

¹⁰ OECD (2006), *Examens territoriaux de l'OCDE – France*.

Innovation, 200 million euros from the National Agency for Research and 30 million euros from OSEO innovation. In total, the R&D budget of the 165 projects has reached a level of 1 800 million euros.

The leverage effect of public expenditures appears through the first set of selected projects to be funded by the Agency for Industrial Innovation. This list was published in April 2006. The leverage effect of the projects goes from 1.3 to 1.8:

- 1.8 private euros for each public euro for Quaero which focuses on numerical content research and recognition. This project, led by Thomson in cooperation with Arvato/ Bertelsmann, has a budget of 250 million euros over 5 years, of which 90 million funded by the State.
- 1.6 private euros for each public euro for the programme for mobile television led by Alcatel. The budget is 98 million euros over 4 years of which 38 million funded by the State.
- 1.4 private euros for each public euro for NeoVal which is a transport system concept. The project is led by Siemens France for a budget of 62 million euros over 5 years with a public funding share of 26 million euros.
- 1.3 private euros for each public euro for BioHub which is a bio-refinery concept led by Roquette. The budget reaches at 98 million euros over 6 years of which 43 million funded by the State.
- 1.3 private euros for each public euro for Homes which is a project on eco-building with low energy consumption. The project, driven by Schneider Electric, has a budget of 88 million euros over 5 years with a public funding share of 39 million euros.

The search for means to enhance cooperation between public research institutes have been seriously taken on board by the governmental authorities. This ended up with the creation of the Research and Higher Education Clusters and the Thematic Advanced Research Networks. These new instruments are however received with doubt by the research actors since they raise serious core problems as regards their governance.

The increase in the number of researchers

The Pact for Research and the related Law for Research were the legislative reply to the massive researchers' dissatisfaction due to the partial freeze of research credits that took place in 2003. After the researchers' mobilisation, the Government stated its willingness to strongly increase public R&D expenditures in line with its commitment to the Lisbon agenda. As already noted in Q1, the public R&D expenditures have effectively increased and will continue to increase significantly.

The improvement in public R&D expenditures and of job opportunities in the public sector was done alongside a reform of the funding mechanisms. While public research in France was traditionally funded through (non-competitive) funding provided to research institutions (Higher Education Institutions and Public Research Organisations), competitive funding has been largely expanded in the past years. This is seen as the best way i) to increase excellence ii) to make possible to fund research according to the research priorities identified by the Government and iii) to orient research activities towards industry needs.

6. Policy mix instruments and target groups

Together the different instruments that were previously presented target each and every actor in the national system of research and innovation:

Researchers received specific attention from the Law for Innovation and Research (1999). As already mentioned, they were given the possibility to work for or even run a company so that they can valorise the outcomes of their research activity themselves. They can therefore mix research and business activities. The recruitment of researchers is also supported by the Agency for Innovation (OSEO innovation) and the Ministry in charge of Research through partially publicly subsidised grants (Cortechs and Cifre grants). Following the reform of the Research Tax Credit, the recruitment of PhD holders has also been facilitated: companies that recruit a PhD holder benefit for the first year from a tax credit equal to twice the salary costs (providing that staff have not decreased in the meantime and that the contract is a non-fixed term contract).

HEIs and **PROs** were put at the heart of the Pact for Research designed in 2005 and of the Law for Research passed in 2006. Three different types of change affected them. Firstly, along with the traditional funding based on structures, the creation of the National Agency for Research has enhanced the share of public funding distributed on a competitive basis. In the future, the level, as well as the share of the competitive funding in the total funding, will increase and as such will affect the behaviour of the research institutions to receive money to carry out their research activities. Secondly, the Pact for Research has emphasised the need for more harmonised evaluation procedures. Research units will be systematically evaluated, as it is already the case. The novelty is that the evaluation outcomes will be more systematically taken into account when the State will negotiate with the research institutions their budgets and their research strategies. Thirdly, because research activities are no longer of a national dimension but of an international dimension, recognition and visibility only makes sense at the international level. In order to overcome the relatively low number of large French research centres, the Pact for Research has provided the HEIs and the PROs with two instruments to help them with gathering resources and building large research centres that can compete in terms of visibility with their foreign counterparts. These two instruments are the Research and Higher Education Clusters and the Thematic Networks for Research. In a nutshell, the principle is to incite public research institutions to pool resources by giving them supplementary resources. Participants in the Clusters and Networks will hence have a larger budget for their R&D activities.

