FINAL REPORT

Contract n°: SOE1-CT97-1061

Project n°: 1309

Title: SME policy and the regional dimension of innovation (SMEPOL)

Project coordinator:

- **The STEP Group, Studies in Technology, Innovation and Economic Policy, Norway**

Partners:

- **University of Economics and Business Administration, Austria; University of Southern Denmark, Denmark;**
- **Universitá degli Studi di Pavia, Italy;**
- **Maastricht Economic Research Institute on Innovation and Technology, The Netherlands;**
- **Universidad Autonoma de Madrid, Spain;**
- **Middlesex University, The United Kingdom**

Reference period: from 1 December 1997 to 1 December 1999

Starting date: 1 December 1997 Duration: 24 months

Date of issue of this report: 31 January 2000

Project financed within the TSER Programme

Abstract

The SMEPOL project (SME policy and the regional dimension of innovation) is a collaborative activity including seven research institutions in Europe. The project evaluates almost 40 existing policy instruments of promoting innovation activity in SMEs in 11 regions in eight European countries in order to identify 'good practice' policy. The aim is to construct a sound and organised knowledge base about existing practices, qualify their appropriateness and efficiency in order to identify 'good practice' principles, in a relative sense, and help to see how they can be adapted to other environments and situations.

Drawing on the findings of the studied policy instruments, the SMEPOL project finds arguments which call for a new policy paradigm and an actual shift in concrete policy. Our findings support the rationale for interactive policy and we also have observed some shifts in this direction, but so far insufficient.

This new paradigm is expressed as follows: Since the majority of SMEs has a limited resource base with regard to innovation, they need external orientation to understand and (pro-actively) adapt to their environment, and engage in innovation on an informal mode. The main role for innovation policy, which aims to increase the capacity of a region and the capabilities of its SMEs to innovate, is therefore to foster interactive learning within the firms and within the region. This calls for an interactive mode of policy intervention. The overview of the evaluated policy tools in 11 regions, shows that such a challenge is hardly met by the policies presently at work in these regions.

The project undertakes a benchmarking exercise that delivers concrete suggestions for improving or re-orienting individual policy tools, along the lines of the new paradigm. We also propose a reflection on policy mixes, showing that similar SME problems need to be tackled differently according to the regional context, but also that there is scope for importing elements of good practices from one context into another. The variety of regional contexts and the diversity of firms' abilities, attitudes, driving forces and barriers towards innovation prevents us to aim for one permanent 'best practice' policy, valid for each and every situation. Thus, the combination of regional and firms' strengths and weaknesses should form the basis for the design of policy intervention.

SME innovation support policies in the EU regions, thus, could substantially be improved by three key principles:

- Matching the context and SME needs' with the policy tools in each region.
- Confronting the policy tools with the lessons of theory and practice.
- Comparing results achieved with a range of policy instruments in different environments.

The SMEPOL project gives concrete inputs on all these principles. However, achieving progress in this direction would be best handled through the involvement of policy makers themselves, in benchmarking and evaluation exercises. One salient element of the conclusion is therefore the need for more 'policy intelligence' in this complex field.

Content

Executive summary

This section contains the summary of the main findings of the SMEPOL project (SME policy and the regional dimension of innovation) financed by the Targeted Socio-Economic Research (TSER) Programme in EU.

The SMEPOL project: objective and research questions

The SMEPOL-project is a collaborative activity including seven research institutions in Europe: University of Economics and Business Administration, Austria; University of Southern Denmark, Denmark; Universitá degli Studi di Pavia, Italy; Maastricht Economic Research Institute on Innovation and Technology, The Netherlands; The STEP Group, Norway (project coordinator); Universidad Autonoma de Madrid, Spain; and Middlesex University, The United Kingdom

The *objective* of the SMEPOL project is to analyse in a comparative setting almost 40 innovation policy tools at the regional level aimed at small and medium-sized enterprises (SMEs) in eight European countries. The goal of the research is to single out principles of 'good practice' for policy tools aimed at different kinds of SMEs and different regions. The project tries to provide a conceptual reflection on rationales and modes of operation of innovation policies.

The main *research question* of the SMEPOL project can be summarised as follows:

- *How should innovation policies targeted at SMEs be designed and implemented in order to improve their effects in terms of raising the innovative activity and capability in firms as well as regions?*

The wider aim of the project is to inform policy makers in the studied regions and at national and EU level about ways in which policies and initiatives can be improved. Thus, the SMEPOL project teams are involved in a large number of dissemination activities.

Increasing focus on innovation and innovation policy

The point of departure for the SMEPOL project is the increasing focus on innovation and innovation policy. Thus, innovation is increasingly seen as the basis for obtaining competitiveness by firms, regions and nations, as it represents a major response to intensified competition following globalisation by enhancing the learning ability of firms and workers. Drawing on results from recent TSER projects, it is 'argued that globalisation has not only increased market competition, but also transformed it into market competition based increasingly on knowledge and learning' (Lundvall and Borrás 1997: 28).

The increasing importance put on innovation and learning for the competitiveness of firms, regions and nations has simultaneously made innovation policy a more important policy area. Innovation policy is increasingly put at the centre of policies for enhancing economic development as innovation is seen as a focal policy area of endogenous development in times of major restructuring of the global economy.

This new focus has put the question of how to best stimulate innovation capabilities of firms and in particular of SMEs high on the research and policy agenda. The SMEPOL research question encompasses, thus, both an investigation on the *content* of innovation policies targeted at SMEs, but also on the *process* of policy development.

Theoretical background

The theoretical background of the SMEPOL project builds on three main pillars:

- a broad interpretation of innovation and an interactive learning conceptualisation of the innovation process,
- a focus on the distinctive characteristics of SMEs with respect to innovation, and
- a recognition of the regional dimension of innovation activity.

These main pillars reflect recent developments in innovation policy. Thus, policy starts targeting networks and systems of firms and institutions in order to stimulate interactive learning among actors, rather than just focusing on inputs for innovation in 'isolated' firms; SMEs are increasingly recognised as a target for policy intervention; and a move towards strengthening of the regional dimension of policy takes place.

Interactive learning conceptualisation

The analysis is based on the view of innovation as a complex, interactive, non-linear learning process inside firms and between firms and its environment. This view reflects a broad definition of innovation, to include both improvements in technology and better methods or ways of doing things. It can be manifested as new or changed products, services and production methods, new approaches to marketing, new forms of distribution and changes in management, work organisation and skills of the workforce (EC 1995). This view involves a critique of the linear, sequential model of innovation, which focuses exclusively on more radical, technological innovations. The interactivity of the innovation process refers to the internal collaboration between different departments of a company as well as to external co-operation with other firms (especially with customers and suppliers), knowledge providers, finance, training and public administration. These arguments, together with the broad understanding of innovation, imply an extension of the range of industries that can be viewed as innovative from typical high-tech industries, often located in central areas,

to include also traditional, non-R&D-intensive industries often located in peripheral regions.

Although recognising that a strong competitive environment is the main stimulus for innovation in companies, the conceptualisation of innovation as interactive learning emphasises the importance of co-operation in innovation processes as well as a systemic view of innovation. The concept innovation *system* is thus based in the idea that the overall innovation performance of an economy to a large extent depends on how firms manage to utilise the experience and knowledge in other firms, R&D institutes, the government sector etc. in innovation processes (Gregersen and Johnson 1997), and not just on the capability of every single firm (although competence and attitude by founders, leaders and workers are also of critical importance for their innovation capability). Firms combine internal and external resources and knowledge by many actors in building unique, firm-specific competencies, that cannot rapidly be imitated by competitors (Maskell et. al. 1998). Entrepreneurs and firms that fail to learn and change their products and ways of doing things will sooner or later exit from the market.

The role and characteristics of SMEs in the innovation process

Following a re-emergence of the small firm sector in western industrialised countries since the mid 1970s', SMEs have been increasingly recognised by policy makers as a target for policy intervention. The SMEPOL project, accordingly, analyses the role and distinctive characteristics of SMEs that may affect the rationale for policy intervention to support innovation in them, as well as any barriers they may face in achieving their innovative potential.

Whilst there has been much debate about the relative contribution of firms of different sizes to innovation, a number of recent studies like the Community Innovation Survey reveal that small firms tend to make less frequently (technological) innovations than larger firms. However, the points to stress are (i) that innovative activity, in the broad sense utilised in the SMEPOL project, is of potential importance to all firms, irrespective of size and sector, (ii) that both large and small firms often play important, if different, roles in innovative activity, (iii) that dynamic complementarities often exist between large and small enterprises, particularly in the context of integrated production systems, and (iv) that small firms often make important contributions to the renewal of industries.

Distinctive features of SMEs at the micro-level can have implications for their support needs. Thus, support directed at SMEs, including innovation support, needs to be based on an appreciation of three key size-related characteristics: (i) their limited resource base, particularly with respect to finance and management resources, compared with larger firms; (ii) the distinctive organisational culture, stemming from

the combination of ownership and management that typifies the majority of SMEs; and (iii) their lesser ability to shape and influence the external environment.

The heterogeneity that exists within the SME sector means that there is no single model or set of factors that adequately explains how and why innovation takes place. Nevertheless, the key role of internal factors on the nature and extent of innovative activity in SMEs has been emphasised by many researchers. These include both the personal characteristics of SME owners and managers, such as their background in terms of education and previous experience, and firm characteristics that include both resource and organisational issues, together with the interaction between the two. Although the key role of external orientation and networking has been heavily emphasised by many recent commentators, it is important to recognise there can also be disadvantages as well as advantages to such linkages and relationships in practice.

A number of policy implication follow already from the above insights: limited internal resources mean that SMEs are more likely to be dependent on external inputs to support innovative activity than larger enterprises; small firm owners/managers typically prefer personal and informal links to formal systems for meeting their information and other external support needs; small firms are often more receptive to learning from peers with whom they have some shared knowledge base; and that efforts to strengthen a firm's human resource base can be a particularly effective way of stimulating knowledge transfer and learning.

The regional dimension of innovation

The establishment of SMEs as a more important target group of innovation policy also means having a greater awareness of the importance of the *regional level* in innovation policies. It is argued that SMEs often need help from intermediary organisations to acquire technological knowledge from R&D institutes and other knowledge providers, pointing to the need for *local* organisations and a *regional* innovation policy (Hassink 1996). 'The idea (is) that the region forms an appropriate level for developing more strategic initiatives for technology support to local firms based on networking principles' (OECD 1998: 7).

At least two main arguments can be put forward for a strengthening of the regional level in innovation policy.

The first refers to the heterogeneity of regions. This is especially recognised in the SMEPOL project, where the 11 study regions have their different firm and industrial structure as well as distinctive innovation barriers. With large regional differences there is not one set of policy instruments or 'one-size-fits all' policy portfolio that suit all types of regions. In order to be effective**,** instruments must be created for or adjusted to differences in regional circumstances.

The second and more important argument in based on the view that innovation activity is (also) a territorial phenomenon, meaning that innovation is stimulated by co-operation between local actors and by place-specific resources, i.e. resources that are found in some places, and which cannot quickly and cheaply be copied and reproduced elsewhere. In these places interactive learning and knowledge spillover take place resulting in asymmetric information and unique knowledge being created and absorbed in a way that promotes competitiveness for local firms (Storper 1997).

This argument about specific regional resources underpinning innovation processes reflects the 'rediscovery' by researchers and policy makers of the region as an important source of competitive advantage for firms in the global economy (Amin 1998). Innovation processes are seen as socially and territorially embedded interactive learning and knowledge upgrading processes, implying that firms, and especially SMEs, depend very much on a favourable economic environment for their innovation performance (Asheim 1998).

However, it is a matter of debate whether innovation policy towards SMEs needs to rest on a notion of regional innovation systems in which proximity facilitates collaboration and learning that stimulates innovation activity. Thus, the existence of localised externalities is not a necessary situation in all regions, but can occur in some cases and in some contexts. For many firms innovation is a rather internal affair. In other firms involvement of external partners and networking is quite important in order to supplement the internal competence. However, the networks or systems can be observed at various spatial levels, and firms may draw on ideas, know-how and complementary assets from customers, suppliers, consultants, universities, funding and training institutions, independent of geographical location (Tödtling and Kaufmann 1999). Nevertheless, deficits in the regional innovation system may hamper innovation activity of *some* firms. Principally, these deficits may be of three types:

1) A regional innovation system does not exist due to a lack of relevant regional actors. This points to the fact that not all regions are important bases for economic co-ordination. That may demand a sufficient number of firms as well as of knowledge organisations in order to enable collective learning.
2) A regional innovation system does not exist due to lack of innovation collaboration between actors in the region. Thus, the relevant actors may be present, but they do not form a regional system, which may reflect a lack of social capital.
3) A regional innovation system exists, however, the system is too closed and the networks too rigid resulting in a 'lock in' situation as is often the case in old industrial areas.

Policy context and SME innovation pattern

National and regional contexts for innovation

The SMEPOL project includes comparative evaluations of almost 40 different innovation policy tools aimed at SMEs drawn from 11 regions: Upper Austria, Wallonia in Belgium, the Triangle region in southern Jutland (Denmark), Lombardy and Apulia in Italy, Limburg in the Netherlands, northern and south-eastern Norway, Valencia in Spain, parts of London (Lee Valley) and parts of its outer metropolitan area (Hertfordshire). It is important to consider the specific institutional and economic conditions in the regions as these affect SMEs' innovation pattern, the results and impacts of different policy instruments, as well as recommendations for policy portfolios.

One contextual aspect refers to the differing national policy environments in the eight countries included in the SMEPOL project. These eight countries have some specific characteristics of their national innovation systems:

- All the countries have a comparatively modest R&D-intensity. Britain, the Netherlands and Denmark are close the OECD average. A low R&D intensity applies to Spain and Italy in particular, signifying a comparatively weak R&D system in these countries.
- The figures on innovation costs correspond with the countries' R&D-intensity. However, Austria in particular has relatively high innovation costs compared to its modest R&D-intensity. Belgium on the other hand performs relatively better on R&D-intensity than on the innovation cost indicator.
- Denmark, Austria, the Netherlands and Britain have the highest share of innovating enterprises (according to the Community Innovation Survey). Belgium and Spain have the lowest share, and Norway has a low share of innovating service firms.
- Regarding industrial specialisation pattern the eight countries may be divided in three main groups. i) Austria, Italy, Norway and Spain have their export specialisation in the more mature and/or resource based industries, belonging to the low or medium-low technology groups. ii) The export specialisation industries in the Netherlands, Denmark, and to a lesser extent Belgium include both their traditional industries as well as relatively high exports in some R&D-intensive sectors. iii) Britain only, has its export specialisation industries entirely in some of the most high-tech or R&D-intensive industries.

Another contextual aspect refers to the role of the regional administrative level in the design and execution of innovation policy tools. The autonomy and available funds at the regional level greatly influence where (at which level) and how ('top-down' or 'bottom-up') policy tool are initiated, designed and executed. In three of our regional cases – Wallonia in Belgium, Valencia in Spain and Lombardy in Italy – the regional

level both initiate, design and carry out most of the innovation policies. The other Italian study region, Apulia, as well as the Danish, Norwegian and British regions are seen as examples of mainly nationally or EU oriented innovation policy, in which the national or EU level design most innovation policy instruments and dispose most of available funds. Regions in The Netherlands and Austria hold an intermediary position regarding the possibilities for innovation policy initiatives at the regional level.

Still another contextual aspect refers to the differing approaches to innovation policy in the study regions or nations. A trend towards more interactive policy approaches is revealed in nearly all the study regions, although linear tools are still seen as relevant for some firms. However, only Limburg in the Netherlands has so far developed an explicit regional innovation policy.

The study regions also illustrate different typical regional innovation barriers concerning SMEs. Some regions are organisationally 'thin' with a lack of relevant knowledge providers and/or few firms to stimulate SMEs' innovation activity. Apulia, Northern Norway, Upper Austria, Valencia and the Danish Triangle Regions illustrate different aspects of organisational 'thinness'.

Four other SMEPOL study regions may illustrate aspects of fragmented regional innovation systems. Fragmented systems points to the fact that linkages between actors are not well developed even if all the relevant actors are present in a region. The UK region of Hertfordshire, Lombardy, south-eastern Norway and Limburg reveals aspects of fragmented regional systems. The third typical regional innovation barrier points to the fact that too strong ties may lead to 'lock-in' situations, a situation particularly found in the two old manufacturing regions of Lee Valley and Wallonia.

Innovation pattern in SMEs

An important objective in the SMEPOL project is to assess the extent to which the evaluated policy tools manage to stimulate innovation activity in their target group of firms, that is most often different kinds of SMEs. Do the policy tools provide the kind of support required for SMEs' innovation projects? This question required in-depth knowledge about how the target group of firms innovate, and the bottlenecks faced by these firms. Thus, the SMEPOL project includes analyses of SMEs' innovation pattern in the studied regions.

These studies reveal that the SME-sector is in fact very heterogenous with respect to innovation. It ranges from firms without any innovative activity to highly innovative high-tech companies. Innovation strategies of SMEs tend to have a defensive character. Often SMEs focus on the specialisation on niches, quality advantage and

the redesign of a traditional product. Offensive strategies like entering or opening up of new markets are rather rare; most likely they can be found in the case of R&D-intensive SMEs.

SMEs innovate with a higher resource intensity than large companies. This is especially true of human resources. Manpower is relatively more important for SMEs than for large firms. However, SMEs are less often engaged in research than large firms. Most SMEs are confronted with serious size-specific barriers restricting the potential to do research: lack of time of the key persons which are preoccupied with day-to-day work, too limited financial capacity to engage in research and development, narrow product ranges make it risky to introduce very innovative products. SMEs often innovate more informally than large firms, i.e. without developing an explicit strategic framework for innovation, and outside the framework of formal R&D projects.

SMEs rarely have external relations in the innovation process, clearly less than large firms. If there are external relations, then usually this takes place within the value chain. Co-operative innovation projects, characterised by intensive collaboration and interaction, are very rare. In particular co-operation with knowledge providers, both from science and technology, is very limited. Information and knowledge tends to be restricted to the well-known markets leading to dependency either on strong business partners (usually dominant customers) or small specialised markets. Many SMEs have a lack of manpower for networking. This applies both to the search for innovation-related information and the co-operation in innovation projects. Therefore the danger of lock-ins is greater in the case of SMEs than large firms. Willingness or ability to co-operate is related to the technological level of a firm. This applies primarily to scientific partners, but to some extent also to business partners. The most active SMEs regarding innovation co-operation are higher-technology and more innovative firms. SMEs are more region-centred than large firms. A too dominant focus on the region, however, limits the scope of available technical information, technologies, and accessible markets. Another problem is the lack of adequate partners to co-operate with due to the limited scope of the region. This in fact is one of the most frequent reasons of SMEs not to co-operate in the innovation process.

The problems constraining or preventing innovation are very diverse depending on region and type of SME. Nevertheless, some results apply to most SMEs in the studied regions in general. This applies especially to the lack of funding. Technological barriers are generally more serious in lower-technology, traditional sectors. Other types of problems than technical or financial do also constrain innovation although firms often do not sufficiently recognise them. It is especially the value of co-operation for innovativeness which is underassessed by many SMEs. In addition, market research activities are rarely performed. Of central importance are strategic deficits and organisational weaknesses of SMEs. A frequent strategy deficit

in the case of SMEs is the narrow customer focus making their innovation process dependent on their clients.

The evaluated policy tools, results, impacts and coherence

Overview of policy instruments

The SMEPOL study includes evaluation of almost 40 innovation policy instruments in the 11 study regions. In order to gain an overview the 40 tools or so are categorised in five main types in Table 1. The typology of policy instruments also allows us to benchmark instruments against each other and develop precise guidelines for each main type of instruments.

The categorisation includes two elements. We differentiate between two different types of target groups of the policy instruments; firms (through instruments directly oriented to them) and the regional system (aiming for externalities or synergies from increased interaction and knowledge upgrading in the region). The other dimension considers the nature of the tools, i.e. the main weaknesses of SMEs regarding innovation (as revealed in the SMEPOL studies of SMEs' innovation performance) targeted by the tools. These are (i) financial barriers, (ii) lack of accessibility of strategic information, (iii) lack of interaction with knowledge providers, and (iv) lack of adequate human resources.

Table 1: Typology of policy instruments in the SMEPOL project

	Target groups	
Nature of tools	*Firm oriented*	*System oriented*
Finance	Support schemes for innovation/R&D projects (A1)	
Information		Technology centres (B1)
Advice		Innovation brokers (B2)
Human resources	Technical personnel introduction schemes (A2)	Mobility schemes for researchers (B3)

The A1 and A2 tools are designed for individual firms, and recognise financial barriers and the lack of technical competencies as main barriers to innovation in SMEs. The tools do not recognise the existence of innovation systems. The three B tools focus more on indirect diffusion of technological competence through increased interaction between actors to SMEs. The B2 tools are distinguished by the active role played by technology or innovation brokers whose role is to identify technological needs of firms. A2 and B3 tools may overlap. However, while A2 tools mainly subsidise the salaries of technical personnel in SMEs, the B3 tools focus more on

strengthening the long term collaboration and interactive learning between firms and different regional knowledge providers through the mobility of researchers.

The typology in Table 1 is simple and cannot do justice to all the studied policy tools. Some more innovative and interactive tools, which cannot be well placed in the table, have been introduced in some of the studied regions. These tools are more process oriented. They try to promote continuous interactive learning via proactive actions and initiatives, and they directly aim to up-grade the innovation capability of local and regional innovation systems.

Results and impacts of policy instruments

The SMEPOL projects assesses the results of the studied policy instruments. We then distinguish between three 'levels'. Firstly, the direct results of the instruments, i.e. if the policy tools achieve the operational objectives or main targets assigned to them. Secondly, results other than those related to the direct targets, such as increased technological and managerial knowledge and learning capability in firms. Thirdly, longer term effects and impacts of the policy tools outside of the target group of firms. This is difficult to evaluate, in particular due to the time lag between the inception of the supported project and the commercialisation phase and the difficulty in isolating the real effects of the policy instrument from a host of other factors. Nevertheless, one way of gaining an impression of the wider effects of policy tools is to focus on the extent to which they appear to encourage closer linkages and interactive learning.

The policy instruments have different aims, means and working methods, and the results differ among them. However, based on the typology in Table 1, we can withdraw some general results for each main type of instruments. Regarding the direct *support schemes* (A1 type of tools), the performance of SME supported has improved in various fields: employment, productivity, management and workforce skills, profits, sales and market shares. The clients also tend to have a favourable attitude towards these tools. However, there seem to be low additionality of some of these instruments as firms would have carried out the innovation projects regardless of the support, and since these tools tend to support the already innovative core of firms. Some of these support instruments identify positive indirect results arising in terms of management and workforce skills. However, impacts are reduced due to a tendency to focus on R&D in isolation without sufficient integration with other forms of support necessary for the innovation process, particularly with respect to marketing and commercialisation.

Most *technology centres* (B1 type of tools) show positive trends in terms of number of clients, users, services rendered and awareness. The general level of satisfaction with the support tools seems to be high, too. However, technology centres seem to have a limited impact beyond the improvement of existing products and processes among

supported SMEs, i.e. in strengthening the technological and managerial knowledge in firms. On the other hand, technology centres generally reveal a high additionality as innovation projects or activity in many SMEs could not have taken place without the support. Technology centres also show beneficial effects outside the firms receiving support. This is in particular the case where the centres are strongly embedded in the regional industrial milieu that may foster the diffusion of information, knowledge and innovations through proximity and the frequency of contacts between firms in the region and with the technology centres. This seems to be valid in particular for the technology centres in Valencia, less so for those in Austria which had fewer links to external firms.

Regarding *innovation brokers* (B2 type of tools), the level of satisfaction of SME with these policy tools is positive, although the number of firms supported is low. The results differs between the instruments in this group. Some instruments have a low degree of additionality, while in other cases there is a high degree of additionality as the supported firms could not have gone ahead without the advice from the innovation brokers. However, these tools generally have demonstrated positive effects in changing firms behaviour, as they link firms to public and private knowledge providers that often become collaborators in firms innovation process. Thus, innovation broker may in particular have longer term effects on less innovative firms in strengthening their access to external knowledge and starting a process of continuous innovation. However, it must be admitted that measurements of effects of these tools, oriented towards longer term goals, are very difficult to trace.

The two types of *mobility schemes* (A2 and B3) have positive additionality and effects on innovation and business performance. These schemes may also encourages a long-term approach to innovation in firms as they target an important problem in many SMEs in stimulating firms to recruit persons with higher education. A large part of the employment contracts are extended after the labour cost subsidy have stopped, and firms appear to have a more positive attitude towards recruiting more higher educated employees and towards innovation than before. The employment of higher educated person often marks the beginning of continuous innovation activity in supported non-innovative SMEs. A main problem with mobility schemes relates to a low rate of take-up of the scheme.

Coherence of innovation policy instruments

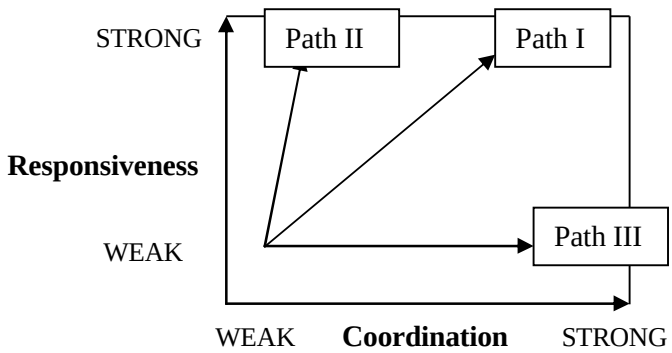
Coherence of innovation policy *instruments* is in the SMEPOL project understood as the overall adequacy and effectiveness of an instrument in stimulating and improving the innovative performance of SMEs. A coherent innovation policy *system* can, accordingly, be defined as one in which the individual instruments can be combined in a way to be effective to solve specific problems of innovation.

However, there is a basic contradiction between, on the one side, the aim of responsiveness to diversified regional needs as well as responsiveness to dynamic changes in clients' needs and conditions and, on the other side, the aim to build co-ordinated instruments for the sake of scope and administrative simplicity and transparency. Thus, the core of a dynamic and interactive system of innovation policy is set in between the ability to keep coherence between the individual instruments and the ability of the support instruments to stimulate and improve innovative performance of SMEs in a specific regional and sectoral context

Seen as a stream of actions, two pathways tend to prevail in design and implementation of innovation policy tools in the SMEPOL countries. In one path the issue of responsiveness is the most central one, illustrated as path II in Figure 1. Huge differences in the regional industrial context as well as administrative and political traditions founded on a philosophy of regional autonomy may promote this priority. Thus, in some countries, e.g. Norway, some coherence is given up in exchange of more responsiveness.

In the other pathway, co-ordination, and how to integrate streams of action with diverse actors centrally as well as on a decentralised basis is a key issue (path III in Figure 1). It may be caused by traditions favouring a strong central planning agency or by the squeeze on public spending and claims on public service provision. Thus, in some cases (e.g. the direct support system of Austria) central co-ordination has priority.

Figure 1: Different intended path of innovation policy support



In a dynamic setting there is a need for flexibility in order to respond to changing or diversified needs of client enterprises. This flexibility can principally be established by help of frequent changes in instruments, broad scopes and by help of an organisational set-up that favours integration of key tools of support targeting different barriers to innovation among SMEs. In terms of the ‘stream of action’ perspective, flexibility may thus be attached to two separate phenomena, namely the

flexibility in the design and development of support instruments and the organisational flexibility.

Main policy lessons

Towards a new paradigm for innovation policy ?

Drawing on the findings of the studied policy instruments, the SMEPOL report brings forward some overall policy conclusions regarding the support of SME's innovation at regional level. A main question is: Do we find arguments which call for a new policy paradigm and do we witness an actual shift in concrete policy? The answer is positive. Our findings support the rationale for interactive policy and we also have observed some shifts in this direction, but so far insufficient.

This new paradigm is expressed as follows: Since the majority of SMEs has a limited resource base with regard to innovation, they need external orientation to understand and (pro-actively) adapt to their environment, and engage in innovation on an informal mode, the main role for innovation policy, which aims to increase the capacity of a region and the capabilities of its SMEs to innovate, is to *foster interactive learning* within the firms and within the region. This calls for an interactive mode of policy intervention.

The horizontal overview and comparison between the evaluated policy tools in 11 European regions, show that such a challenge is hardly met by the policies at work in these regions. Both the content and the modes of delivery of policies are in most cases not interactive.

The need for system oriented tools focusing on behavioural additionality

More precisely, we use Table 2 to discuss the way to combine tools that are reactive or pro-active, and target internal processes in SMEs or the functioning of the regional innovation system. On the one hand, firms may focus on allocation of resources as inputs for innovation or focus on learning aiming for behavioural additionality. On the other hand tools may be firm oriented or (regional) system oriented (ref. Table 1).

We suggest that in practice all types of tools are relevant in aiming for a change in innovative performance, but that they respond to different needs of the firms and their regions. 'Linear' tools (A and C tools in Table 2) directly aim for more innovation *performance*, while 'interactive' tools (B and D) address innovation *behaviour*, but addressing behaviour is only meaningful if, in the end, it results in better performance. The correspondence between the distinctive characteristics of SMEs regarding innovation and the various policy approaches shows first of all that every of the four types of policy instruments is relevant and secondly that the instruments have to be

conceived starting from SMEs needs, expressed as well as latent ones. A proper sequence of instruments becomes then more appropriate than a search for universally and permanently adequate tools.

Table 2: Classification of policy instruments studied in SMEPOL along two policy paradigm dimensions

	Form and focus of innovation support	
Target level of support	*input resources* *(reactive tools allocating inputs for innovation)*	*behavioural additionality* *(proactive tools focusing on learning to innovate)*
firm-oriented	**A**	**B**
(regional) system-oriented	**C**	**D**

The main outcome of the SMEPOL study, i.e. the overview gained through the evaluations of almost 40 policy tools, is that the tools are too much concentrated in category A in Table 2, and that there are few instruments in category D. All types of instruments are relevant to different types of firms and different types of environments (and at different points in time), but the main gaps in the support systems in the SMEPOL cases, are to be found in category D. In order to conduct a change in perspective, it seems necessary, however, in most cases, to first develop instruments of the B (which try to influence certain attitudinal and behavioural aspects with SMEs) and C type (which try to raise endowments in the innovation systems the SMEs are part of), before the system and agents become apt to implement and absorb D-type instruments.

Main challenges and ways to improve policy instruments

Using this framework, we employ the typology of our five main policy instruments (cf. Table 1) to undertake a benchmarking exercise that delivers concrete suggestions for improving or re-orienting individual policy tools, along the lines of this new

paradigm. (The possible introduction of completely new tools in a regional support system could also be considered, based on the analyses revealed in Table 2).

Regarding direct support schemes for innovation and R&D projects the main challenges are:

- Lower fragmentation of support according to various aspects of innovation process, take a longer term view on support.
- Increase additionality (broaden and renew client base to pick up less obvious clients) without losing focus on innovation.
- Introduce more policy learning in these traditional policy tools.
- Work in complementarity with risk capital.

In technical personnel introduction schemes we see the main challenges as :

- Increase penetration rate of the schemes.
- Increase additionality of the schemes, i.e. their role in changing behaviour in SMEs, rather than responding mainly to financial considerations.
- Upgrade flexibility of the schemes, to adapt them to firms' characteristics.

The main challenges regarding technology centres are seen to be :

- Reconcile self-sufficiency on financial side with public service mission (awareness-raising in SMEs, etc.).
- Combine role of developing supply-side and of responding to demands.
- Make the technology advisers evolve from a ‘consultant’ mode (transferring existing knowledge from their shelves to the firm) towards a ‘process consultant’ mode (working together with the firm on its transformation process, bringing in relevant knowledge).
- Reconcile openness with context sensitivity: while proximity might help, it should not mean that support need necessarily to be delivered from sources in proximity; a key role of technology centre is to help firms find ways to relevant sources worldwide.

Regarding innovation brokers the main challenges are seen as:

- Ensure a user-oriented mission while broker has a vested interest in the system.
- Professionalise such a, often loosely defined, job; develop the skills of brokers in making tacit needs apparent.
- Improve the value-added to a ‘pure’ brokerage service.
- Maintain an innovation focus and avoide downgrading to ‘basic’ business development support.
- Reach micro-enterprises and less obvious clients.
- Attain effectiveness of services with a long term and rather fuzzy impact.

Lastly, the main challenges in mobility schemes for researchers are:

- Focuse schemes on companies' needs rather than providing opportunities for finance research in the education's sector.
- Ensure a sufficient take-up of the scheme.
- Ensure additionality of the scheme.
- Upgrade behavioural impact of the scheme in the longer term, in terms of developing lasting collaborative patterns between research and industry.

Customising a policy portfolio to regional specificity's

Furthermore, we propose a reflection on policy mixes, showing that similar SME problems need to be tackled differently according to the regional context, but also that there is scope for importing elements of good practices from one context into another. The variety of regional contexts and the diversity of firms' abilities, attitudes, driving forces and barriers towards innovation prevents us to aim for one permanent 'best practice' policy, valid for each and every situation. Thus, the combination of regional and firms' deficits should form the basis for the design of policy intervention.

SME innovation support policies in the EU regions, thus, could substantially be improved by three key principles:

- Matching the context and SME needs' with the policy tools in each region;
- Confronting the policy tools with the lessons of theory and practice;
- Comparing results achieved with a range of policy instruments in different environments.

Achieving progress in this direction would be best handled through the involvement of policy makers themselves, in evaluation and benchmarking exercises. One salient element of the conclusion of this chapter is therefore the need for more 'policy intelligence' in this complex field.

Background, objectives and methodological approach of the SMEPOL project

The SMEPOL-project is a collaborative activity including seven research institutions in Europe: University of Economics and Business Administration, Austria; University of Southern Denmark, Denmark; Universitá degli Studi di Pavia, Italy; Maastricht Economic Research Institute on Innovation and Technology, The Netherlands; The STEP Group, Norway (project coordinator); Universidad Autonoma de Madrid, Spain; and Middlesex University, The United Kingdom.

