# WHAT CAN BE EXPECTED FROM THE FRENCH COMPETITIVENESS CLUSTERS?

*⊄# France has acquired a new industrial policy vehicle: the competitiveness cluster. The system consists of bringing together companies, research units, training centres and public authorities in a defined geographical area to address the question of technology. The objective is the creation of innovative projects that will generate growth and jobs.*

*⊄# Developments elsewhere in Europe, notably in Sweden and Denmark which offer strong parallels with the policy adopted in France, provide an indication of the potential advantages of these clusters: an increase in public-private research partnerships aimed at boosting industrial innovation; improved dissemination and easier assimilation of advanced technologies within industry. The expected results are well adapted to France's structural weaknesses in terms of innovation: small number of innovative companies (particularly as far as SMEs are concerned); low level of interaction between industrial and public research; insufficiently productive research.*

*⊄# There is nonetheless a risk that a number of sources of inefficiency could detract from the results that the cluster policy is expected to produce. The main potential stumbling blocks are as follows: uncertainty over the allocation of public funds; the complexity and lack of visibility of the process for obtaining such funds, the sheer number of public decision-makers; the risk that funds will be allocated to insufficiently profitable projects and that too much priority will be given to large companies.*

## *Competitiveness clusters: a "new" approach to industrial policy ...*

The call for competitiveness cluster projects in France, launched in 2004[1], resulted in the selection by the CIADT (the interministerial committee for regional planning and development) on July 12, 2005 of 67 structures (66 after the merging of two national clusters). These clusters can be broken down into 3 categories: global clusters (6), clusters with global visibility (9) and national or regional clusters (51).

BREAKDOWN OF COMPETITIVENESS CLUSTERS BY SECTOR AND TYPE*

| | Sectors concerned | Global | Global visibility | National or regional |
|---|---|---|---|---|
| High technology ** | Electronics/communication | 3 | 2 | 4 |
| | Pharmaceutical industry | 2 | 1 | 3 |
| | Aerospace | 1 | - | - |
| | Scientific instruments | - | - | 2 |
| Medium-high technology ** | Chemicals (excl. Pharm. Ind.) | - | 2 | 2 |
| | Electrical machinery | - | - | 3 |
| | Automobile industry | - | - | 6 |
| | Railway equipment | - | 1 | - |
| | Machinery & equipment n.e.c. | - | - | 1 |
| Medium-low technology ** | Refined oil products and nuclear combustibles | - | - | 2 |
| | Plastic and rubber products | - | - | 1 |
| | Naval construction | | 2 | |
| | Processed metal products | - | - | 4 |
| | Non-metallic mineral products | - | - | 1 |
| Low technology ** | Agribusiness and food | - | 1 | 10 |
| | Textiles and clothing | - | - | 5 |
| | Construction | - | - | 2 |
| | Wood | - | - | 1 |

** 4 competitiveness clusters are included in the service industry classification.*
*** OECD classification*

Competitiveness clusters of an international dimension (global + with global visibility, i.e. 15 clusters) are largely focussed on high and medium-high technologies, notably electronics/communication and the pharmaceutical industry. National and regional clusters (48 without counting the 4 clusters included in the service industry classification) are principally involved in medium-low and low technologies. The agribusiness and food industry (10 clusters), metal processing (4 clusters) and textile (5 clusters) sectors represent 40% of the clusters.

*[1] The stimulus behind the call for projects was provided by Christian BLANC's Report to the Prime Minister entitled "Towards a growth ecosystem" (2004).*

The aim of this policy is to underpin innovation and competitiveness within French industry by setting up R&D project partnerships. The objective is to generate medium-term (a maximum of 5 years) growth opportunities for industrial players, create jobs and also to boost regional economies in a country that remains over-centralised. It is consequently a combination of regional planning, industrial and innovation support policies.

The programme is based on Michael Porter[2]'s cluster theory (cf. inset) which has inspired many innovation support policies in other parts of Europe, notably in Finland, Sweden and Denmark. A cluster is a "geographical concentration of interdependent companies and institutions connected by a system of market and non-market links" (COOKE and HUGGINS, 2002). A cluster allows economic agents to be in competition whilst also co-operating on specific projects.

R&D PROJECT FUNDING, CLUSTERS WITH A GLOBAL DIMENSION

| Sector concerned | Total amount of R&D investment budgeted (€m] | Funds allocated by ANR* in 2005* (€m) |
|---|---|---|
| Electronics/communication | 1 293 | 84.02 |
| Pharmaceutical industry | 479 | 35.33 |
| Aerospace | 480 | Nd |
| Chemicals (excl. Pharm. Ind.) | 240 | 12.35 |
| Railway equipment | 145 | Nd |
| Naval construction | 240 | 9.65 |
| Agribusiness and food | 125 | Nd |

** ANR: the French National Agency for Research. The agency funds research projects and, in 2005 had at its disposal a EUR 700m commitment capacity for research projects lasting for a maximum of three years.*
*Source : ANR, call for project documents.*

The French cluster system consists of "bringing together, in a given geographical zone, companies, research units and training centres committed to innovative and structured competence-related projects that will make these clusters key centres at a national and even international level" (DIACT: the interministerial delegation for regional planning and competitiveness). The clusters will receive financial support for 3 years In addition to government funding estimated at EUR 1.5bn between 2006 and 2009[3], local authorities