SMEs have a dedicated Agency to support them, the Oseo Group, which gathers together several Agencies, of which the Agency for Innovation (OSEO innovation). This Agency has several instruments in order to support SMEs in their innovative activities like subsidies and reimbursable grants for instance. SMEs are also the implicit target of the Research Tax Credit. Even if the measure is size neutral as it is sector neutral, in reality, it is oriented towards SMEs. The maximal amount of the tax credit (16 million euro) is not negligible for the large companies, but it can be very small in comparison with their R&D budget. Anyway, the existence of a threshold indicates that the measure is designed for SMEs. The SME Pact is a new tool which

shows the increasing focus put on SMEs. As already noted, the Pact is aimed at strengthening relationships between the large companies that participate in the Pact as well as Ministries and public agencies with innovative companies represented by an ad hoc committee (called Richelieu Committee).

As far as **large companies** are concerned, most of the public support was traditionally given to them, according to the Colbertism doctrine. Theorized by the French industrial economics, the rationale was to think in terms of industrial “filiere”. The analysis adopted a meso-level analysis where the focus was put on vertical integration; that is relations between producers and consumers of products and services and/or producers and users of technologies. Regarding technologies, the structuring effects of the system rely on spill-overs. In practice, until the mid-1980s, the basis of the public support was in line with this view in that the Government supported large PROs on very focused thematic areas on the one hand and large public-owned enterprises on the other hand. Organised around subsidised national champions (for example, the Centre for Atomic Energy and the French Electricity Society in the field of energy in charge of, respectively, research and energy production), the implicit thought was that the progression of knowledge would benefit afterwards hundreds of smaller companies either upstream or downstream.

The implementation of the Agency for Industrial Innovation is an attempt to give a new impetus to this public support. Some commentators perceived the Agency as an obsolete instrument that may have been efficient in the past but that would not be that efficient nowadays.

In order to raise intramural private R&D expenditures, French research and innovation policies have put a strong emphasis on routes 1 and 2 and to a lesser extent on routes 3 and 4. The status of the **Young Innovative Company** was designed in order to increase the creation of R&D intensive companies. In order to promote the growth of the fastest growing SMEs, the Ministry in charge of SMEs has launched in May 2006 the **Gazelles programme**. It is one of the five 'SMEs growth programmes' (Financing growth programme; Competitiveness programme; New markets for SMEs' programme; External growth and transfer programme; Gazelles programme). Those programmes follow on from the laws and measures passed since 2003 for SMEs (e.g. 'the law for economic initiative' passed in august 2003 or the SME Pact in 2005).

The reform of the **Research Tax Credit** was motivated by the wish to incite companies that perform R&D to increase their efforts (route 2) as well as to incite companies that do not carry out or even fund research activities to start doing so (route 3). Hence, companies have the possibility to assign a public or a private research centre or a company to perform research for them and to benefit from tax credit. Another argument in favour of route 3 is given by the setting-up of the RRITs that are aimed at inciting large non-performing companies to invest fundings in R&D projects performed by other actors.

Route 4 is not neglected either. For instance, the increase of the maximum tax credit threshold is an indirect means to attract large foreign companies and to incite large indigenous companies to maintain their research activities in France. In order to attract R&D performing firms from abroad, the Government counts strongly on the

Competitiveness Clusters as well as on the Research and Higher Education Clusters and the Thematic Networks for Research. By increasing the visibility of French research, they would incite foreign companies to locate research and/or production units close to or within these Competitiveness Clusters.