Objectives and research questions

The *objective* of the SMEPOL project is to analyse in a comparative setting almost 40 innovation policy tools aimed at small and medium-sized enterprises (SMEs) in regions of eight European countries. The goal of the research is to single out principles of 'good practice' for policy tools aimed at different kinds of SMEs and different regions, as well as provide a more conceptual reflection on rationales and modes of operation of innovation policies.The main *research question* of the SMEPOL project can be summarised as follows:

- *How should innovation policies targeted at SMEs be designed and implemented in order to improve their effects in terms of raising the innovative activity and capability in firms as well as regions?*

The 40 or so tools are evaluated by means of to two main kinds of information. The tools are evaluated (i) against 'lessons' from modern innovation theory, as well (ii) seen in relation to SMEs' need for innovation support in the SMEPOL study regions. Regarding the theoretical foundation, the project acknowledges the broad concept of innovation, the interactive innovation model and the concept of regional innovation system as tools for policy shaping. The interactive model, for instance, means an extension of the range of branches, firm-sizes and regions that can be viewed as innovative, to also include traditional, non R&D-intensive branches, often constituted by SMEs and located in peripheral regions. Thus, the interactive perspective seems to be important in policy making, and especially for SMEs, and this perspective underlines the relevance of a wider set of knowledge and knowledge providers than the science based knowledge created in R&D institutes emphasised in the linear innovation model. Accordingly, an important research question is: *To what extent has the evaluated policy tools taken on board recent developments in innovation theory and policy?*

Regarding SMEs' innovation need, the project has identified innovation performance and barriers in different kind of SMEs in the SMEPOL study regions. On that basis, the project analyses how the policies and instruments studied are geared to stimulate the demand for innovation within different kinds of SMEs, improve the innovation

processes in firms, stimulate effects outside the firms supported, and how they effectively succeed in raising the learning capacity of firms. Thus, an important research question is: *Do the policy tools and support systems provide the kind of support required to stimulate SMEs' innovation processes in the study regions?*

Background

The point of departure for the SMEPOL project is the increasing focus on innovation and innovation policy. Thus, innovation is increasingly seen as the basis for obtaining competitiveness by firms, regions and nations, as it represents a major response to intensified competition following globalisation by enhancing the learning ability of firms and workers. Drawing on results from recent TSER projects, it is 'argued that globalisation has not only increased market competition, but also transformed it into market competition based increasingly on knowledge and learning' (Lundvall and Borrás 1997: 28).

These developments have put innovation policy increasingly at the centre of policies for enhancing economic development as innovation is seen as a focal policy area of endogenous development in times of major restructuring of the global economy. Innovation policy is defined broadly as this policy area 'explicitly aims at promoting the development, spread and efficient use of new products, services and processes in markets or inside private and public organisations' (Lundvall and Borrás 1997: 37).

The approach of innovation policy has changed since the 1980s, and the current approach to innovation policy has at least three distinctive features; i) a broad interpretation of innovation and an interactive learning conceptualisation of the innovation process, ii) an increased focus on small and medium sized enterprises (SMEs), and iii) a move towards strengthening the regional dimension of policy (Smallbone et. al. 1999). These trends in the development of innovation policy lie at the heart of the SMEPOL project that focuses on innovation policy aimed at SMEs in 11 European regions. The project in particular attempts to identify what constitute 'good practice' SME innovation support based on results from instruments evaluated in these regions.

Study regions and evaluated policy tools

The 11 study regions (and nations) in the SMEPOL project are the following ones:

- Austria: Upper Austria
- Belgium: Wallonia
- Denmark: The triangle region (including parts of Velje, Fyn and Ribe counties)
- Italy: Lombardy and Apulia
- The Netherlands: Limburg
- Norway: Northern Norway and South-eastern Norway

- Spain: The region of Valencia
- UK: The Lee Valley Subregion of London, and adjacent parts of the outer metropolitan area in the counties of Hertfordshire and Essex.

The study regions cover quite different economic and policy contexts and are dominated by different approaches to innovation policy. The variety of regional contexts constitutes a good basis to examine amongst other things how the same main type of instruments can give different results in different situations, how 'similar' instruments have been adapted to different regional circumstances, and how 'good practice' has evolved in different contexts.

Existing innovation policy instruments have been evaluated in these regions. The evaluated tools were selected according to the following criteria applied to all the regions.

1) The tools aim to stimulate different aspects of innovative activity in firms, and/or to stimulate co-operation between knowledge providers and firms.
2) The tools are explicitly aimed at SMEs or in practice involved with SMEs.
3) The tools have a regional focus, but are not necessarily created at the regional level.
4) The tools should be important in the innovation support system in the study regions.
5) The tools should comprise some potential lessons for sound innovation policy.

Using these criteria almost 40 policy tools were selected for closer examination. These tools include five main types:

A) *Firms oriented* support schemes (tools designed for individual firms):
A1) Support schemes (through grants and loans) for innovation projects, the introduction of new products and R&D projects. The SMEPOL project includes 16 policy tools in this group.
A2) Introduction of research/technical personnel in SMEs, which only includes two evaluated policy tools.

B) *System oriented* support schemes (tools designed to increase transfer of knowledge and interaction between firms and with knowledge providers):
B1) Policies based on technology centres and schemes fostering technological diffusion to SMEs, of which the SMEPOL project evaluates 12 tools.
B2) Schemes fostering the role of innovation brokers. Five tools are included in this group.
B3) Mobility schemes for researchers, which includes four evaluated tools.

Methodology

The methodology employed in the SMEPOL project has been organised in four main stages or work packages which provide a framework for the research undertaken in each of the study regions. In addition, co-ordination meetings involving representatives from all the research teams have been held in each stage, and an extensive internet based interaction have taken place.

1) Review of existing theory and key literature relating to SMEs and innovation

Work package 1 involved a necessary first step in order to established a sound theoretical basis and a common analytical framework in the research group, as revealed in chapter 1 and 2 of the scientific report. This stage provided a basis for obtaining comparability between the evaluation of individual policy instruments in the regions and countries. As the SMEPOL is an applied project with little time and resources set apart for theoretical work, we did not intend to contribute to the background literature on the subject of SME and innovation, neither to achieve a complete review of all the relevant literature. The aim of work package 1 was to extract the core ideas on which to base the common evaluation method.

2) Evaluation of individual policy instruments and innovation support systems

Work package 2 represents the core of the project and has been the far largest in terms of labour input. This package contains evaluations of the selected policy instruments in the 11 study regions in order to identify rules of 'good practice'.

The various policy instruments have been assessed using different information sources. In many cases it has been possible to draw on pre-existing evaluation studies, conducted by government evaluation units or by consultants/academics, and content analysis of policy documents have taken place. Interviews have also been carried out with administrative and business support staff involved in policy implementation.

In addition, surveys (telephone, postal and interviews) have been carried out in sample groups of clients, and in-depth interviews with selected clients and other SMEs. Some studies have also made use of 'control group' surveys of firms to investigate innovation performance in SMEs (including the use of internal and external resources) that are not necessarily clients or beneficiaries of particular organisations or policies. The firm studies have been carried out in order to identify SMEs' innovation patterns and innovation barriers in the study regions, as a basis for assessing to what extent the policy tools respond to well-identified problems in fostering innovation within the tools' target group of SMEs.

The concept of evaluation refers to 'a process which seeks to determine as systematically and objectively as possible the relevance, efficiency and effect of an activity in terms of its objectives, including the analysis of the implementation and administrative management of such activities' (Polt, 1997). In the SMEPOL project it

is important to obtain comparability and 'objectivity' in the evaluations, i.e. to ensure that each instrument is analysed against the same reference. Thus, the evaluation of the 40 tools are based on the common theoretical and analytical framework prepared in work package 1. The evaluations also target the same main research question belonging to eight horizontal themes, as presented in Figure 1.

The eight horizontal themes addressed for every evaluated tool and support system are as follows:

1. *Theoretical relevance* of the evaluated policy tools relates to the question of whether the policy tools are conceived in a way that is coherent with the lessons from theory and empirical studies on innovation process and innovation systems. The evaluations examine what theoretical understanding underpins the various policy instruments and how this differs from the main policy lessons.

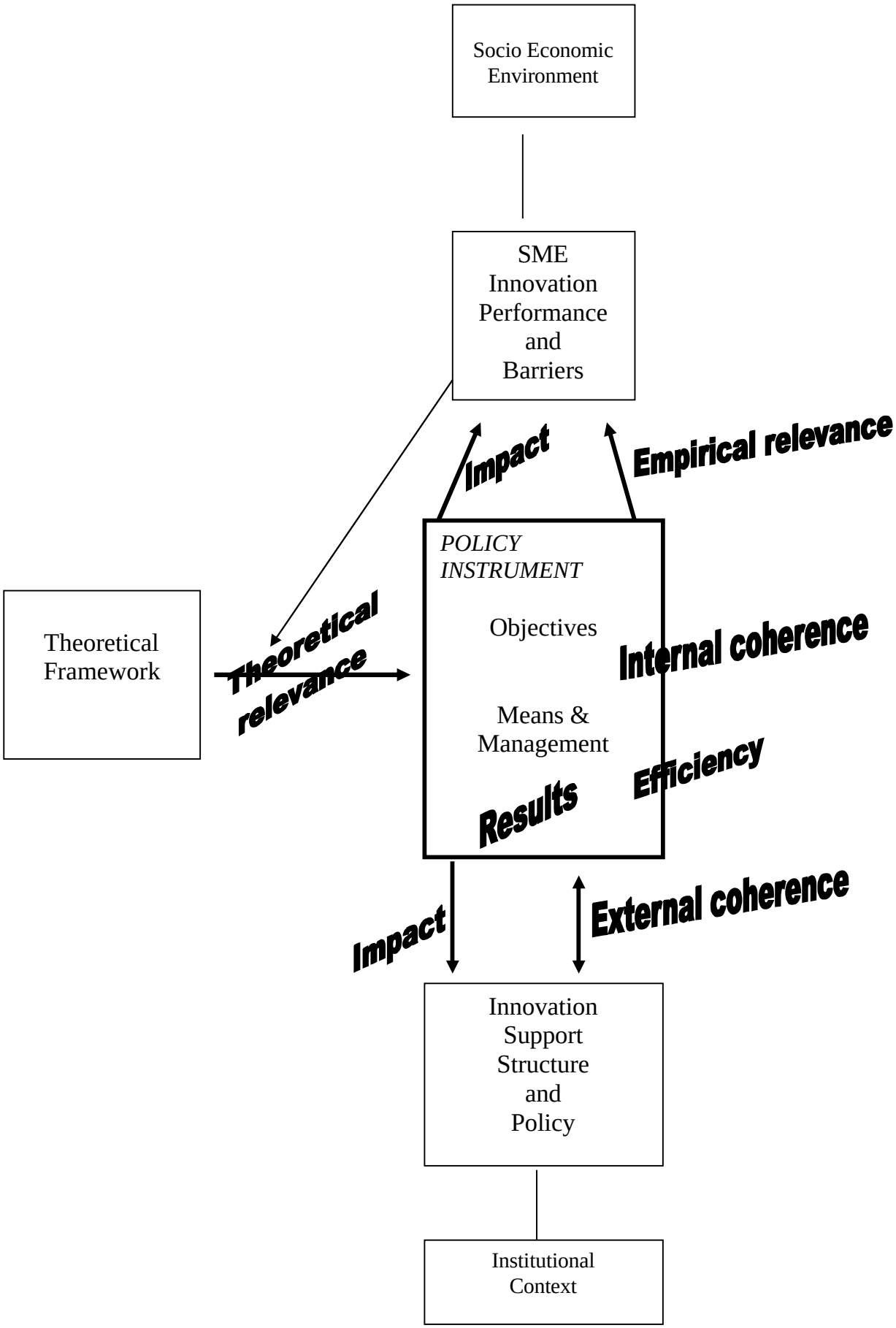
2. Important characteristics of SMEs' *innovation performance and barriers* in the study regions are identified in order to answer the question of empirical relevance. This relates to questions like: How do SMEs in the regions innovate? With which barriers and constraints are SMEs confronted with regarding innovation? What are the needs of SMEs regarding external support?

3. *Empirical relevance* of the policy tools concerns to which degree the policy tools' objectives, grasp of the problem, means and working methods are appropriate in relation to the innovation barriers and support needs of their target group of SMEs. Do the evaluated policy instruments match up with the needs of SMEs within the study regions with regard to innovation and technology transfer support?

4. The question of *internal coherence* relates to whether he means and activities used by the policy tools are coherent with the objectives and goals set to them. It is also a question of how both objectives and means, and their relationship evolve over time.

5. *External coherence* refers to two main questions; firstly, whether the individual policy tools are well embedded in a support system, showing complementarities and synergies with other tools; and secondly whether experiences and results obtained by the policy instruments are fuelled back into the policy and support system, i.e. if there is a learning process at stake on the policy side.

Figure 1: Framework of analysis for the SMEPOL project (based on Nauwelaers et. at. 1999: 17)



This distinction between internal and external coherence, that we put at the start of the project was difficult to maintain as the work evolved (chapter 7). What seems to be important is how 'packages' and 'umbrellas' of policy instruments work. Thus, a coherent innovation policy *system* can be defined as one in which the individual instruments can be combined in a way to be effective to solve specific problems of innovation.

6. *Efficiency* of the policy tools refers to the cost of running the scheme compared to results achieved. Are the management processes of the scheme effective and the costs well in balance with results?

7. *Results and impacts* refer to three main aspects; (i) to the *direct results* of the instruments, i.e. whether the policy tools reach the operational objectives or main targets assigned to them; (ii) to other *effects* on firms and institutions, i.e. results other than those related to the direct targets, such as increased knowledge and learning capability in SMEs and support institutions; and (iii) to *impacts* or social consequences of the policy tools outside their target group of firms and focal institutions, i.e. if the tools contribute to the broader aims set to the policy, for example the strengthening of the regional innovation system.

8. The last horizontal theme is the identification of guidelines for *good practice* innovation support policies designed to meet the needs of different types of SMEs and different kind of regions. Thus, the evaluations single out main strength and weakness of the evaluated policy tools (Appendix 2).

The comparative evaluation of policy tools in the 11 European regions is presented in seven national reports, which are the results of work package 2 in the project. (These reports may be downloaded from the SMEPOL Web-site: http://www.step.no/Projectarea/smepol/. Password: data/index.)

The seven national reports evaluating selected policy tools are:

- Kaufmann, A. and F. Tödtling (1999), *Innovation Support for SMEs in Upper Austria*. Institute for Urban and Regional Studies, Vienna University of Economics and Business Administration, Vienna. SMEPOL report no. 1
- Christensen, P. R., A. Cornett and K. Philipsen (1999), *Innovations & Innovation Support for SMEs – The Triangle Region of Denmark*. Centre for Small Business Research. Southern Denmark University, Kolding. SMEPOL report no. 2.
- Garofoli, G. (1999) (Ed.), *SMEs, Innovation Trajectories and Policies: the Case of Lombardy and Apulia*. Dipartemento di Economia politica e metodi Quantitativi. Universitá degli Stidi di Pavia, Pavia. SMEPOL report no. 3

- Nauwelaers, C., N. Schall and R. Wintjes (1999), *SME Policy and the Regional Dimension of Innovation: The cases of Wallonia and Limburg*. MERIT, Maastricht University, Maastrich. SMEPOL report no. 4

- Isaksen, A., B. T. Asheim and S. O. Remøe (1999) (Eds.), *SME policy and the regional dimension of innovation*. The Norwegian report. STEP Group, Oslo. SMEPOL report no. 5.

- Vázquez Barquero, A., J. Alfonso Gil, A Sáes Cala, A. Viñas Apaolaza and M. Atinza Úbeda (1999), *SME policy and the regional dimension of innovation: The Spanish report.* GIDIT, Departamento de Estructura Económica y Economía del Desarrolla. Facultad de Ciencias Económica y Empresarialas, Universidad Autónoma de Madrid, Madrid. SMEPOL report no. 6.

- Smallbone, D., D. North, I. Vickers and I McCarthy (1999), *SME Policy and the Regional Dimension of Innovation: UK National Report*. Centre for Enterprise and Economic Development Research. Middlesex University Business School, London. SMEPOL report no. 7

3) Comparisons of evaluation studies, and identification of policy conclusions

After finalising the seven national evaluation reports, the third stage of the project has involved pooling material from the national reports, pointing to some overall results and policy conclusions based on the criteria contained in stage 2 above. This work package resulted in the final scientific report following the introduction above. The final report is prepared by the individual research teams writing thematic chapters covering particular horizontal themes. The chapters are mainly based on results taken from the national studies.

The final scientific report is divided into four parts. The first part is predominantly theoretical and consists of two chapters. Chapter 1 is concerned with the role and distinctive characteristics of SMEs that may affect the rationale for policy intervention designed to support innovation in them, as well as any barriers they may face in achieving their innovative potential. Chapter 2 examines the new understanding of the innovation process as a complex, social embedded interactive learning process, as well as discusses the theoretical basis for the increased focus on the regional level in innovation activity.

The second part of the report describes the different policy contexts and innovation processes in the 11 study regions in the eight countries. Chapter 3 points to important characteristics, similarities and differences between the national innovation systems in the eight countries, describes the various approaches to regional innovation support, as well the economic characteristics and typical innovation barriers in the 11 study regions. Chapter 4 presents the 40 or so policy instruments evaluated, and suggest a typology of instruments that takes into consideration the problems addressed and the target group for the instruments, i.e. if the tools target (mainly) individual firms or regional systems. Chapter 5 analyses the innovation activities of SMEs and the

problems they are confronted with in the 11 study regions. From these innovation patterns implications for policies aiming at supporting innovation in the SME-sector are deduced; these empirical results provide a fundamental guideline on which aspects SME innovation support instruments should focus in order to be effective.

The third part of the report reveals results from the evaluations of the policy instruments. Chapter 6 analyses results, effects and impacts of the various policy tools using the typology of chapter 4. For these types of instruments aims, target groups, use, direct and indirect effects and the level of satisfaction of SMEs are investigated. By selecting two policy instruments from each category it also discusses why some tools achieve better results than others and why some are more successful in eliminating barriers to innovation in SMEs. Chapter 7 discusses the concept of coherence in view of responsiveness and co-ordination, and analyses specific aspects of coherence in the evaluated policy instruments and support systems. Based on this discussion an integrated view on coherence in the policy process is put forward, in which the core of a dynamic and interactive support system is set in between the ability to keep coherence between the individual instruments and the ability of the support instruments to stimulate and improve innovative performance of SMEs in a specific regional and sectoral context.

The fourth and concluding part of the scientific report, finally, consists of one single chapter (8) that draws the main policy lessons from the national evaluation studies. The chapter argues for a new innovation policy paradigm based on the interactive innovation model, and proposes a shift in rationale and broad orientations for innovation policy, addressing SMEs in their regional context. Further, the chapter provides elements of good practice of a more operational nature in different types of policy instruments, that may found a basis for practical benchmarking exercises, to be carried out by policy designers and implementers. The chapter also synthesises a stylised view on the content of a sound regional innovation policy for SMEs, as well as it deals with the question of how to build a coherent portfolio of policies, taking into account both regional situation and specific SMEs needs in terms of innovation.

4) Reporting and dissemination

The final stage is firstly to produce the consolidated synthesis report for the project. However, the wider aim of the SMEPOL project is to inform policy makers in the studied regions and at national and EU level about ways in which policies and initiatives can be improved. Thus, the SMEPOL project teams are involved in a large number of dissemination activities, for example more than 50 workshops targeting national and regional policy-makers have been arranged (Appendix 1). An important feature of the project is its participative character: the evaluations are to some extent carried out in partnership with regional policy-makers in charge of designing and implementing the schemes, and with firms, and organisations in the support system as an ‘interactive policy design’ process. Although evaluators should keep their

independence in any case, this is not contradictory with an approach that tries to seek the involvement of policy-makers, firms and support organisations in the definition of the evaluation's aims, and the discussion of its results. Thus, an important experience from the SMEPOL project is the usefulness of involving policy makers themselves in benchmarking and evaluations exercises.

Scientific report with policy conclusions

Edited by

Arne Isaksen, Bjørn T. Asheim, Claire Nauwelaers, David North and Franz Tödtling

Part I: Introduction

Chapter 1: The role and characteristics of SMEs

David Smallbone, David North and Ian Wickers

1.1. Introduction

The main objective of the SMEPOL project is to undertake comparative analysis of existing policies and programmes to encourage and support innovation in small and medium enterprises (SMEs) in order to establish good practice. Since SMEs have been increasingly recognised by policy makers as a target for policy intervention, an important part of the context for the SMEPOL project is the role of SMEs in contemporary European economies. Another is the distinctive characteristics of SMEs with respect to innovation, since these are likely to influence the rationale for policy intervention designed to support innovation in them, as well as any barriers they face in achieving their innovative potential. It may be suggested that one of the key underlying aims of policy intervention in this respect should be to help firms to overcome any size-related barriers that may limit their ability to achieve their potential contribution to the innovative capability of a local, regional or national economy.

Although there are variations between policy programmes (within as well as between countries) in the eligibility criteria that are applied, the SME definition used in the SMEPOL project is that currently used by the EC for statistical purposes: very small enterprises, with less than 10 employees; small enterprises with 10-49 employees and a turnover of less than Euro 7m; and medium enterprises with 50-249 employees and an annual turnover of less than Euro 40m.

1.2 The Role of SMEs in Contemporary European Economies

One aspect of the structural change that has been affecting most European economies in the last two decades is a growth in the number of small firms and an increase in their relative importance. Whilst the starting points and pace of change may vary between countries, the underlying trend is consistent, which helps to explain the increasing attention to the needs of the SME sector by policy makers. In the more industrialised countries, this re-emergence of the small firm sector followed a period of increasing concentration, particularly in manufacturing. This reflected a previous emphasis on scale economies associated with the mass production of standardised products, market expansion to minimise costs at optimal plant sizes and an extensive division of labour. The reversal of this trend towards increasing size of enterprises and

establishments in the 1970s saw the share of small enterprises start to grow, particularly in terms of employment (Sengenberger *et al.*, 1990).

During the 1980s, the apparent ability of small enterprises to create jobs at a time when many large firms were shedding labour attracted the attention of policy makers in many countries. Whilst the magnitude of the increase varied considerably from country to country, as well as between sectors, Sengenberger et al concluded that the increasing share of small enterprises (<100 employees) in total employment represented a reversal of a decline in the share of the small sector that had existed for several decades previously. However, whilst emphasising that data limitations (particularly with respect to the availability of comparable time series) limit the scope for direct comparison, Storey has suggested that the evidence available to support the Sengenberger hypothesis concerning the increasing contribution of small firms to employment is less convincing when the UK is excluded (Storey, 1994). In this regard, it must be remembered that the UK started from a lower base of new firm formation and of small business activity in the 1970s than most other European countries.

Nevertheless, following the publication of the Birch Report (Birch, 1979) which showed that between 1969-1976, SMEs accounted for approximately 80% of net employment growth in the US, the contribution of SMEs to employment generation became a focus of attention of policy makers at the local, regional and national levels in a number of European countries (Storey, 1988). Although later empirical results were less dramatic than the earlier Birch findings, various studies in market economies that include a variety of timespans and both recessionary and non-recessionary conditions, reinforced the original message with respect to the disproportionate contribution of small enterprises to new job creation (e.g., Commission of the European Communities 1987; Storey and Johnson 1987; Sengenberger et al 1990; Lageman et al, 1999).

Moreover, although job losses tend to increase during recessionary periods while the number of job gains decreases, SME performance in terms of employment has been shown to be relatively stable over the economic cycle in comparison with larger firms (Davis et al 1992, EIM 1994, Fendel and Frenkel 1998, Schmidt 1995), particularly that of the smallest enterprises. For example, in EU countries at the beginning of the recession in 1991, employment in microenterprises continued to increase whilst that in small and medium firms remained unchanged and that in large enterprises declined. However, during the recovery in 1994-95, large enterprises were the first to increase their employment (EIM, 1996). It would appear that employment in large enterprises is more vulnerable to cyclical effects than employment in SMEs. During recessionary periods, SMEs are able to partly offset job losses in large firms while during recovery periods employment growth is concentrated in large enterprises (EIM, 1997).

In seeking to explain the re-emergence of the small firm sector, David Storey (1994) has distinguished between supply and demand side influences. On the supply side, technological change has contributed to the development of new products and services and the emergence of new knowledge based activities, which has in turn created opportunities for new and small companies. In some sectors, such as printing, technological change has contributed to a reduction in the minimum optimum scale of production, enabling smaller firms to compete more actively with larger enterprises. In other cases, such as business services, the growth in the number of small firms is based on the new 'commodity' of information (Storey, op cit). Increasing opportunities for smaller firms have also resulted from the fragmentation and cost reduction strategies of larger enterprises which have contributed to an increase in outsourcing and subcontracting out. Whilst it is difficult to estimate the extent to which the increase in either the number of small firms, or the people they employ, is a result of externalisation strategies of large firms, it is clear that the growth of the small firms sector during the 1970s and '80s particularly, reflected changes in the nature of the relationships between firms of different sizes.

The growth in the number and role of small firms is associated with structural shifts between manufacturing and services, alongside an increase in the demand for business services. Rising real incomes have contributed to a growth in consumer demand for a more varied range of products and services, thereby creating niche opportunities which small firms are ideally suited to serve. There has also been an increase in the supply of potential entrepreneurs, influenced during some periods by recession-push factors that can lead to so-called 'enforced entrepreneurship'. Finally, government policies which, in Storey's analysis, includes privatisation, deregulation and taxation policy as well as direct support measures designed to promote or assist small business development, have also contributed. Whilst the precise nature and extent of the commitment to SME policy varies between European countries, most EU member states attempt to encourage the development of SMEs through some combination of policies designed to improve the environment for enterprise establishment and development (such as through deregulation, liberalisation, tax reforms) and direct support measures (such as financial schemes or tax relief) (EIM, 1994).

It is clear that the re-emergence of the small firms sector in Europe's mature market economies is associated with a change in the nature of the relationships between firms of different sizes which has involved a number of processes. Outsourcing and contracting out by large enterprises create business opportunities for small firms which, in some cases, can contribute to the development of clustering in which a few large enterprises act as final producers, and as customers for their small firm suppliers. Small firms in this instance can contribute to regional competitiveness through their supply role to large firms and to regional innovation capacity through the dynamic nature of their inter-relationships with large firms. Moreover, from an economic development perspective, the efficiency of the local supply system and the

ability of SMEs to develop linkages with larger firms affects not just regional competitiveness but also the spread effects associated with any expansion of leading firms within the region. In other cases, regional competitiveness may be based on the interdependence between SMEs rather than on the strategies and actions of individual firms or a dependence of SMEs on larger firms. Whilst it may be argued that the social conditions within which such integrated production systems develop are highly specific, the potential advantages of co-operation in terms of external economies of scale between SMEs, between SMEs and large firms and between SMEs and external agencies makes regions where such networks exist of considerable policy interest, even if the importance of local economic networks for the majority of small firms is the exception rather than the rule (Curran and Blackburn, 1994).

Differences between EU countries with respect to the relative importance of the SME sector can be demonstrated with respect to Table 1 which shows the share of total employment contributed by firms of different sizes. It shows that there is considerable variation in the role of SMEs in total employment between the seven countries featuring in the SMEPOL project. On the one hand, in the UK and Netherlands, SMEs represent a smaller share of total employment than the EU average (66%), whilst on the other hand, in Italy, Spain, Norway and Denmark, SMEs make an above average contribution. Indeed, in Spain and Italy, only 20% of total employment is represented by large enterprises.

Table 1: Percentage Employment Share 1996 by Size Class

	Very small	Small	Medium	Large	All	Total employment (1000)
Austria	25	19	21	35	100%	2,470
Belgium	48	14	11	27	100%	3,835
Denmark	30	22	18	30	100%	1,590
Finland	23	16	17	44	100%	1,030
France	32	19	15	34	100%	15,310
Germany	24	20	14	43	100%	29,090
Greece	47	18	14	21	100%	1,585
Ireland	18	16	14	51	100%	840
Italy	48	21	11	20	100%	14,040
Lux/burg	19	26	29	29	100%	155
Netherlands	26	19	15	40	100%	5,295
Portugal	38	23	18	21	100%	2,800
Spain	47	19	12	21	100%	10.910
Sweden	25	17	16	41	100%	2,030
UK	31	16	12	41	100%	20,420

EU	33	19	14	34	100%	111,405
Norway	32	21	18	29	100%	1,045

Source: EIM (1997) 'The European Observatory for SMEs: Fifth Annual Report', Table A2, p305

It is clear that there are a variety of potential contributions that SMEs can make to economic development at the regional and national levels, that include employment generation, acting as suppliers to large companies and contributing to a more diversified economic structure through the development of new activities, particularly through new firm formation in service activities. In the following section, we consider their potential contribution with respect to a region's innovative capability.

1.3 The Contribution of SMEs to Innovation

There has been much debate in the literature about the relative contribution of firms of different sizes to innovation. For example, based on an analysis of the size distribution of innovating firms in the UK between 1945-83, Pavitt *et al.* (1987) concluded that small firms are more likely to introduce new innovations than larger firms because they have less commitment to existing practices and products than larger enterprises. Innovative SMEs can also be important in developing radically new innovation through their contribution to maintaining technological diversity, since large firms typically innovate incrementally within existing technological trajectories or paradigms. Acs and Audretsch (1990) provided further empirical support for the disproportionate contribution of SMEs to innovation, based on US data.

On the other hand, recent evidence from the second Community Innovation Survey (CIS) suggests that across all sectors SMEs made fewer innovations (in terms of introducing technologically new or improved products or processes) between 1994-96 than large enterprises. Across Europe (excluding Spain, where the results are not yet available) the proportion of innovating firms by size class varied from 73% of large firms, 49% of medium sized firms to 37% of small firms. Moreover, the gap is wider when only 'novel' or 'radical' innovations are considered. For example, in the UK, large firms were three times more likely to be novel innovators than SMEs, both in manufacturing and services (Craggs and Jones, 1998). Moreover, evidence from another recent study, which involved a re-examination of evidence from the Science Policy Research Unit's (SPRU) Innovations Database, also challenged earlier findings. The results showed that the largest enterprises have consistently been a disproportionately important source of innovation in the manufacturing sector in the UK (Tether *et al.*, 1997).

Whilst this debate is likely to continue, not least because different studies typically use different definitions of what constitutes innovation as well as different databases to examine it, the point to stress is that both large and small firms play important, if

different, roles in innovation. In other words, viewed across all sectors and types of innovation there is no optimal firm size from the point of view of innovation and that dynamic complementarities exist between large and small enterprises (Tether *et al.*, 1997; Rothwell, 1983; Pavitt *et al.*, 1989). In this respect, it can be argued that whilst it is questionable whether SMEs are more or less likely to introduce fundamentally new (or novel) innovations than large firms (Storey and Sykes, 1996), they do have a greater ability to make more incremental innovations as a result of the niche role which they often perform (Storey, 1994).

At the same time, it is important to recognise the heterogeneity that exists within the SME sector that has implications for the contribution of different types of SME with respect to innovation. On the one hand, there are many conservatively, managed traditional SMEs, operating in niches that are relatively untouched by technological change, where innovation is not an issue for managers. On the other hand, there are highly innovative new technology based firms whose knowledge base makes them potential world leaders in a specific field. Perhaps the point to stress is that as markets become increasingly internationalised, a lack of innovation (broadly defined) means that SMEs performing the former type of role look increasingly vulnerable, particularly in mature market economies. As a result, it is the importance of innovation to the competitiveness of individual firms (of all sizes) that needs to be stressed, with the need for policy to encourage and support that process. The qualitative differences that exist between SMEs with respect to innovation, suggest that a segmented approach to innovation support policy is essential if it is to be effective.

One of the factors helping to explain the heterogeneity that exists between SMEs with respect to innovation is the sectoral context, which has led some authors to attempt to classify the various roles that small firms play in relation to innovative activities. Rizzoni (1991) for example, has produced a six-fold classification based on the role of small manufacturing firms with respect to technological innovation, in which the sectoral dimension is very important. These ranged on the one hand from 'static' small firms in the sense of being largely uninvolved with innovation and showing a degree of conservatism and inefficiency, and 'traditional' small firms which play a more active role in the diffusion of innovation, to 'new technology' based small firms at the other extreme, where small firms play an important role in the introduction of significant new technologies. Rizzoni's taxonomy can be used to identify the variety of roles that small firms can play in technological change, thus emphasising the heterogeneity that is a recurrent characteristic of the SME sector.

Similarly, Hassink (1996) has developed a typology, initially put forward by others (McKinsey & Company, 1987; Rothwell, 1991), to distinguish between (i) technology-driven SMEs which need to keep abreast of leading edge technologies; (ii) technology-following SMEs where technology though important does not have to be the most

advanced available; and (iii) technology-indifferent SMEs, which are essentially craft firms, and which rarely invest in new technological equipment. Any assessment of firms' support needs should be assessed in relation to the technology base of SMEs as well as the differences that can be expected between firms in different sectors. At the same time, there are also dangers in adopting an overly deterministic perspective in this respect.

The point to stress is that the role which different types of innovation play in the competitiveness of SMEs can vary considerably between sectors, which in turn has implications for what innovation means in practice and thus for the type of policy support that is appropriate to particular firms. For example, in some sectors (such as branches of engineering), the development of innovative, proprietary products which are new to the industry is likely to be an important means which firms use to seek competitive advantage. As a result, firms in these sectors that are seeking to differentiate their products from those of their competitors in order to compete on the basis of non-price advantages, have an incentive to seek innovative product development, in order to create and/or maintain specialised niches for proprietary products. The process of innovation in such firms may require a substantial resource commitment at the pre-launch stage that can be particularly demanding for new and young companies. The support needs in such cases often focus on financing and the need for external technical advice in order to extend the firm's internal resource base.