*[2] Michael E. PORTER, "The Competitive Advantage of Nations", The Free Press, 1990. "Clusters and Competition", in: On Competition, Harvard Business School Press, 1998.*

*[3] Breakdown of financial support: agencies (ANR, Agency for Industrial Innovation, OSEO-ANVAR) and CDC : EUR 270m on average p.a.; tax concessions and reduced social security contributions : EUR 100m on average p.a.; funds released by various government ministries : EUR 130m on average p.a. including a EUR 60m contribution from the Ministry of Industry Department for Businesses.*

Theoretical aspects of Porter's work on clusters

| Advantages | Disadvantages |
|---|---|
| ⊄# Enhanced innovation potential:<br>⊄# Shorter launch periods for new products and production processes<br>⊄# Improved spread of R&D project-related risk<br>⊄# Greater understanding of consumer requirements and higher capacity to react<br>⊄# Productivity gains:<br>⊄# Emulation paves the way for a higher level of specialisation<br>⊄# Improved visibility of production for consumers<br>⊄# Greater access to human, financial, material and immaterial resources, etc. | ⊄# Vulnerability:<br>⊄# Specialisation can heighten a region's vulnerability to external shocks (excluding technological developments and changes in target market conditions, etc.)<br>⊄# Reduced flexibility:<br>⊄# Focus on one sector penalising new networks, slowdown in potential structural changes, conservatism<br>⊄# Lower competitive pressure:<br>⊄# Unless competitive pressure remains strong, co-operation can give rise to a cartel system<br>⊄# Short-sightedness:<br>⊄# Failure to keep abreast of productive technological progress, over-dependence on local partners, lack of international visibility |

*Source: T. Andersson, S. Schwaag Serger, J. Sörvik and E. Wise Hansson (2004), "The Clusters Policies Whitebook", International Organisation for Knowledge Economy and Enterprise Development.*

are also expected to provide financial support. Public funds are not allocated in advance to each cluster. They are allocated by each provider of funds on a case-by-case basis.

The budgets of the research projects, as indicated in the call for projects and as communicated by the various clusters, are substantial. The amount of public funding would appear modest relative to the requirements expressed by the global clusters, or those with global visibility, alone.

### *… established in the early 90s in Europe*

A large number of clusters have grown up in other parts of Europe, on a more or less spontaneous basis, on Silicon Valley-based initiatives from Stanford University or Sophia Antipolis in France. Frequent reference is made to Italian industrial zones. However, the difficulties that these are currently facing show that a cluster must constantly maintain a high level of innovation if it is to survive. The attraction of clustering (clearly apparent in France where 105 applications to the call for projects were submitted) is that it provides a means of remedying three forms of weakness in the national innovation system: market inefficiency (innovation financing, unequal information, external factors, "go it alone" logic, etc.); ineffective public policies and flaws in the system (difficulties in operating as a partnership, inadequate public-private co-ordination, etc)..

In various European countries, the public authorities have adopted explicit strategies to increase the scope for innovation within their economies by putting strong emphasis on the cluster system. There are two different approaches to the adoption of cluster policies[4]: a global approach, on a national level, and regional development programmes. National initiatives have taken on a considerable proportion since the early 90s. Denmark and the Netherlands systematically adopt a national approach for all sectors of activity, construction in particular. Ireland uses the cluster system as a tool for enhancing competitiveness and attracting a higher level of FDI. Sweden and Finland have had major recourse to the cluster system since the mid-90s.

Regional approaches are also very widespread in Europe. The Spanish Basque Country and Catalonia focussed their economic growth policies on the cluster system ten years ago, when their economic systems underwent in-depth restructuring. They are currently amongst the richest regions in Spain with per capita GDP in line with the European average. Most of the local clustering initiatives were made by government authorities or by regional economic development agencies.

Examples in other parts of Europe provide useful information as they render possible an initial evaluation of the potential results of the voluntarist approach – such as adopted by the French government. In this respect, the cases of Sweden and Denmark[5] are the most interesting.

#### Cases with strong similarities to French policy

The prime objective of these policies is to step up the capacity to produce and to use advanced technologies in high-technology, but also in the case of Denmark, low-technology sectors[6].

Firstly, industrial activities that will be strategic in the future and for which the country has an advantage in terms of technological know-how or industrial specialisation must be identified. Secondly, the measures planned must enable the strengthening of links between the economic agents in these key activities in order to improve their development, industrialisation and innovation processes. The objective is to create industrial growth and qualified jobs by positioning the country on new markets and on high-technology products. The policies adopted are similar in the following respects:

⊄# The cluster takes the form of a partnership between companies, public and private (universities, etc.) research centres and public organisations or institutions (government agencies responsible for science and technology issues, national and local authorities). This three-tier (companies/research centres/public institutions) structure which is, in many cases, represented by a dedicated association, tends to focus on a single theme;

⊄# The cluster is a platform for R&D projects. The R&D projects are required to result, over the medium or long term (5 years in Denmark, 10 years in Sweden) in innovations that can be used by industry (production processes or new products);