Table 2: Policy instruments and broad routes to increase R&D investments

Policy categories	Policy instruments	ROUTE 1: promote the establishment of new indigenous R&D-performing firms	ROUTE 2: stimulate greater R&D investment in R&D- performing firms	ROUTE 3: stimulate R&D investments in firms non- performing R&D	ROUTE 4: attract R&D- performing firms from abroad	ROUTE 5: increasing extramural R&D carried out in cooperation with public sector	ROUTE 6: increase R&D in public sector
R&D Domain							
R&D policy generic	Research Tax Credit	X	XX	XX	XX	XX	
	Research and Technological Innovation Networks	X	XX				X
	National Centres of Technological Research		X				
	Regional Innovation and Technology Transfer Centres			X			
	Technological Platforms			X			
	Technological Development Networks			X			
	Industrial and Commercial Activities Services	X	X	X			
	Research and Higher Education Clusters						XX
	Thematic Networks for Research						XX
R&D policy sectoral							
R&D / Innovation	Competitiveness Clusters		XX		XX	XX	XX

policy – Linkage	National Agency for Research		X		X	X	XX
	Agency for Industrial Innovation		XX		X	XX	X
	Carnot Awards		X		X	X	X
R&D / Innovation policy – IPR							
R&D specific financial and fiscal policy	Young Innovative Company	XX	XX				
R&D specific education policy	Institute for Advanced Studies in Science and Technology						
R&D specific employment policy							
Finance Domain							
Financial and fiscal policy							
Macroeconomic policy	Consolidation of public finance						
Human Capital Domain							
Education policy	Investment in human capital	XX	XX	XX	XX	XX	XX
Employment policy	Decrease of salary costs for the lower wages						
Innovation Domain							
Innovation policy generic	Competitiveness Clusters		XX		XX	XX	XX
	Agency for Industrial Innovation		XX		X	XX	X
Innovation policy sectoral							
Other policies -	Gazelles programme		XX				

industry							
Other policies - trade	Tax credit for export						
Other policies - defence							
Other policies – consumer protection							
Other policies – health and safety	Cancer Plan		X		X	X	X
Other policies - environment							
Other policies – regional development	State Region Project Contracts	X	X	X	X	X	X
Other policies - competition	Competition						
Other policies – social security	Consolidation of public finance						

7. Balance within R&D policy mix

In terms of **volume public funding**, the most important policy instrument is the **Research Tax Credit** with an annual budget that has regularly increased since 2004 and the introduction of the volume-based scheme. The objective of the government is to reach a steady budget of around 1 billion euros per year (against 400 million euros in 2004).

In terms of **overall contribution**, it is difficult to say which instrument has obtained the best results insofar as instruments and measures are not systematically evaluated. For this reason, it is not possible to say which instrument had or has the widest impact in relative terms (by comparing the increase in R&D expenditures with the level of public support) or in absolute terms (by measuring the increase in R&D expenditures imputable to the measure/instrument).

A recent empirical study has tried to evaluate the impact of the French Research Tax Credit¹¹. Their results show that for the period from 1980 to 1997, the elasticity was comprised between 2 and 3.6. These results seem however very high when one knows that the OECD¹² considered that in general the elasticity is close to one.

In terms of **impact on specific aspects of the NIS or R&D performers**, one may argue that the **Research Tax Credit** is the most powerful instrument for inciting SMEs to invest in R&D and/or to increase their investment in R&D. As already noted, traditionally, French industrial and innovation policies were rather oriented towards large companies (national champions according to the so-called Colbertism approach). In the recent years, large companies were given a new funding scheme through the programmes supported by the **Agency for Industrial Innovation**, but SMEs received more attention too. The Research Tax Credit that is essentially designed for SMEs has been reformed in order to increase the public support for companies to invest or invest more in R&D and as such may justify a shift in public funding in terms of beneficiaries. From this point of view, one may argue that the main beneficiaries of a shift in public funding are SMEs. In the meantime, the creation of the Agency for Industrial Innovation is indeed biased towards large companies, in spite of the explicit statement to distribute funding that will benefit large companies as well as to SMEs. This is at least how many SMEs seem to perceive it. Hence, all in all, it is not sure that there was a shift when speaking about **beneficiary of public support**. The effects of one of the measures, namely the reform of the Research Tax Credit, are more or less counterbalanced by the effects of the other measures, corresponding to the programmes subsidised by the Agency for Industrial Innovation. If this statement were true, that would mean that large companies continue to receive a share of public funding for R&D which is larger than their weight in the total of R&D expenditures.