By contrast, in a sector such as food processing, competitiveness may depend more upon SMEs being able to maintain a high level of flexibility to customer demands that involves them developing slightly modified versions of existing products, or new ways of packaging them. In other words, innovative SMEs typically rely on incremental changes to their product portfolio and the way it is presented to customers rather than making more fundamental innovations or radical changes to the product range or the way that products are produced. This does not mean that SMEs cannot achieve more significant innovations in the food industry but simply that these are likely to be relatively infrequent. The main implication for support needs emphasises the importance of marketing and in particular the nature and extent of the firm's ability to develop value added links with its major customers.

An assessment of the performance of SMEs in terms of innovation is undoubtedly influenced by the definition of innovation that is used, as well as between different types of SME. Adopting a Porterian view, innovation is an attempt "to create competitive advantage by perceiving or discovering new and better ways of competing in an industry and bringing them to market" (Porter, 1990). Innovation is broadly defined to include both improvements in technology and better methods or ways of doing things, which can be manifested in product changes, process changes, new approaches to marketing and/or new forms of distribution. An approach to innovation which emphasises the application of ideas and methods that are new to the firm inevitably means that much innovation in

practice can appear rather mundane and incremental rather than radical from an industry perspective, depending upon an accumulation of small insights rather than on major breakthroughs. Moreover as Porter stated, innovation can result from informal organisational learning as much as from formal research and development, which is a view that also emerges from much of the recent innovation literature which conceives innovation as an interactive, non-linear process. The focus of Bessant et al (1994) on 'continuous improvement' is also relevant here as an important complement to radical, step-change forms of innovation, particularly since this type of innovation often results from an essentially internal process of 'learning by doing'. Since the number of firms which are likely to be truly innovative in a technological sense is fairly small, an emphasis on a broad concept of innovation is more appropriate as far as the majority of SMEs, which is reflected in the approach to innovation of some policy programmes evaluated in the SMEPOL project (e.g. Business Link in the UK).

Whilst it is the firm that has been adopted as the main focus of investigation in the SMEPOL project, a distinction between the organisation and the entrepreneur does have potential implications from a policy perspective. Since individual entrepreneurs may be involved in a number of business enterprises, an individual firm that appears non-innovative could be part of a highly innovating group of companies within an individual entrepreneur's portfolio. As Scott and Rosa (1997) pointed out, portfolio entrepreneurship can result in a very different picture of growth (or innovation) when the unit of analysis is shifted from individual firms to entrepreneurs. However, the greater difficulties in implementing such an approach is an important practical constraint, both for researchers and policy makers.

1.4 The Distinctiveness of SMEs at the Micro-Level and their Support Needs

Despite the variations that can exist empirically between the extent of innovation in SMEs, both between and within sectors, there are certain size-related characteristics of SMEs at the micro level that can contribute to the shaping of strategic activity and underlying management actions affecting the innovation process which has potential implications both for support needs and for the way in which those needs are addressed. Whilst it must be recognised that a definition of SME that includes firms employing between 1 and 249 people means that considerable variation is likely to exist between SMEs, nevertheless a number of size-related characteristics can be identified:

(i) *A limited resource base***,** particularly with respect to finance and management resources (both management time and a more limited range of management skills) compared with larger firms, because of the more limited scope for managerial division of labour. Indeed, this is one of the arguments that can be used to justify public resources being allocated to developing an external support infrastructure which small firms can tap into. Limited resources can influence a firm's ability to scan, identify and respond to opportunities and threats presented by the external

environment. This includes scanning for new developments relevant to their activity that in a large firm would be typically undertaken by dedicated R & D staff. Limited internal resources is a key justification for interventions designed to provide external support for innovation in SMEs, particularly at the start-up stage or in very young businesses where the opportunities to resource innovation and business development internally are more limited than in established firms.

(ii) *A distinctive organisational culture* that stems from the combination of ownership and management that typifies the majority of SMEs. This emphasises the role of the owner-manager and his/her family in the way in which the business is managed and developed, that can affect management behaviour, attitudes to risk, and the nature and extent of external financing. These attitudinal and behavioural characteristics all have potential implications for the nature and extent of the support needs, as well as effective delivery of external support to small companies.

(iii) *Less ability to shape and influence the external environment than in the case of larger companies* e.g. relationships with customers, suppliers, sources of finance and the labour market. This means that the smaller firm is typically faced with a more uncertain external environment than a larger firm. As a consequence, competitiveness often relies on the firm's flexibility and adaptability to external changes, which is a key attribute that should be considered and enhanced when designing support programmes and initiatives targeted at SMEs.

The distinctiveness that results from these size-related characteristics affects the ‘support needs’ of SMEs and the way that support is delivered if it is to be effective. `Support needs' refers to the need of a firm's management to draw on resources from outside the firm to supply information, advice, training, finance or other assistance which will enable it to deal more effectively with a variety of issues. With respect to innovation, such assistance might range from obtaining basic market information to advice to underpin strategic decisions about new product development, that may affect the firm's core business and/or its future development path. In this context, firms may be said to have a `hierarchy' of support needs which can affect how frequently support is required, how much the firm is prepared to pay for it (if anything), who is the best person/organisation to supply it, the firm's ability to make effective use of the support provided, as well as their willingness to accept it. Some of these needs may be provided by private sector organisations as a result of a market transaction; some may be provided by public or semi-public agencies, justified on the basis of a demonstrated market failure in the external support system or because of a recognition by the state of the potential welfare gains to the economy of raising the level and effectiveness of innovative activity; a third possibility is that assistance is delivered by a private sector organisation but is partly funded by the state (as in the case of a programme of subsidised consultancy).

One of the issues that arises when considering the 'support needs' of SMEs is the distinction between 'expressed needs' and 'latent needs'. The distinction refers to the difference that can exist between what a business owner or manager's stated wants or expressed needs are compared with what may emerge from a systematic audit of the strengths and weaknesses of the firm in terms of strategies, resources and competencies. Differences between 'expressed' and 'latent' needs often stem from the difficulties which many SME owners/managers have in diagnosing the external support requirements of their business, particularly in cases where they have limited formal professional management training. For example, what may be expressed as a need for marketing support may conceal a deeper latent need for a root and branch strategic review of the business, with possible implications for the core business definition. Differences between expressed and latent support needs have important potential implications for policy, particularly where it seeks to be 'client' or 'market-led'. To some extent, effective demand for business support needs to be developed if the aim of contributing to improving a region's innovative performance and competitiveness is to be achieved.

Although firms of all sizes are likely to require external support of different types from time to time, there are particular characteristics of SMEs that affect both the nature of their external support needs and the process of meeting them effectively. In principle, the more limited resource base of smaller firms with respect to management can make the effective use of external support a necessity if the firm is to be managed effectively. However, the behavioural characteristics of small firms that stem from the combination of ownership and management can result in a reluctance, or even a resistance, to taking in external help for a variety of reasons. These include: doubts about the value for money on the part of the business owner or manager; a scepticism about generalist advice, particularly where this is offered by advisers who lack a detailed sectoral knowledge; and a preference for autonomy which they may perceive is threatened by the use of external advice. This may result in a greater use of informal rather than formal channels of support, in cases where the professional management resources (i.e. where managers lack formal management training or management qualifications) are limited (Smallbone, 1997).

It also has implications for the effective delivery of support by formal support agencies because of the importance of trust based relationships in relation to advice and consultancy in particular. In this regard, previous CEEDR research has drawn attention to the varying impact of different types of external consultancy on SMEs, with assistance with business planning being a more difficult type to deliver effectively than that concerned with more specific issues such as product design/development (Smallbone et al, 1993). The reasons appeared to be a combination of its more fundamental 'root and branch' nature and the 'in and out' method of delivery typically used by consultants, as well as the more challenging nature of the exercise when previous decisions and judgements of the owner may be placed under the microscope. In such circumstances,

the nature of relationship between the external agent or consultant and the client firm is critical to its success. It needs to extend to implementing and monitoring the effectiveness of the assistance offered and not simply based on 'arms length' delivery of assistance of a 'advise and forget' nature. The distinctiveness of SMEs affects their support needs and how such support is delivered if it is to be effective. In addition, ongoing relationships with external providers of support are more likely to provide a basis for organisational learning than relationships of a one-off sort.

Another important area of support need is finance. No business can develop without adequate and appropriate financial resources and many SMEs face particular difficulties in this respect, as a result of a combination of supply and demand side factors that affect their access to both loan and equity finance. Supply side constraints include an over-emphasis on a collateral based approach to lending on the part of commercial banks and a reluctance on the part of venture capital fund managers to invest in tranches of less than about £250,000 which limits access to these sources for many companies. Whilst a growing recognition of the role of business angels, or informal risk capitalists, exists in some countries, the potential contribution of this source of finance to supporting innovative projects appears to be underdeveloped. It is also important to recognise that SMEs have a range of financial needs with respect to innovation (including working capital as well as investment finance), requiring a mix of finance from different sources, that can present a particular challenge for certain types of company. New or young high technology based firms are recognised to face particular problems in this respect (Bank of England, 1996). In this context, a key potential role exists for public policy in seeking to address areas where the financial needs of SMEs with respect to innovation are not being adequately addressed through market mechanisms. SMEs also have different financial structures than large firms, typically involving a lower ratio of fixed to total assets. They are more reliant on short-term loans and overdrafts than large firms, where a higher proportion of finance is usually sourced through equity (Cosh and Hughes, 1994).

The heterogeneity that exists within the SME sector also has implications for support needs and their effective delivery. One aspect is a firm's sector which leads to some support needs being sector-specific (Curran, 1993), although this more commonly applies in manufacturing than in service sector firms (Smallbone et al, 1998). Another important distinction in this regard is between new or very young firms and established firms, since as a firm matures and its management becomes more experienced, its external support needs tend to become more specialised (Smallbone et al, 1993). The problems faced in raising external finance also vary between different stages of business development, with new start-ups facing particular problems because of the absence of a track record and a typically more limited ability to offer sufficient collateral to potential lenders, than more established firms.

At the same time, it must be recognised that it is neither realistic or desirable that all of the support needs of firms (expressed or latent) can or should be addressed through

public policy. In this respect, the aim should be to focus those public resources that are available on the needs of the economy at the regional (or national) level. In setting such targets, attention should be paid to the strengths and weaknesses of the innovative capability of the economy, and the priorities for raising it, taking into account the potential welfare gains as well as cost effectiveness in terms of resource allocation. By implication, there is a need for a regional innovation strategy to guide effective and appropriate decisions in terms of policy development in this area.

1.5 Key Influences on the Innovative Potential of SMEs

This section focuses on the factors influencing the innovative potential of SMEs and the implications for policy, paying attention to both internal and external influences. However, it is important to stress that the heterogeneity that exists within the SME sector means that there is no single model or set of factors that adequately explains how and why innovation takes place.

The key role played by internal factors on the nature and extent of innovative activity in SMEs has been emphasised by various researchers (see, for example, Hoffman *et al.*, 1998). These internal factors include both personal characteristics of SME owners and managers, such as their background in terms of education and previous experience, and firm characteristics that include both resource and organisational issues, together with the interaction between the two. Both are potentially important to the way that SMEs innovate not least through their influence on a firm's learning capacity, whether this be internally or through interaction with external individuals and organisations.

In very small and small firms that are owner-managed, an 'organisational learning' perspective often focuses on learning processes in individuals. Drawing upon Personal Construct Theory (Kelly 1955) and contemporary learning theory (Hawkins 1994), Wyer and Boocock (1996) have offered insight into the ways in which small business owner-managers learn and have provided foundations for considering how small firms cope with open-ended change. The thrust of their work is founded on Kelly's proposition that all individuals utilise a personal construct system (derived from inherent personal characteristics and accumulated experience) which is used as a frame of reference to interpret the world. In brief, we all have personal constructs that act as frames of reference to help us view the world which confronts us and to deal with new situations which arise.

If change situations impact on a small firm owner or manager (s)he will use his/her existing personal constructs to cope with the change. On many occasions minor adjustments to the construct may allow the owner-manager to deal with the change, simply because a similar situation has been dealt with in the past. This can be characterised as 'simple' or 'closed loop' learning (Stacey 1996) which takes place in

situations where the owner-manager has confirmed the validity of his/her current constructs by using them to make sense of a new situation. The concept may be most relevant to situations where the innovation is incremental rather than novel or radical. However, sometimes change situations arise for which existing constructs are inadequate, which requires them to be extended through a process which entails the questioning of the underlying assumptions upon which the existing constructs are based. This is a more 'complex' or 'double loop' learning process (Stacey, 1996), that would appear to be more appropriate to situations where innovation is 'novel' or 'radical' rather than incremental.

Where external knowledge is critical to the innovation process the ability to identify and exploit such knowledge is crucial. Research on cognitive structures and problem solving has drawn attention to how the learning of individuals is greatest when the new knowledge to be assimilated is related to the individual's existing knowledge structure (Ellis, 1965, Estes 1970, Bower and Hilgard, 1981). Applying these insights to the organisational level, Cohen and Levinthal (1990) have coined the term 'absorptive capacity' which they define as the firm's general ability to value, assimilate and commercialise new, external knowledge. The term 'receptivity' has been used in a similar way to describe the overall ability of organisations to be aware of, to identify and to take effective advantage of new knowledge (Seaton and Cordey-Hayes, 1993).[1] Cohen and Levinthal suggest that an organisation's absorptive capacity is largely a function of the firm's prior related knowledge, which in turn is dependent on prior investments in its members individual absorptive capacities. Investment in R&D is seen as making a particular contribution to a firm's absorptive capacity, although absorptive capacity may also be developed as a by-product of a firm's involvement in other areas, particularly manufacturing. Cohen and Levinthal further argue that the diversity of expertise within a firm is an important source of creativity, as well as strengthening assimilative powers, knowledge diversity facilitates the innovative process by enabling individuals to make novel associations and linkages.

One of the most important determinants of innovative activity at the organisational level relates to the knowledge base of the firm which, in high technology sectors, may be reflected in a high incidence of qualified scientists and engineers (QSEs) among employees, together with the leadership provided by a highly educated entrepreneur. Management attitudes are another factor since they influence the priority given to innovation in business development as well as in the style of management,

[1] Camagni (1991) offers a related perspective to explain how firms translate external information into a language that the firm can understand via a 'transcoding function'. According to Camagni: "These functions are perhaps the most critical, though widely overlooked by economic theory, in that they control the process of interfirm know-how transfer and information appropriation. Utilising codified information, both freely available or costly, and merging it with chaotic and unordered 'information' flow into a firm-specific 'knowledge' and possibly into potential business ideas at the disposal of the managerial decision making" (Camagni, 1991, p.127).

particularly with respect to the extent to which there exists a climate in which individual members are encouraged to learn and develop to their full potential. With regard to human capital, an inability to recruit technical staff of sufficient quality can be a serious constraint on innovation for some SMEs, which Cosh *et al.* (1996) found had significantly increased in importance as a barrier to innovation in SMEs in the UK during the period 1986-95.

Firms also need to be able to commercially exploit the potential benefits of their innovative efforts. Key factors in this respect include the nature and effectiveness of the firm's marketing effort, the degree of marketing involvement in product planning and development and, in some sectors, the firm's competence in the area of technology strategy and technology management (see Hoffman *et al.*, 1998, p. 45; Cobbenhagen *et al*., 1995). Marketing is a commonly reported weakness in small companies (e.g. Carson, 1991) and the marketing of innovative products and services frequently involves developing new geographical markets, including foreign markets, which can represent a particular challenge for smaller firms.

It has long been recognised that most behaviour in organisations is governed by routines (March and Simon, 1958; Cyert and March, 1963; Nelson and Winter, 1982), although it must be emphasised that most of this literature does not explicitly recognise the distinctive organisational characteristics of SMEs. 'Routines' refer to the procedures, conventions, strategies and rules around which organisations are formed and through which they operate. In SMEs, these routines can represent practices developed and nurtured over time to facilitate innovation, or they can reflect the habits and behavioural patterns which evolve in relation to manager's perception of the barriers to innovation. However, unlike many large organisations, these routines are likely to be informal and implicit rather than more formalised and explicitly embedded in management procedures. In other words, in contrast to large firms, most routines in SMEs tend to be tacit and therefore difficult to imitate. In this respect, the capabilities and skills associated with innovation are particularly difficult to emulate. They are often acquired through 'learning by doing' and informal intra-organisational and inter-organisational interactions. In other words, 'learning by interacting' which emphasises the nature of innovation as a process, although not necessarily perceived in process terms by SME owners and managers.

Management routines which are effective in supporting innovation are particularly difficult to acquire, for a number of reasons. Firstly, such routines represent what a firm has learned over time i.e., what an individual or group has learned over time and handed over to and embedded in the organisation and its wider context (Tidd, Bessant and Pavitt, 1997). Secondly, routines are often developed in interaction with other individuals or organisations, such as customers, suppliers and supporting institutions. This applies particularly in the context of more integrated production networks, where innovation and technical change take on a more collaborative and systemic character.

As such, routines as well as particular skills of innovation management may be embedded in a specific business network. If the network is broken down, routines will be amputated and cross-skills may be lost, which may explain why the long-lasting relations found by Anderson and Christensen (1998) to be predominant between Danish subcontractors and their customers.

The role of networks and long term relationships is particularly emphasised by writers such as Cooke and Morgan (1998) who suggest that the inclination and ability of SMEs to innovate is linked to the extent to which they enter into interactive learning networks. In this view, the innovative potential of a region depends upon the learning ability of the owners and managers of firms within that region, as well as their technological competence (i.e. their ability to utilise relevant technologies) and entrepreneurial competence (i.e. their ability to integrate relevant technologies with other aspects of the business). Thus, 'interactive learning' and external networking are seen as important stimuli to innovation. In describing innovation as a process of 'know-how' accumulation, Rothwell (1991) says that "successfully innovative firms generally are well plugged into the market place and to external sources of technological expertise and advice". A clear link is therefore being drawn between the propensity of SMEs to innovate and their involvement in external networks, although internal factors such as those described above are likely to affect the propensity of firms to engage in such networks.

However, it is not clear, to what extent these 'networks' need to be regional or local as opposed to national or international. A presumption of advocates of the industrial district model of regional economic development is that many traded and untraded interdependencies (e.g. tacit knowledge) tend to operate best at the regional scale. However, some writers have produced evidence that questions this link between innovation and local networking. For example, Hart and Simmie (1997) found that the majority of award winning innovative firms in Hertfordshire (part of the 'information rich' South East region), did not consider local networks to be important and that a concern for commercial confidentiality prevented firms from co-operating with each other. Moreover, where firms in high technology sectors have been shown to rely on extensive linkages with a variety of external sources of knowledge, these have been shown to operate over a variety of spatial scales. For example, Keeble et al, (1997) found that technology intensive firms which have achieved high levels of international links also demonstrate above average levels of local networking with respect to research collaboration and inter-industry linkages.

At the same time, there is evidence which suggests that the role of external sources of knowledge in innovation is complex and varies according to the nature of the activity. Two related areas of investigation are: (a) the contribution of Higher Education Institutions (HEIs) as sources of innovative ideas and technical assistance for SMEs and (b) collaborative research ventures between SMEs or between SMEs and larger

firms. There is a body of research which raises a number of concerns about the effectiveness of such linkages in practice. For example, Garnsey and Moore (1993) identify a number of disadvantages for smaller firms with regard to the LINK scheme for supporting collaborative research in the UK, which have wider application. Being more resource-constrained than large firms, small firms often cannot carry the managerial overhead costs required for participation in collaborative research and the Scheme is therefore more suited to larger firms. In addition, the independence and adaptability of small firms can be a major source of competitive advantage although these attributes are inevitably constrained when companies have to work in large consortia as required by the LINK scheme. Moreover, under circumstances where it is difficult to protect intellectual property, managers and technologists in small firms express concern about large 'partners' taking over their ideas.

There are a number of policy implications deriving from the insights outlined above. The first is that limited internal resources means that there is an 'a priori' expectation that SMEs might be expected to rely more on external inputs to support innovative activity than larger enterprises. Moreover, the fact that they frequently find it difficult to identify and articulate their own support needs (particularly in terms of technological innovation), highlights the potentially valuable role of intermediaries in offering diagnostic and evaluation support to SMEs (Seaton and Cordey-Hayes, 1993; Oakey and White, 1993; Hassink, 1996). However, to be successful, these intermediaries need to establish trust-based relations with SME owners/managers. Secondly, small firm owner/managers typically prefer personal and informal links to formal systems for meeting their information and other external support needs, mirroring the less formalised approaches to management within a small organisation. Some small firms are receptive to learning from peers with whom they have some shared knowledge base, and therefore a high level of 'relative absorptive capacity' (Lane and Lubatkin, 1998). These findings are compatible with those from other sources which suggest that SMEs learn more quickly from other firms, that business partners and customers are the leading stimulants for change and innovation (Rothwell, 1991; Dankbaar, 1994); and that most SMEs take others as examples, using a reactive strategy, partly imitating others (OECD, 1993).

In the case of small owner-managed firms, the transfer of information is most effective between individuals with a similar background (OECD 1993). The third point relates to the valuable role of more resilient channels for developing the absorptive capacity of SMEs and promoting knowledge transfer. In this respect, some of the most effective means of promoting a demand for knowledge, and thus knowledge transfer, involve strengthening the human resource base of the firm, such as by stimulating the employment of graduates in SMEs. Finally, an emphasis on individual and organisational learning has implications for the way that support is delivered to SMEs if it is to be effective. More specifically, it implies a need for innovative interactive

approaches to the delivery of training and consultancy to smaller firms in order that the knowledge or skills acquired may lead to a more or less permanent change in behaviour.

It should also be noted that the concept of absorptive capacity (or receptivity) can be used to explain less beneficial effects of inter-organisational learning, such as mimetic isomorphism (DiMaggio and Powell, 1983; Lane and Lubatkin, 1998) or, applied more broadly to sectors and industrial districts, the phenomena of 'lock-in' (Grabher, 1993). This simply means that while firms learn most easily from peers with whom they have some commonalities this can also lead to patterns of learning which may not be optimal in terms of the firm's longer term survival, or from a particular regional development perspective which aims to facilitate industrial re-structuring by targeting support away from declining sectors towards 'infant industries'. The implications of this will be discussed more fully in Chapter 2.

Chapter 2: SMEs and the regional dimension of innovation

Bjørn T. Asheim and Arne Isaksen

While chapter one analyses the characteristics of SMS with respect to innovation, this chapter focuses on another key pillar in the SMEPOL project, the role of the regional level in innovation activity. The focus on SMEs and the regional level reflect changes in the approach to innovation policy since the 1980s. One distinctive feature is a greater emphasis on stimulating innovation activity in SMEs, and relatively less focus on the few national 'champions'. Another distinctive feature is a move towards strengthening the regional dimension of policy, and, consequently, the theoretical basis for the increased focus on the regional level is examined in this chapter. However, a broad interpretation of innovation and a more interactive learning conceptualisation of the innovation process lies behind both the greater emphasis on SMEs and on the regional level. This new understanding of the innovation process is, thus, further elaborated in chapter two.

2.1 SMEs in different types of production and innovation systems

What is meant by the regional dimension of innovation policy? At least two main arguments can be put forward for a strengthening of the regional level in innovation policy. The first refers to the heterogeneity of regions. This is especially recognised in the SMEPOL project, which includes 11 regions in eight countries, with their different firm and industrial structure as well as distinctive innovation barriers (chapter 3). With large regional differences there is not one set of policy instruments that suit all types of regions. In order to be effective instruments must be created for or adjusted to differences in regional circumstances. Consequently, one may argue that parts of the national and EU-based innovation policy should be carried out at the

regional level where the best knowledge of the varying regional conditions can be secured.

The second and more argument is based on the view that innovation activity is (also) a territorial phenomenon, meaning that innovation is stimulated by co-operation between local actors and by place-specific resources, i.e. resources that are only found in some places, and which cannot rapidly and easily be transferred and 'copied' elsewhere. In these places interactive learning and knowledge spillover take place resulting in asymmetric information and unique knowledge being created and absorbed in a way that promotes competitiveness for local firms (Storper 1997). This argument about specific regional resources underpinning innovation processes is, perhaps, the most important argument for the regionalisation of innovation policy. This argument is examined in greater detail in this chapter as it forms an important theoretical basis for the evaluation of innovation policy in the SMEPOL project.

However, the significanse of the regional level for the innovation activity of SMEs varies among other things according to the different kinds of SMEs. Far form all SMEs are embedded in a local innovative milieu characterised by dense interaction between firms, a high level of collective knowledge etc. SMEs participate in different kinds of production and innovation systems, both regional, national and supra-national. The position and role of firms within such systems will affect the way in which they innovate as well as shape their needs for services from the innovation support system.

Table 2.1 distinguishes between three main types of SMEs and the basic characteristics of their innovation activity. The division builds on the suggestion by Pyke about the existence of 'at least three basic ways in which small firms could seek to survive and prosper in a globalized environment' (Pyke 1994, 4). Small firms could obtain collective strength by networking with other small firms, sometimes firms belonging to the same regional cluster. This implies that firms innovate, produce and/or market through alliances and collective institutions. Secondly, firms could compete more or less 'individually' on final markets. Thirdly, small firms 'could strengthen their claims to be preferred suppliers to large corporations by upgrading their manufacturing quality and delivery standards' (Pyke 1994, 4).

The first main type – SMEs within local production systems – will often make use of local or regional input factors in their innovation process. In some local production systems certain interactive learning takes place, involving local firms and institutions as well as non-local actors, in which unique and 'sticky' knowledge may be created. Parts of this unique knowledge are not 'owned' by any particular firm, but belong to the local production system as a whole as one of it's 'intangible' resources (Gottardi 1996). Thus, in local production systems innovations are often the result of firm-specific and region-specific knowledge.

Industrial districts provide one example of such local production systems, consisting mainly of SMEs and including both end firms, subcontractors and service firms. The firms enter into formal and informal partnerships, and this co-operation increases the collective innovative capability of these firms. Specialisation at local system and firm level as well as co-operation within networks of firms, thus, provide the key to innovative activity in industrial districts, making it possible for firms to specialise in core competence and allow their neighbouring firms to carry out complementary activities. This kind of specialisation may lead to high levels of competence amongst groups of firms, within relatively narrow fields, which in turn increases the chances of identifying new, cost-efficient solutions. Employees can, for example, discover better production methods, or identify new product solutions. Innovative capacity is further strengthened by the establishment of a regional research and education system directed towards the dominant branches of the region.

It is the first kind of SMEs in Table 2.1 that most typically rely on recourses of the regional industrial milieu for their competitiveness – and the basis for this kind of competitiveness is examined in more detail in the rest of the chapter. However, we shall first discuss the two other types of SMEs that are less embedded or integrated in regional production and innovation systems. Thus, another main type of SMEs is the 'isolated' end firms, i.e., firms that do not – or cannot – participate in local production systems. Such firms are sometimes found in peripheral areas where there are few suitable local firms to co-operate with, but the firms may enter into collaboration in national and/or international production and innovation systems.

Research intensive, 'isolated' SMEs, in particular, may be integrated in innovation systems at higher geographical levels. These are resource strong firms which are keen to co-operate with R&D organisations, or which can enter into strategic alliances with advanced firms outside their home region to promote economic growth. By way of education and job experience the entrepreneurs, firm managers and/or engineers may be members of a community of professionals which facilitates the interchange of information and knowledge between persons independent of location. Research intensive or high-tech small firms are typically spinn-offs from universities, R&D-institutes or other small or large high-tech firms, and the spinn-offs are often located near-by by their 'mother' organisation. Thus, research intensive firms tend to have dense interactions with neighbouring knowledge organisations and firms. When these kind of firms are located outside a regional innovative milieu, they may, thus, be integrated in a 'professional' space, i.e. interacting with actors belonging to some other regional innovation system, or being part of national and international systems.

Other 'isolated' firms may be less integrated in national and international innovation systems than the research intensive ones. Thus, incrementally innovative and non-innovative SMEs often lack the necessary competence to co-operate directly with

R&D organisations and R&D intensive firms. Such SMEs may not have highly educated employees who 'speak the same language' as researchers at R&D institutes, and they may lack both the competence and capital necessary to carry out R&D projects on their own. However, R&D-knowledge may play an important role in the innovation processes of these firms, although in an indirect way, for example via ubiquitous knowledge drawn from a national or global knowledge base (Smith 1999). These knowledge bases are accessed via national and international suppliers of equipment, with their related consulting activities including installation, test running, service and maintenance, training and skill development. Contact and co-operation with suppliers and traders of production equipment and inputs is likely to be an important source for innovation support in 'isolated' and less resource-rich SMEs, in addition to interaction with customers and clients, and the firm-specific knowledge built up within the firms.

The third SME-type in Table 2.1 refers to subcontractors who supply firms outside the region, or large, dominant local firms. In principle, these SMEs can belong to one of two main types, defined according to the relationship between subcontractor and customer. The first type of subcontractors co-operates with customers on design and quality, and often employs long-term contracts (Amin and Robins 1991). Such subcontractors generally have their own product-range, are highly technically competent and are in a strong position in relation to their customers (Grabher 1993). Known as specialisation subcontractors (Holmes 1986), they hold additional and complementary core competence with respect to their customer firms – competence their customers often need for their own innovation activity.

Table 2.1: Characteristics of innovation activity for different types of SMEs

Type of SME	*Example*	*Important source for innovations*	*Type of innovation system*
Firms in local production systems	Industrial districts or other kinds of regional clusters	Local collective knowlegde and local actors	Regional, territorially embedded
End firms* outside local production systems	Isolated firms with little or no local collaboration	The R&D-sector for reasearch intensive SMEs. Suppliers of machinery and equipment for less technology advanced SMEs	National/ international
Subcontractors for firms outside the region or for large, local firms	Specialisation subcontractors in local innovative milieus. Capacity subcontractors in 'low cost' areas	Local competence and actors. Customers	All geographical levels

* SMEs producing for the final market

Specialisation subcontractors can participate in many different kinds of innovation systems. They may enter into co-operation with national or global innovation systems in those cases where they have clients outside the local region. Specialisation subcontractors must be innovative to survive; they are under pressure from customers to constantly upgrade their products technological base, and also to take up new production concepts such as 'just-in-time' deliveries. In some cases these suppliers may have attained high levels of technical competence and innovative ability through initially being located within innovative, local production systems. Thus, transnational corporations (TNCs) to a certain extent identify their suppliers in different knowledge intensive milieus according to their need to connect their own knowledge bases with locally based, often tacit and immobile competence rooted in innovative regional industrial milieus (Mariussen 1997). TNCs are increasingly aware of the potential of exploiting unique local knowledge and creativity in specific places as a source of profit (Davis 1995). The pursuit of this kind of strategy by TNCs extends the reach of global production systems by simultaneously linking global and regional innovation systems. Thus, firms become competitive through the mobilisation of location-specific resources in different places, for example by tapping into other firms' expertise through subcontracting, take-overs or strategic alliances (Storper 1997). Furthermore, competence and technology from global production systems may also diffuse to other firms in local networks.

Dependent subcontractors are in a very different position compared to specialisation subcontractors. The former have very little technical competence, produce components only to order, are subject to strong pressure on pricing and are in constant danger of being rejected in favour of other subcontractors (Grabher 1993). What we see here is an asymmetric relationship between the customers and the capacity

subcontractors. These kinds of subcontractors compete through lowering prices, and exploiting numerical flexible working arrangements such as short-term contracts, overtime, putting-out and subcontracting to other lower tier firms. These firms are often incrementally innovative or non-innovative firms, and, thus, not part of a regional innovation system.

2.2 Interactive learning, clusters and regional innovation systems

The chapter now goes on to describe in more detail the territorial dimension of innovation, mostly related to SME-type number 1 in Table 2.1. The important starting point is, thus, to understand both industrialisation as a territorial process, i.e. underlining the importance of agglomeration and «non-economic» factors for economic development, and innovation as a socially embedded process, i.e. as an institutionally and culturally contextualised, interactive learning process. The combined effect of these two processes has changed the view on SMEs as a strategic job-generating instrument in future regional policy. While innovative, non-high tech SMEs previously were looked upon as dynamic, but fragile exceptions from the modern high-tech based path of industrialisation, this new understanding looks at innovative and competitive SMEs as a result of successful regionalisation strategies, i.e. as an alternative way of achieving global competitive advantage. This regionalisation strategy is based on:

(i) learning as a localised process, pointing at the importance of historical trajectories and «disembodied knowledge»;
(ii) innovation as an interactive learning process, involving a critique of the linear model of innovation and emphasising the importance of cooperation in promoting competitiveness; and
(iii) agglomeration as the most efficient basis for interactive learning, arguing for the importance of «untraded interdependencies» and bottom-up, interactive regional innovation systems and networks.

In much of the literature on industrial districts during the last 10-15 years the seemingly paradoxical productive role played by traditional, pre-capitalistic socio-cultural structures in competitive, modern local and regional economies has been discussed as well as questioned. Commentators generally agreed upon that what made these regions (e.g. industrial districts) so successful was their combination of functional and territorial integration. The territorial dimension of the socio-cultural structures represented the basic input promoting flexibility and dynamism. However, on the one hand, the continual influence of socio-cultural structures was said to make the regions vulnerable to changes in the global capitalist economy, but on the other hand much work was put into the evaluation of the adaptability and replicability of the industrial district model to other regions in need of development strategies (Asheim 1994).

An important factor contributing to the generalisation of the experiences of industrial districts is the new theoretical understanding of innovation as basically a social process. Compared to the previous dominating linear model of innovation, this implies a more sociological view, in which interactive learning is looked upon as a fundamental aspect of the innovation process, which, thus, cannot be understood independent of its institutional and cultural contexts (Lundvall 1992).

Taken together, this theoretical development has dramatically changed the basis for launching innovation policies towards SMEs with the intention of promoting endogenous regional development. Such a regionalisation approach can be seen as an alternative strategy of achieving competitiveness in a global economy, a position which is often neglected in the globalisation debate.

Towards an interactive innovation model

One important type of innovation policy is the stimulation of innovation systems. Basically, an innovation system consists of a *production structure* and an *institutional infrastructure*, and the interaction between these structures. Innovation systems are normally referred to as *national* systems, but they can also comprise larger or smaller geographical areas. The last years we have seen an increasing interest in regional innovation systems in particular both by academics and policy-makers (Storper 1995).