⊄# Although Scandinavian policies are centred on the partnership system, the programmes are also required to foster the dissemination of scientific knowledge, know-how and technological innovation to companies, SMEs in particular. In order to achieve this goal, policies are directed at creating business networks around the clusters with responsibility for disseminating information;

*[4] Christian KETELS, "European Clusters", Hagbarth publication, 2004. OECD, "Innovative clusters – Drivers of national innovation systems", 2001.*

*[5] Danish Ministry of Science, Technology and Innovation, "Evaluation of the Centre Contract/ Innovation Consortium Programme" 2005. Vinnova, "Impact of Swedish Competence Centres Programme 1995/2003" 2004.*

*[6] In his report, Christian BLANC referred to the example of the expansion of the Australian wine-producing industry: the government's initial contribution to research funding (50% of total expenditure) was subsequently complemented by associations of wine producers.*

| | Denmark: *Centre Contract (1995-2003)* | Sweden: *Competence Centres (1995-2005)* |
|---|---|---|
| Overview | The objective of the Centre Contract system, launched in 1995, was to promote co-operation projects leading to strategic innovation with a view to:<br>⊄# Enhancing the innovative capacity of companies<br>⊄# Increasing interaction between research and companies<br>⊄# Bringing the scope of intervention and efficiency in line with the requirements of companies and entities that support innovation<br>75 clusters received support, equivalent to total funding of EUR 190m, between 1995 and 2003. The programme was continued after 2003 under a new name, Innovative Consortiums, but on a smaller scale (15 clusters received support in 2005) and an extended budget (EUR 51.4m p.a. in the form of subsidies) | The objective of the Competence Centres programme, launched in 1995, was to establish links between industry and university research. The two main goals are to:<br>⊄# Maximise the involvement of industry in university research, in order to make the latter more productive<br>⊄# Promote the introduction and implementation of new technologies and enhance the technical competence of Swedish industry.<br>29 clusters received support, equivalent to total funding of EUR 550m (60% public, 40% private) between 1995 and 2005. The programme was continued under the name VINN Excellence centres. The process of selecting new clusters (theoretically 25) is underway. The estimated budget is for EUR 160m over 5 years. |
| Key measures implemented | ⊄# Facilitate the acquisition of knowledge and know-how by companies and make research less compartmentalised<br>⊄# Encourage growth in partnerships between companies and research centres, with the aim of developing joint fields of research and technological exchanges.<br>⊄# Development of new products/creation of prototypes | ⊄# Encourage growth in partnerships between companies and research centres, with the aim of developing joint fields of research and technological exchanges.<br>⊄# Development of new products/creation of prototypes<br>⊄# Increase the marketability rate of the R&D project results |
| Eligibility criteria | Partnerships must comply with the following criteria:<br>⊄# Research projects must be compatible with industrial and service industry requirements<br>⊄# SMEs must be provided with easier access to skills and specialist services<br>⊄# A top-flight scientific and technological environment must be created<br>⊄# Projects with a high generic content that can be disseminated outside the cluster must be developed<br>The projects must be completed within 5 years | ⊄# Partnerships between industry, universities and public agencies (VINNOVA – 23 clusters – and STEM – 5 clusters)<br>⊄# Long-term (10 years) R&D projects that require co-operation over a long period.<br>⊄# Strong focus on multidisciplinary research and horizontal research themes<br>⊄# Strong focus on contact between companies, research centres and educational establishments<br>⊄# Dissemination and transfer of technology to companies with a view to upgrading their production processes or products |

*Source: European Commission, Department for Businesses, Innovation Policy Unit*

⊄# A cluster's R&D project can take two forms: 1) projects linked to the development of technological progress with a high scientific content (this form is the most prevalent in high-technology sectors); 2) projects with a stronger focus on the application of new technologies to improve production processes or products that have already been developed (more mature industrial sectors);

⊄# The projects are 60% financed by public funds, but the total amounts invested remain modest: EUR 550m on 29 clusters between 1995 and 2005 in Sweden and EUR 190m on 75 clusters between 1995 and 2003 in Denmark. The major proportion of these funds is used to finance R&D staff costs and the necessary infrastructure. The bulk of public funding is allocated via a "*guichet unique*" (single funding centre) form of structure.

These policies are similar to that recently adopted in France. The clusters are chosen by means of a call for projects, which can be either single-round, as was the case in Sweden in 1994, or continuous, as was the case in Denmark. The distinction between the label (consortium in Denmark and competence centre in Sweden) and the projects that it covers is drawn as clearly in Scandinavian countries as it is in France. The main differences lie in the fact that, in France, funding is more substantial and the project life-times are shorter (3 to 5 years).

### A real impact in terms of innovation...

According to the various evaluations carried out, the appraisal of the programmes is extremely positive overall. As a result, the programmes targeted at underpinning trilateral co-operation in Scandinavia have been prolonged and accorded a higher level of funding.

The level of commitment to the partnerships by most participants has been satisfactory. The creation of innovations that can be used in the private sector, which is the prime objective of the clusters, has become a reality. In the vast majority, companies claim to have benefited from innovations relating to products or production processes. They have consequently succeeded in increasing productivity and market outlets alike. Moreover, the partnerships formed tend to remain intact after the projects reach an end and give rise to further innovation. Once the co-operation process has been sparked off, it intensifies around a hard core formed mainly by the largest companies and the most influential research centres. However, the more fundamental the nature of the R&D, the higher the tendency of companies to drop the R&D activity at the end of the project. Finally the production/innovation to market launch cycle is shortened.