¹¹ Mairesse et Mulkey (2004), "Une évaluation du crédit d'impôt recherche en France (1980 -1997)", *Revue d'Economie Politique*, no. 6, novembre-décembre, pp. 747-778.

¹² OCDE (2002), *Tax Incentives for Research and Development: Trends and Issues*.

Table 3: Assessment of ‘importance’ of R&D policy instruments

Instruments	Funding	Criteria				
		a	b	c	d	e
Research Tax Credit		XX		XX	XX	X
Competitiveness Clusters		XX	XX	XX	XX	XX
National Agency for Research		X	XX	XX	XX	XX
Agency for Industrial Innovation		XX	XX	XX	XX	X
Carnot Awards			X	XX	X	
Young Innovative Company		XX	X	XX	X	XX
Gazelles programme					X	X
Research and Technological Innovation Networks						
National Centres of Technological Research						
Regional Innovation and Technology Transfer Centres						
Technological Platforms						
Technological Development Networks						
Industrial and Commercial Activities Services						

8. Emergence of R&D policy mix

Most of the time, the decision to devise a new legislative arsenal or new measures in favour of research and innovation is taken by the Ministry in charge of research on the behalf of the Government. It is also interesting to note that in the past 20 years, almost every new law was initiated by Governments at the beginning of their legislature. This testifies that research and innovation policies ranked high in the agenda of these new Governments. In 1982, the Socialist Party won the legislative election. The same year, the Ministry in charge of research put the Law of Orientation and Programming of Technological Research and Development into action. In 1997, the same applied when the Socialist Party won the election and when the Ministry in charge of research designed the Law for Innovation and Research (that was voted in 1998). In 2002, the new Conservative Government launched an initiative that resulted in the Innovation Plan in 2003. The only notable exception was the Law for Research that was first mentioned in 2003 following the researchers' movement against the cuts in research budgets. The Law was eventually voted in 2006.

The mechanisms to collect stakeholders' opinion

In France, there is no institutional mechanism to take views of stakeholders before preparing a project of law. This is true in all area and is therefore the same for innovation and research issues. However, this does not mean that, for instance, industrialists, company or researcher representatives are not consulted before the design of a new law or a new measure. If there are discussions, they are done on an *ad hoc* basis. In practice, the Governments use three different schemes.

- The first means at the disposal of the Governmental authorities to be aware of the expectations and needs of those who are concerned by and/or interested in the law/measure is to organise a meeting or a set of meetings with representatives.
- The second means, still based on a bottom-up approach, consists of organising large meetings and conferences with a larger audience. This takes time but has the advantage of giving a clear picture of what is going on in the relevant field and to have a large view of needs and expectations.
- The third means is to assign someone to write a report that provides clear proposals. The success depends obviously on the legitimacy of the person(s) who is (are) given this task.

In 1998, the Minister in charge of research assigned Mr. Guillaume, who was an ex-director of the French Agency for Innovation (Anvar which is now OSEO innovation) for 1) assessing the action of public actors and public instruments in favour of technological development 2) formulating proposals for strengthening efficiency in the French innovation and research system. One part of the report was focused on the possibility for the researchers to exploit the economic potential of their discoveries themselves. This was notably based on the US experience. The Law for Research and Innovation that was voted the following year point fully endorsed this point.

In order to design the Innovation Plan, the Minister in charge of industry and the Minister in charge of research launched a consultation process in December 2002.

These consultations of different public research actors resulted in a series of propositions of measures that are enshrined in the final document.

In 2003, the President of the Republic asked the CEO of Saint Gobain, Mr Jean Louis Beffa to advance some ideas to give a new momentum to the French innovation and industrial policy. Again, based on a benchmark of other industrialised countries (including the USA and Japan), the report underlined the need for a new industrial policy based on industrial projects run by large companies around which SMEs and public actors would gravitate. A few months after the report was finished, the Agency for Industrial Innovation was created and was given the task to support large programmes that display a huge innovative potential with large spill-over effects in the long-run.