The increased interest in regional innovation systems is also a result of the new theoretical understanding of the innovation process, which points to new options for SMEs in innovation performance, and new possibilities in designing innovation policy aiming at SMEs. Traditionally, policies for upgrading the innovative capability of SMEs have been based on introducing (more) formal R&D-based product and process innovations. The problem with this strategy, however, has been that formal R&D activity has normally been out of reach for the majority of SMEs due to lack of financial as well as human resources (chapter 1). Traditional SMEs have a more limited resource base (particularly finance and management) compared to larger firms. However, some SMEs are very innovation rich, especially SMEs in high-tech sectors, employing many persons with higher education and having extensive co-operation with R&D institutions. At the same time the key potential competitive strength, in general, stems from SMEs adaptability and flexibility which tends to point to a non-linear model of support.

Modern innovation theory has developed as a result of criticism of the traditional dominating linear model of innovation, as the main strategy for national R&D policies, of being too "research-based, sequential and technocratic" (Smith 1994, 2). This criticism implies another and broader view of innovation as a social as well as a technical process, as a non-linear process, and as a process of interactive learning between firms and their environment (Lundvall 1992, Smith 1994). In fact it could be argued that due to the rapid technological change characterising the globalising

learning economy the linear model, which is timely and costly, can only be used efficiently in basic research in laboratories of universities and large firms in such R&D-intensive branches as pharmacy and defence industry. Thus, this cannot, in general, be seen independent of the type of industry in question, as high-tech industries to a larger degree will continue to be most dependent on formal R&D, which, due to its basic characteristics, will remain expensive and protected, and, thus will not promote co-operation. However, in industries with expensive, but not especially advanced R&D based product innovations, such as in the automobile industry, more co-operation has been applied in order to share development costs.

This alternative model could be referred to as a bottom-up *interactive innovation model* (Asheim and Isaksen 1997), much more adapted to traditional SMEs and the «learning economy», where *knowledge* is the most fundamental resource and *learning* the most important process (Lundvall and Johnson 1994). Lundvall and Johnson use the concept of «learning economy» when referring to the contemporary post-Fordist economy dominated by the ICT (information, computer and telecommunication) - related techno-economic paradigm (Lundvall and Johnson 1994). In addition to the combined effect of widespread ICT-technologies and flexible production methods, the learning economy is firmly based on «innovation ... (understood as interactive learning) ... as a crucial means of competition» (Lundvall and Johnson 1994, 26). The interactive innovation model puts emphasis on "the plurality of types of production systems and of innovation (science and engineering is only relevant to some sectors), "small" processes of economic co-ordination, informal practices as well as formal institutions, and incremental as well as large-scale innovation and adjustment" (Storper and Scott 1995, 519).

What this broader understanding of innovation as a social, non-linear and interactive learning process means, is a change in the evaluation of the importance and role played by socio-cultural structures in regional development from being looked upon as mere reminiscences from pre-capitalist civil societies (although still productive), to be viewed as necessary prerequisites for regions in order to be innovative and competitive in a post-Fordist learning economy. According to Amin and Thrift, this forces a re-evaluation of «the significance of territoriality in economic globalisation» (Amin and Thrift 1995, 8). Furthermore, this new and alternative conceptualisation of innovation as an interactive learning process means an extension of the range of branches, firm-sizes and regions that can be viewed as innovative, also to include traditional, non R&D-intensive brances, often constituted by SMEs and located in peripheral regions. The basic critique of the linear model is precisely the equation of innovative activities with R&D-intensity. The majority of SMEs are in branches which are not R&D-intensive, but which could still be considered to be innovative (e.g. the importance of design in making furniture manufactures competitive and moving them up the value-added chain). Table 2.2 beneath provides a summary of characteristics of the two innovation models:

The emphasis on interactive learning as a fundamental aspect of the process of innovation points to co-operation as an important strategy in order to promote innovations (Asheim 1996). In interactive innovation processes interactive learning takes place a) between different steps of the innovation process, involving the mobilisation of different forms of knowledge and information (e.g. science-based knowledge, market information, technical skills); b) with different firms and organisations involving inter-firm collaborations between suppliers and subcontractors in local and/or global production systems as well as with customers; c) with different knowledge production centres and organisations, representing a wide variety from R&D-institutions regionally, nationally and internationally via other parts of the knowledge infrastructure broadly defined to other firms or departments within a corporation (i.e. if the firm belongs to a TNC); and d) interaction between different departments of the same enterprise, involving the co-operation between different groups of employees with different forms of knowledge (e.g. R&D-based, artisan and tacit knowledge) (Asheim 1999; Lundvall and Borras 1997).

Table 2.2: Characteristics of two innovation models (from Asheim and Isaksen 1997)

	Linear innovation model	*Interactive innovation model*
Important actors	Large firms and the R&D sector	Both small and large firms, the R&D sector, clients, suppliers, technical colleges, public authorities
Important inputs in the innovation process	R&D	R&D, market information, technical competence, informal practical knowledge
Geographical consequences	Most innovative activity (R&D) in central areas	Innovation activity more geographical widespread, but especially occurring in manufacturing milieus
Typical industrial sectors	Fordist manufacturing	Flexible industrial sectors
Implications for regional policy	Promote R&D in less central areas. Promotion of technology diffusion	Develop regional innovation systems, and linking firms to wider innovation systems

The hegemonic techno-economic paradigm of the post-Fordist "learning economy" is to a very large extent (and more than previous techno-economic paradimgs) dependent on organisational innovations to have its potential exploited, and the more important organisational innovations are, the more important interactive learning can be considered to be for the promotion of innovations in general, as organisational innovations enable the formation of learning organisations in post-Fordist societies. A dynamic flexible "learning organisation" can be defined as one that promotes the learning of all its members and has the capacity of continuously transforming itself by rapidly adapting to changing environments by adopting and developing innovations (Pedler et al. 1991, Weinstein 1992). Such learning organisations must ideally be

based on strong involvement of workers within firms, on horizontal cooperation between firms in networks, and on bottom-up, interactive based innovation systems at the regional level and beyond. This could, together with other necessary organisational and institutional innovations at different administrative levels from the local to the supra-national contribute to the formation of «learning regions» (Asheim 1996).

Firms of the learning economy are basically «learning organisations». They choose organisational modes such as inter-firm networking and intra-firm horizontal communication patterns in order to enhance learning capabilites (Lundvall and Johnson 1994). Lundvall and Johnson argue that «the firm's capability to learn reflects the way it is organised. The movement away from tall hierarchies with vertical flows of information towards more flat organisations with horizontal flows of information is one aspect of the learning economy» (Lundvall and Johnson 1994, 39). This is in line with Scandinavian experiences, based on the socio-technical approach to organisation theory, which have shown that flat and egalitarian organisations have the best prerequisites of being flexible and learning organsations, and that industrial relations characterised by strong involvement of functional flexible, central workers is important in order to have a working «learning organisation» (Asheim 1996).

Thus, if these observations are correct, this represents new "forces" in the promotion of technological development in capitalist economies, implying a modification of the overall importance of competition between individual capitals. Of course, the fundamental forces in a capitalist mode of production constituting the technological dynamism are still caused by the contradictions of the capital-capital relationship. However, Lazonick argues, referring to Porter's empirical evidence (Porter 1990), that "domestic cooperation rather than domestic competition is the key determinant of global competitive advantage. For a domestic industry to attain and sustain global competitive advantage requires continuous innovation, which in turn requires domestic cooperation" (Lazonick 1993, 4). Cooke (1994) supports this view, emphasising that "the co-operative approach is not infrequently the only solution to intractable problems posed by globalization, lean production or flexibilisation" (Cooke 1994, 32).

Knowledge infrastructures and interactive learning

One further, important implication of this view on innovation is that it makes the distinction between high-tech and low-tech branches and sectors, which is a product of the linear model, irrelevant when competitiveness is discussed, as it maintains that all branches and sectors can be innovative in this broader sense, although they innovate differently. According to Porter, "the term *high-tech*, normally used to refer to fields such as information technology and biotechnology, has distorted thinking about competition, creating the misconception that only a handful of businesses compete in sophisticated ways. In fact, there is no such thing as a low-tech industry.

There are only low-tech companies – that is, companies that fail to use world-class technology and practices to enhance productivity and innovation" (Porter 1998, 85-86). Following Porter, this implies that it is possible in all branches and sectors to find productive and innovative firms enjoying competitive advantages on the global markets. Thus, this theoretical perspective even broaden the scope for a policy of strong competition for post-Fordist learning economies (Storper and Walker 1989), i.e. competition building on innovation and differentiation strategies, in contrast to weak competition based on price competition.

Thus, instead of using high-tech and low-tech to describe firms and branches, it would be more theoretically adequate and empirically relevant to talk about the knowledge base of firms and the knowledge infrastructure of branches and regions, in order to better understanding the complex interactions and relationships which characterise the innovation processes of firms in the vertical disintegrated, global and local production systems of the post-Fordist learning economy. This points to the importance of the knowledge infrastructures of regions and countries. According to Smith (1997), «any analysis of the technological performance of a country or region should therefore have the infrastructure clearly in focus» (Smith 1997, 94). Knowedge infrastructures are constituted by a variety of institutions and organiations such as universities, other R&D insitutions, training systems, production knowledge of firms etc., «whose role is the production, maintenance, distribution, management, and protection of knowedge» (Smith 1997, 94-95).

Such knowledge infrastructures are of strategic economic importance concerning the promotion of innovation and economic growth, since all industrial production is based on knowledge, which can be either formal, codified (scientific or engineering knowledge) or informal, tacit (embodied in skilled personal routines or technical practice) (Smith 1997). Of specific importance in the context of localised learning is what could be called «soft» knowledge infrastructures, - i.e. infrastructures producing knowledge according to an interactive, bottom-up model - for regional economic performance.

One of the consequences of the considerable more knowledge-intensive modern economies is that "the production and use of knowledge is at the core of value-added activities, and innovation is at the core of firms' and nations' strategies for growth" (Archibugi and Michie 1995, 1). Thus, in a "learning economy" "technical and organisational change have become increasingly endogenous. Learning processes have been institutionalised and feed-back loops for knowledge accumulation have been built in so that the economy as a whole [...] is "learning by doing" and "learning by using" (Lundvall and Johnson 1994, 26). Lundvall and Borras explicitly argue that they prefer "the learning economy" to "the knowledge-based economy" as it "emphasises the high rate of economic, social and technical change that continuously underlies specialised (and codified) knowledge. It makes it clear that what really

matters for economic performance is the ability to learn (and forget) and not the stock of knowledge" (Lundvall and Borras 1997, 35). However, as knowledge, according to Lundvall and Johnson (1994), is considered the most fundamental resource, the learning economy is of course a knowledge-based economy. Furthermore, in order to underline the dynamic and rapid change in the contemporary globalising economy it is necessary also to pay attention to *knowledge creation* as a process of equal importance to learning and forgetting. Nonaka and Reinmöller emphasise that "organizational and interorganizational analysis of the conditions for innovation underlines the importance of knowledge and the key process of knowledge creation" (Nonaka and Reinmöller 1998, 410).

One problematic aspect of the "learning economy" has been its focus being mainly on «catching up» learning (i.e. learning by doing and using) based on incremental innovations, and not on radical innovations requiring the creation of new knowledge. In a long-term perspective of the globalising economy it will be increasingly difficult for the reproduction and growth of a learning economy to primarily rely on incremental improvements of products and processes, for example in the form of imitation, and not on basically new products (i.e. radical innovations) as a result of, for example, an invention, even if Freeman underlines "the tremendous importance of incremental innovation, learning by doing, by using and by interacting in the process of technical change and diffusion of innovations" (Freeman 1993, 9-10). Focusing on territorial agglomerated SMEs, Crevoisier argues that the reliance on incremental innovations "would mean that these areas will very quickly exhaust the technical paradigm on which they are founded" (Crevoisier 1994, 259), and Bellandi sees "the assessment of the endogenous innovation capacities of the industrial districts [...] (as) [...] a key issue" (Bellandi 1994, 73). More specifically, this means the capability to break path dependence and change technological trajectory through radical innovations, so as to avoid falling into "lock-in situations" as a result of internal "weakness of strong ties" (Granovetter 1973) or of external "weak competition" from low cost producers (Glasmeier 1994). This would be even more important if the alternative strategy was to base regional development on exogenous learning. According to Nonaka and Reinmöller, "no matter how great the efficiency and speed of exogenous learning, it will not substitute for the endogenous creation of knowledge. The faster knowledge is absorbed, the greater the dependence on the sources of knowledge becomes" (Nonaka and Reinmöller 1998, 425-26). Thus, what is more and more needed in a competitive globalising economy is the creation of new knowledge through searching, exploring and experimentation involving creativity as well as more systematic R&D in the development of new products and processes.

Learning as a localised process

In the perspective of this new understanding of innovation, strategic parts of learning processes emerges as a localised, and not a placeless, process, and, thus, constitute important parts of the knowledge base and infrastructure of firms and regions, which

points to the role of historical trajectories. This view is supported by Porter, who argues that "competitive advantage is created and sustained through a highly localised process. Differences in national economic structures, values, cultures, institutions, and histories contribute profoundly to competitive success" (Porter 1990, 19). Accordingly, Porter argues that "the building of a "home base" within a nation, or within a region of a nation, represents the organizational foundation for global competitive advantage" (as referred in Lazonick 1993, 2). Localised learning is not only based on tacit knowledge, as we argue that contextual knowledge also is constituted by "sticky", codified knowledge. This refers to "disembodied" knowledge and know-how which are not embodied in machinery, but are the result of positive externalities of the innovation process, and generally based on a high level of individual skill and experience, collective technical culture and a well developed institutional framework, which are highly immobile in geographical terms (de Castro and Jensen-Butler 1993), and, thus, can represent important context conditions of regional clusters with a potentially favourable impact on their innovativeness and competitiveness. Such "disembodied" knowledge is often constituted by a combination of place-specific experience based, tacit knowledge and competence, artisan skills and R&D-based knowledge (Asheim 1999).

Disembodied knowledge can, thus, be both tacit and codified, which implies that some codified knowledge can be a product of localised rather than placeless learning. This implies that the adaptability of this localised form of codified knowledge is dependent upon, and limited by artison skills and tacit knowlege (Asheim and Cooke 1998). In a similar way, Malmberg (1997) argues that «one of the few remaining genuinely localized phenomena in this increasingly «slippery» global space economy is precisely the «stickiness» of some forms of knowledge and learning processes» (Malmberg 1997, 574; Markusen 1996), and Lundvall (1996) maintains that «the increasing emergence of knowledge-based networks of firms, research groups and experts may be regarded as an expression of the growing importance of knowledge which is codified in local rather than universal codes" (Lundvall 1996, 10).

Other researchers have also recognised the need for an intermediate form of contextual knowledge transcending the dichotomy of codified and tacit knowledge. Nonaka and Reinmöller maintain that "industrial regions can provide the necessary combination of explicit knowledge and tacit knowledge through colocation" (Nonaka and Reinmöller 1998, 421), and Lundvall and Borras argue that "tacit knowledge may be shared through human interaction and this may be the major force behind the formation of business networks. This means that codified and tacit knowledge are complementary and co-exist in time" (Lundvall and Borras 1997, 33).

Following this line of reasoning it could be argued that the combination of contextual disembodied knowledge and "untraded interdependencies", i.e. «a structured set of technological externalities which can be a collective asset of groups of firms/indus-

tries within countries/regions» and which represent country- or region-specific «context conditions» of fundamental importance to the innovative process (Dosi 1988, 226), can constitute the material basis for the competitive advantage of regions in the globalising learning economy. Storper (1997) defines such contexts as «territorialization», understood as a distinctive subset of territorial agglomerations, where «economic viability is rooted in assets (including practices and relations) that are not available in many other places and cannot easily or rapidly be created or imitated in places that lack them» (Storper 1997, 170). This would represent an argument against the idea that «ubiquitification» (i.e. the global availability of new production technologies and organisational designs at more or less the same cost (Malmberg and Maskell 1999), as an outcome of globalisation and codification processes, in general tends to "undermine the competitiveness of firms in the high-cost areas of the world" (Malmberg and Maskell 1999, 6). Such an argument is implicit based on the dominance of a near free-market situation in the global economy, leaving no room for the importance of networks and clusters, creating external economies and increasing returns, as the economic basis for imperfect competition (Krugman 1991), as well as on the principles of comparative advantage, based on cost advantages, for example, through the exploitation of a supply of cheap labour (Porter 1998).

Concerning the question of the extent of codification of tacit knowlede in the globalising learning economy Lundvall and Borras argue that "there are two important limits to the codification process. First, the fact that codified and tacit knowledge are complementary and co-existing means that there are natural limits to codified knowledge. … And second, increased codification does not necessarily reduce the relative importance of tacit knowledge - mostly skills and capabilities – in the process of learning and knowledge accumulation. Actually, easier and less expensive access to information makes skills and capabilities relating to the selection and efficient use of information even more crucial than before. This means that tacit knowledge is still a key element in the appropriation and effective use of knowledge, especially when the whole innovation process is accelerating" (Lundvall and Borras 1997, 33).

Thus, the strict dichotomy normally applied between codified and tacit knowledge can be quite misleading both from a theoretical as well as from a policy point of view. This is especially the case if localised learning is primarily said to be based on tacit knowledge. A claim for the superiority of tacit knowledge on such a ground could lead to a fetishisation of the potentials of local production systems, not discovering the problems such systems could face due to their lack of strategic, goal oriented actions and strategies, which, basically, has to be supported by codified knowledge (e.g. formal R&D) (Amin and Cohendet 1999). The category of localised, disembodied knowledge represents a concept which would be able to grasp the important basis for endogenous regional development, represented by firms relying on

localised learning, but building this localised learning on a strategic use of codified, R&D-based knowledge in addition to tacit knowledge. Thus, we agree with Lundvall and Borras, who claim that "it is the consitution of new ensembles of codified and tacit knowledge which is in question rather than a massive transformation of tacit into codified knowledge" (Lundvall and Borras 1997, 33).

Clusters, networks and the competitive advantage of regions

A dynamic, processual understanding of competitiveness clearly indicates that enterprises in order to keep their position in the global market, must focus on developing their own core competencies (which also includes new competencies) through transforming themselves into learning organisations. But internal restructuring alone cannot sustain the competitiveness of firms in the long run. As firms are embedded in regional economies (although in a varying degree) they are very much depended on a favourable economic and industrial environment in general, and knowledge infrastructures at different geographical levels specifically. According to Porter "untangling the paradox of location in a global economy reveals a number of key insights about how companies continually create competitive advantage. What happens *inside* companies is important, but clusters reveal that the immediate business environment *outside* companies play a vital role as well" (Porter 1998, 78).

Thus, a strong case is made today that regional clusters are growing in importance as a mode of economic coordination in post-Fordist learning economies (Asheim and Isaksen 1997, Cooke 1994). The main argument for this is that regional clusters may provide an optimal context for an innovation based learning economy due to the existence of localised learning and "untraded interdependencies" among actors. In general, "geographical distance, accessibility, agglomeration and the presence of externalities provide a powerful influence on knowledge flows, learning and innovation and this interaction is often played out within a regional arena" (Howells 1996, 18). Close co-operation with suppliers, subcontractors, customers and support institutions in the region may enhance the process of interactive learning and create an innovative milieu favourable to innovation and constant improvement. This influences the performance of the firms and strengthens the competitiveness of the clusters, and is increasingly seen as an important aspect of fostering regional competitive advantage.

Agglomeration economies can, thus, represent important basic conditions and stimulus to incremental innovations through informal "learning-by-doing" and "learning-by-using", primarily based on tacit knowledge (Asheim 1994). As Bellandi suggests, such learning, based on practical knowledge (experience) of which specialised practice is a prerequisite, may have significant creative content, implying that the collective potential innovative capacity of small firms in industrial districts is not always inferior to that of large, research-based companies (Bellandi 1994). Still the fact remains, however, that, in general, the individual results of what he calls

decentralised industrial creativity (DIC) are incremental, even if "their accumulation has possible major effects on economic performance" (Bellandi 1994, 76).

This perspective on the importance of regional clusters can find support from modern innovation theory, originating from new institutional economics, which argues that "regional production systems, industrial districts and technological districts are becoming increasingly important" (Lundvall 1992, 3), and from Porter, who emphasises that "the process of clustering, and the interchange among industries in the cluster, also works best when the industries involved are geographically concentrated" (Porter 1990, 157). In 1998 Porter argues even stronger that “a vibrant cluster can help any company in any industry compete in the most sophisticated ways, using the most advanced, relevant skills and technologies” (Porter 1998, 86).

Thus, what is a cluster? In a recent article Porter defines clusters as “geographic concentrations of interconnected companies and institutions in a particular field. Clusters encompass an array of linked industries and other entities important to competition. They include, for example, suppliers of specialized inputs such as components, machinery, and services, and providers of specialized infrastructure. Clusters also often extend downstream to channels and customers and laterally to manufacturers of complementary products and to companies in industries related by skills, technologies, or common inputs. Finally, many clusters include governmental and other institutions – such as universities, standards-setting agencies, think tanks, vocational training providers, and trade associations – that provide specialized training, education, information, research, and technical support” (Porter 1998, 78).

As a contrast, Porter's original cluster concept was basically an economic concept indicating that "a nation's successful industries are usually linked through vertical (buyer/supplier) or horizontal (common customers, technology etc.) relationships" (Porter 1990, 149). In our view there is a need to operate with clusters in both conceptualisations, as it is a quite normal situation to find (geographical) clusters of specialised branches being part of a national (economic) cluster of the same branches (e.g. the Norwegian shipping cluster, which is a national economic cluster (Reve et al. 1992), but which, in part, is constituted by geographical clusters of specialised branches making up the Norwegian shipping cluster).

What this extension of the definition of the concept of cluster also indicates is a deepening and widening of the degree and form of co-operation taking place in a cluster. The original and simplest form of co-operation within a cluster can often be described as a *territorial* integrated input-output (value chain) relations, which could be supported by informal, social networking as is the case with Marshallian agglomeration economies, but which could also take the form of arms-length market transactions between a capacity subcontractor and the client firm. The next step of formally establishing inter-firm networks, is represented by a purposeful, *functional*

integration of value chain collaboration in production systems as well as building up a competence network between the collaborating firms, which could form part of a regional innovation system. A distinction between clusters defined as input-output relations and networks is that *proximity* is the most important constituting variable in the first case, while formal networking represents a step towards more *systemic* (i.e. planned) forms of co-operation, as well as a development from vertical to horizontal forms of co-operation, which more efficiently promotes learning and innovation in the systems. Or as Nonaka and Reinmöller put it, “industrial districts are accumulations of interdependent companies located near each other (the condition of proximity). Networks are a concept focused on interorganizational relations. ... Unlike the concept of industrial districts, the concept of networks does not necessarily entail the condition of proximity” (Nonaka and Reinmöller 1998, 406).

The new, post-Fordist ways of organising industrial production can take various forms. The specific new form of industrial organisation resulting from close inter-firm networking is represented by "quasi-integration" (Leborgne and Lipietz 1988). Quasi-integration refers to relatively stable relationships between firms, where the principal firms (i.e. the buyers) aim at combining the benefits of vertical integration as well as vertical disintegration in their collaboration with suppliers and subcontractors (Haraldsen 1995). According to Leborgne and Lipietz "quasi-integration minimises both the costs of coordination (because of the autonomy of the specialised firms or plant), and the costs of information/transaction (because of the routinised just-in-time transactions between firms). Moreover the financial risks of R&D and investments are shared within the quasi-integrated network" (Leborgne and Lipietz 1992, 341).

Leborgne and Lipietz (1992) maintain that the more horizontal the ties between the partners in the network are, the more efficient the network as a whole is. This is also emphasised by Håkansson, who points out that “collaboration with customers leads in the first instance to the step-by-step kind of changes (i.e. incremental innovations), while collaboration with partners in the horizontal dimension is more likely to lead to leap-wise changes (i.e. radical innovations)” (Håkansson 1992, 41). Generally Leborgne and Lipietz argue that “the upgrading of the partner increases the efficiency of the whole network” (Leborgne and Lipietz 1992, 399).

This reorganisation of networking between firms can be described as a change from a domination of vertical relations between principal firms and their subcontractors to horizontal relations between principal firms and suppliers. Patchell refers to this as a transformation from production systems to learning systems, which implies a transition from “a conventional understanding of production systems as fixed flows of goods and services to dynamic systems based on learning” (Patchell 1993, 797). Such institutionalisation of a continual organisational learning process involves a redefinition of a firm’s relations to its major suppliers based on the recognition that “a network based on long-term, trust-based alliances could not only provide flexibility,

but also a framework for joint learning and technological and managerial innovation. To be an integral partner in the development of the total product, the supplier must operate in a state of constant learning, and this process is greatly accelerated if carried out in an organisational environment that promotes it" (Bonaccorsi and Lipparini 1994, 144). According to Lundvall and Borras "the growing complexity of the knowledge base and the more rapid rate of change makes it attractive to establish long term and selective relationships in the production and distribution of knowledge. The skills necessary to understand and use these codes will often be developed by those allowed to join the network and to take part in a process of interactive learning. Perhaps one of the most fundamental characteristics of the present phase of the learning economy is the formation of knowledge based networks some of which are local while others cross national boundaries" (Lundvall 1996, 10-11).

Such enterprise development is based on what Lazonick and O'Sullivan (1996) call the innovative enterprise. An innovative business enterprise does not take an achieved competitive advantage as given, as it can be eliminated through imitation. Thus, it must be continually reproduced through innovation. However, the innovation process has to be based on collective learning inside the business enterprise or network of co--operating firms to give the firm a possibility of developing their specific competitive advantage over competing enterprises. In this way collective learning stands in contrast to individual learning, where the improved skills are sold and purchased on the labour market at a given price (Lazonick and O'Sullivan 1996, Storper 1997). According to Lazonick and O'Sullivan, innovation processes in the advanced knowledge based society are characterized by such collective learning, which depends on business enterprises creating social organisations (e.g. learning organisations and networks) enabling collective learning to take place (Lazonick and O'Sullivan 1996).

Types of regional innovation networks and systems

The growing interest in the role of national and regional innovation systems must be understood in the context of creating a policy instrument aiming at a systematic promotion of localised learning processes in order to secure the innovativeness and competitive advantage of national and regional economies (Freeman 1995; Cooke 1995). According to Storper and Scott, "a new "heterodox" economic policy framework has emerged in which significant dimensions of economic policy at large are being reformulated in terms of regional policies" (Storper and Scott 1995, 513). This is partly the result of the economic success stories of territorially agglomerated clusters of SMEs (e.g. in the Third Italy), which have become a major point of reference in the recent international debate on industrial policy promoting endogenous development, and partly the result of the new political initiatives towards a "Europe of regions", where the development prospects of the lagging regions of Europe in particular have been of great concern to the EU.

The concept of innovation system is based in the idea that the overall innovation performance of an economy to a large extent depends on how firms manage to utilise the experience and knowledge of other firms, research organisations, the government sector agencies etc. in innovation processes, and not just on the capability of the individual firm (although the competencies and attitude of entrepreneurs, managers and workers are also important for their innovation capability). Thus, factors stimulating innovativeness to a considerable degree seem to be determined by conditions in the environment of firms, and specific contextual factors may hamper as well as promote innovation processes. However, the environment of firms should be understood both in a territorial and functional sense. In a functional sense firms draw on ideas, know-how and complementary assets from customers, suppliers, consultants, universities, funding and training organisations, independent of geographical location (Tödtling and Kaufmann 1999). SMEs are also often linked up to the global economy through international production and innovation systems, where other firms, universities and R&D-institutes can represent accessibility to global knowledge. In particular regional clusters of SMEs need to be 'in touch, not necessarily directly, but through the supply chain with global networks' (Cooke 1998, 10) in order to attract the complementary assets needed to be competitive, when, for example, local R&D competence may be in scarcity.

In a territorial sense, the stock of knowledge and the learning ability in the regional industrial milieu can be of great importance in stimulating the innovation capability of firms. SMEs in particular seem to depend on assets in the regional industrial milieu when innovating, as they by definition often have scarce resources internally, as well as external problems in managing collaboration with remote actors. Thus, 'smaller firms – particularly those that lack resources and incentives to develop their own training, research or engineering departments, depend heavily on local services' (Rosenfeld 1997, 20). As underlined throughout the chapter, regions are more generally seen as an important unit of economic coordination at the meso level: 'the region is increasingly the level at which innovation is produced through regional networks of innovators, local clusters and the cross-fertilising effects of research institutions' (Lundvall and Borrás 1999, 39). Thus, several factors contribute to the regional dimension of firms' innovation processes: i) industrial clusters are in many cases localised, ii) educational institutions and research organisations are tied to specific regions, iii) interaction between firms and knowledge providers, knowledge spillovers and spin-offs is often localised, iv) a common technical and organisational culture may develop to support collective learning and innovation, and v) regional public organisations have generally been more active in supporting technology transfer and innovation activity in the past years (Tödtling and Kaufmann 1999). Thus, the build-up of different local organisations to create 'institutional thickness' (Amin and Thrift 1994) is emphasised as important in stimulating co-operation, interactive learning and innovative activity.

However, for many firms innovation is a rather internal affair. Reliance on internal competence and lack of trust in external actors are among the main reasons for this (Tödtling and Kaufmann 1999). For other firms co-operation with external partners and inter-firm networking is quite important in order to supplement the internal competence. The networks or systems can be observed at various spatial levels. Thus, firms may innovate successfully without belonging to a regional innovation system as they may find relevant competence milieus, for example, in national or international innovation systems. However, trustful and long term collaboration in innovation activity with other local firms or knowledge organisations, skilled workers, and a general innovative atmosphere in a region may stimulate the innovation activity of firms, while the absence of or a weak regional innovation system may hamper innovation activity in SMEs. In general, possible deficits in the regional innovation system that may hamper the innovation activity of firms can be of three types:

First, a regional innovation system may not exist due to a lack of relevant regional actors (i.e. *organisational 'thinness'*). This points to the fact that not all regions are important units for economic coordination. To attain such importance this will require a sufficient number of firms as well as a knowledge infrastructure in order to enable collective learning. A lack of collective learning may be a deficit particularly in peripheral regions with small industrial milieus and located a long distance from relevant knowledge organisations. However, organisational 'thin' regions also points to the facts that regions differ in their capacity to build up relevant organisations to stimulate firms innovation activity, depending on their decision-making power, financial resources and policy orientation (Tödtling and Kaufmann 1999).

Second, a regional innovation system may not exist due to a lack of innovation collaboration between actors in the region (i.e. a *fragmented regional system*). Thus, the relevant actors may be present, but they do not form a regional system reflecting a lack of social capital. Fragmented regional systems point to the fact that regions differ in the attitude of local actors towards co-operation, which may hamper or advance innovation activity. This follows from the view of interactive learning processes as a basis for innovation activity. Thus, innovation activity nearly always involves some forms of qualitative communication, i.e. interpersonal linkages. The existence of informal institutions facilitate collaboration and the exchange of qualitative information between actors. Thus, 'in networks and other kinds of "organised" market relations, people develop codes of communication, styles of behaviour, trust, methods of cooperation etc. to facilitate and support interactive learning' (Gregersen and Johnson 1997, 482). Such informal institutions mean that firms may enter into different kinds of co-operation without always requiring written contracts, as persons know and follow the same established practices, routines and unwritten rules of business behaviour and rely upon trustful relationships. However, in some regions interaction is hampered leading to a fragmented system.

Third, a regional innovation system exists, but the system is too closed and the networks too rigid resulting in a *'lock in'* situation. Thus, the other side of cumulative learning and path-dependency that often characterises strong innovation systems is the institutional, social and cultural 'lock-in' of business behaviour. This may be the case if a region historically has had a strong regional innovation system based on R&D-institutes and vocational training organisations, with specialised activities dedicated to the declining technology. Such a regional production and innovation system, which has become technologically mature, must upgrade the knowledge base and promote product innovations in order to break path dependence (Cooke 1998). There is also an inherent danger of 'lock-in' in regional innovation systems owing to a homogenisation of 'world views' (Grabher 1993), and these views may become an obstacle to adjustment when technologal trajectories and global economic conditions change. This often creates situations where politicians, labour unions etc. argue for protecting and subsidising firms in declining industries.

In other regions working innovation systems do exist. However, it is important, analytically as well as politically, also to distinguish between different types of existing regional systems. On the one hand, we find innovation systems that could be called *regionalised* national innovation systems, i.e. parts of the production structure and the institutional infrastructure *located* in a region, but *functionally* integrated in, or equivalent to, national (or international) innovation systems, which is more or less based on a top-down, linear model of innovation (e.g. science parks and technopolis). On the other hand we can either identify *networked* innovation *systems* constituted by the parts of the production structure and institutional set-up that is *territorially* integrated in a particular region, and built up by a bottom-up, interactive innovation model, or innovation *networks*, which are *embedded* in the socio-cultural structures of a region, characterised by a «fusion» of the economy with society (Piore and Sabel 1984), and based on bottom-up, interactive learning (e.g. the traditional industrial district of the Third Italy).

The networked regional innovation system is different from the embedded innovation network due to the *systemic* dimension of the former, which requires that the relationships between the elements of the system must involve a degree of long-term, stable interdependence. This implies that it is based on *system* integration and not on *social* integration. A further consequence of this is that networked regional innovation system cannot be *embedded* in the community, as embeddedness builds on *social* integration (Granovetter 1985). However, it is still an example of a bottom-up, interactive innovation model, and, thus, represents an alternative to regionalised national innovation systems. The systemic, networked approach to regional innovation systems brings together regional governance mechanisms, universities, research institutes, technology transfer and training agencies, consultants and other firms acting in concert on innovation matters (Asheim and Cooke 1999). As such it

could be said to represent a development towards a «learning region» understood as a «development coalition» (Asheim 1998; Ennals and Gustavsen 1999).