In the case of the majority of clusters, the projects would not have been undertaken without government backing and co-operation. Companies have stressed the fact that R&D projects would have either been carried out on an individual basis and on a smaller scale or would have never been undertaken at all. The research centres, universities in particular, also receive private funding and substantial financial backing from industrial R&D laboratories. This provides them with the critical mass necessary to undertake large-scale projects.

The creation of knowledge-bank networks facilitates the pooling of technological information. SMEs have greater access to human and, above all, technological resources. They can consequently integrate external innovations into their production processes and products. As far as concerns the most innovative SMEs which take part in research into technical progress, involvement in a project opens up scope in terms of greater specialisation and market outlets as a result of the links created with larger companies.

That said, as the impact on market outlets is not quantified in the various evaluations, it is difficult to compare the strengths and weaknesses of the different programmes.

### ... despite a few reservations

Setting aside the high-technology industry, SME involvement is too low. As "technological progress" style projects require highly-specialised know-how and development techniques, it is not easy for small companies to take part in them – mainly because the timescales involved are too long and the technological implications

are too complex to be harnessed. In such cases, SME project participants consist largely of companies set up by researchers or spin-offs. These SMEs are highly R&D intensive and build their skills almost exclusively on the technology developed by the project. This means that the objective of disseminating technological information cannot be met because of the low level of SME involvement.

Procedures for obtaining public funding are considered too complex by private sector players. Evaluations highlight the need for public sector players (governments, regional and local authorities) to ensure that the procedures required to gain subsidies are better co-ordinated and simplified. "Call for project" style procedures are appreciated as they put the various projects in competition, which works to the advantage of the most coherent projects. The drawback is that the process is deemed to be too lengthy and holds back the launch of the R&D phase.

The policies adopted have fallen short of expectations in terms of the attractiveness of foreign companies and the international profile of the clusters. The policies are focussed primarily on national players. This limits the scope for international co-operation with research centres or companies that have yet to establish themselves in the geographical base of the cluster.

The evaluations show that cases where partnerships have failed to work are largely due to insufficient thematic clarity. In Denmark, the approach of giving priority to the largest economic groupings (mega-clusters) has been abandoned in favour of an approach more highly geared to consortia.

Analysis of Scandinavia's track record in terms of clusters makes it possible to identify the key economic effects. Firstly, an increase in three-tier partnerships, enhancing an economy's capacity to produce industrial innovation. Secondly, easier dissemination and assimilation of advanced technology in companies with activities related to those of the clusters. It is therefore possible to use competitiveness clusters to help fill the shortcomings of France's national innovation system in terms of co-operation and technological dissemination.

## *Competitiveness clusters are well adapted to France's weaknesses in terms of innovation*

FRANCE IS HANDICAPPED BY ITS TECHNOLOGICAL ENVIRONMENT

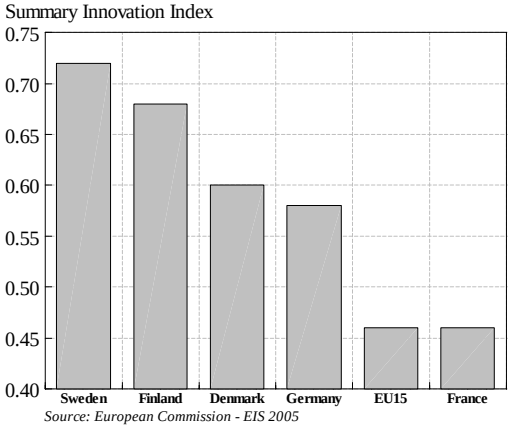
| Growth Competitiveness Index | | | Technology index (50% of the index) | | Public Institutions index (25% of the index) | | Macro-economic environment (25% of the index) | |
|---|---|---|---|---|---|---|---|---|
| RANK (2005) | Country | Score | Rank | Score | Rank | Score | Rank | Score |
| 1 | Finland | 5.94 | 2 | 6.02 | 6 | 6.19 | 4 | 5.52 |
| 2 | USA | 5.81 | 1 | 6.19 | 18 | 5.77 | 23 | 5.07 |
| 3 | Sweden | 5.65 | 4 | 5.78 | 17 | 5.32 | 12 | 5.24 |
| 4 | Denmark | 5.65 | 5 | 5.30 | 2 | 6.35 | 3 | 5.64 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 12 | Japan | 5.18 | 8 | 5.24 | 14 | 5.84 | 42 | 4.40 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 15 | Germany | 5.10 | 16 | 4.78 | 8 | 6.04 | 28 | 4.81 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 29 | Spain | 4.80 | 27 | 4.21 | 36 | 5.13 | 24 | 5.07 |
| 30 | France | 4.78 | 24 | 4.26 | 20 | 5.72 | 27 | 4.90 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 47 | Italy | 4.21 | 44 | 3.68 | 46 | 4.70 | 47 | 4.26 |

*Source: World Economic Forum.*

As highlighted in the report of the Council of Economic Analysis entitled "Education and Growth" (AGHION and COHEN, 2004), France has been at a "technological cross-roads" since the late 70s. This means that France can no longer content itself with imitating technology that is already on the market, but must produce its own innovations to improve its productivity. France must therefore take an active part in the latest technological developments by stimulating the capacity of economic agents to achieve and apply technological progress. The problem is that France is currently finding it difficult to assimilate new technologies (ICT, biotechnology, etc.) into its production systems. The technology sub-component of the World Economic Forum ratings thus places France 30% behind Finland (which ranks no. 1), though France's rating in terms of the other two major sub-components is only 10% lower.