After the researchers' movement against the freeze of research credits in 2003, the scientific community launched the Estates-General of Research and Higher Education in order to propose a consensual report for the Government presenting their views on the future of research in France. The Government did not initiate these committees that took place over six months but committed itself to take conclusions and recommendations into account for the design of the Law for Research it was planning to do. The Pact for Research and the Law for Research were presented as the Governmental arsenal to reply to researchers' concerns.

Redundancy of instruments

In terms of policy measures and related instruments, French policies are characterised by a tradition of creating new instruments alongside the existing ones. It is rare that a new measure takes the place of a previous one. Instead of systematically evaluating policy measures, and in case of weak results removing it, the idea is often to create a new measure with more or less the same objectives but with a larger budget and/or a larger coverage. As an example, it is interesting to highlight the creation of the High Council for Science and Technology (in 2006) that is in charge of identifying research and technology priorities and carrying out foresight activities. The remarkable point is that there already exists a High Council for Research and Technology that has the responsibility to give an expert assessment to any research policy measure and to express its opinion to the Government on the yearly R&D budget. There is an obvious overlap between the tasks of the two Councils. However, instead of removing the existing Council and giving its duties to the new Council or instead of giving the existing Council new responsibilities through a reinforcement of its role, it was decided to create a new Council next to the existing Council. The High Council for Research and Technology acknowledged the creation of the High Council for Science and Technology but mentioned that the distribution of roles between the two Councils will have to be clarified¹³.

At the same time, one has to underline that in some cases, the creation of new instrument is also a means to give a new impetus to previous instruments. For example, the Carnot Award generates debates within existing structures aimed at networking public and private research actors on their overall strategy.

¹³ High Council of Research and Technology (2005), *Opinion of the High Council of Research and Technology on the Pact for Research*.

Construction of the policy-mix

In terms of policy mix, the recent years testify an increasing emphasis put on innovation. From this point of view, we can argue that the policy mix is a construction of policy measures that all share the same objective consisting of increasing innovation activities and capabilities of companies. All decisions that have an impact on this are hence taken precisely because they have an impact on this. There is a strong coherence of policy measures. One may argue about the relevancy of the objective and the way to reach it. For instance, a share of the research community do not agree on the emphasis put on the needs to strongly connect research activities with innovation or said differently to assign a larger share of research with innovation outcomes. However, one cannot deny that policies are in coherence with the objective. For instance, the reform of the French research system was motivated by the wish to increase the stock of knowledge that may give birth to innovation. The focus put on entrepreneurship is also aimed at increasing the creation of companies, including high-R&D intensive ones. The same applies for the measures oriented towards attracting foreign researchers or “repatriating” French researchers that work abroad.

9. Governance of the policy mix

From an institutional point of view, the Ministry in charge of research is in theory responsible for designing, implementing and monitoring each and every part of research policy. In practice, the Ministry does not have enough power to really lead the French research strategy. This was pointed out by the Court of Auditors (Cour des Comptes) in 2003 in its evaluation of research policies and was acknowledged by the Ministry in charge of research. As a matter of fact, the scientific community stressed during the Estates-General of Research and Higher Education the need to create an independent Ministry in charge of research (i.e. not attached to another larger Ministry).

Discussions between Ministries take place in the context of the Inter-ministerial Committee of Scientific and Technological Research which is led by the Minister in charge of research. In reality, this Committee is not often the place where discussions take place. In practice, most of the time, the Committee of Scientific and Technological Research acts upon decisions that were agreed by the Ministry in charge of research and by the Ministry in charge of industry beforehand. Before the Committee convenes, each Ministry defends its view during bilateral discussions. To caricature a little bit, the Ministry in charge of industry is rather focused on innovation and partnerships between public and private actors whereas the Ministry in charge of research is rather interested in research issues. Most often, the objective is shared but the means to achieve it may differ. These two views are hence discussed and if no agreement is found, the Committee has the responsibility to arbitrate and to eventually choose one option. Discussions between the two Ministries take place at different hierarchy levels: chief officers (most frequently), mission officers, cabinets and Directors General (least frequently).