The networked regional innovation systems represent a planned interactive enterprise-support approach to innovation policy relying on close university-industry cooperation. Large and smaller firms establish network relationships with other firms, universities, research institutes, and government agencies. Examples of such networked innovation systems can either be found in regions in Germany, Austria, and the Nordic countries, where this model has been the more typical to implement (Asheim and Cooke 1999), or in later stages in the evolution of industrial districts, which were previously characterised by territorially embedded, innovation networks (e.g. industrial districts in Emilia-Romagna).

Such territorially based regional innovation systems and networks build on different types of knowledge and view of innovative activities compared to the traditional national system of innovation. In addition to the informal, practical and tacit knowledge of "learning by doing" and "learning by using", localised learning processes depend on the important category of disembodied knowledge (in contrast to codified knowledge of a universal character). Different industries, in terms of branch, size and forms of organisation, have different requirements with respect to knowledge infrastructures and innovation systems. Locally controlled, traditional SMEs on the one hand may benefit most from networked regional innovation systems or embedded innovation networks, based on an interactive innovation model, while high-tech SMEs and large firms on the other hand may need access to R&D based knowledge of the linear national innovation systems or transnational (e.g. EU) sectoral innovation systems. Networked regional innovation systems often attempts to link and integrate these different types of knowledge through an interactive university-industry approach.

2.3 Conclusions

One way of solving the problem of improving the innovate capacity of the small-firm sector of regional clusters, to avoid these firms remaining as firms with a low level of internal resources and competence, is to rely on collective capacity-building by setting up centres for real services and regional innovation systems which could systematically assist firms in regional clusters so that they are able to keep pace with the latest technological development. This could be done either through a networking strategy between firms and public and private agencies, or through public intervention. However, for SMEs to carry out (especially radical) innovations there is often a need to supplement the informal, tacit and localised form of codified knowledge with R&D competence and more systematically accomplished basic research and development, typically taking place within universities and research institutes. In the long run most firms cannot rely only on localised learning, but must

also have access to more universal, codified knowledge of, for example, national innovation systems. The strength of the traditional, place-specific and often informal competence and tacit knowledge must be integrated with codified, more generally available and R&D-based knowledge. According to Varaldo and Ferrucci (with reference to industrial districts), "long-term strategic relationships, R&D investments, engineering skills, new technical languages and new organizational and inter-organizational models are needed for supporting these innovative strategies in firms in industrial districts" (Varaldo and Ferrucci 1996, 32).

Thus, in spite of the important role of place-specific, local resources and regional innovation systems, firms in regional clusters are in need of innovative co-operation and interaction with world-class, national and international competence centres and innovation systems in order to stay competitive. This represents an example of a multilevel approach to innovation systems and knowledge infrastructures as firms' innovation activity rely both on place-specific experience based, tacit knowledge and competence, artisan skills and R&D-based knowledge. In order for non R&D-intensive firms to be able to acquire formally codified knowledge available from national and international innovation systems, the operation of such systems must be stimulated to become more interactive. In this way, these innovation systems, originally organised according to the linear model, would become more accessible as well as responsive to the individual and collective needs of international competitive non R&D-intensive firms in regional clusters.

In conclusion, it is necessary to remember that a learning based strategy of endogenous regional development cannot be applied across the board without some form of public intervention as well as public-private co-operation, stimulating cluster creation and network formation through the building up of social capital on a regional basis, as the necessary requirements concerning socio-cultural and socio-economic structures are to be found in relatively well-off regions, and the sufficient techno-economic and political-institutional structures only in relatively developed countries. However, even then a learning based strategy, for example through the creation or strengthening of regional innovation systems, may be very difficult to accomplish in rural and peripheral areas with little manufacturing industry and traditions, as well as in declining industrial regions dominated by branch plant activities of TNC, as regionalization trends in such places appear structurally constrained (Asheim and Isaksen 1997; Pike and Tomeney 1999). Many peripheral areas often have too few firms in the same industrial sector or local production system to constitute a regional cluster, and then an important condition for local networking and interactive learning is missing. In the second kind of regions it *may* be difficult in a short term perspective to bring about the kind of trust and co-operation between a large dominating TNC and local subcontractors necessary to form regional innovative networks. At least, the first task of a learning based strategy in this kind of areas may be to stimulate more

collaboration in innovation activities between the large firms and their local subcontractors.

Finally, in the discussion of transfer of experiences from one region to another it is important to distinguish between *general* and *specific* factors explaining the formation and development of regions. The more important the specific factors are, the more difficult it is to transfer experiences from one region to another, as specific socio-cultural factors, which are historically rooted in a particular region, cannot be repeated in another region. However, the rapid growth of industrial districts and other specialised areas of production has addressed the perspective of the post-Fordist learning economy on innovation as a socially and territorially embedded, interactive learning process. This constitutes the most significant «general» lessons to be learned from the particular experiences of various industrial districts, and which, thus, are easier to transfer from one region to another, even if the contingent expression of these experiences can be very specific (e.g. Emilia-Romagna) (Asheim 1994).

Part II: Innovation processes and policy context

Chapter 3: National and regional contexts for innovation

Arne Isaksen

This chapter gives a general view of the different policy contexts of the 11 SMEPOL study regions which are found in eight European countries. The chapter (i) points to important characteristics, similarities and differences between the national innovation systems in the eight countries, (ii) describes the various approaches to regional innovation support in these countries, and (iii) discusses the typical innovation barriers in the study regions. Thus, the chapter pays attention to the specific institutional and economic contexts of the 11 study regions. The chapter forms a basis for some of the analyses in subsequent chapters, as differing policy contexts influence SMEs' innovation pattern, the results achieved by different policy tools, as well as the policy approaches selected in the regions.

3.1 Different national innovation systems

The SMEPOL project analyses selected innovation policy instruments in eight countries throughout western Europe: Austria, Belgium, Britain, Denmark, Italy, The Netherlands, Norway and Spain. This chapter aims first to disentangle some main similarities and differences between the countries in their approach to innovation policy. What characterise the innovation policy contexts in these countries?

In accordance with our broad view of innovation (chapter 2), we also regard innovation policy as a broad policy area. Innovation policy is defined by Lundvall and Borrás (1997) as policy 'that explicitly aims at promoting the development, spread and efficient use of new products, services and processes in markets or inside private and public organisations' (p. 37). Innovation policy has wider objectives than those of science policy and technology policy, but incorporates elements of these policy areas. Science policy is concerned with the development of science and the training of scientists, while technology policy involves the use of scientific knowledge in development of technology, often with a stress on moving into 'higher technology' areas of production. These policy areas focus to a large extent on formal, scientific knowledge, technological innovations and seeing innovation as a rather linear process.

Innovation policy takes more into account the complexities of the innovation process, focusing more on interactions between different types of knowledge as well as interaction between firms and with the institutional infrastructure, including R&D-institutes and higher education institutions. Market information and research, and systematic feedback from customers have also recently been taken into account by

innovation policy. Innovation policy builds to a larger degree on the understanding from the interactive innovation model than science and technology policy. Then innovation policy does not primarily focus on the transfer of R&D competence and the stimulation of R&D in industry. A main objective is to foster and speed-up learning and innovation processes within firms, and between firms and their environment, where technology transfer may be one of the means (Nauwelaers et. al. 1999).

The significance of national innovation systems

Innovation policy rose during the 1980s in western Europe, mainly at national and EU level, to strengthen the innovation capability and competitiveness of a European industry facing increased international competition. Thus, the broad innovation policy is a rather new policy area. Innovation policy lies increasingly at the heart of all industrial policy that aims to raise the competitiveness of national industries. This reflects the view that the strengthening of innovation activity represents a main answer to the requirements on firms, nations and regions from the globalisation process by enhancing the learning ability of workers, firms and 'systems'.

Innovation policy is also based on the view that innovation is not necessarily – and not for the majority of SMEs – a product from investment in the knowledge producing sectors only as seen in the linear innovation model. Then, the policy emphasis moves towards the support of networks and clusters of firms (that may have a regional, national or even a larger geographical extension), and the stimulation of interactive learning among firms and with knowledge organisations. The shift towards the interactive innovation model has, accordingly, increased the importance of the concepts of national and regional innovation systems in policy design.

The interest in national innovation systems reflects a belief that the innovation capabilities of a nation's firm are a key source of their competitiveness, and that these capabilities are largely national and can be built by national policies (Nelson and Rosenberg 1993). Based on the broad understanding of innovation processes, national systems of innovation are seen as systems of interconnected actors (like firms, organisations and government agencies) that interact with each other in ways which influence the innovation performance of a national economy, and that this interaction takes place within a specific national context of shared norms, routines and established practices . Thus, at the heart of the concept of innovation systems is the idea that 'the overall innovation performance of an economy depends not only on how specific organizations like firms and research institutes perform, but also on how they interact with each other and with the government sector in knowledge production and distribution' (Gregersen and Johnson 1997: 482).

Innovation systems are open systems, and a specific firm may be part of several innovation systems, be they sectoral, local and national, at the same time. During the last ten years, international co-operation in R&D, both technology-based alliances between firms and co-operation with foreign universities and research centres, has increased. The EU's successive Framework Programmes for Research and Technological Development are one important factor in increased international R&D co-operation (EC 1999), and a European innovation system is developing. Although there are many similarities in innovation systems in individual western European countries, some striking differences are seen to exist. Thus, Gregersen and Johnson (1997) regard Europe as a diverse set of national systems of innovation. Firms innovation performance 'depends on numerous and often country-specific institutional, infrastructural and cultural conditions regarding relationships among the science, education and business sectors, conflict resolutions, accounting practices, corporate governance structure, labour relations etc.' (OECD 1999a: 21-22).

The continuous predominance of national innovation systems is demonstrated in an empirical analysis of firms' innovation collaboration in the two bordering regions of Alsace in France and Baden in Germany, divided by the river Rhine (Koschatzky 1999). The study includes 479 manufacturing and business service firms in Baden and 280 in Alsace. While slightly less than 40% of the firms in both regions cooperate with research institutes, none of the firms in Baden has research contacts with an institute in Alsace, and only 7% of the Alsatian firms co-operate with research and transfer institutes in Baden. Spatial distance can not explain low cross-border co-operation in this case. However, linguistic barriers, differences in mentality and institutional distance matters. Language, laws and diverse national regulations favour innovation co-operation with partners from the own region or nation. Firm leaders are often familiar with national R&D institutes due to earlier experiences, but unfamiliar with the institutional setting abroad. Thus, in spite of the European efforts for integration and several cross-border initiatives, national innovation systems with their regulations and institutional settings are still important for firms' innovation interactions, and firms in both regions are strongly incorporated in their respective national innovation systems

What are then the main differences in national innovation systems between the eight countries included in the SMEPOL project? Gregersen and Johnson (1997) see national innovation systems in the broad sense as influenced by specific parts of a) the knowledge infrastructure, b) the industrial specialisation pattern, c) the institutional set-up, d) public and private consumer demand and e) government policy. Thus, in order to compare national innovation systems one have to compare these five main factors and their importance for differing innovation performance.

Differing R&D system

The knowledge infrastructure consists of universities, schools, training systems, research institutes etc. that are often oriented towards helping a particular industry or other clients advance its technologies, and which also determine the supply of skills in the labour force. Although the knowledge infrastructure is larger than the R&D system, we start by analysing the amount of resources devoted to R&D in the eight 'SMEPOL countries'. R&D indicators do not reach the full spectrum of innovation process and particularly the innovation activities of small firms. Research and development is nevertheless of crucial importance in giving firms and countries the capacity to generate, absorb, and diffuse technology.

Except for Britain, the eight countries have a comparatively modest R&D intensity. Although UK's spending on R&D has been stagnating since the 1980s (Walker 1993) it equals the OECD average of 2,1%, while the other countries are below this figure (Table 3.1) [2]. A low R&D intensity applies to Spain and Italy in particular, signifying a comparatively weak R&D system in these countries.

Table 3.1: R&D indicators 1995, innovation costs 1996

Country	*R&D intensity*	*Business R&D intensity*	*Government share of R&D*	*Innovation costs in manufact.*	*Innovation costs in service*	*GDP per head*
Austria	1,5	1,1	47,6	3,5	3,0	111
Belgium	1,6	1,4	26,4	2,1	1,2	112
Denmark	1,8	1,7	39,2	4,8	4,7	117
Italy	1,1	0,8	46,2	2,6	n.a.	102
Netherlands	2,0	1,3	42,1	3,8	1,6	106
Norway	1,7	1,4	43,5	2,7	3,5	128
Spain	0,9	0,5	43,6	1,8	n.a.	77
U. K.	2,1	1,8	33,3	3.2	4.0	98

Notes: **R&D intensity** is measured as Gross domestic expenditures on R&D as a % of GDP. **Business R&D intensity** is measured as business expenditures on R&D as a % of business GDP. **Government share of R&D** concerns government financing of R&D as a % of total R&D. **Innovation costs** is measured as total innovation costs in firms as percentage of total turnover in firms. **GDP per head** is measured as GDP per head of population as a % of OECD average. **n.a.**: non available.
Source: OECD (1999a) and Eurostat (for Innovation costs)

Governments finance around 40% or more of total R&D in all the countries, except UK and Belgium, where a very large part of R&D are financed by business. The large gab between public and private sector R&D investment in Belgium is also reflected in a very small number of R&D personnel working in the government and higher education sector (EC 1999). In fact Belgium is in the last place in Europe regarding government R&D infrastructure (Capron et.al. undated). On the other hand the share of expenditure on R&D in the higher education sector financed by government,

[2] The most recent figures from OECD (1999b) reveal a slight decrease in R&D intensity in Britain (1,9 in 1997), and a significant increase in Denmark (2,1 in 1998).

although declining in the majority of OECD countries, remains very high in Austria, in particular (OECD 1999a). To the extent that a high proportion of private funding of R&D is an indicator of technological 'maturity' (Edquist and Lundvall 1993), Belgium and UK is most advanced in this respect, signifying that Belgian and UK firms have transformed themselves to R&D-based actors to a larger extent than usually found in the other countries. Austria, Italy and Spain (with a very low figure on business R&D intensity) are the most lagging ones measured by this indicator.

What lie behind the differences in R&D intensity between the eight countries? First, despite a common trend away from the traditional 'mission' in R&D-spending on defence and nuclear energy after the end of the cold war, the defence cluster still plays an important role in particular in UK, explaining part of its high R&D intensity as well as its growth in high technology products (cf. Table 3.3). Defence activities amount to more than one third of the total Government R&D budget in Britain, and only the United States surpasses Britain among Western countries in R&D spending on defence purposes (OECD 1999b). Spain also has as much as one fifth of its R&D budget on defence purposes, while the other countries use a negligible part of their R&D budgets on defence purposes. Removing this component of the R&D expenditure would set UK, and even Spain, in a less flattering light than revealed in Table 3.1.

Second, the figures on R&D intensity partly reflect the industrial and firm size structure of the countries. A comparatively large share of R&D expenditures is concentrated in a few medium- or high-technology industries (EC 1999), and small manufacturing firms tend to invest proportionally less in R&D than larger companies. As demonstrated below, Austria, Italy, Norway and Spain are relatively specialised in industries with traditionally low R&D expenditures, contributing to a low private R&D spending and hence a relatively high government financing of R&D. In fact, Norway has a R&D spending similar to the OECD average when one 'control' for its traditional industrial structure, i.e. the country is overrepresented with jobs in industrial sectors that generally have low R&D spending. Britain on the other hand, is comparatively specialised in R&D intensive industries, contributing to a high private R&D spending. There is also substantial differences in size structure of enterprises between the countries. In Italy and Spain enterprises with less than 50 employees accounted for 69 and 66% of total employment, while the corresponding figures for Austria is 35% and for UK and the Netherlands 45%. (cf chapter 1). The significance of large companies is important as long as private R&D spending in several countries is heavily dependent upon a few large companies and the ups and downs in these companies. For instance, in the Netherlands almost half of private sector R&D are carried out by the five largest industrial companies (Wolters and Hendriks 1997).

What does the R&D indicator tell about the innovation system in these countries and about their prospects for further economic development? A striking feature in Table

3.1 is the fact that most of the countries have been able for a long time to sustain a high level of income per capita despite a comparatively low score on a traditional technological performance indicator as R&D intensity. In a country like Norway, the world's second largest exporter of oil, the cause of the high per capita income is to a large extent found in rich natural resources. Italy may be a more instructive case, as (part of) this country represents one of the success stories of postwar economic development, but with a comparatively very low R&D spending. This paradox has to be explained by first recognising that Italy has not one, but two very different innovation systems: a small firm network and a core R&D system (Malerba 1993). The small firm networks have developed historically on a local, regional, and vocational basis. The networks consist of a large number of SMEs (in some cases located in industrial districts) operating in traditional industries and specialised in custom made products and fashion items. The firms interact intensively and share knowledge at the local level in an atmosphere of mutual trust and common understanding. The networks have been innovative, but it is mainly innovation without R&D, and largely insulated from Italian science and technology policy. Innovations are rather the results of experience based skills, and originates from informal learning by doing, by using, and by interacting (in particular between equipment producers and technology advanced users), and backed up by specific local institutions and local associations (Garofoli 1992, Ed.).

The Italian core R&D system is much more recent than the small firm networks. It consists of large firms with R&D departments, small high-tech firms, universities, large public research institutes, and the national government. However, this complex system lacks some qualitative elements needed for an effective and successful working. This refers to elements such as low R&D capability in several industrial sectors due to relatively few large firms and few small high tech firms, an uneven level of scientific research in university and research institutes, a lack of technologically progressive public procurement, a lack of co-ordination of public R&D policy, and no tradition of successful industry-university co-operation in research (Malerba 1993).Thus, the Italian R&D expenditures have not translated into international competitiveness in high tech industries.

The Italian experience is relevant also for other countries. Traditional SMEs are involved in innovation activities and collaborate in innovation, however, these activities are often part of more routine activities and do not register in R&D statistics. Thus, industries may be characterised by considerable innovation, and in a broader sense learning, without a high R&D intensity (Nelson 1993). This is partly reflected in the figures on total innovation costs in Table 3.1 (and in the analysis of 'innovation output' beneath). Figures on total innovation costs give a more valid assessment of innovation intensity than just R&D spending. Thus, innovation costs consist of three main components; i) R&D-costs, ii) non-R&D innovation costs as acquisition of patents and licences, expenditures for production design activities, trial

production, and market introduction of technological innovations, and iii) investment in plant, machinery and equipment related to innovation activity.

Britain, the Netherlands and Denmark, having the highest R&D-intensity, also have comparatively high innovation costs. This concerns in particular Denmark with very high innovation expenditures, and services in Britain and manufacturing in the Netherlands. Spain holding the lowest R&D intensity also has low innovation costs. Austria in particular has relatively high innovation costs compared to its modest R&D-intensity, i.e. Austrian firms spend relatively much money on the other innovation activities than R&D. Belgium on the other hand performs relatively better on R&D-intensity than on the innovation cost indicator. Thus, Belgian firms in general focus comparatively more on the R&D component in their innovation activity than firms in other countries. This focus may reflect an orientation of policy towards the linkage between research and industry in this country.

The capability to absorb, diffuse and adapt new technology developed abroad is also crucial, especially for small countries, not only the capacity to contribute to the global pool of generic technology by high R&D spending. Thus, indicators like R&D intensity do not catch all (the incremental) innovation of large importance for competitiveness. Nevertheless, the comparatively low R&D intensity and the underdeveloped formal R&D system, as demonstrated in the Italian case, may present some treats in the future in the presence of increasing global competition. Thus, R&D indicators have become a major object of political interest, and small OECD countries try hard to improve their relative standing in order to develop more high tech industries and make R&D a more important part of their innovation systems (Maskell et. al. 1998).

Difference in innovation results

In assessing the characteristics, strength and weakness of the national innovation systems we also have to consider outputs and results of innovation processes. Outputs have traditionally received less interest than inputs to the innovation process (as R&D costs) due to a lack of relevant statistical sources. However, Table 3.2 uses some new indicators from the Community Innovation Survey (CIS) on the share of innovating enterprises in the eight 'SMEPOL countries'. An innovating enterprise consists of an enterprise that introduced new or improved products on the market or new or improved processes during a three year period[3]. CIS uses the same questions to firms in different countries, however, one have to be careful when comparing countries due to differences in data collection methods and sample sizes.

The share of innovating enterprises rises with increasing enterprise size in all countries and both for manufacturing and service industries (cf. chapter 1). This may

[3] The figures in Table 3.2 refer to the period 1994-96 (1995-97 in Norway).

partly reflect the fact that large firms often have more products or services in their portfolio than smaller ones. Then, it may be more likely that a large firm introduces a significant change in at least one of its products or services in the three year period than a small firm.

Table 3.2 demonstrates very large differences between the 'SMEPOL countries' in their share of innovating enterprises. Denmark, Austria, the Netherlands and Britain have the highest share of innovating enterprises according to CIS both in manufacturing and service industries. Belgium and Spain have the lowest share, and Norway also has a low share of innovating service firms. The differences between the countries are seen in all size classes of firms in Table 3.2. The same result applies to subsectors of the manufacturing and service industries (not included in Table 3.2); i.e. the countries with the highest total share of innovating enterprises also have the highest shares in the individual subsectors. Then, the differences in the share of innovating enterprises mainly seem to be an effect of 'nationality', and not an effect of differing firm size and industry structure between the individual countries. Firms in for instance Denmark and Austria are generally more innovative (as measured by the indicator in Table 3.2) than firms in Belgium and Spain, even when considering country-wide differences in firm size and industry structure.

Table 3.2: Number of innovating enterprises in different size-classes. Percentage

	Manufacturing sector				*Service sector*				*New products*
Country	*Total*	20-49	50-249	250+	*Total*	20-49	50-249	250+	*Total*
AU	*67*	59	73	88	*55*	54	58	74	*31*
BE	*34*	33	34	51	*13*	11	21	55	*14*
DK	*71*	64	76	91	*30*	24	45	71	*21*
I	*48*	44	57	73	*n.a.*	n.a	n.a.	n.a.	*27*
NL	*62*	54	71	84	*36*	32	45	71	*25*
NO	*48*	39	56	77	*22*	20	26	50	*20*
ES	*29*	21	43	77	*n.a*	n.a	n.a	n.a	*27*
UK	*59*	54	59	81	*40*	40	37	55	*23*

Notes: **Innovating enterprises** include enterprises who has introduced new or improved products on the market or new or improved processes. **Manufacturing sector** includes NACE 15-37. **Service sector** includes NACE 51, 60-62, 64.2, 65-67, 72 and 74.2. **New products** includes turnover of new or improved products in manufacturing as a percentage of total turnover. **n.a.**: Non available
Source: Eurostat

The figures on turnover of new or improved products follow mainly the same pattern as seen in the share of innovating enterprises (the last column in Table 3.2). Belgium has still the lowest score, i.e. Belgium manufacturing firms have the lowest share of new or improved products from the last three years in their portfolio. Thus, a picture emerges where relatively few Belgium firms innovate, those who innovate focus heavily on R&D, possibly to develop radical innovation, that may give few new or improved products, however, having a high potential if succeeding. Italy and Spain, on the other hand, have a high score on the 'new product' indicator. Thus, Italy and Spain, in particular, have relatively few innovating enterprises, but those who

innovate succeed well in bringing new or improved products to the market place compared to other countries. This may partly reflect the industry structure in these two countries with comparatively many firms producing custom made and fashion items, where design (as an incremental innovation activity) is important.

Comparing Table 3.1 and 3.2 reveals a clear correlation between total innovation costs and the results of the innovation process as measured by share of innovating enterprises. The countries where the firms spend most money on innovation activities also have the highest share of innovating enterprises. The share of innovating enterprises *may* reflect the effectiveness of the innovation systems in the different countries. Thus, in countries like Denmark, Austria, the Netherlands and Britain firms generally spend more money on innovation activities and produce more innovation outputs than is the case in particular in Belgium, and to some extent in Spain, Italy and Norway.

The results in Table 3.2 *could* also influence how innovation policy should be designed in the countries. Thus, in Belgium and Spain the population of firms contains a much larger share of non-innovating firms than in other countries. Then, ideally more efforts could be directed towards raising the number of innovating firms, i.e. helping firms start innovating, than in countries with a much larger share of already innovating firms. In the last group of countries, and in Denmark and Austria in particular, more efforts could be directed towards stimulating more robust innovation projects in the already innovative core of firms.

To further examine how firms in the 'SMEPOL countries' innovate, we may use results from CIS on to which extent firms utilise different sources of information when innovating (cf. also chapter 5). Which type of partner do firm interact with? Where do they find information and knowledge when innovating? CIS reveals, however, that firms in the different countries employ basically the same information sources, and the remaining differences between the countries are difficult to explain. Thus, we focus on the basic pattern in firms' innovation performance that are more or less common for all the 'SMEPOL countries'[4]:

- Innovation activity is generally a rather internal process, as an important information source in most firms is within the enterprise or the enterprise group. Thus, firms first and foremost rely on their internal competence or competence found elsewhere in the enterprise group when innovating. Internal sources are in particular relative important sources of information in Dutch firms.
- The most important external sources are partners along the value chain, and in particular clients or customers. This concerns both manufacturing and service firms. Clients or customers are the most important external source for firms in

[4] Figures for Denmark and Italy were not available from Eurostat when summarising firms' innovation performance.

every country, and is generally mentioned as an important source by the at least the same number of firms that see internal sources as important.

- Universities, R&D-institutes and consultancy enterprises are generally of little importance. Less that 7% of firms in all the 'SMEPOL countries' see these as very important sources for innovation. Although the differences are small between the countries, Norwegian and Belgian firms value the knowledge infrastructure highest as a source of information.
- Professional conferences, journals, computer based information networks, fairs and exhibitions are more important sources of innovation than universities and R&D-institutes in all the countries. This concerns in particular fairs and exhibition, that are valued highly as an important source of information in particular in Austria and Spain.

Industrial specialisation pattern

Differences in national innovation systems and typical innovation performance appear in the production structure and in particular the specialisation pattern of an economy. There are important *inter-industry* differences in innovation performance, the sources of innovation, how the involved actors are connected to each other etc. Nations differ in the mix of industries and specialisation pattern, and these differences strongly influence the shapes of national innovation systems as the scientific and technological specialisation of their universities and R&D-institutions (Nelson and Rosenberg 1993).

Table 3.3 shows the export specialisation in some broadly defined manufacturing industries. The countries may be divided in three main groups. First, four countries – Austria, Italy, Norway and Spain – with their export specialisation in the more mature and/or resource based industries. Thus, these countries have their highest export specialisation in wood products and furniture, textiles, apparel and leather, basic metals and non-metallic mineral products, respectively; industries belonging to the low or medium-low technology groups (Maskell et. al 1998).

The second group consists of Britain only, that has its export specialisation industries in some of the most high-tech or R&D-intensive industries. Thus, UK is on second place, after Ireland, among EU member states in exports of high tech products (EC 1999). However, the good performance of British manufacturing export by this indicator is the result of both deindustrialisation, the heavy decline in areas such as metalworking, and positive restructuring, mainly caused by foreign investment in electronics industry (Walker 1993).However, Britain's relative strength in pharmaceuticals, chemicals and aircraft is mainly based on indigenous capabilities in British owned firms.

The third group consists of the Netherlands, Denmark, and to a lesser extent Belgium. Their export specialisation industries include both their traditional industries as basic metals (Belgium) and food (Denmark and Netherlands), as well as relatively high exports in R&D-intensive sectors as pharmaceuticals and office and computing equipment (Netherlands). At least in Denmark, the 'old' and 'new' specialisation are interconnected as some of the strategic competencies in pharmaceuticals can be traced back to experiences and learning in the agroindustrial complex (Edquist and Lundvall 1993).

Table 3.3: Export specialisation by manufacturing industry 1994, and in high-technology industries 1996

Country	*Industries with a high export specialisation and the relevant indicator*	*High-tech exports*
Austria	Wood prod. (248), paper etc. (197), non-metallic mineral prod. (178), basic metals (146), textiles etc. (135), pharmaceuticals (117),	n.a.
Belgium	Basic metals (169), non-metallic mineral prod. (154), chemicals (149), pharmaceuticals (136), food etc. (129), textiles etc. (125), motor vehicles (121)	8,0
Denmark	Food etc. (369), wood prod. (312), pharmaceuticals (246)	12,9
Italy	Textiles etc. (314), non-metallic mineral prod. (248), wood prod. (175),	7,5
The Netherlands	Food etc. (270), chemicals (161), office and computing eq. (143), pharmaceuticals (114)	19,2
Norway	Basic metals (401), paper etc. (213), food etc. (169), wood prod. (141), chemicals (133)	5,9
Spain	Non-metallic mineral prod. (243), motor vehicles (190), basic metals (133), food etc. (129), textiles etc. (129)	7,9
UK	Office and computing eq. (166), pharmaceuticals (158), aircraft (129), chemicals (123), communication eq. (103)	24,7

Note: **The export soecialisation indicator** is defined as the share of an industry's export in the country's total export, divided by the industry's OECD-wide share in total manufacturing exports. Values greater than 100 reveals relative export specialisation in a country/industry. **High tech export** is defined as the share of exports from high-technology industries compared to total manufacturing export. **n.a.**: non available
Source: OECD (1999a, b)

What do the differences in export specialisation tell us about differing national innovation systems? The export rate of high tech products may reflect the capacity of a country's innovation system to develop new technology advanced products or absorb new and advanced product technology from abroad. An inability in such activities keeps firms and countries outside the most rapidly growing sectors and products. Britain's 'modern' industrial structure reflects partly high defence spending, as industries from which the military procures tend to be R&D intensive.

Thus, a weak export specialisation in high-technology exports *may* constitute a long-term structural growth problem in the majority of the 'SMEPOL countries'. Maskell et. al. (1998) argue, however, that it may be advantages for small countries to increase the competitiveness in their traditional low tech industries. They also argue that it is

fully possible to maintain a high level of prosperity while retaining a low tech industrial specialisation following a 'low tech route' to sustained prosperity, as many low tech products and industries are growing and demand technological advancement and continual improvements stimulated by specific inter-organisational factors. The important point in this argument is to consider the knowledge base of industries, and not only the R&D-intensity of the individual manufacturing sectors. Thus, 'the knowledge bases of apparently low and medium technology industries (…) are in fact deep, complex, science-based and above all systemic (in the sense of involving complex and sustained institutional interaction' (Smith, 1999: 1). Thus, 'low-tech' sectors may be highly innovative as they are knowledge intensive from a systemic perspective, and industries may also use scientific knowledge and basic research as part of their knowledge bases. Knowledge links may be indirect, as much flows of technology are embodied in equipment and intermediary products, as well as disembodied spillovers via recruitment of personnel and services provided by the knowledge infrastructure. For example, scientific research and high-technology inputs (in areas as sonar, medicine, nutrition, robotics) have been of critical importance in developing the Norwegian aquaculture cluster, but firms have received research results mainly in embodied forms, as new or improved equipment, medicine and fodder. Thus, low or medium technology industries are frequently back up by complex, scientific knowledge bases, or they are part of 'high-tech' national innovation systems.

The Netherlands is the main exception among the 'SMEPOL countries' of the 'rule' that small European countries remain their low tech specialisation. Thus, export of high-tech products has grown most rapidly in the Netherlands and Britain during the 1990s, and the largest increase is observed in computer and electronics products (EC 1999). These two countries are also the only 'SMEPOL countries' with a surplus in net export of high tech products, while Austria reveals a very high trade deficit in high tech products. However, the growth in export of high tech products does not necessarily reflect national innovation systems more geared towards development of new generic technologies than before. Thus, the priority given to advanced manufacturing and technological development has often been lower in UK than in other European countries, reflecting a focus on tradable services based in the City of London, which are predominantly technology users rather than technology producers (Walker 1993). The growing export of high-tech products is partly explained by the Netherlands and UK being host countries for multinationals producing microelectronic products. Then, growing intra-firm trade (trade between firms located in different countries but belonging to the same multinational group) and re-exportation (foreign multinationals that assemble and re-export final product to other countries) may cause increasing export of high tech products. As a result, growing part of innovation system in these countries may be seen as appendages of foreign innovation systems (c.f. Walker 1993).

3.2 Different regional context and policy approach

The SMEPOL project includes evaluation of some specific policy tools in 11 regions with quite different economic and policy contexts. One aspect of different regional contexts is the differing national policy environments in terms of R&D expenditures, innovation costs and outputs, and industrial specialisation pattern discussed above. Another differentiating factor is the role of the regional administrative level in the design and execution of innovation policy tools in the regions. The autonomy and available funds at the regional level greatly influence where (at which level) and how ('top-down' or 'bottom-up') policy tools are initiated, designed and executed.

However, one have to keep in mind that innovation policy (following the broad understanding of innovation) is a wide policy area including different administrative levels. The policy area consists of three main parts (according to Lundvall and Borrás 1997). First, policies affecting the pressure of change, as competition policy, in order to level the conditions for competition between firms and countries. These policy areas are mainly international, and carried out at the EU level. The second part is policies affecting the ability to innovate and absorb change, as human resource development and the more narrow innovation policy supporting firms' innovation capability. The national level still remains the most important actor in this policy area, controlling the education system for example, however, the regional level may play a role. The third part is policies designed to take care of losers in the game of change. Thus, it is supposed that the learning economy, if left to itself, gives rise to polarisation between sectors, regions, firms and groups of people. This gives a need for redistributive policy, a policy area traditionally dominated by the national level. However, the Structural Funds play a growing role in terms of territorial redistribution inside EU. The third policy area, however, is also included as a prerequisite for innovation. The interaction, cooperation and bottom-up processes that form part of most innovation activity may be difficult to achieve in a socially divided society, and probably more likely to happen in relatively egalitarian societies.