In terms of innovation, the European Commission places France in 12th position, which is just in line with the EU-15 average. The 2005 European Innovation Scoreboard picks out a group of leaders (Sweden, Switzerland, Finland, Denmark and Germany), the composite index (Summary Innovation Index - SII) of which is 20% higher than the EU-15 average. The SII composite index, which provides greater detail on the ratings, takes five innovation aspects into account: education and training, funding of innovation, innovative company potential, the economic weight of innovation and intellectual property. The heavy Scandinavian weighting is symptomatic of the strong focus on technological innovation in these countries since the early 90s.

**FRANCE LAGS BEHIND IN TERMS OF INNOVATION**




*Source: European Commission - EIS 2005*

According to EIS findings for 2005, the fact that France is lagging behind in terms of innovation can be largely attributed to the small number of innovative companies, the non-existence of public-private partnerships and low R&D productivity with respect to innovation that can be used by industry.

### Inadequate potential for innovation

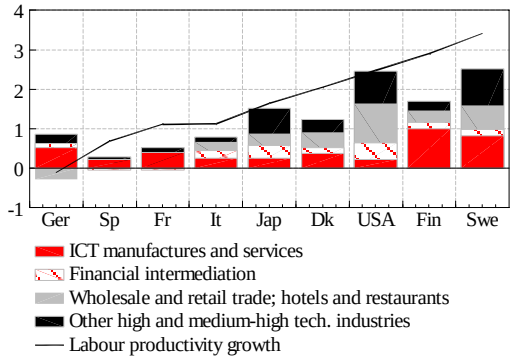
The French economy stands out by the low percentage of companies that carry out industrial R&D. According to a European Commission survey (CIS-3), the percentage of companies that implement R&D programmes, on a permanent or temporary basis, for the purposes of developing product or production process innovations can be estimated at 20% in France vs. more than 25% in Sweden, 28% in Denmark and 32% in Finland.

Whilst the proportion of innovative manufacturing companies remains broadly in line with that of the group of leaders, as far as large and medium-sized companies are concerned, innovation is extremely low in the case of French companies with less than 50 employees. 66% of these companies state that they do not carry out innovation research, compared with less than 60% in Sweden and in Finland. Furthermore, only 29% of these companies actually implement R&D programmes (vs. 35% in Sweden and 38% in Finland). The remaining 71% just convert or recycle innovations made by other companies to adapt their production processes or products without carrying out their own research projects.

The level of private funding for spending on innovation is highly inadequate in France. Between 1991 and 2001, the R&D expenditure of French companies as a percentage of GDP rose from 1.01% to 1.21% (the Lisbon target is for 2% of GDP in 2010). Taking French manufacturing industry as a whole, growth in R&D spending by companies is estimated at 3.2% p.a. over the period 1993 - 2002, vs. more than 6.4% in Sweden and over 10% in Denmark and in Finland. The differential is largely attributable to the high and medium-high technology sectors which account for more than 60% of R&D in Scandinavia, compared with 53% in France.

**CONTRIBUTIONS OF KEY SECTORS TO LABOUR PRODUCTIVITY GROWTH (EXCL. AGRIBUSINESS)**

Contributions to average annual growth rate, 1990-2003, as %

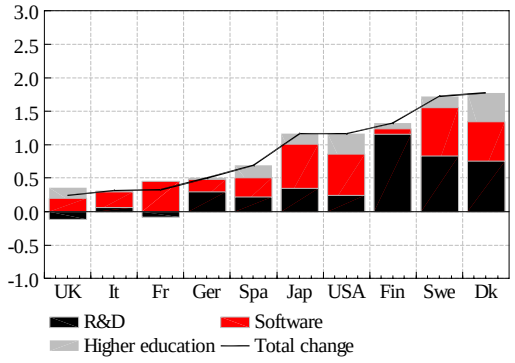



*Source: OCDE, STI Scoreboard 2005*

Total expenditure on innovation contributed 0.3 percentage points p.a. to growth over the period 1994 - 2002 in France vs. 1.3 percentage points in Finland, 1.7 percentage points in Sweden and 1.8 percentage points in Denmark. Productivity gains achieved in the manufacturing industry over the period 1993 - 2003 were running at 0.6% p.a. in France vs. 1% in Finland and 1.3% in Sweden.