There are also many relationships between the Ministry in charge of research or the Ministry in charge of industry and other Ministries on issues that have a common interest. For instance, issues related to entrepreneurship involve the Ministry in charge of industry and the Ministry in charge of SMEs which work together. Training issues that focus on R&D mobilise the Ministry in charge of industry and the Ministry in charge of employment.

As for the financial side, from 1982 to 2005 the main instrument in the hands of the government (and more precisely of the Ministry in charge of research) for the research budget corresponded to the Civil Budget for R&D (BCRD). The Civil Budget for R&D gathered resources which were devoted to R&D whatever the Ministry which distributed them. However, in practice, each Ministry was responsible for the execution (or the non execution) of its R&D budget and the Ministry in charge of research did not really have an effect on the orientation of R&D. Furthermore, there were public expenditures on R&D that are not included in the Civil Budget for R&D (all in all the Civil Budget for R&D represents half of the total public R&D expenditures).

In 2000, an initiative of the Parliament tried to introduce new mechanisms in the management of public fund, following recommendations put forward by the OECD

and by the Court of Auditors (Cour des Comptes). The outcome was the design of the Institutional Act of the Finance Law (LOLF), which became operational the first time for the 2006 budget. This systematic tool is aimed at improving transparency of public sector accounts, improving the ability of the authorities to set spending priorities and promoting a results based outlook.

As far as research policy is concerned, the Institutional Act of the Finance Law (LOLF) was seen as a mean to give the Ministry in charge of research the possibility to truly orient research policy. For the first time in 2006, the State Budget was defined according to this law. As far as research policies are concerned, the Institutional Act of the Finance Law identifies one inter-ministerial mission (Mission of Research and Higher Education). This mission which replaces the former Civil Budget for R&D involves seven Ministries for 13 programmes.

In 2006, the Ministry in charge of research was reorganised. In May 2006, the Technology Directorate and the Research Directorate merged into the Directorate General of Research and Innovation. However, the reorganisation maintains the logic of offices that are each responsible for one thematic. Said differently, the distribution of programmes is in accordance with the distribution of activities within the Ministry in charge of research. As such, each programme within the inter-ministerial mission can be followed by the Ministry in charge of research in an efficient way.

As for coordination of policies and instruments, one should mention that the creation of the National Agency for Research and the Agency for Industrial Innovation in 2005 has indeed reinforced the coherence of instruments that are designed and implemented. As the Ministry in charge of industry and the Ministry in charge of research are present in the executive board of each of these Agencies (as well as in that of the OSEO Group) and as some Agencies are also present in the executive board of its counterparts, each time the executive board of any of these Agencies convenes is an opportunity to discuss the overall national innovation strategy, from the design to the implementation. However, to counterbalance this point, one should also note that the effectiveness of the coordination of the Agencies is questionable. The future will show how effective the coordination is.

To finish with the governance of the policy mix, the coordination and the monitoring of the Competitiveness Clusters is done at an inter-ministerial level. Regarding the funding side, an inter-ministerial fund was implemented. Each project is however followed by the Ministry in charge of the topic that corresponds to that of the cluster.

10. Interactions between policy objectives and instruments

The governmental strategy related to the French research and innovation focuses on different areas, which are jointly aimed at stimulating knowledge creation and knowledge diffusion. Hence, the accent is placed at the same time on:

Supporting of private R&D expenditures and innovative activities

Since the weakest element of the NSI corresponds to SMEs, many instruments oriented towards SMEs have been implemented so far. Some are directly aimed at increasing SMEs' R&D expenditures. The main policy instrument dedicated to this is the Research Tax Credit. In 2004, the Research Tax Credit was reshaped in order to reinforce its role on private research investment. Apart from the introduction of a volume-scheme based, emphasis was placed on supporting companies, especially SMEs, to devote funds for research which is performed by research centres or by companies. Networking is seen as an important way to incite companies to think more and more in technological terms when confronted with a problem.