The SMEPOL project evaluates policy instruments included in the second and third policy area. Actually, these policy areas tend to merge. Inside the 'narrow' innovation policy we have seen a move towards strengthening the regional dimension of policy, associated with the creation of Regional Development Agencies and the formulation of regional innovation strategies (chapter 2). Thus, recent policy discussions focus on the role of the regional institutional environment as an area to develop a more strategic and customised approach to innovation support (OECD 1998). Inside regional industrial policy we have seen a long term move from redistributive or exogenous strategies to endogenous ones (Stöhr 1990). Exogenous strategies focus on acquisition of enterprises or investments from other areas, while endogenous strategies mean the stimulation of local start-ups and SME growth. These strategies increasingly focus on the stimulation of innovative activity and capability in local

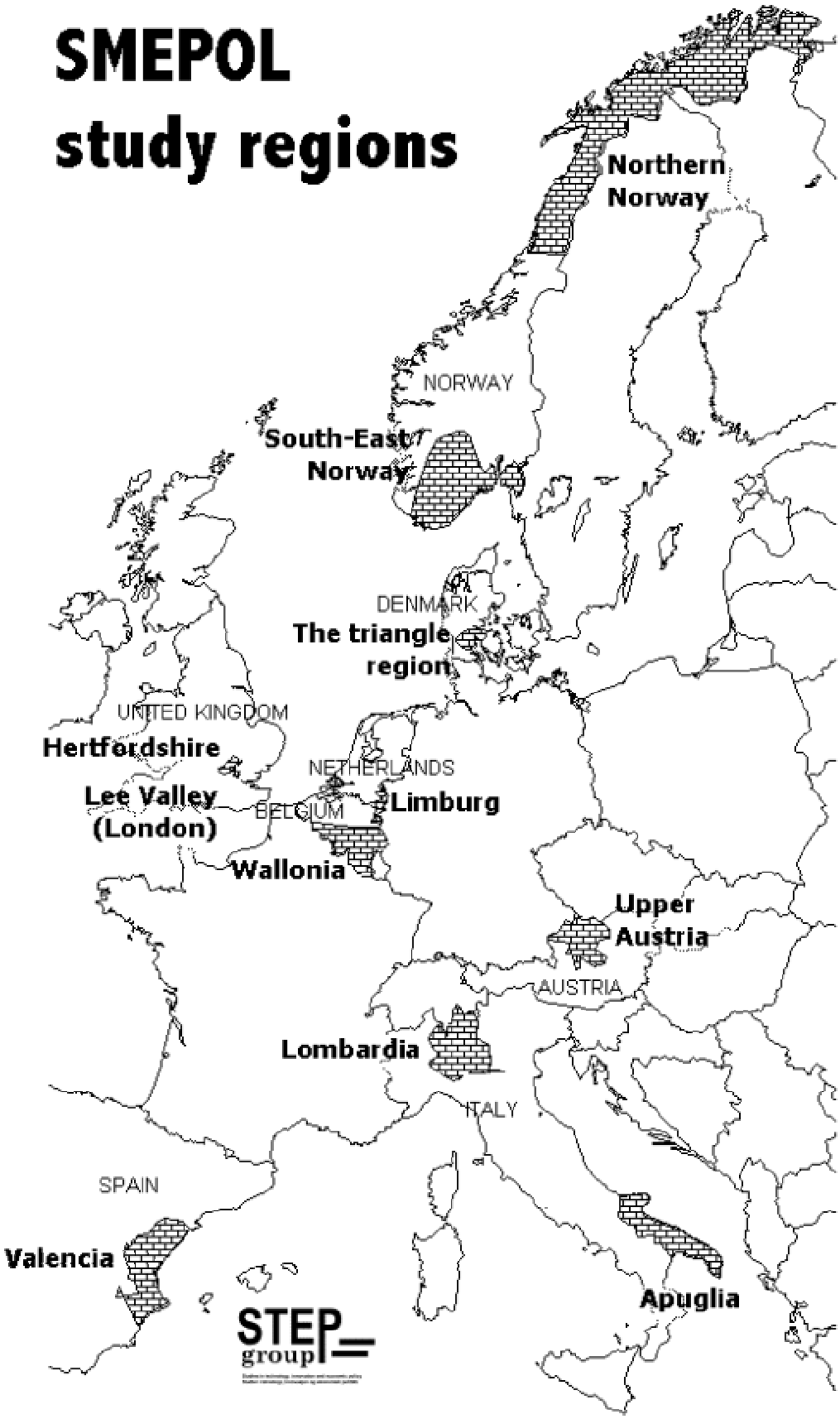
firms and clusters, mainly through obtaining risk capital, upgrading of local skills bases through support for vocational training and incentives for local entrepreneuship, and the transfer of technological know-how to enhance the technological capabilities of SMEs. Partly, these strategies tends to favour bottom-up, region-specific, longer-term, and plural-actor based policy actions (Amin 1998).

In accordance with these development tendencies in innovation and regional policy, a general process of transferring authority from the national administration to the regional level seems to take place in most countries, and very distinct in Spain and Belgium. Britain may be an exception, where the Thacherite policies led to a reduction in the ability of local government to engage in policy design (Smallbone et. al. 1999).

The 11 SMEPOL study regions differ greatly in size from Lombardy's 8,9 mill inhabitants to only a bit more then 200.000 in the Triangle Region. Lombardy is larger measured in size of population and industrial activity than countries like Norway and Denmark. Besides, the regions differ in their approach to innovation policy, in industrial structure and in their barriers and capacities for change.

Table 3.4 reveals three main institutional and organisational set-up of government support regarding the role played by the regional level in policy design. The demarcation line between the three regional types is not always clear-cut. However, in three cases the regional level both initiate, design and carry out most of the innovation policy. Thus, Belgium is a federal state, where the regional government since 1990 have the responsibility for applied research and the formulation and executions of innovation policy. However, some policy tools, as university-industry liaison offices, are greatly supported by EU funding through Structural Funds. The Spanish autonomous region of Valencia also designs and implements innovation policy tools, of which Technology Centres are the most important ones. In the first type of regions in Figure 3.4 networked regional innovation systems *may* more likely exist or develop

SMEPOL study regions



(chapter 2). The regional autonomy and available resources make a strengthening of the regional institutional infrastructure possible, i.e. that more R&D-institutes, vocational training organisations, technology centres (as in Valencia) etc. are involved in firms' innovation processes.

In Italy important innovation policy tools are launched by the central government. However, the Italian state is weak, leaving a scope for creativity in the manner of regional enterprise and innovation support (Cooke and Morgan 1998), especially to support the small firm network innovation systems. Active regions are key players in the modernisation of the regions' industry and the Italian economy more generally. Of our two Italian study regions, Lombardy has been relatively active in introducing 'regional' laws to stimulate innovation processes among SMEs, both through publicly financed service and technology centres, and financial support for innovation projects in firms. Apulia, on the other hand, has relied much more on Community Intervention Schemes, and no one 'regional laws' to foster innovation processes has been introduced (Garofoli 1999, Ed.).

Table 3.4: Organisation of innovation policy at the national versus regional level

1) Regionally designed and executed	*2) Regional initiatives, mainly based on national (or EU) funding*	*3) Nationally (or EU) initiated, designed and executed*
Wallonia (Be), Valencia (ES), Lombardy (I)	Limburg (NL), Upper Austria	Apulia (I), The Triangle Region (DK), Norwegian regions, UK regions

Thus, Apulia belongs to the other extreme in Table 3.4, in which the national (and EU) level designs most innovation policy instruments, disposes most of available funds, and thus carries out the actual work with the tools. While the regions also have some policy instruments, the lack of financial recourses, traditions and competence strongly limits the possibilities for autonomous innovation policy at the regional level. In such regions, regional innovation systems will often be regionalised national systems (chapter 2). Then, intermediary organisations, for example, are national ones or the regionally located organisations are integrated in national or EU wide networks. The Norwegian TEFT programme offers an example of national intermediary organisations. This programme aims to help regional SMEs to collaborate more frequently with the largest technological R&D institutes in Norway which are located in some of the country's largest cities. Another example is Technopolis in Apulia, the first scientific park in Italy, founded in 1984. Technopolis is a member of the European Network of Business Innovation Centres and since 1993 included in the EU Innovation Relay Centres network.

Denmark, Norway and Britain are seen as examples of mainly nationally or EU oriented innovation policy. Tools may in various ways be adapted to differing regional circumstances, like the Technology Information Centres in Denmark and the Norwegian REGINN programme that is based on regional innovation analyses.

However, the recourses and decision making power are mainly found at the national level. Likewise, the regional policy level is weak in Britain compared with some other European countries. Two of the UK policy tools evaluated in the SMEPOL project (the Lee Valley Centre and the Lee Valley Business Innovation Centre) were nevertheless established by initiatives taken by local agencies including local authorities. However, both instruments are heavily dependent upon European and national sources of funding and form part of a wider EU strategy for encouraging and supporting innovation in Europe's more disadvantaged regions.

Regions in The Netherlands and Austria hold an intermediary position regarding the possibilities for innovation policy initiatives at the regional level. In Limburg, the most important innovation support for Limburg's business sector in terms of volume is the national government's technology policy instruments. However, this policy has been decentralised or regionalised in order to reach out to SMEs, in some respect by setting up 18 Innovation Centres. Within Limburg, European, national and regional policy tools have recently 'merged' into a regional support system, with the Regional Technology Plan (RTP) Limburg in its core. Thus, policy instruments are run by regionally based organisations, with room for adapting the instruments to regional specific contexts. In Upper Austria, Technology centres are the most important support instrument financed at the regional level. However, the lack of financial means in the province urge them to co-operate with higher levels (federal state, EU-programmes) and to rely on co-financed programmes and private funds (Kaufmann and Tödtling 1999).

A region may be seen as 'a territory less than its state(s) possessing significant supralocal administrative, cultural, or economic power and cohesiveness differentiating it from its state and other regions' (Cooke and Morgan 1998: 64). The 11 study regions constitute regions in this sense to a varying degree. This is to some extent reflected in Table 3.4, where Wallonia, Valencia and Lombardy have the largest administrative and economic power of relevance for innovation policy design. The UK Lee Valley region, the Danish Triangle Region and the Norwegian South-eastern region probably have the weakest administrative and political power, as these do not constitute single *administrative* units. However, Lee Valley and the Triangle Regions are small geographic areas characterised by very distinct economic processes, and in a way constituting 'economic' regions. The Triangle Region, for example, comprises a coherent regional business community and labour market with the stainless steel industry in its core.

The main policy approach in the study regions

Another contextual aspect refers to the differing approaches to innovation policy in the study regions or nations. A trend towards more interactive policy approaches is revealed in nearly all the study regions. Linear instruments focus on direct R&D aids

and transfer of research based knowledge to firms in order to achieve, in particular, radical, technological innovations. Interactive tools, on the other hand, target a wider set of knowledge providers, including other firms, and focus also on other kinds of knowledge (as experience based know how and market information) and other kinds of innovations (as incremental and organisational innovations). Both types of instruments are seen as relevant, but they often target different kinds of firms.

Beneath, we try to mention the study regions or nations according to an increasing significance of interactive instruments in the their support system. Thus, Apulia still relies on rather linear policy tools. The most effective instruments give financial support for the purchase of new machinery, underlining the focus on process innovations and cost cutting strategies in this region. Cultural and political constraints have also blocked the possibility to introduce schemes targeting local systems and interaction between research institutions and firms in Apulia.

The emerging Wallon innovation policy may be divided into a 'mainstream' and a 'fringe' part, which are founded on each of the two views on innovation processes. The linear approach underlies the 'mainstream' policy with its main objective geared towards transferring scientific and technological advances in industrial processes. The main stimulus for innovation is considered to be the introduction of more formalised R&D, the main channel is through the upgrading of the internal resources in the firm, the 'ideal' innovation is the radical, product innovation, and the technological content of innovative projects should be advanced. The interactive approach has inspired the 'fringe' instruments, that constitutes an unarticulated and rather fuzzy set of initiatives, and trial-and-errors efforts.

The linear approach also dominates the main policy instruments in Austria, Britain and Denmark. Thus, the big national technology and R&D support institutions in Austria still follow the linear innovation model. Similarly, a rather linear approach focusing on the transfer of scientific knowledge to industry is found in the UK Forsight Technology Programme. The support needs in Denmark are also seen in a linear perspective, in which for example the role of the GTS (Approved Technical Service) Institutes is to transform research into innovations in firms.

Some movements towards more interactive support, are, however, evident in these countries. Thus, the strategic programme Öberösterreich 2000+ suggests to establish competence centres for specific fields, support the formation of industrial clusters, and improve institutions and programmes providing technology transfer services. In Britain some interactive learning conceptualisation also influence policy, like the intention to stimulate networking and industry clusters.

In Valencia, the Technological Institutes may at the present time be consider to lie in between traditional instruments based on linear innovation models (because they

mostly deliver mainly 'off-the-shelf' technologies to firms) and new approaches based on the interactive model (because they are context sensitive and receiver oriented). In Norway, a transition from linear tools occupied with the diffusion of scientific knowledge and commercialisation of scientific results to more interactive tools, with a stronger focus on demand orientation and context sensitivity is distinct. This is clearly illustrated by the Norwegian tools evaluated in the SMEPOL project, which are all directed towards unravelling firms' real needs for innovation support and fulfilling these needs with a varied set of instruments, that includes more than just the supply of research competence.

In Lombardy, service centres and technological centres started to work in the 1980s based on a rather interactive understanding of innovation processes. The starting idea was, through public financial support, to help strengthening the capability of local systems of firms. The centres have also changed due to a learning process that has taken place for more than a decade. Lastly, Limburg is at the forefront within the Netherlands as far as regional innovation policy is concerned because of the early RTP experience in this region. The mainstream approach within the Limburg support system is interactive policy carried by the Syntens network (the former Innovation Centres).

Typical regional innovation barriers

Chapter 1 and 5 analyse barriers to innovation at firm level. This chapter discusses typical *regional* innovation barriers, by which we mean hampering factors in the regional industrial milieu, in its institutional set-up, as well as barriers related to the inhabitants' typical attitudes towards innovation and entrepreneurship. The point of departure for identifying regional innovation barriers is the concept of regional innovation system as discussed in chapter 2. An innovation system consists of two main groups of actors and the interaction between them. The actors are first of all firms of the main industrial clusters of the region, including their support industries. Clusters consist of interdependent firms with active channels for business transactions, dialoque and communication (Rosenfeld 1997) both within and outside of the region. The other main actors in regional innovation systems are knowledge creating and diffusing organisations, as universities, colleges, training organisations, R&D-institutes, technology transfer agencies, business associations, finance institutions etc. These organisations hold important competence, train labours, provide necessary finance etc. to support regional innovation.

Based on this conceptualisation, chapter 2 identifies three possible deficits in regional innovation system that may act as barriers in SMEs' innovation activity:

4) Regions may be *organisational 'thin'*, as, in particular may be the case in peripheral areas. Then the regions do not have regional innovation systems due to a lack of local knowledge organisations and/or too few firms.

5) Regions may have *fragmented regional systems*. Then the relevant actors may be present, but they do not form a regional system due to a lack of innovation collaboration.
6) A regional innovation system exists, however, the system is too closed and the networks too rigid resulting in a *'lock in'* situation as is often the case in old industrial areas.

Table 3.5 includes the three above mentioned typical regional innovation barriers, and we have placed the SMEPOL study regions in one of the categories. The regions, and especially the larger ones, contain several important industries or clusters, and the regional industries and clusters may suffer from different main barriers. Thus, each region is characterised by several, and sometimes all of the typical innovation problems dependent on which industry we focus on. However, we discuss innovation barriers in each of our study region, and illustrate each region with one typical barrier.

Table 3.5: Classification of typical regional innovation barriers

Regional innovation barrier	*Illustration from SMEPOL study regions*
Organisational 'thinness'	Apulia, Northern Norway, Upper Austria, the Triangle Region, Valencia
Fragmented regional system	Hertfordshire, Lombardy, South-eastern Norway, Limburg,
Lock-in	Lee Valley, Valencia

Organisational 'thinness'

In organisational 'thin' regions there is a lack of universities and R&D-institutes, technology centres or other important local organisations to stimulate SMEs' innovation activity. The region may also lack industrial clusters, and then firms may find few other local firms with which to co-operate.

Five of the SMEPOL study regions illustrate different aspects of organisational 'thinness'. In Apulia, a lack of relevant R&D organisations, in particular, hampers the development of a working regional innovation system. Thus, very few firms in Apulia (13%) find solutions of their technical problems at local level, while Lombardian firms mostly find help locally (61%). Likewise, research centres and universities are of much less importance in SMEs' innovation activity in Apulia than in Lombardy. A lack of tradition and willingness in inter-firm cooperation and with R&D-milieus is also pronounced in Apulia (Garofoli et. al. 1999, Ed.).

Northern Norway has one university, and several colleges and research institutes with competence and research activities of potential relevance for the dominating fishing processing industry, however, has a lack of knowledge suppliers and actors outside the fish industry. Fish processing firms generally have little co-operation with local organisations when innovating. That *may* be an important hampering factor as fish

processing firms in Northern Norway are significantly less innovative than fish processing firms in the rest of the country. Incremental innovations, and in particular process innovations, dominate in the Northern Norwegian fish processing industry, and the most important inputs come from equipment suppliers and customers, that are international and in rare cases national (Isaksen et. al. 1999, Eds.).

In Upper Austria the innovation support system has its main deficits in a lack of technology transfer agencies, especially aiming at non-R&D intensive firms, innovation consultancy, support services targeting commercial aspects of innovation, and risk capital (Kaufmann and Tödtling 1999). In addition the region has no specialised technical university and no contract research organisation. This contributes to the fact that few SMEs actually engage in innovation collaboration with actors outside of the value chain (or beyond the region or country), thus, the regional innovation system is highly firm centred. The most important elements of the technology and innovation system in Upper Austria besides the firms are the six technology centres, that has been established in the resent past, and which could take over some of the missing functions of non-profit R&D and basic research in the region. However, hitherto the technology centres have few relations to SMEs which are not located in the centres, and especially the smallest SMEs, and those belonging to traditional industries do not use them.

The Danish Triangle Region and Valencia are also scarce in some local knowledge organisations. Both these regions are characterised by local production systems of mainly SMEs in mature manufacturing industries such as footwear, textiles, ceramics, toys and furniture (Valencia), and the food-processing equipment industry (the Triangle Region). The R&D component is rather weak in the innovation system in both regions. Thus, the Triangle Region has a lack of higher education institutions and research institutes (Christensen et.al. 1999), however, these may to some extent be found in nearby areas. The Valencian Technological Institutes have paid little attention to R&D (except for the ceramic institute). The Institutes perform services ‘from the shelf’, standard testing etc., however, more R&D competence is necessary in the regional network of firms due to increased competition resulting from economic integration in EU and globalisation processes (Vázquez Barquero et. al. 1999).

Fragmented regional innovation systems

The second typical innovation barrier points to the fact that a working innovation system does not exist automatically even if all the relevant actors are present in a region. The actors also have to interact, e.g. the firms have to make use of the regional knowledge organisations. Thus, the second barrier reflects that regions differ in the attitude of local actors towards co-operation, which may hamper or advance innovation activity.

Four of the SMEPOL study regions may illustrate aspects of fragmented regional systems. The outer metropolitan area of Hertfordshire near London is typically viewed as a dynamic and growing economy. The region is a favoured location for new investments in R&D-intensive industries, in particular aerospace and pharmaceuticals, and several major firms have set up both R&D facilities and production plants in the area. The area has the third largest number of R&D workers in Britain, and it is located nearby a dense location of leading universities, research institute laboratories and hospitals in the South East of England. Thus, the elements to form a strong regional innovation system are present.

However, the area may suffer from some general problems related to UK industrial development. Thus, a general characteristic of British industrial culture relates to the lack of a tradition of inter-firm networking and low trust. This may hamper the development of working innovation systems, both at the regional and national level, as innovation interaction between firms is a first necessary condition to develop an innovation system. Low inter-firm networking may be 'symptomatic of an industrial economy which has prioritised low cost over quality and where firms place greater emphasis on short-term relationships than on negotiation and longer term co-operative relations with other firms' (Smallbone et. al. 1999: 21). In addition, UK regions also to a large extent lack the organisational infrastructure to support the development of regional innovation capacity, a further prerequisite in order to develop regional innovation systems.

The Italian region of Lombardy is, like Hertfordshire, a dynamic part of the national economy. Lombary has a considerably varied industrial base, the region spends most on R&D among the Italian regions, focusing on applied research that contributes to an efficient and competitive R&D system. However, Lombardy seems to suffer from the same innovation barrier as Italy as a whole, i.e. a lack of interaction between the small firm network systems and the core R&D system (Malerba 1993). Thus, innovative firms in Lombardy sometimes have none or few contacts to the regional knowledge infrastructure, and it is generally difficult to involve universities and research centres in the region in innovation activity in local firms. The lack of interaction is very often found in cultural barriers (Garofoli, 1999, Ed.)

Studies of regional clusters in south-eastern Norway also points to the existence of fragmented regional innovation systems. However, regional resources form an important basis for innovation activity in the regional clusters, i.e. firms rely on regional resources when innovating. These resources include unique combination of knowledge and skills by the labour force and in specialised suppliers, the existence of local learning processes and spill-over effects supported by geographical and cultural proximity. However, many firms in the clusters have 'grown out' of their home region when it comes to more radical technological development. This reflects partly a lack of relevant competence in the regional R&D system. Some firms are world leaders in

their niches, and they have to co-operate with the 'best' R&D-milieus, which they find at the national and international level. Also many SMEs have important external contacts. These results point to the relevance of a multilevel approach, rather than just focusing on the regional *or* national level, when analysing innovation processes, as firms exploit both place-specific resources as well as external, world-class knowledge respectively when innovating.

The Dutch region of Limburg also suffers from a relatively poor public research and development infrastructure as far as technical science are concerned. Actually, the R&D centres of two large multinational firms are the prime actors in Limburg in creating 'new' research based knowledge (Nauwelaers et. al. 1999). However, the RTP-study from the province of Limburg points to a lack of innovation interaction as a more relevant innovation barrier in the area. Considering the fact that the major actors are company R&D-centres which have to deal with issues like secrecy and proprietary knowledge, increasing innovation may be difficult to achieve. The RTP study states that 'the availability of technology as such can hardly be considered a problem. The problem lies more in the access to knowledge. Companies, especially SMEs, are not sufficiently aware of the importance of the knowledge infrastructure. Moreover, the knowledge centres and the intermediary organisations have not yet succeeded in taking know-how to the company effectively' (RTP-Limburg 1996:83).

'Lock-in' of innovation systems

The third typical regional innovation barrier point to the fact that too strong ties may lead to 'lock-in' situations. Several of the study regions have elements of 'lock-in' due to a history of dynamic industrial development. We illustrate 'lock-in' by the two old manufacturing regions of Lee Valley and Wallonia. Historically, London's Lee Valley has provided a social, economic and institutional environment to encourage and facilitate innovation and entrepreneurship. Thus, at one time Lee Valley was London's foremost industrial area with an impressive number of successful manufacturing companies. However, it is highly questionable whether the area continues to provide an enabling environment for the 'new' types of economic activity.

Over the last two decades, Lee Valley has experienced considerable industrial decline and associated high levels of social deprivation, and the area has been an EU assisted area, receiving Objective Two status for the 1994-99 period. A certain 'lock-in' in Lee Valley is indicated by the SMEPOL evaluation of the SMART scheme (Smallbone et. al. 1999). SMART targets R&D-based firms and entrepreneurs based on an annual competition (chapter 4). The take-up of SMART is much lower in Lee Valley than in the other SMEPOL study region in UK (Hertfordshire), signifying that the kinds of firms and entrepreneurs that develop new science and technology based products are relatively seldom found in Lee Valley. Several universities have become

partners in regeneration policy initiatives. However, the SMART evaluation indicates that firms and entrepreneurs in Lee Valley often lack the competence in R&D-based innovations, and the kinds of firms and entrepreneurs that are most able to compete on SMART funds are not 'raised' in the industrial milieu found in Lee Valley.

Wallonia has experienced the same kind of industrial development as Lee Valley. Thus, Wallonia was one of the first regions of the European continent to industrialise, based on industries as coal and steel, textile and glass. Wallonia is still heavy dependent on mature industries in declining sectors, however, the region has been involved in a deep restructuring process the last decades. The region has developed a considerable research and higher education infrastructure, and highly innovative firms have clustered around universities, and some of Wallonia's Science Parks are internationally renowned. However, the former dependence of large companies may still be reflected in a general 'lock in' of entrepreneurial spirit in the region, and a sub-contractor culture in SMEs (Nauwelaers, 1999, Ed.). The region has also been less successful in networking within industry and between industry and the knowledge infrastructure. The Wallonian regional innovation system also suffer from a relatively poor business service sector, which may uphold a 'lock in' situation.

3.3 Summary

The SMEPOL project includes comparative evaluations of almost 40 different innovation policy tools aimed at SMEs drawn from 11 European regions. This chapter has considered the specific institutional and economic conditions in the regions as these form a basis for some of the analyses and policy discussions in subsequent chapters.

One contextual aspect refers to the differing national policy environments in the eight countries included in the SMEPOL project. All the countries have a comparatively modest *R&D-intensity*. Britain, the Netherlands and Denmark are close the OECD average. A low R&D intensity applies to Spain and Italy in particular, signifying a comparatively weak R&D system in these countries. The figures on *innovation costs* correspond with the countries' R&D-intensity, and Denmark, in particular, has high innovation cost. Austria reveals high innovation costs compared to its modest R&D-intensity, while Belgium, on the other, hand performs relatively better on R&D-intensity than on the innovation cost indicator.

Regarding *industrial specialisation* pattern the eight countries may be divided in three main groups. i) Austria, Italy, Norway and Spain have their export specialisation in the more mature and/or resource based industries, belonging to the low or medium-low technology groups. ii) The export specialisation industries in the Netherlands, Denmark, and to a lesser extent Belgium include both their traditional industries as well as relatively high exports in some R&D-intensive sectors. iii) Britain only, has its

export specialisation industries entirely in some of the most high-tech or R&D-intensive industries.

Another contextual aspect refers to the role of the regional administrative level in the design and execution of innovation policy tools. In three of the regional cases – Wallonia, Valencia and Lombardy – the regional level both initiate, design and carry out most of the innovation policies. The other Italian study region, Apulia, as well as the Danish, Norwegian and British regions are seen as examples of mainly nationally or EU oriented innovation policy, in which the national or EU level design most innovation policy instruments and dispose most of available funds. Regions in the Netherlands and Austria hold an intermediary position regarding the possibilities for innovation policy initiatives at the regional level.

Still another contextual aspect refers to the differing approaches to innovation policy in the study regions or nations. A trend towards more interactive policy approaches is revealed in nearly all the study regions, although linear tools are still seen as relevant for some firms. Limburg seems to have the most interactive support system, while Apulia still rely on linear instruments.

The study regions also illustrate different typical regional innovation barriers concerning SMEs. Some regions are organisationally ‘thin’ with a lack of relevant knowledge providers and/or few firms to stimulate SMEs’ innovation activity.. Apulia, Northern Norway Upper Austria, Valencia and the Danish Triangle Regions illustrate different aspects of organisational ‘thinness’.

Four other SMEPOL study regions may illustrate aspects of fragmented regional innovation systems. Fragmented systems points to the fact that linkages between actors are not well developed even if all the relevant actors are present in a region. The UK region of Hertfordshire, Lombardy, south-eastern Norway and Limburg reveals aspects of fragmented regional systems. The third typical regional innovation barrier points to the fact that too strong ties may lead to ‘lock-in’ situations, a situation particularly found in the two old manufacturing regions of Lee Valley and Wallonia.

Chapter 4: Overview of policy instruments

Gioacchino Garofoli, with the collaboration of Bernard Musyck

4.1 Introduction

This chapter describes and categorises the policy instruments evaluated in the SMEPOL project. The typology prepared is based on a recognition of the main weaknesses of SMEs regarding innovation activity, and the shortcomings of existing innovation infrastructures and support schemes for SMEs, that are briefly reviewed in the introduction.

SMEs and areas based on SMEs suffer from three main weaknesses which often affect their ability to grow in a sustained fashion and which make the introduction of innovation and change difficult (cf. chapter 1.4 and 5.4):

a) SMEs lack strategic capabilities and are often unaware of the existence of specific problems that should be dealt with and solved, at least in a long-term perspective;
b) SMEs suffer from a lack of co-operation culture, which further enhances their isolation;

c) regarding local productive systems formed by SMEs, there is very often a lack of culture of animation and capability to launch strategic systemic objectives. These weaknesses mostly derive from the absence of collective local investments in upgrading the region's competitive advantages, through the implementation of specific resources and expertise. In systems and cluster of small firms, where specific advantages are created by interactive linkages among actors of the system, there is often a poor awareness of the necessity to improve the collective efficiency (i.e. the efficiency of the system).

The above mentioned weaknesses of SMEs are compounded by existing weaknesses in the R&D infrastructure. Knowledge providers do not network sufficiently amongst themselves; too often, R&D institutes work in isolation of each other. In fact, there is no real awareness of the potential benefits of working in a network of local and regional actors, which may foster an innovation culture in the long run. Finally, it should be noted that the role of universities, research departments and technological centres in the overall process of innovation is still relatively negligible and that significant improvements could be achieved in this field.

Another point concerns the mismatch observed between weaknesses of firms (and the consequent implicit demand of industrial services) and existing support schemes. Indeed, the schemes, which are most frequently used in the SMEPOL study regions, are direct financial schemes, operating at the level of individual firms through grants and loans. Indirect schemes which should normally address some of the weaknesses of SMEs and local productive systems (fostering interactive learning) as highlighted in point c above, are rather underdeveloped. Indirect schemes are not firms oriented; they are system oriented fostering relationships, linkages and the exchange of knowledge among local actors. These indirect innovation schemes refer to:

a) support for knowledge and technical transfer;
b) support for the strengthening of consultancy and business services in a virtuous interactive circle with SMEs and research institutions;
c) support for the creation of interfaces and networks between institutional and private business actors involved in an interactive innovation process.

Before discussing the proposed typology of the evaluated support schemes it is necessary to obtain a better understanding of the barriers for

innovation faced by SMEs. These barriers are financial, technological and cultural.

4.2 Barriers for SMEs innovation

Financial barriers

The largest number of technological support measures for SMEs in the SMEPOL study regions relates to the financial constraints experienced by the firms. Indeed, the principal aim of most support schemes is the reduction of the innovation cost for the firm, which in the long run could improve even more the orientation of the firms towards the reduction of production costs more than towards the quality improvement.

The main schemes on offer concern equipment grants and loans, service and consultancy grants, and grants for hiring technical personnel. Each of these schemes works at the level of the individual firm, often without additionally in the innovative propensity of the firm and without interactive processes with external bodies and organisations.

If one is aiming at the development of an interactive innovation process, one would have to operate a clear distinction between the policy objective of reducing financial barriers to small firms on one hand, and the policy objective of fostering innovation behaviour and technological transfer on the other hand. More specifically, it should be possible to address the problem of the financial barriers for SMEs through alternative schemes which are outside the realm of innovation policy schemes. Such schemes could include loan guarantee consortia and risk capital funds (i. e. venture capital initiatives for innovative SMEs).

Barriers to a technological culture

Regarding the lack of technological culture, know how and information, a variety of schemes have been introduced in different regions and countries to foster the introduction of new products, to diversify production, to facilitate the engineering of prototypes, to foster organisational changes. These aims have been reached through the following schemes: a) the introduction of R&D grants; b) the setting up (through public financial support) of technological centres aimed at facilitating the access of SMEs to technological innovation; c) the organisation of university-industry interfaces. In recent years, other programmes have been developed with

the ultimate aim of helping firms engaging into a more dynamic process of interactive innovation.

The analyses in the SMEPOL study regions show there is a particular difficulty regarding the creation of a process of interaction among local and regional actors involved in the field of innovation. Given the underlined weaknesses of SMEs referred to earlier, it appears that what is missing today are complex programmes which could promote networking actions among local and regional actors. Such programmes would raise the awareness of entrepreneurs about the necessity to follow strategies based on innovation and quality products, fostering at the same time the strategic perspective of the firm. In the end, the aim would be to improve the social capability to innovate at the level of the local productive system and to set into motion new dynamics based on interactive learning. Such an approach would be based on the potential of innovation *external* to the firm, rather than the ability of each individual firm to generate know how within the confines of its own working space. In other words, what is crucial here is the development of a cultural and technological environment in which small firms could base their innovation efforts. One way to foster the creation of such an environment would be to launch proactive processes pushing firms to engage on the "high road" of development. This particular issue is well documented in chapter 8, where policy instruments are classified along these lines (cf. Table 8.1), combining the focus of innovation support (towards behavioural additionality and proactive tools focusing on learning to innovate) and the target group of the support scheme (i.e. system oriented initiatives).

Barriers to a culture of co-operation

The main obstacle to the development of an interactive process of innovation is the lack of a diffused culture of co-operation among local actors. Local actors are not always aware of the benefit of organising a networking system that may allow them to internalise external knowledge and information. In other words, the diffused individualism, which often characterises the behaviour of small entrepreneurs, may in some cases be detrimental to the development of local competitive advantages.

The main obstacles concern the capability to reinforce both the strategic cooperation among firms (mainly among complementary firms) and the networking between the system of the firms (the world of production) and the institutional system. When local governance is able to create and implement this networking, it will put in motion the knowledge and the competencies existing within the local system (for example, within the

world of higher education and research) but also the capability to have access to external knowledge (i.e. in other research centres and institutions) through the interface of local institutions.

4.3 Typology of policy instruments

As analysed in chapter 5, main weaknesses of small firms in innovation activities concern the following areas:

- financial barriers
- lack of accessibility to strategic information
- lack of interaction with services sector
- lack of adequate human resources (mainly technical personnel).

It is possible to look at the various schemes of innovation policies for SMEs in the SMEPOL study regions in line with the SME weaknesses highlighted above; i.e. the tools can be ranked in the above four categories of finance, information, advice and human resources. Thus, the matrix in Table 4.1 categorises innovation policies schemes from the 11 study regions and countries. The matrix takes into consideration the nature of the tools and the particular target groups to which the tools are aimed. We differentiate between two different types of target groups in the support schemes of technological transfer: firms (through schemes directly oriented to them) and the local & regional system (through the use of indirect schemes fostering external economies and the production of public goods).