**CONTRIBUTION TO THE GROWTH OF INVESTMENT IN KNOWLEDGE**

1994-2002, as % of GDP




*Source: OCDE, STI Scoreboard 2005*

TECHNOLOGICAL PROFILE OF THE MANUFACTURING INDUSTRY

| | France | Denmark | Finland | Sweden |
|---|---|---|---|---|
| VA, as a % of total VA in 2000 | | | | |
| High technology | 2.9 | 2.3 | 6.4 | 3.4 |
| Medium-high technology | 4.5 | 3.9 | 5.0 | 6.9 |
| Medium-low technology | 4.1 | 3.4 | 5.4 | 4.1 |
| Low technology | 4.8 | 6.6 | 9.3 | 6.6 |
| Annual average export growth rate (1994 -2003), in % | | | | |
| High technology | 6.9 | 9.0 | 12.9 | 7.4 |
| High and medium-high technologies | 5.8 | 7.2 | 8.9 | 6.7 |
| Manufacturing industry (Total) | 4.9 | 4.8 | 6.3 | 5.7 |

*Source: OECD, Science, Technologies and Industry Scoreboard 2005.*

As a result of the lack of potential for innovation, the level of specialisation in the high and medium-high technology sectors is reduced. The value added produced by these two sectors accounted for 7.4% of the total figure for 2003 in France, compared with more than 10% in Sweden and Finland. Even though the percentage of exports in the high and medium-high technology sectors is slightly higher in France than in Scandinavia (64% vs. 53%), the annual average growth rate for the period 1994 - 2003 is considerably lower (i.e. 5.8%).

## France is lagging behind in terms of research partnerships

A research partnership consists of bringing together, on a basis that can vary, the three key economic agents in terms of research: the State, companies and higher education.

Public funding of corporate R&D is high in France (10.3% of the total cost of projects in 2002 vs. 7.3% in the EU-15), which is indicative of the high level of involvement of the public sector in corporate sector research. Partnerships take the form of state-controlled defence contracts or strategic programmes. The government's budget is consequently focussed on a few key sectors (nuclear, aerospace and arms).

According to the OECD, in 2001, government contracts accounted for 30% of R&D spending in the aerospace sector and less than 1% in the pharmaceutical, chemical and land-based transport industries. All in all, the aerospace industry receives almost 50% of the funds set aside for government defence-related R&D contracts and major programmes and the electronics sector accounts for a third. In France, therefore, co-operation between the State and industry is limited to strategic sectors.

Public research capacity (higher education and public research institutes) is severely underexploited by companies. The percentage of public research (universities, the CNRS and EPIC research centres, etc.) funded by the private sector only represents 4.6% of total public R&D, which is below the average for OECD and EU-15 countries. This can be largely attributed to the under-funding of universities by the corporate sector. The lack of co-operation between industrial and public research is acting as a major brake on innovation.

PRIVATE FUNDING OF PUBLIC RESEARCH

| | Public institutions | | Higher education | |
|---|---|---|---|---|
| Percentage of R&D expenditure funded by industry, as a % of the sector total | | | | |
| | 1991 | 2001 | 1991 | 2001 |
| Germany | 1.3 | 2.3 | 7.0 | 12.2 |
| France | 4.8 | 6.3 | 4.2 | 3.1 |
| Denmark | 3.6 | 7.5 | 1.6 | 3.0 |
| Sweden | 4.8 | 1.6 | 5.2 | 5.5 |
| Finland | 11.2 | 15.2 | 3.6 | 6.7 |

*Source : OECD Science, Technology and Industry Outlook 2004.*

To compound the situation, the involvement of innovative French companies in joint research projects is insufficient. Only 9.3% of innovative SMEs in France have stated that they have co-operated with other companies on research projects over the period 1998/2000 (source: CIS-3), which is well below the levels reported in Finland (20%), Denmark (15.7%) and Sweden (13.4%). In France, only 8.9% of companies co-operated in international projects, compared with over 10% in Scandinavian countries.

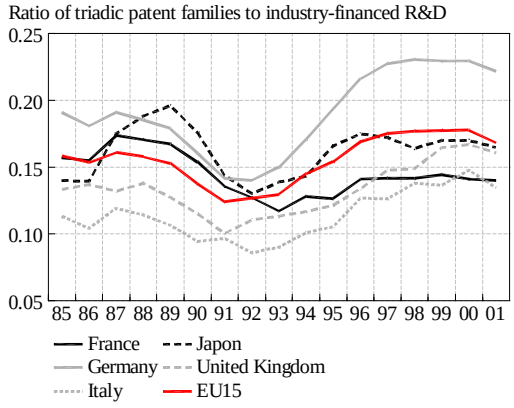
The low level of partnerships is not offset by higher dissemination of technological information. Access to sources of information provided by higher education establishments is in fact only considered important by 5.9% of manufacturing industry companies. A mere 30% of companies in this sector have recourse to external sources of technological information.

## Research is not sufficiently productive

There is a strong correlation ($R^2$ = 98%) between the number of triadic patents (patent applications filed with US, European and Japanese intellectual property agencies) and R&D spending financed by industry. France is admittedly still well placed, with an average global ranking of no. 4 for the period 1991/2001, but its position in terms of R&D productivity has been steadily deteriorating. The rate of return, with respect to innovation, of corporate sector R&D spending can be measured via a ratio comparing the number of triadic patents with industrial R&D spending expressed in dollars and adjusted for PPP. This ratio has held stable in France since the early 90s: it increased by a meagre 3% between 1991 and 2001, compared with a 36% increase for the EU-15 as a whole (the ratio surged by 67% in Germany and by 60% in the United Kingdom).