As far as innovation is concerned, SMEs can count on the support of OSEO innovation. The agency provides SMEs with subsidies, loans for their innovative projects, ... Several network structures have also been created to incite and support SMEs in their innovative activities: the Research and Technological Innovation Networks (RRITs), 20 National Centres of Technological Research (CNRTs), Regional Innovation and Technology Transfer Centres (CRITTs), Technological Platforms (PFTs), Technological Development Networks (RDTs), Industrial and Commercial Activities Services (SAICs).

Other instruments that have an indirect effect on private SME's R&D and relate to other policy fields have also been set up in the recent years. In 2004, the status of the Young Innovative Company was designed in order to facilitate the creation of high-technology companies. The same year, the status of Business Angel (SUIR) was put into action to enable a better access to capital funds for new companies.

The high-growth SMEs are also supported by the Gazelles Programme and CDC Enterprises which is a subsidiary of the Public Funding Institution CDC (Caisse des Dépôts). CDC Enterprises is in charge of entering the capital of innovative companies with a high growth potential. In November 2005, a third Fund of Technological Fund was launched by the CDC Enterprises, the State and the European Investment Bank with a budget of 150 million euros.

In 2005, the Government put the emphasis on the need to create and provide funds to Competitiveness Clusters. Based on local research and industrial competences, the clusters have the objective to increase research and innovation of the actors that are involved in the clusters. The reinforcement of these competences is seen as a means to increase the international visibility of the actors involved in the clusters. As such,

the Competitiveness Clusters have an indirect impact on research and innovation activities of companies, including SMEs. The same applies for the projects funded by the Agency for Industrial Innovation.

The focus on both innovation and R&D expenditures testifies the complementary of the government's instruments to support SMEs' efforts. Additionally, the creation of these instruments participates in the implementation of an ambitious industrial and innovation policy in France. From the companies' point of view, it seems that they believe that these instruments confirm that the French government has understood the importance of research and innovation for the economy. From the point of view of the policy mix, one may argue that a real effort has been done by the government to have, on the one hand, an action for each actor in the research and innovation system, and with several specific instruments on the other hand.

Reinforcing science base capabilities

The Pact for Research highlights the mission of the public research system. Public research actors were originally given the mission: to contribute to the development and to the progress of science in every knowledge field, to participate in the valorisation of research outcomes, to diffuse scientific knowledge, to play a major role in 'training through research' and 'training to research', to develop its scientific expertise.

For the research system, by trying to strengthen the links between the public research actors and the private research actors on the one hand and between the research and innovation on the other hand, the Government has shown its willingness to orient a larger share of the public research towards industry needs. As such, it has implemented the National Agency for Research as well as the High Council for Research and Technology. The former is aimed at funding research projects according to thematic fields that are considered as important while the latter has the duties to identify the research fields that are important for the French economy. From this point of view, the public research system will be partially reshaped in order to better reply to industry needs.

Furthermore, the creation of the Agency for the Evaluation of Research and Higher Education shows the willingness of the government to improve the overall research system. The Agency to be created by the end of 2006 will be in charge of systematically assessing programmes, research units and researchers.

Instruments aimed at improving human capital

In order to better take industry needs into account, the Government has also focused on human capital. In the future, a special emphasis will be put on increasing, as well as, monitoring the number of researchers by scientific fields. A dedicated office will be in charge of identifying the disciplines that will need researchers in the future. In order to increase the supply of researchers accordingly, actions will be taken, such as an increase in the number of PhD grants distributed in the fields for which an insufficient supply of researchers is detected. Conversely, in the fields where there is already a surplus of researchers, less PhD grants may be distributed. All in all, the Government is modifying the research system in order to enhance the overall number of researchers as well as to better connect the PhD training with industry needs.

Regarding entrepreneurship, many individual initiatives are taken by HEIs to provide students with training in entrepreneurship and/or management of innovative projects. The point is not to list all of these initiatives but to insist on the fact that innovation has gained considerable interest in society and the economy.

In conclusion, it appears that successive French Governments have acknowledged the needs to have complementary instruments in order to incite companies to increase their investments in R&D. As shown, instruments were implemented to:

- To increase access to funding for SMEs
- To support SMEs in their research activities
- To support SMEs in their innovative activities
- To reinforce the efficiency of the research system
- To increase the links between public and private actors
- To enhance human capital

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