Table 4.1: Typology of evaluated policy tools

Target groups		
Too**ls**	*Firms orientated*	*System orientated*
Finance	Support schemes for innovation projects, R&D projects (A1)	
Information		Technological centres (B1)
Advice		Innovation brokers (B2)
Human resources	Technical personnel introduction schemes (A2)	Mobility schemes for researchers (B3)

The distribution of different innovation schemes in the above matrix, makes it possible to propose the following typology:

A) *Firms oriented* support schemes:

A1) support schemes (through grants and loans) for innovation projects, the introduction of new products and R&D projects;

A2) introduction of research/technical personnel in SMEs;

B) *System oriented* support schemes:

B1) policies based on technology centres and schemes fostering technological diffusion to SMEs;

B2) schemes fostering the role of innovation brokers;

B3) mobility schemes for researchers.

This proposition is a very simple one and it is meant to be an illustrative typology which is based on the main variables which play a substantial role in the innovation policies schemes. We feel that this typology may help us to formulate critical reflections on the regional case-studies, allowing us to prepare policy lessons for the European Commission, even if this typology cannot include all the possible and actual schemes introduced in innovation policies. For instance, some more innovative and interactive schemes, which cannot be considered in the previous matrix, have been actually introduced in some of the studied regions. However, we will consider these different schemes in chapter 4.6, where we will develop some critical ideas and propose policy lessons for innovation policies oriented towards SMEs.

Chapter 4.4 and 4.5 will concentrate on illustrating the above typology with the specific schemes introduced in the different study regions. We will show the features of the various schemes, underlining the specific tools and measures which seem coherent with the proposed typology.

4.4 Firms oriented support schemes

A1) support schemes (through grants and loans) for innovation projects, the introduction of new products and R&D projects

These innovation schemes and incentives are designed for individual firms and underline the crucial role of the entrepreneur or the SME's manager in the innovation process. The support schemes recognise , moreover, the financial barrier as the main obstacle to innovation for SMEs.

These schemes appear to be quite traditional and especially very incoherent with the need to promote interactive learning processes as outlined before. Moreover, they do not recognise the existence of local and regional innovation systems. However, until today, these schemes have been prevalent in many regions. The central aim of these schemes is the reduction of the cost of innovation faced by SMEs. Through grants and loans, these schemes support the purchase of innovative and up-to-date equipment, the effective demand of specific real services and consultancy.

Several schemes, introduced in different countries and regions, could be included in this typology. It seems useful to underline the difference between the schemes which foster the purchase of new equipment and machinery (A1.1) and the schemes which promote the introduction of new products and R&D investments (A1.2).

A1.1) Support schemes for process innovation

Among the schemes which foster the purchase of new equipment and machinery it is possible to remember the measures specifically oriented to individual firms introduced with national laws in Italy (L. 1329/1965, L. 696/1983, L. 399/1987, L.317/1991, L. 488/1994, L. 598/1994) and with regional laws in Lombardy (L.R. 34/1985, L.R. 7/1993), regional schemes and support schemes introduced (mainly through structural funds) in Apulia, some schemes supporting material investments in Walloon development zones (but this is very diffuse in Objective 1 and 2 regions of the European Structural Funds policy), the Regional Innovation Premium (RIP) in Austria.

Only few comments on effective schemes are necessary for this very traditional kind of innovation policy.

At the national level in Italy, the best parts of incentive schemes were geared towards the introduction of new capital equipment by mean of

subsidised credit or capital grants. This is typically the case of national laws *L. 1329/1965* (the so called "Sabatini Law"), *L. 696/1983, L. 399/1987, L. 317/1991, L. 488/1992 and L. 598/1994* which support the use of new capital equipment. Some of these schemes (especially "Sabatini Law") have been relatively successful due to simplified procedures.

The *Regional Innovation Premium (RIP),* in Austria, is a programme designed to support the economic recovery of old industrial regions and to contribute to structural improvements and economic growth of peripheral regions. The programme, which is administrated by the ERP, offers non-repayable grants for investment projects with an innovation or technical content as well as the creation of new jobs. While size and sector do not play a role, only firms located in certain areas can benefit from the scheme. The amount of the grant will depend upon the impact of the companies activity on the regional economy (relations with regional suppliers and impact on the level of qualification). The scheme offers a clear SME-focus. One of the weaknesses of the programme is its insufficient focus on producer services. Compared to other programmes, which have a national dimension, the RIP has a regional dimension.

A1.2) support schemes for innovation projects, new products introduction and R&D projects

Among the schemes fostering new products introduction, R&D and other immaterial investments it is possible to remember, among other schemes, mainly the Italian law 46/1982, some schemes (not very well used) within regional laws in Lombardy (i.e. L.R. 34/1985, L.R. 35/1996), SMART and SPUR programmes in United Kingdom, FFR, ERP and ITF in Austria, some measures of NT programme in Norway , the scheme "interest free revolving loans" and RIT in Wallonia (Belgium), some measures if KIM in Limburg.

Regarding the introduction of new products, the Italian Law *L. 46/1982* is probably one of the most well known incentive scheme that promotes the transfer of know how from research institutes to SMEs. However, because of administrative difficulties linked to the application process, this scheme has mainly benefited larger firms: for example, in 1996 small firms used only 29.5% of total public spending and even only 19% for what concerns the public spending for grants.

In Lombardy, two schemes are also concerned with the development of new products and services (*L. R. 34/1985 and L. R. 35/1996*). The

Regional Law (L. R.) 34/1985 aimed to stimulate productivity increases and improvements in competitiveness of SMEs, fostering the access of SMEs to the activities of research institutes, university departments and laboratories as well as to business services. Support was concentrated in applied research (art. 5 L. R. 34) and specific innovation projects initiated by SMEs (art. 6 L. R. 34). Companies could obtain a subsidy covering up to 50% of eligible costs with a maximum of 200,000 ECU. Financial support was provided by mean of grants which were allocated through the CESTEC (SME Technological Development Centre) to companies collaborating with specialised institutes to develop, test and implement the results of common research projects. The scheme also foresaw subsidised loans for innovative projects developed by individual firms through a special fund "Rotation Fund for Innovation" established by Lombardy Region and collaborating banks. Because of complicated administrative procedures the scheme remained relatively unsuccessful. However, in 1993, a new Regional Law was introduced (*L. R. 7/1993*) with the aim of facilitating procedures. Grants were provided instead of subsidised loans for research projects carried out by small handicraft enterprises. Also "participating loans" to SMEs were introduced whereby interest rates charged to the firms were linked to the profitability of the projects carried out, which was a novelty in Italy.

L. r. 35/1996 is based on experience accumulated from other schemes during the last decade and involves a complex programme and mix of instruments and actions addressed to the different sectors of the economy (industry, tourism, trading, services). The scheme launched in 1996 aims at a) the promotion of service centres, technological poles, intermediate structures of support of technology transfer to SMEs; b) direct support (through grants) to new firms working in engineering and production of new products and services (for research equipment, technicians' training, engineering personnel, technical consultancy and prototype development and testing); c) grants for carrying out R&D projects, for participation to EU research programmes and for internships of graduates in R&D projects; and finally, d) subsidised loans for innovation, including R&D equipment purchases. Support for innovative products and services is provided mainly by means of grants, access to the "Rotation Fund for Innovation" and through medium-term grants or "participation loans".

In other European regions, there are a range of financial schemes operating through grants, loans and subsidised interest rates. In Denmark, the involvement of the State in the provision of risk capital has been based on the so called *Development Corporations* and the *Growth Fund* which provide loans for R&D. The two organisations are in the process of

merging together. The number of applications and approved projects to the Growth Fund has been decreasing steadily in recent years. There are 19 Development Corporations at work in Denmark with a regional or sectoral profile. Compared to the Growth Fund, the Development Corporation have a closer involvement in the day-to-day management of the subsidised firms. An important weakness of the Development Corporation is that they have no links with regional development agencies and seem not to be integrated in the territory.

In Austria, there are three different innovation and technology funds. The *Austrian Industrial Research Promotion Fund* (FFF) supports research and development projects and concentrates on the early phases of the innovation process. It is interesting to note that the scheme follows a strategy of co-operation in international research through Austrian subsidiary companies and that the programme is trying to help companies to evolve from component suppliers to system suppliers. The FFF pursues a bottom-up strategy and firms decide for themselves which technologies and markets they want to explore. Through grants, loans and low interest rates, the fund concentrates on high-risk projects. The scheme stimulates R&D co-operation with universities, research organisations, technical colleges and students. However, most of the funds are still allocated within standard programmes, which are dominated by the linear approach to innovation.

The *Technology Programmes of the ERP-Fund* relevant to this analysis comprise the Technology Programme and the SME-Technology Programme. The programmes focus on the transfer of prototypes into regular production through the provision of loans at low interest rates for an amount of up to 50% of total investment. Special banks (Treuhand-Banks) which select projects and prepare the proposals, which are usually accepted within a period of 2 months. In general, ERP support aims at ”lower-tech” industries, and firms belonging to higher technological levels belong more to the clientele of the FFF. The ERP pursues a bottom-up strategy. The programme follows legal instructions and there is not much space for innovative initiatives.

The *Innovation and Technology Fund (ITF)* only grants support for certain technological areas. In contrast to FFF and the ERP-fund, it has a top-down approach, trying to define those areas with the highest potential for technological development and economic growth. Innovative projects are supported through the provision of grants. There is a strong concentration of funds on larger companies and industries that most frequently benefit from ITF-grants show a “high-tech” bias, mainly in the

area of data processing, information and communication technologies. The major problem of the programme is that it is mission-orientated and it has too little funds available to grant significant support for each of its focus area. Although the programme will be reorganised in 1999, it will follow the same top-down support strategy and similar goals.

In Wallonia, the *Interest Free Revolving Loan* aims to fund industrial applied research and development. It covers 70% of research costs for SMEs and 50% for large firms. It appears that the loan scheme is primarily targeted towards "research rather than development". There is too much focus on the promotion of high-technology products (with an uncertain market potential) compared to innovation projects, which may turn out as "profitable economic activity in Wallonia". In fact, high tech firms with a good regional image seem to enjoy an easier access to funds than firms in traditional sectors. Moreover, during the phase that follows the actual R&D, the number of support schemes available is rather limited, which makes the "development phase" of the products all the more difficult. Another problem is the time lag between the application and the allocation of the subsidy. For many firms in sectors with short product life cycles, the subsidy comes too late. For other companies (the strongly innovative ones), the subsidy comes as an additional source of finance with little or no behavioural impact. Overall, a more integrated design of innovation support is necessary, allowing easier links between instruments or an access in the form of a package.

A2) Support schemes for the introduction of technical personnel in small firms

Very often one serious barrier for the introduction of innovation in SMEs is the lack of technical competencies. Some policy schemes aimed at solving this problem, through specific measures which could foster the introduction of technical personnel in small firms.

In Wallonia we can find one of the most interesting case of measures which foster the introduction of high technical and professional personnel into SMEs, with the supply of grants for the reduction of salary costs of very qualified personnel. The *Technology and Innovation Manager* (RIT) programme is exclusively targeted at SMEs. The aim is to strengthen resources for the development of innovation projects. The scheme covers the funding of a technological audit of a project and 80% of the salary of an innovation manager for one year. This programme is particularly relevant for firms, which are not particularly innovative. One difficulty of the programme is the recruitment of a good innovation manager for the limited period of one year. It should be noticed that the scheme, which

was popular in the eighties, has attracted little interest in recent years. This is due to the existence of other alternative instruments in support of human resources. However, the scheme has been relatively successful in the sense that it benefited non-innovative firms, which have, in most cases, been keen to extend the RIT. For already innovative companies, the programme was considered more as a training and employment support programme. The value added of the scheme is therefore much higher in low-tech and non-innovative companies (SMEs). Overall, the RIT has a potentially high behavioural impact on SMEs. The employment of an innovation and technology manager often marks the start of a continuous innovation activity, fostering then additionality in the innovation process.

Among other experiences, it seems important to remember the attempt introduced in Lombardy, through the regional law no. *35/1996* (under the measure d3) which offers grants for internships for newly graduated students in the field of R&D activities. Indeed, the number of accepted applications has been extremely low so far and this explains the difficulties it is possible to face when this kind of schemes are introduced exclusively in the perspective of firms oriented policies without the involvement of other institutions (especially research institution) in a more integrate scheme which should try to foster relationships, networking and the transfer of knowledge.

4.5 System oriented innovation support schemes

B1) policies based on technology centres and schemes fostering technological diffusion to SMEs

These schemes are the most common schemes in support of indirect technological diffusion for SMEs. They can be categorised either as "top down" schemes whereby technology transfer initiatives are supply driven like in the case of Tecnopolis in Apulia, or as "bottom up" actions whereby a group or network of small local firms tries to find solutions to existing technological challenges (the experiences in the Valencia region and to a certain extent in Lombardy illustrate this point). There are several examples of technology centres of both types, which have been studied within the SMEPOL project, some being more effective than others.

In Norway, the *RUSH* (Regional development programme between state owned colleges and SMEs) and the subsequent *REGINN* (regional innovation programme) are regionally based schemes aimed at improving collaboration between colleges and local firms. RUSH was an experimental programme, which lasted for 4 years and covered 4 colleges.

This open-ended pilot programme became the REGINN programme in 1997. The programme has a double aim: assisting SMEs in need of external R&D resources and helping R&D institutions and colleges to strengthen their competence on SMEs' innovation needs. RUSH was regionally based, focused on manufacturing SMEs and allowed funding of 50% of joint development projects to be funded, while provisions were also made for training and education activities. The original idea behind the programme was the Steinbeis system of technology transfer in Baden-Würtemberg. The REGINN programme has a much wider scope aimed at promoting and developing a regional innovation system, with particular emphasis on selected clusters of firms in the region. Because REGINN has been launched fairly recently, it is difficult to asses its impact.

The *IMPIVA* (Instituto de la Mediana y Pequena Industria en Valencia) was created in 1984. It is a public organisation in charge of designing and carrying out industrial policy for SMEs in the region of Valencia. The organisation operates as a network which provides services to firms: the 15 Technological Institutes affiliated to IMPIVA offer information and documentation, technical studies, laboratory tests, consultancy and technology transfer and human resource training; the Business Innovation Centres promote new economic activities and stimulate the creation of innovative projects; the Technological Parks promote investments in high technology industries and links between research institutions and firms. Four technological institutes were studied: AICE focuses its activity on R&D projects and technological consulting or transfer in the ceramic sector; AITEX focuses on human resource training and the production of multimedia training products for the textile sector; AIJU is specialised in training in the toys sector and INESCOP provides information services to the footwear industry. Several factors have probably contributed to the relative success of the Technological Institutes: their governing body are composed of firms' representatives, their operations are increasingly self-funded (an average rate of 60% for the sample under study), and finally, the centres are integrated in the social and economic fabric and have frequent contacts with firms while at the same time being well connected to other similar international centres. One of the most important merit of the institutes is to have prepared companies to achieve improved quality and production standards, which were of paramount importance to sustain competitiveness of companies at a time when Spain was joining the European Community. In doing this, the institutes concentrated their activities in technological advice paying relatively less attention to join R&D projects with local companies. Overall, the institutes have allowed firms of the region to evolve from a situation of "imitators" to "adapting SMEs" with some innovative capacity.

In Lombardy, *L.R. 33/1981* provided support for the promotion and building of specific structures and facilities for technological assistance to SMEs like *CENTROCOT* in Busto Arsizio, *Centro Tessile* in Como and *AQM* in Brescia.

In Apulia, *Tecnopolis/CSATA/Novus Ortus* in Bari is a typical "top-down" structure of a large (over 200 employees) technological park based on a supply-side policy aimed at offering existing academic expertise. It was the first technological park created in Italy in 1984. The activities of the centre concentrate on technological transfer, applied research in industrial automation, training for innovation, supply of innovative services to firms and the public administration, participation in international programmes in applied research and the creation of new firms. One of the weakness of the centre is that is has never really engaged in a thorough analysis of the potential needs of local or external firms in order to make the interaction between research centre and economic activities as meaningful as possible. In fact, the centre is typical of a "self-refereed" institution, which encounters difficulties to evaluate its own results by external examiners. Moreover, the way the centre is financed may also be to blame for the situation: 62% of the budget is financed by national bodies, 29% by regional and local institutions, 2% by the EU and only 7% by the private sector.

Technology centres and related institution in Upper Austria have been conveniently categorised in three groups: R&D orientated centres, facility-orientated centres and technology transfer centres.

In the first category, the *Software Park Hagenberg* offers an interesting example of a thriving institution linking together research laboratories, firms and a technical colleges. The park also fulfils the role of an incubation centre since many new firms are spin-offs of former research projects. Two major Austrian electronic companies are also hosted on the premises. The park is funded by the federal university budget as well as contract research. The intensive interaction between researchers, engineers, managers and Ph.D. students is considered to be one of the major advantage of the park. Interestingly, companies tend to collaborate rather than compete in order to succeed in their application for research grants.

A second important centre is *the Research and Training Centre for Labour and Technology (FAZAT*) which is located in the old industrial area of Steyr which has been going through a process of restructuring in

recent years. Originally designed as an incubation centre, it has become a technology centre coupled to a technical college where the activities concentrate in automation and telematics. Technology transfer takes place in larger companies located in the region, while relations with SMEs are less developed. The centre was set up with different kinds of public subsidies and it currently receives 50% of its funds from contract research and consulting services. The project is considered a successful one, partly because of the political consensus, which has supported the municipality in its efforts to set up the centre.

In the category of facility providers, we identify four different technology centres. The *Incubation and Technology Centre Wels (GTZ)* provides infrastructure for new small firms and information, marketing and PR services including help for R&D grants applications. The centre is more or less self-supporting and it is primarily controlled by private investors. The centre's performance as an incubator has been very satisfactory, the number of new firms created has exceeded all expectations. However, from the point of view of transfer of technology, performance has been very poor. The three other centres analysed in the study (*Technology Centre Linz, Technology Centre Innviertel and Technology Centre Salzkammergut*) are all concentrated in the provision of infrastructure and basic facility services. The fact that the largest centres in Upper Austria are not performing technology transfer functions constitutes a serious deficit in the technology and innovation system of the region.

Regarding the last category of technology centres, there is no central technology transfer agency in Upper Austria. However, the *Innovation Relay Centre Austria* (CATT) located in Linz focuses on aspects of technology transfer. The centre, which is a partner of the Innovation Relay Centre Austria also member of the European Innovation Relay Centre, offers active and passive technology transfer services. However, it is more an information provider than a consultant, its perspective is the European innovation exchange network, rather than the regional market.

In the UK, the *London Lee Valley Centres* (LVCs) and the *London Lee Valley Business Innovation Centre* (LVBIC) at the Middlesex University, are not part of a national innovation policy but were established by local agencies and authorities and are supported by European and national funds.

The LVCs were established in 1995 with support of European Regional Development Funds (ERDF). They include four semi-independent centres in the area of design, telematics, technology transfer and teaching. The

four centres aim to help businesses to expand and become more competitive and profitable and to stimulate industrial and commercial growth in the Lee Valley region. One of the major problems of the centres is that they are "funding driven" which means that the needs of the firms have not been considered and that projects are created to absorb available funds. This problem has been exacerbated by the requirements of quantitative output indicators prescribed by the ERDF. Consequently, the projects lack a clear conception of the potential demand for services, the available university facilities and staff and a clear perspective on how the centres relate to other business support initiatives within the region.

The LVBIC is one of the 140 centres sponsored by the European Commission DGXVI in less favoured regions of the Union. The centre focuses on the provision of intensive support for selected innovative individuals and enterprises, with emphasis on technological opportunities and product innovations, including the commercialisation of innovative ideas. A key component of the support package is the provision of finance in the form of a short-term loan or as equity. The centre also supports firms applying for government schemes (such as SMART for instance) and it has its own annual award scheme, the "London Lee Valley Innovation Award". The most important weakness identified by clients is the insufficient financial support and the lack of access to venture capital for innovation.

B2) schemes fostering the role of "innovation brokers"

These schemes distinguish themselves from other schemes in this section because of the active role played by "technology or innovation brokers" whose role it is to identify technological needs of firms, even when these are not yet explicitly expressed by entrepreneurs. Examples in the studied regions include, the SYNTENS scheme in Limburg, the Business Links programme in the UK, the TIC and GTS schemes in Denmark, but also some measures of the Norwegian TEFT programme (chapter 4.6).

One of the best examples within this typology is the case of *SYNTENS* in Limburg (Netherlands). Syntens stems from a previous experience made by the Dutch government to establish a network of 18 Innovation Centres created in 1987. Each Innovation Centre had a consulting staff of 5 to 10 people, mainly engineers, that actively contacted , visited and consulted SMEs in the region. The initial role of the Ics gradually changed from bringing technology to regional SMEs (with a model of technology push) to an intermediate role of “broker”, and more recently it fulfils the role of “organiser, animator or coach”. The IC network privatised in 1993 and

merged with the IMK (Institute for SMEs) in 1998 taking the name of ‘Syntens: an innovation network for entrepreneurs’. The main task of Syntens is to raise awareness among firms in the region of the importance of continual innovation and the input of new knowledge and it is able to provide all-round service and support to SMEs.

In the UK, the *Business Link* scheme provides assistance for innovating SMEs following the concept of a "one-stop-shop", encouraging firms to access external support through a single channel. These services include personal business advice, diagnostics and consultancy services, marketing training and advice, international trade advice, and financial information. At the centre of the business support network, a Personal Business Adviser (PBA) is assisting SME entrepreneurs in defining their business needs and formulating their strategy. These generalists are assisted by specialist counsellors including Innovation and Technology Counsellors (ITC) and Design Counsellor (DeC). Business Links adopt a holistic view of business development, providing an integrated range of services to their clients, in which technical advice is rarely provided on its own, helping firms to reap the full commercial benefit of their innovations. Often, client firms can establish an ongoing relationship with their assigned Business Link advisers. While smaller firms are often recipient of generic assistance, larger and older firms are likely to be referred to external consultants. The networking component of the scheme is rather important since Business Links are concerned with linking SMEs with elements of the external support system, mainly consultants addressing, above all, the commercial dimension of their innovations rather than issues related to product or process development.

The *Technological Information Centres (TIC)* in Denmark constitute a network of advisory centres, which are based in 15 different regions of the country. They deliver information services to SMEs in search of specialised technical advice. The TICs operate as broker between technology-orientated SMEs and a variety of management and technical consultants as well as research institutions relevant to SMEs. Services include the dissemination of information, coaching and regional co-ordination of advisory services. It is interesting to note that all 15 centres are managed by a national centre called TIC Denmark, which ensures the existence of an overall national strategic framework of action to co-ordinate the initiatives of the 15 regional centres. In addition, TIC Denmark is also involved in policy negotiation with the national government and thus, it is in a position to balance national and regional interests within the overall support system. However, this has been subjected to problems in recent years, the TICs finding it difficult to

respond to the specific needs of smaller business communities and at the same time expand the scope of target industries and service tasks within given budgetary limitations (the government and the counties contribute almost 100% of the budget of the network). The situation seems to evolve towards a higher regional autonomy for each centre.

The Danish *Approved Technology Service Institutes (GTS)* comprise a large number of formerly independent research institutions and industrial service providers which still operate as independent business units. The GTS Institutes operate as a link between the research community and the business community; they are involved in the development of new technologies and the diffusion of existing know how originating from other sources. It is interesting to note that the GTS Institutes are private businesses with goals of their own, but at the same time they provide a public service for which they are paid by the State. Inevitably, this creates dilemmas in the operation of these institutes. Technology services provided by the centre are still understood in a linear perspective and the whole network may benefit from a better understanding of clusters of production, value chains, networks of personal relations and tacit knowledge and the functioning of a regional innovation system at large. While the TICs are caught in a dilemma of regional versus national programme co-ordination, the GTS face their own dilemma between the needs of market based large clients and the specific (less economical) needs of small firms.

B3) mobility schemes for researchers

The mobility schemes promote the diffusion of technological expertise and the ability to manage newly acquired know how through the mobility of researchers between different organisations and institutions such as technology institutes, universities and private firms. The indirect aim of such programmes is to cluster relationships between the above actors and to promote the transformation of researchers into economic operators and entrepreneurs. In other words, it is hoped that a researcher or a scientist who has the chance of working for a company on a given project, will eventually be turned into an entrepreneurial perspective or will at least establish new links between the firm and the home institute.

Even if some overlapping exists with the measures which offer grants for R & D salary costs (cf. the typology A.2) that are very often the first measure of intervention for the organisation of a mobility scheme and, if the process goes on, of interactive tools for the creation of an innovative local system, it seems possible to underline some schemes with the

specific goal of researchers mobility in the perspective of clustering relationships between research institutions and productive firms. Examples of such schemes include the Dutch KIM programme, the Belgian FIRST programme, the “Technology mentorships” within NT programme in Norway, the mobility schemes in Denmark. Some opportunities were launched in Lombardy through specific measures within the regional law L.R. 35/1996.

In Wallonia, the scheme *FIRST enterprise* (Formation et Impulsion à la Recherche Scientifique) aims to strengthen the scientific and technological potential of firms through the employment of young researchers working part-time in the company and part-time in a research laboratory. The programme emphasises the aspect of ”knowledge creation” rather than the industrial application of this knowledge. However, the original feature of the programme is that it promotes collaboration between research and high-tech companies. The number of applications has more than doubled in the past 3 years and the recruitment of FIRST researchers does not seem to pose any problems. Through the scheme, companies have access to external equipment, material and competencies, and these resources are often a prime motivation for accessing the FIRST programme. Also, the scheme may help establishing a routine in linking with external resources of technologies and expertise. This includes informal contacts, which are very important for the company’s “technological watch”. Overall, the programme offers the companies the possibility of acquiring qualified researchers, it provides privileged access to specialised equipment and establishes an “industry-university interaction” which may yield significant benefits in the long term.

The *KIM* programme (which stands for Knowledge-carriers in medium and small-sized firms) focuses on the mobility of human resources. The scheme aims at stimulating and supporting small firms to engage in technological innovation through special funding aimed at reducing the labour costs of hiring a highly educated graduate for one year. The idea is to transfer technology and to diffuse technical and management skills from institutions of higher education to knowledge-extensive SMEs by using young graduates as knowledge carriers. The major outcome of the KIM is that it has lowered the barrier to employ personnel with higher education. KIM is based on an interactive mode of intervention, whereby a consultant acts as a mentor or coach to the firm, translating informal interaction with the firm into a formal plan of action. The consultant "actually decodifies the policy instrument and uses its codifying skills to codify the tacit needs of the firm" (MERIT SMEPOL Report, 1999, p82).

The scheme, which addresses the internal innovative capabilities of firms, is perfectly suited to firms, which operate within a logic of "learning-through-producing". Overall, participating firms seem to share a more positive attitude towards highly educated employees and innovation. Also, there seem to be other systemic effects internal to the firm, but external to the supported innovation plan.

In Norway NT programme has introduced a scheme called “Technology mentorships” which allows the involvement of scientific researchers in solving specific technological problems arisen in innovation projects of SMEs.

In Lombardy, *L.R. 35/1996* (under the measure d3), as already remembered, offers grants for internships for newly graduated students in the field of R&D activities. While this particular measure could have been seen as a coherent tool to improve the social capability for innovation (through the placement of technical staff in SMEs and the building of privileged links between firms and universities and research centres), in fact, the reality turned out to be quite different. Indeed, the number of accepted applications has been extremely low so far and therefore this goes to show that being in line with theoretical line of action is no guarantee for success.

4.6. Learning from the overview of innovation policy instruments and ideas for policy lessons: the construction of an innovation process

4.6.1 Some introductory remarks

Some of the schemes discussed in this chapter are quite traditional; others are more or less innovative. However as discussed before what is missing, in most of the schemes under study, is the existence of interactive mechanisms which could foster learning process, additionality, the construction of local & regional innovative systems, the progressive networking of local actors and institutions, the capability of implementation of the effective schemes; in synthesis the construction of a local & regional innovation process, which could valorise a regional innovation system, is missing.

There are, however, a few examples in the analysed regions of interactive tools which can induce the accumulation of localised learning and the strengthening of the fabric of relationships among local actors and institutions, which in turn may foster the innovation capability of the

system. If we take into account the main outcome of the recent literature on industrial districts (Becattini, 1987, 1989, 1998; Brusco, 1982, 1989; Garofoli, 1983, 1989, 1993), local development models (Garofoli, 1991; Storper and Harrison, 1991; Leborgne and Lipietz, 1992b), endogenous development (Garofoli, 1992), learning regions (Morgan, 1997; Maskell et al., 1998) and regional innovation systems (Gaffard, 1992; Asheim, 1999b), it appears clearly that the only way to foster the competitiveness of local systems of small firms, especially in rich regions and countries, is a strategic transformation based on quality and innovation. This "high road to development" (Pyke and Sengerberger, 1992) is based on the fundamental pillar of strengthening external economies (external to the firms but internal to the territory) (Garofoli, 1999b).

Having said this, it seems that few regional policy makers have taken on board lessons emerging from theoretical reflections and interpretative analyses of regional and technological change. The support schemes analysed in the typology presented in the first part of the chapter are mainly static, one way and monotone; there is the lack of implementation, additionality, interactive and dynamic relationships. This leads us to conclude that the first policy lesson for the technological transfer to SMEs, and especially to cluster of SMEs, is the creation of a dynamic process based on linkages effects.

4.6.2 Dynamic innovation schemes

In this perspective, it may be useful to discuss the relevance of support schemes which have tried to enhance, through interactive tools, proactive actions and initiatives (C1) as well as schemes aimed at the up-grading of the local and regional innovation systems (C2). In fact, there are few but very interesting examples among the policy instruments introduced in the regions under study.

C1) interactive tools based on proactive actions and initiatives

The schemes based on interactive tools seem the most appropriate schemes for the promotion of continuous interactive learning through the implementation of networking structures at the local and regional level. These schemes are *process oriented* and caused to this they mainly differ from the schemes we have analysed in the previous typology. Among the case studies carried out in this project, two schemes offer a good example of such actions: the TEFT and NT programmes in Norway.

In Norway, the *TEFT* (Technology diffusion from research institutes to SMEs) programme aims to help SMEs in the manufacturing and producer services to collaborate with the four largest polytechnic research institutions in Norway. The idea is to draw non-R&D-intensive SMEs into the national innovation system and to make SMEs become continuous customers of the national R&D system. The scheme is further enhanced by the action of county-based technology *attachés* whose task it is to match technological needs of firms with technological potential of the institutions. In this respect, the TEFT programme is essentially a proactive scheme in which technology brokers aim to lower existing barriers of co-operation between institutions and SMEs through frequent visits. The scheme comprises the identification and subsequent subsidisation of technology projects for an amount of 75% of the total cost, the contribution of TEFT being used to buy services from selected institutions. One of the weakness of the programme, is that to some extent, it is supply orientated, serving the interest of participating institutions first, by focusing on the generation of income through projects. In fact, it is sometimes unclear whether the programme's priority is to improve attitudes of research institutions vis-à-vis firms or whether it aims to increase SMEs' use of R&D competence. Another weakness relates to the nature of the subsidised technology projects: these are often too short and independent with no linkages to other projects or further continuation. Finally, the issue of achieving innovation and competitiveness without R&D should be addressed. Indeed, it is questionable whether low R&D-intensive SMEs need the kind of policy instruments provided by the TEFT in stepwise innovation activity. Innovation, in fact, is not only about R&D.

The *NT-programme* (Innovation and Technology programme for Northern Norway) started in 1987 and is a regionally based programme. The aim is to provide financial support to projects in firms in the region, to strengthen the co-operation between centres of expertise and the firms and to strengthen the co-operation between firms and within firms. The main focus of the scheme is to provide funds for innovation projects but the philosophy is to provide all-round proactive support for innovation and that is why programme managers are following firms closely and establish long term links with them. The approach is tailored made and intends to meet the specific needs of firms (there is a system of technology advisory contracts with R&D institutions). The target group of NT are R&D intensive firms or the "best" firms in manufacturing and consulting. The programme foresees support for the development of products, production processes, marketing and collaborative links between firms and R&D institutions. It has no "infrastructure aim" but concentrates more on the

relations between firms and institutions. From a general point of view, it seems that NT has been performing a co-ordinating role in the support system in Northern Norway, not surprisingly since the programme puts greater emphasis on innovation projects as parts of the firm's general strategy. It is clear that the NT programme goes beyond the provision of financial grants and would deserve to be placed concurrently in other categories of our typology.

C2) schemes aimed at up-grading the local and regional innovation systems

According to the literature and to the success stories of local development based on knowledge and specific resources, the best way to support the starting up of an innovative local process is the up-grading of technological knowledge within local system. The policy schemes which try to introduce and to implement the knowledge resources are, then, *goal oriented* and this explains why we could not introduce this policy scheme within the previous typology.

In this category we find all schemes which are concerned with the systematic upgrade of the social capability of a local system to foster and control the development of technology. The idea here is to facilitate the diffusion, within the local and regional system, of a collective ability to promote change and innovation within the firms. In concrete terms, this refers to any actions that may lead firms to improve their attention for quality when acting as suppliers. Good examples are the improvement of services provided by technological institutes, the development of new links between university and industry, the systematic up-grading of human resources and managerial skills in support of innovation and finally the improvement of the awareness of local and regional actors regarding training and development of new professional skills.

There are obviously some overlaps with the previously mentioned category, but the main distinction between the present category and other categories relates to the final recipient of the measure. The present scheme is directly aimed at up-grading the innovation capacity of the local productive system whereas the previously mentioned schemes may (or may not) achieve this same goal, after the creation and implementation of interactive tools. In other words, the present scheme concentrates on the innovation capability of a whole system whereas the previous programmes considered this aim as an indirect possible outcome of their actions. That means other actions with direct support to firms or oriented to technological centres could become mediate tools for this general and

local system oriented goal if additionality is produced and if the SMEs attention to innovative behaviour increases[5].