**R&D PRODUCTIVITY IS INSUFFICIENT**

Ratio of triadic patent families to industry-financed R&D

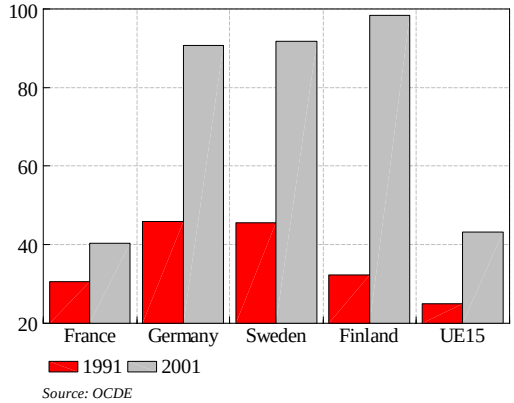



*Source: OCDE, Science, Technologies and Industry Scoreboard 2005*

The publication of the European Commission's national patent indicators attests to the low productivity of French research. Relative to the national population, patent applications filed with the European Patent Office (EPO) in 2002 were running in France at half the levels seen in countries included in the group of leaders for innovation.

**PATENT FILINGS LEAVE MUCH TO BE DESIRED**

No. of triadic patent per million inhabitants




*Source: OCDE*

In 2001, France was below the EU-15 average, in terms of the number of triadic patents per million inhabitants, with only half the score achieved by Sweden, Finland and Germany.

## *Funding should be focussed on high and medium-high technologies*

The announcement of the results of the call for projects aroused severe criticism: the number of clusters was deemed to be excessive. Initial plans were for only 15 clusters, with total funding of EUR 750m, i.e. approximately EUR 17m per cluster p.a. Despite the fact that the total budget has been increased to EUR 1.5bn, annual average funding per cluster has plunged to EUR 7.5m. The government had nonetheless made provision for specific funding terms for clusters with an international dimension. State intervention in the form of subsidies and special tax concessions is aimed at encouraging businesses to innovate and invest in R&D, on the basis that public authorities will help them to shoulder the costs of innovation. With this objective in view, it would be appropriate for the entities responsible for granting state subsidies to evaluate the funding requirements of the clusters according to the target market, the type of spending envisaged and the anticipated returns at an individual and collective level. Allocation of public funds "on an equal basis" is consequently not the most appropriate solution.

At this stage, it is impossible to evaluate the requirements of each individual cluster, largely due to the lack of detailed monographs and quantitative data. The table below provides an indication of the industries among the 18 sectors comprising at least one competitiveness cluster that ought to take priority in terms of public funding.

INNOVATION CAPACITY INDICATORS BY SECTOR

| Sector concerned | ISI* | R&D intensity ** | Rate of return on R&D*** |
|---|---|---|---|
| | 2005 | 2000 | 2000 |
| Electronics/communication | 0.61 | 33.2 | 1.10 |
| Pharmaceutical industry | 0.63 | 26.3 | 0.95 |
| Aerospace | 0.59 | 32.5 | 0.33 |
| Scientific instruments | 0.66 | 16.5 | 0.96 |
| Chemicals (excl. Pharm. Ind.) | 0.63 | 7.1 | 6.27 |
| Electrical machinery | 0.57 | 6.8 | 0.97 |
| Automobile industry | 0.58 | 13.8 | 0.71 |
| Railway equipment | 0.59 | 6.6 | 8.37 |
| Machinery & equipment n.e.c. | 0.55 | 5.3 | 2.36 |
| Refined oil products and nuclear combustibles | Nd | 2.4 | 1.42 |
| Plastic & rubber products | 0.54 | 5.1 | 0.93 |
| Naval construction | Nd | 1.9 | 33.47 |
| Processed metal goods | 0.39 | 1.4 | 2.19 |
| Mineral products (excl. Met.). | 0.47 | 2.4 | 1.93 |
| Agribusiness and food | 0.43 | 1.2 | 1.24 |
| Textiles and clothing | 0.38 | 1.0 | 0.90 |
| Construction | Nd | 0.2 | Nd |
| Wood | 0.4 | 0.3 | Nd |

*Sources: Eurostat, OECD, European Commission.*
**Innovation Sector Index: this index is calculated on indicators measuring the weight of partnerships in the sector, the use of qualified human resources and the latest technology, the generation of patents or products using innovative technology.*
*** Company R&D expenditure as a % of sector value added*
****(the ratio obtained by expressing the number of patent applications filed by the sector, as a % of the total, over R&D spending of companies in the sector, as a % of total company spending on R&D)x100.*
*The grey-tinted sections indicate the top 5 sectors for each of the indicators identified.*

According to the ISI Index, high technology sectors are by far the most productive in terms of innovation (which is quite logical). However, the automotive, railway and chemical (excluding pharmaceuticals) industries are also well placed with respect to available indicators. The low returns on R&D in the high technology sector draw attention to the fact that product development in these industries is highly capital-intensive. Moreover, a number of medium-low and low technology sector activities are distinctly ill placed: agribusiness and food, wood and textiles.

The Innovation Sector Scoreboard provides a comparison between sector-specific innovation capacity across Europe. Finland is clearly in the lead in terms of its industrial strengths: in the 16 industrial sectors covered by the index, it ranks among the European top three 11 times, 7 of which as leader. In contrast, France only ranks among the top three 3 times and never as leader. The best-performing sectors in France are transport equipment, the automobile industry and electrical machinery and

equipment. High and medium-high technology industries are therefore those which require the greatest product development R&D effort and those with the best results in terms of innovation.

The priority fields of research, as defined by ANR (the French national research agency), will continue to account for a high proportion of research funding. In 2005, ANR's contribution to "cluster projects" was heavily geared to the fields of healthcare, sustainable energy&environment and matter&information, which are high and medium-high technology. In all probability, the breakdown will not change significantly in the future.

BREAKDOWN OF THE FUNDING CONTRIBUTION TO COMPETITIVENESS CLUSTERS IN 2005 (€ M)

| | |
|---|---|
| Outside thematic areas | 16.4 |
| Matter information | 68.9 |
| Sustainable energy and the environment | 82.1 |
| Ecosystems and sustainable development | 15.0 |
| Biotechnology and healthcare | 36.3 |

*Source: ANR.*

The aim of the French agency for industrial innovation is to "promote the development of high technology industrial activities with two objectives: highly-qualified jobs and exports" (*www.aii.fr*). The agency is expected to focus its annual budget of approximately EUR 100m for clusters on those with an international dimension.

Finally, the French government has implicitly defined priority clusters by drawing a distinction between clusters that operate at an international level and those that operate at a national or regional level. In addition, the forums for funding innovation and competitiveness [7], launched by the French Ministry of Industry and designed to facilitate the development of innovative SMEs, will be tailored exclusively for global clusters or those with global visibility.

All things considered, medium-low and low technology clusters are unlikely to receive substantial funding.

* *
*

The potential benefits of competitiveness clusters are well adapted to a number of France's structural weaknesses in terms of innovation. That said, the long-term success of this policy depends upon an in-depth reform of higher education and research.

The clusters should make it possible to enhance the innovation capacity and competitiveness of French industry by stimulating the dissemination of technological information and encouraging the creation of new research partnerships.

Moreover, the advantage of a country-wide network-based strategy is that it reduces the geographic density of research centres and high-growth segments of the economy. However, the clusters are unlikely to do much to undermine the strong economic focus on certain key regions (Île-de-France, Province-Alpes-Côte d'Azur, Rhône-Alpes, Midi-Pyrénées and Aquitaine). The most dynamic clusters are, in fact, heavily concentrated (100% in the case of global clusters and 60% in the case of clusters with global visibility) in the above-mentioned regions. Growth in the cluster system might nonetheless contribute to greater decentralisation from the Paris region.

A number of potential flaws in the French system – either to be corrected or avoided - can already be pinpointed based on an analysis of the results seen in Sweden and Denmark and the identification of the best-performing sectors:

⊄# An over complex funding system (the sheer number of public economic agents: OSEO-ANVAR, AII, ANR, government departments, local authorities, etc.) that lacks visibility. The fact that payment is not centralised in a single centre gives rise to heavy transaction costs as each agency or public entity is responsible for its own budget. Lack of centralisation also increases the number of calls for specific projects (Ministry of Industry, ANR, AII, local authorities, etc.) which can lead to the selection of unprofitable projects (windfall effect), funding overlaps, excessively long negotiation times (approximately 6 months between the submission of an application and approval, or otherwise, in the case of the Ministry of Industry);

⊄# The risk of spreading financial backing over too many clusters. As demonstrated earlier, high and medium-high technology sectors can be considered as the key priorities in terms of public funding. However, the number of clusters can lead to a waste of money detrimental to highly-focussed funding. Even though the cases of more technologically-mature clusters merit consideration, allowance should be made for the fact that their R&D programme funding requirements are lower. This risk factor is particularly high with respect to regional funding which is by no means negligible (for instance, the Rhône-Alpes regional council has an annual funding budget of EUR 130m);

⊄# The focus on major companies. Making an exception for highly-performing large companies, one of the structural weaknesses of the French economy, is an approach that hinges upon an over-restricted hub of companies. It is essential that SMEs are more closely involved in R&D projects. SMEs are viewed as less flexible than major companies with an extremely high level of international exposure (and which consequently have fewer problems in relocating). In addition, SMEs are stronger potential beneficiaries of gains in competitiveness than major companies because they start out from a less favourable position. Lastly, as a result of their smaller dimension which means that there are inevitably limits to what they can do alone, SMEs are more prepared to co-operate with other companies and economic agents.

*Guillaume GUIDONI +33 1 42 14 27 96*

[7] *"[These forums] will enable entrepreneurs to meet and establish a working relationship with all the partners that they need to realise their growth potential: their clients (large companies and major accounts), their financial partners (business angels, venture capitalists, banks) and their scientific and technological partners – be it on a regional, national or international level." (the French Ministry of Industry). Seven forums are scheduled from March 2006 onwards in Lyons, Marseilles, Grenoble, Paris, Toulouse, Rennes and Strasbourg.*