The *KIC* (Knowledge intensive Industrial Clustering) is a joined public-private initiative aimed at upgrading regional SME suppliers through co-operation with each other in co-engineering projects for the renowned Dutch multination *OcE*. Most KIC-projects were initially set up to engineer systems or modules for *OcE's* new colour copier. The multinational company was interested in outsourcing manufacturing and engineering to a group of co-operating suppliers within the region, to turn regional "jobbers" to "co-makers" with the help of the Dutch innovation centres "Syntens". The scheme has been particularly relevant in Limburg because many industrial SMEs were "isolated" and unable to use their skills in a codified way. Moreover, the use of private R&D facilities helped compensating the relatively weak public research infrastructure. However, one of the weakness of the scheme was that the initial "shared collective goal" from upgrading regional SMEs co-makership evolved towards upgrading *OcE's* suppliers into main-supplier. Having said this, firms have learned to codify their tacit skills and to communicate knowledge with *OcE's* R&D unit, to co-operate in engineering with other SME suppliers in the region, which in the end, favoured the emergence of micro-clusters which acquired dynamic competencies that out-perform the competencies of individual firms. On the negative side, we note the existence of complex procedures, an insufficient training content of the programme, and finally, the project suffers from being "locked" into the technological trajectory of *OcE* and therefore, there is a need for other lead firms to reduce the domination of the multinational company.

For what concerns Italy, a novelty has been introduced with the national law L. 317/1991 which, for the first time, allows the opportunity to organise industrial policies oriented to the territory and to local productive system as a whole, stressing the role of interdependencies of firms decisions within industrial districts. Following this idea, some innovation schemes included the possibility to finance projects in industrial districts, supporting collective initiatives and consortia of small firms (cf., for example, the schemes within L.R. 7/1993 and L.R. 35/1996 in

[5] Examples of such programmes include the KIC in the Netherlands, the SMART Network Clubs in the UK but also well known examples which are not covered by the SMEPOL study, such as the experiences of Grenoble and Toulouse, where public and private actors intervene increasing the capability of local innovation system through systematic programmes which enhance interaction and accumulation of local knowledge.

Lombardy), strengthening thereby the local system. This point is particularly relevant to our analysis, because it underlines the fact that policy makers are sometimes aware of the particular role of local systems of production and the ensuing necessity to design coherent policy tools.

Among the support schemes which aim at the up-grading of local and regional innovation system, it seems possible to include also the support schemes for start-ups of innovative SMEs. In this category we can include all the instruments which foster the creation of new firms on the basis of acquired technical know how in industry or academia. The schemes also aim to facilitate through access to finance and simplified organisational and administrative procedures, the transformation of researchers and technicians into entrepreneurs. In this respect, the experiences of Silicon Valley and Grenoble constitute very interesting examples.

A good example of a start-up scheme is the *Small Firms Merit Award for Science and Technology (SMART)* which has been introduced in the late 1980's by the UK Department of Trade and Industry. The scheme is based on an annual competition and targets innovation support through feasibility studies and development projects for potential entrepreneurs at the pre-start-up stage or very young microenterprises which are highly R&D orientated. Because the scheme is only targeted at a certain class of firms, it is not always able to contribute to raising the overall level of innovation of SMEs in the region. While the programme may have had a positive impact on the ability of entrepreneurs to proceed with innovative projects, and the development of technical and design objectives, commercial objectives seemed more difficult to achieve. This weakness calls for a more holistic approach and the provision of marketing assistance and other business support measures to successful firms. Finally, in view of a longer-term strategy of support, the recent creation of regionally based networks of SMART winning firms may become privileged fora for interactive learning.

In any case, it is important to remember the start-up of innovative firms could be only one measure within a general policy scheme which pursues the overall objective of the up-grading of the local and regional innovative system giving new opportunities for taking into account all the competencies and strength points of local system through learning processes and interactive initiatives, otherwise the risk should be to confine the scheme within traditional firms oriented support policies.

4.6.3 Policy lessons

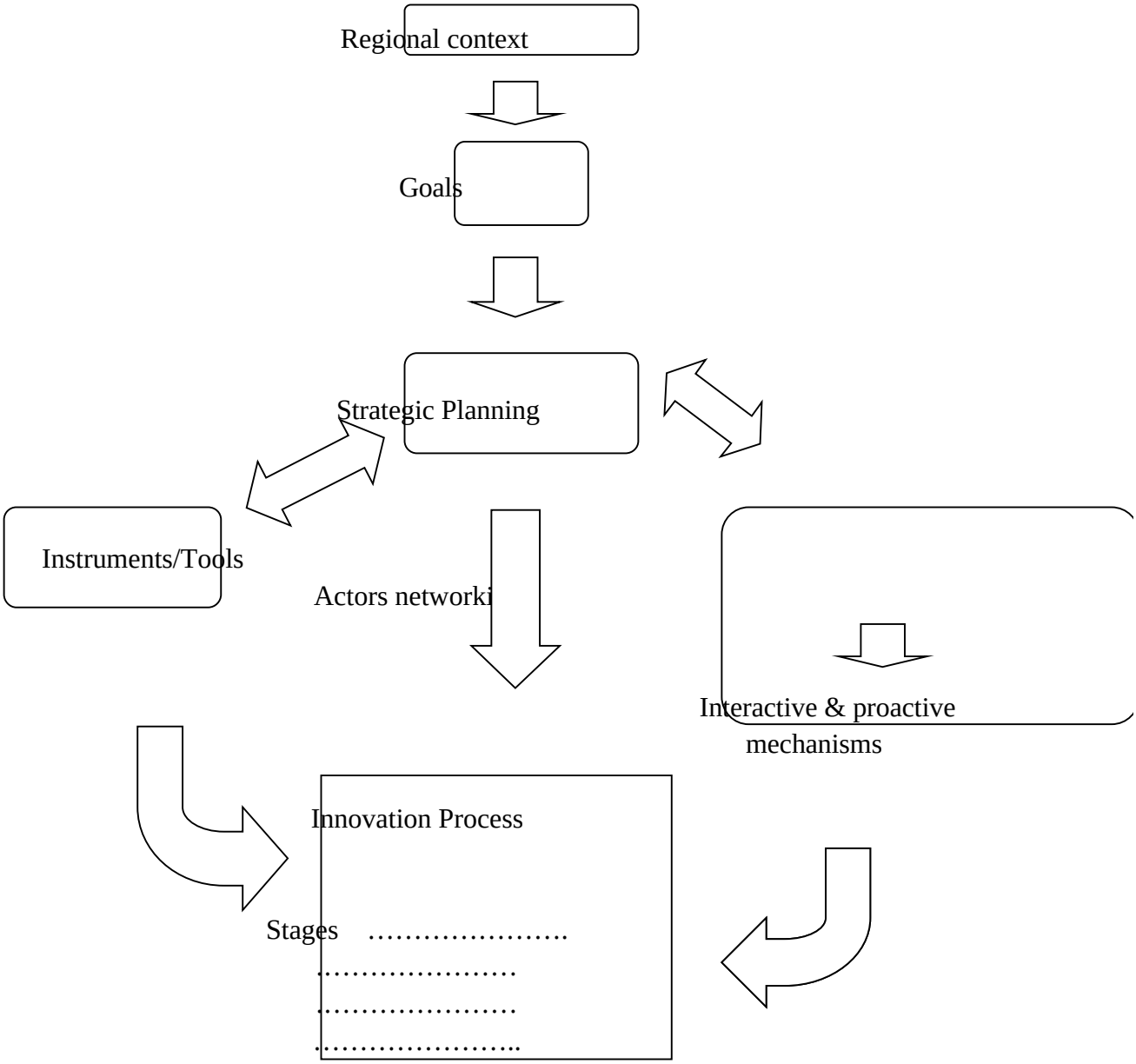
At this stage, it is useful to reflect on the importance of programmes that may help small firms to develop their awareness for the need to engage in a process of continuous innovation and change. Such programmes should be implemented in an interactive fashion, using all positive externalities that the local or regional system of firms and the local networking between production and research and between public and private institutions can offer. Above all, programmes of continuous education will ensure that sufficient pressure is put onto firms to engage in a constant effort to renew their knowledge base without interruption and in collaboration with relevant local actors. An experience in that direction has been carried out in Wales where the Welsh Development Agency through the Employment and Training Centres has set up a programme which promotes the development of a learning organisation at the regional level. It seems that the SMEPOL survey did not identify many examples of this kind of programmes, even though both Norwegian schemes have a secondary aim of introducing an innovation culture in SMEs. In any case, if we consider the difficulties faced by SMEs concerning their ability (or inability) to cooperate and internalise external knowledge, it becomes obvious how important continuous training schemes are, especially for small entrepreneurs and SMEs managers.

Having said this, we would like to convey the following idea to regional policy makers: there is a need for the construction of an interactive process, which could guarantee the progressive awareness of small firms and local actors regarding continuous change and the existence of dynamic competitive advantages based on localised knowledge and learning. The innovation process, which is referred to here, is localised and based on networking among local actors and on relational assets (Storper, 1999).

When the regional context is organised in a cluster fashion, the innovation process should be a “bottom-up” and social process, working according to the mechanism illustrated on the figure below.

Regional context leads to the identification of the main (and feasible) local goals through a “bottom up” process. An appropriate analysis and the ability to involve local actors giving them the opportunity to underline the specific problems for technology transfer and the possible solutions are the first steps for the identification of the goals of the innovation process. After the identification of the local goals it is possible to put in

motion a strategic planning for the innovation process (step 3 in the graph).



Strategic planning is a complex procedure mainly based on the valorisation and implementation of the networking among actors. Trust, reciprocity and effectiveness are the key words of the strategic planning for innovation. Actors networking means governance of a set of specific relationships and networks: firms networking (i.e. clients/subcontractors

and suppliers networks, usually among the most important sources for innovation introduction), institutional networking (which must facilitate the interaction mechanisms and the diffusion of complementary knowledge), the networking between production world and research world, the networking between public and private organisations.

The strategic planning is the drive for the transformation of the networking among local actors into interactive and proactive mechanisms, through learning approaches and positive reactions to new initiatives fostering internalisation of external knowledge and the diffusion of tacit knowledge. The strategic planning, at the same time, must put in motion all the instruments which can bypass the technological barriers for SMEs, using a pool of tools.

Through the simultaneous mobilisation of specific tools and the networking among actors, the strategic planning could enhance the innovation process (step 5 in the graph) which can be addressed only through different and progressive stages which could determine a virtuous and interactive mechanisms .

If this innovation process is considered appropriate, policy lessons are quite obvious. Support schemes should foster, first of all, the idea of the construction of the process and, moreover, the collaboration among different actors in pursuing collective objectives. Policy schemes must, then, facilitate the cooperation culture (avoiding destructive competition for the achievement of prefixed financial public resources) and the integration of different cultures and knowledge which, in synthesis, are at the basis of the innovation culture.

4.7 Some final considerations

In view of establishing an interactive process of innovation two main issues have to be addressed. The first concerns the organisation of strategic co-operation among small firms and local actors. Developing such capability must be the pillar of any policy aimed at fostering a new co-operation culture. The second area of action concerns the process of knowledge internalisation. To fulfil such requirement, procedures must be set up to facilitate the absorption by firms of external codified knowledge and to further develop and adapt existing tacit knowledge. In the countries and regions under study, the implementation of this task has been achieved through a process of strengthening relationships between suppliers and clients. However, alternative means to achieve this goal also include programmes which promote networking processes between any

combination of actors including local firms, external firms, research institutions, regional development agencies, services and training centres. Above all, what matters most is the creation of an interactive process, which increases the capability of each partner to organise and create new relationships, which will favour the emergence of new opportunities and knowledge. Moreover, cooperation between public and private actors must be improved in view of fostering de-bureaucratisation, but also to facilitate the development of a project culture and to introduce a systematic evaluation and possible corrections in existing schemes. Following this idea, the evaluation process of innovation programmes must include, among other parameters, also to the capability of creating interactive processes.

An important point here is to avoid the creation of schemes, which may push technological centres and research institutions to compete for existing financial support. On the contrary, the new schemes must emphasise the creation of interactive processes, which may deliver additional results and additional investments for every individual partner. In other words, the idea is to foster competition to solve problems (of firms and the local system) hoping for strong demonstrative effects, which could be reinforced through schemes aimed at diffusing best practices.

Few final comments must be added. First of all, policy instruments must be addressed to the construction of an *innovation process*. Secondly, interaction of schemes, actors and initiatives are the main ways to be followed to reach the goal of technological transfer to SMEs, stressing the role of *interactive learning and proactive* and additional *initiatives*. Thirdly, a *pool of tools* is necessary to combine innovation processes which are complex and interactive and, especially, should be different in nature in different local and regional contexts, according to their specific awareness and to the endogenous capability of innovation introduction and of the governance of the transformation process.

Our underlying theme while developing this overview of innovation policy instruments has been the importance of innovation policies based on interactive tools. Indeed, processes of continuous and interactive learning through networking at the local and regional level have become crucial means to foster the production of external economies and specific resources. Increasingly, such locally based resources have become the only meaningful basis of dynamic competitive advantages of regions in the most developed parts of Europe.

All this underlines the necessity to work with a strong interactions of initiatives and policy instruments oriented both to the improvement of the local innovation system and to the up-grading of strategic capabilities of SMEs: all this could, in fact, produce new expertise and competencies, in particular external competencies (external to the firms but internal to the local system) and internal competencies (i.e. within the SMEs). The introduction of new and more sophisticated competencies within SMEs are obviously necessary to foster the strategic behaviour of small firms. External competencies are, in any case, the crucial factor because they are at the basis of the coordination and networking process and because they are necessary to fulfil the mission of the up-grading of local system. These competencies are usually implicit in local actors able to act like a “social entrepreneur” or as the “pivot” of the local economy (Garofoli, 1991) but it is very difficult to produce them because very often no one is demanding officially the creation of these specific competencies (and effectively they are usually the product of the interactive process).

From a policy point of view, it would be necessary to concentrate on the following actions: actions that will ensure a "client focused services" perspective (i.e. where intermediate structures have the ability of transforming the tacit needs of SMEs into explicit demand); actions that will introduce new expertise into SMEs; programmes that will promote the creation and implementation of interface structures between industry and research; and finally, schemes that will gradually involve research and higher education in SME problem solving exercises.

To conclude, what is at stake here is a systemic approach to co-ordinate innovation and industrial policies, human resources and training policies, with the final aim of introducing some form of strategic local planning.

Chapter 5: Innovation patterns of SMEs

Alexander Kaufmann and Franz Tödtling

Chapter 5 of the SMEPOL-report analyses the innovation activities of SMEs and the problems they are confronted with. From these innovation patterns implications for policies aiming at supporting innovation in the SME-sector are deduced. They shall provide a fundamental guideline on which aspects SME innovation support instruments should focus in order to be effective. This and the evaluation of the investigated instruments in part III shall deliver the material for the formulation of concrete policy recommendations in the concluding part of this report.

This section concentrates on those basic findings concerning SMEs' innovation activities regarding products as well as technologies, the role of innovation in the SMEs' strategies, the innovation process, the resources dedictated to innovation, the external relations in this process, and the problems constraining innovation which are the most important starting points for support instruments. Using the results of the regional teams' investigations it will be analysed which findings are general in nature applying more or less to all types of SMEs and regions and which are specific.

5.1 The innovative performance of SMEs

In the SMEPOL-research project the term 'innovation' is used in a very broad sense. It covers any modification or improvement of products or services, any kind of change of a firm's range of products or services, and upgrading as well as adopting or developing new technologies. We do not deal with organizational innovations in this chapter. Different levels of innovativeness are determined mainly according to the perspective of novelty. If a product innovation is new only for the firm but not to the market, then this is called 'less innovative' than products or services which are new to the market. The criterion to differentiate between levels of innovativeness is, therefore, whether there are, at the time of introduction, directly competing products or services which fulfill the same functions like the firm's innovation, but which may differ in aspects like quality and price or not. Any technical improvement, redesign, or new product added to the product range which has to compete with similar products of other firms is therefore a minor innovation, those which have not are major innovations. (The frequency of product innovations in certain regions investigated in the SMEPOL-project are presented in table 1.) Another frequently used differentiation is 'incremental' versus 'radical'. These terms are difficult to operationalize, because it is hardly possible to draw a line between changes in existing products without replacing them and the introduction of products based on a new concept or performing new functions. Therefore we will not use these categories in order to classify innovation. It has to be considered that nearly all innovative activity takes place within the range defined above. Innovations which are so fundamental that they

open up new technological trajectories enabling the establishment of a whole family of applications leading to several linked markets for products and services (e.g., the personal computer) are so rare that this category (the truly "radical" innovation) is of little use as orientation for innovation support policy.

1) *SMEs are, overall, less innovative than large firms, but there is considerable variation between types of SMEs:*

Most SMEPOL-studies show that SMEs are less innovative than large firms (Upper Austria, Norway, Wallonia, Limburg). According to the results of the Upper Austrian survey this difference applies to any kind of product innovation (including modifications of already existing products) as well as the more advanced innovations (which are new to the market).

Table 1: Frequency of product innovation in % of the firms

Region	*Type of firm*	*Any kind of product innovation*	*Advanced product innovation*
Upper Austria:		(including modification)	(product new to the market)
	All SMEs	82.9	45.0
	1-9 employees	70.9	45.5
	10-49 employees	87.5	47.5
	50-249 employees	95.0	45.0
	Large firms	96.9	60.9
London:		(including modification)	(innovative compared to other firms)
	All SMEs	94.0	58.0
	1-9 employees	80.0	46.0
	10-49 employees	93.0	66.0
	50-249 employees	90.0	60.0
Denmark:		(product new for the firm)	(product new to the market)
	All SMEs	38.2	27.9
	1-9 employees	26.5	22.1
	10-49 employees	46.9	32.7
	50-249 employees	57.9	36.8
Valencia:		(including incremental improvement)	(completely new product)
	All SMEs	84.0	27.0
Lombardy:		(any innovative product)	(product new to the market)
	All SMEs	76.4	41.6
Apulia:		(any innovative product)	(product new to the market)
	All SMEs	40.7	16.7

Source: SMEPOL-surveys

The SME-sector is very heterogenous regarding innovation, however. Innovativeness ranges from firms without any innovative activity to highly dynamic high-tech companies able to introduce radical innovations. Innovativeness varies across size-classes and industries. Examples are the plastics-sector in Upper Austria which is the most innovative group of firms in the survey whereas the plastics-industry in Austria as a whole belongs to the less innovative industries. In Wallonia, too, the comparatively more innovative industries are not only the typical high-tech sectors like electronics, but chemicals and rubber/plastics. In the chemicals industry of

Wallonia biotechnology and pharmaceuticals are responsible for the good innovation performance.

In general, the service sector seems to be less innovative than the manufacturing sector. This is confirmed by the Upper Austrian, the Walloon, and the Limburg results. Contrary results can be found in the case of London. Excluding simple modifications, within London, the business sevice firms (computer, telecommunications and other business services) are more innovative than the investigated manufacturing sectors (food processing, computer and machinery equipment manufacturing, electrical and instrument engineering). In the outer metropolitan area they are almost as innovative as the engineering industries and more innovative than food processing.

As to be expected, firms applying higher levels of technology are, in general, also more active in product innovation. Nevertheless, there are exceptions where low technology and frequent innovation activity are no contradiction. Examples are industries like textiles and footwear in Valencia which are highly dependent on rapidly changing customer needs and fashions and which are therefore frequently innovative, even if they are not technologically advanced. All SMEs of these industries are in general innovative (including modifications), 70% to 86% have introduced new products. These innovations, however, are predominantly incremental, often (especially toy firms) imitative. Imitation seems to be a very important form of innovation also in the Danish stainless steel industry.

In Wallonia and Norway there is a strong positive correlation between the frequency of general product innovations and size of the SMEs. In Upper Austria, too, this correlation is positive, but weaker. In Denmark, especially the smallest firms with less than 10 employees are lagging behind.

Focusing on more advanced product innovations the positive correlation between size and innovativeness is more ambiguous. In Upper Austria there is almost no difference in the frequency of products which are new to the market between SMEs belonging to different size-classes. In other regions, however, advanced innovations are more frequent in the case of larger SMEs. In Wallonia larger firms are more active than smaller firms with regard to the introduction of products which are new to the market. In Denmark, too, there is a positive correlation between size of SMEs and products which are new to the world or national market or the industry. In London innovations which are new to the market are least frequent in very small firms (less than 10 employees).

è *Implications for policy:* This requires that support instruments must be designed in targeted, flexible, and at the same time comprehensive ways in order to meet the needs of very different SME-clients. Support needs to be targeted regarding the specific needs and the prospects of firms to use the support successfully. It implies that the support services offered have to be designed in a way adequate to the needs of different types of SMEs. In addition, it must be avoided that support tries to reach as many SMEs as possible disregarding the expectable return in terms of increased innovativeness and competitiveness. Standards/acceptable limits which supported firms have to achieve referring to innovative and competitive performance are required. On

the other hand, no SME should be excluded because of structural or sectoral features. The instruments should be open enough to reach 'high-tech' as well as 'low-tech' firms, to cover the whole range from the smallest to medium-sized firms, and to be useful both for manufacturing and service firms. Flexibility refers to the necessary adjustment of the instruments which has to be done continuously based on a routine process of evaluation. Comprehensiveness refers to the scope of support functions offered to SMEs which should cover more than technical issues and should target also innovation-related activities before and after product or process development/introduction (e.g., market and technology information, market penetration of new products).

2) *Innovation strategies of SMEs tend to have a defensive character:*

In Upper Austria the most frequent innovation strategies are specialization on niches and quality advantage. This behaviour is due to the limited scope of products and markets of SMEs. For large firms it is easier to engage in offensive strategies like entering or opening up of new markets. Nevertheless, large firms, too, primarily follow defensive innovation strategies; cost cutting is the predominant objective. Cost-cutting is not a typical innovation objective of large firms only. In the Danish stainless steel-cluster cost cutting-related reasons are predominant for SMEs to innovate. Nevertheless, new technical possibilities and the wish to extend the product range also rank high in importance. In Wallonia there is little difference in the frequency of offensive strategies between SMEs and large firms, defensive strategies are even less frequent in the case of SMEs. Similar to Upper Austria, for large firms cost aspects are more important than for SMEs.

The defensive character of SME-innovation is not an Austrian specificity. Also according to the London survey the most frequent basis of product/service innovation, except for services, is rather defensive: "innovative redesign of a traditional product". In the other regions the results are more ambiguous. In the Norwegian and the Walloon cases it was not distinguished between the goal of opening of new markets and the goal of increasing market share. Only the first objective is undoubtedly offensive. It is not clear, therefore, how many firms concentrate on raising their share in their old market, relying on quality improvements and price competition. In Norway the latter interpretation seems to be more appropriate, because more defensive strategies like improving product quality and reducing labour costs rank first and third within the group of innovative SMEs. The extension of the product range is only the fourth frequent objective of innovation. Opening of new markets and increasing market share becomes more frequent with firm size. In general, offensive strategies are more frequent in R&D-intensive SMEs, defensive in firms not engaged in R&D. In the case of Wallonia the offensive character of innovation might be more important. The diversification of the product range ranks second as innovation objective (behind opening of new markets and increasing market share).

Innovation strategies and objectives are rarely formally stated. The London survey shows that innovation is part of almost all SMEs' strategies, but more frequently in an informal rather than formal way. In Lombardy innovation is not a top competitive factor, at least formulated as an explicit strategy. In Apulia innovation is hardly seen as a competitive factor at all. Nevertheless innovation is implicitly part of the most

frequent competitive advantages like product quality and problem solving capability. This is further confirmed by the fact that by far most of the firms in both regions intend to introduce new products. For more than half of the firms in Lombardy (in contrast to Apulia) new products is even a priority task.

è *Implications for policy:* Instruments should, first, raise the capabilities of SMEs to search for innovation-relevant information and, second, offer market and technology information showing windows of opportunity to SMEs. To improve the monitoring skills in SMEs is one part of the general support strategy to raise the capacity to innovate and to exploit the realized innovations (see also the chapters 5.2 - points 4, 6 - and 5.3 - point 7). But even if firms are well trained to access and use information from a wide range of sources, it is still helpful if firms can use edited and organized information. Providers of such information services have to do this in a way that also very small and low-tech firms are able to use this information. First, it is necessary to distribute this information proactively. Most SMEs will not use information presented without active promotion. The barrier of personal energy required to get information should be kept at a minimum. Second, the information about ongoing market and technology developments and their potentials has to be usable for representatives of SMEs. Concrete examples and realistic scenarios show the realizability of certain innovation projects and how this has be done to other firms. For this purpose it is necessary to target information on certain types of SMEs (technological level, industry, position in the production process, size, and similar characteristics) to be as close to their perception of economic and technical reality as possible. If the information presented is too abstract or the realization and application seems to be too remote, SMEs will not be stimulated to engage in innovation activities on their own.

3) *Process innovation is often independent of product innovation aiming at other objectives than innovation such as cost cutting or flexibility of production:*

The introduction of process innovations and the adoption of new technologies can be independent of or related to product innovations. Particularly in the case of incremental changes or modifications of products, process innovations are often not required. If the product innovations are new for the firm or more advanced, i.e., appearing the first time on the market, then, usually, new production technologies, adopted from outside or developed by the firm itself, will be necessary. Nevertheless, process innovation can also be completely independent of any product innovation activity. Usual reasons for new technologies without changes in the product range are cost cutting, improving delivery, flexibilization, broadening/speeding up of provision and collection of information, etc.

The introduction of new technology to enable the development of new products occurs only in specific segments of the SME-sector. In Upper Austria, process innovations are generally less frequent than product innovations. However, the difference between the frequency of product and process innovation decreases with firm size. Very frequent reasons for process innovations are not linked to new products like improving of quality and productivity. Nevertheless, 30% of the innovative SMEs required new technologies for their product innovations. It is,

further, important not to neglect the differences within the group of SMEs. Most of those SMEs which are more innovative with regard to products (i.e., which have introduced products new to the market) needed new technologies too. Most technologies are adopted, firms developing technologies on their own, especially, are less frequent.

Less correlation between product/service innovation and process innovation was found in the case of London. Most process innovations aim at the expansion of production and the improvement of quality. Less frequent are new technologies which are an integral part of the production of new products or services. This latter reason was found most frequently in the business service sector, least in the engineering industries (computer and machinery equipment manufacturing, electrical and instrument engineering) which focus more on quality improvement. A gap between new technologies and product innovations is further confirmed in the special case of the Internet. The use of websites is quite widespread already, more frequent in larger SMEs and the service sector. But only a minority of these firms uses the website for marketing purposes which shows that the potential of this new ICT is not sufficiently exhausted as a means to strengthen product/service innovativeness.

Also in Italy only few firms (about 12%) invested in new machinery to be able to introduce new products. The most frequent reason to invest in machinery is the extension of production both in Lombardy and Apulia. In Lombardy the reason ‘new technology for new products’ is similarly frequent as ‘improvement of quality’ or ‘substitution of old machinery’. In Apulia other reasons are comparatively more important: increasing labour productivity, lowering production costs, and quality improvement.

No relation between process and product innovation could be found in the case of the Norwegian fish processing industry. In this industry process innovation is clearly more important than product innovation. There is little activity concerning product innovation. Process innovation in mature and low-tech sectors like fish processing means usually the adoption of existing technology, often from outside the industry. The main reason for new technologies is to improve efficiency and productivity and to increase flexibility (in order to be able to deal with rapidly changing supply of fish and demand of consumers).

Other cases where the introduction of new technologies is the dominant form of innovation are the investigated Spanish local production systems. There imitation of leading firms is the main process innovation activity. This applies in particular to small firms, larger firms are more often innovating on their own. A large part of process innovations concern the introduction of computers for data processing, automatisation, testing, and control). The specific value chain in each production system influences strongly the type of and motivation for innovation. In the ceramics-sector certain stages of the production process have been outsourced to newly established local firms specialized on the major process innovations. In textiles innovation is predominantly aiming at improving quality, increasing speed, and becoming more flexible. New technologies, however, are mainly adopted from specialized machine builders located abroad. In the manufacturing of footwear the major process innovations come from other industries (e.g., chemicals). This is

similar in the toys-sector. In general, in these sectors process innovation seems to be slightly more important than product innovation.

è *Implications for policy:* It should be avoided to support new technologies in general, because there are several reasons for process innovation. Often process innovation has a rather defensive character (especially cost cutting). If the primary objective is to support offensive, dynamic firms, then instruments should concentrate primarily on those new technologies which are necessary for product innovation, concerning quality improvements as well as completely new products. A further aspect of support is to enable firms to fully exhaust the potential of new technologies for product innovations.

5.2 The process of innovation

4) *SMEs innovate with a high resource intensity, in particular regarding human resources:*

Typically, in SMEs larger shares of financial and human resources are dedicated to innovation than in the case of large companies. This is especially true of human resources. In Upper Austria SMEs dedicate 11% of their turnover and 15.6% of their manpower to innovation on average. For large firms the mean values are 10.3% and 8.3% respectively. This is also confirmed by results for Limburg and Denmark. In the Triangle region the financial innovation intensity decreases also within the SME-sector with firm size. As far as R&D is concerned, the same tendency of higher resource intensity in smaller firms appears in Norway. The higher R&D-intensities (4% of sales and more) are more frequent in the case of SMEs with less than 50 employees. It has to be considered, however, that the activity 'R&D' (disregarding intensity) is more frequently performed in larger firms. SMEs, on the contrary, are more likely not to do any R&D at all. SMEs rely much more on manpower compared with financial/capital means than large firms in relative terms. Normally, in small firms more persons in relative terms are involved in innovation than in large firms where it is possible to organize some (not all) innovation-related functions in full-time jobs or separate departments.

According to the survey results from Upper Austria, Denmark, and Lombardy few SMEs have a share of sales based on innovative products of more than 50%. The share tends to be higher in the case of smaller firms. Many of them are young relying on one or few innovative products or services. Nevertheless, it is usually necessary to have a significant range of products which are easy to sell ("cash cows") in order to be able to spend funds on innovation activities. This is certainly a particular problem for the smallest SMEs.

è *Implications for policy:* Support instruments will have to focus especially on manpower available for innovation in order to be effective. This applies, in particular, to capabilities of innovation management (organization, time, strategy), market research, technology monitoring, and financial management

(especially risk capital funding). This is to a large extent "pre-R&D-project support" aiming at building up capacity to innovate. To improve human capital it is not only the financial aspect which support should target, e.g., (co-)funding of R&D-personnel. It will be, further, necessary to increase the availability of adequately qualified personnel. The concept 'innovation assistant' might be a model. In addition, the training and education system might have to be upgraded or extended in order to be able to "produce" a sufficient number of people with the required skills.

5) *Research is a less frequent activity in the case of SMEs than large firms:*

That SMEs are less often engaged in research is confirmed by the Upper Austrian and the Danish results. Of course, there are highly research-intensive SMEs, but in general, SMEs are confronted with serious size-specific barriers restricting the potential to do research. Lack of time of the key persons which are preoccupied with day-to-day work. Another problem is that due to the limited financial capacity of SMEs it is far more difficult for them to engage in research and development of products which are many years away from commercialization. The product range of SMEs is small and they usually cannot substitute for the the lack of sales and profits through other products (cash cows) to the same extent like large firms. Within the Danish stainless steel sector 78% of the firms have a time period for product development of not longer than 2 years. According to the London survey lower technology (food processing) SMEs and services have most often short innovation cycles (elapsed time from idea to launch). For most of them the time period is less than one year, reflecting the incremental character of their innovation activities. The higher technology industries (computer and machinery equipment manufacturing, electrical and instrument engineering) have clearly longer cycles (50% between 2 and 5 years, 15% even six or more years).

è *Implications for policy:* In order to increase the research activities in the SME-sector, it is, first, necessary to mediate and stimulate interactions with universities and research organizations. Due to the fact that many SMEs do not have adequately qualified personnel to communicate with science, it is furthermore important to support the firms' ability to employ such persons (through financial support, mobility schemes). Finally, there is a need for long-term funding of innovation projects including market introduction and penetration and funding for long-term R&D-projects. Possible ways are to provide venture (risk) capital or to mediate and support the access of SMEs to private venture capital funds or providers of risk capital. But it is not only the lack of available or accessible risk capital which poses problems to finance innovation projects, often SMEs are not ready to make use of this type of funding. Often, entrepreneurs also fear to lose independence or control of the firm. It seems to be difficult for many SMEs to engage directly in venture capital constructions. It might be a reasonable support approach, therefore, to offer the possibility of a stepwise change from direct support for innovation projects to risk capital funding. An interesting model might be the so-called "mezzanin capital" which is a loan similar to equity capital. There is no or a very low interest rate, no participation in capital expansion, but, after a certain

period of time, the loan / capital has to be substituted by a private investor. This gives the firm some time to get accustomed with private risk financing.

6) *In SMEs there are only few persons able to act as potential nodes for linking with external innovation networks:*

The low capacity of many SMEs in terms of manpower to establish and maintain interfaces to innovation networks applies both to the search for and collection of innovation-related information and the cooperation in innovation projects. In Denmark the lack of experienced employees dedicated to product development is one of the main barriers for collaboration, the other is the lack of time. Market research is very rare in Upper Austrian SMEs (17%), independent of size or technological level. In London the introduction of new sources of market information is also rare, but there is a clearer correlation with size and technological level; larger firms and higher technology SMEs are more engaged. Therefore the danger of lock-ins is greater in the case of SMEs than large firms. According to Norwegian data, for example, there is a clear correlation between the size of a firm and the number of different types of innovation partners. Larger firms can establish relations to a broader range of cooperation partners than smaller firms. In some of the studied groups of SMEs in Norway (e.g., the regionally isolated SMEs) the problem of too little time for innovation due to routine and administrative work became very clear.

è *Implications for policy:* Support instruments should try to strengthen the boundary-crossing functions, in the way of improving the capacity of the relevant people to interact with the firm's environment as well as by increasing the number of intra-firm nodes, for example by (co-)funding of innovation assistants/consultants. But it is also possible to offer indirect support in order to increase the available time for innovation of key persons. For this purpose it is necessary to ease the access to innovation-related information (see also chapter 5.1 - point 2). It must be clearly structured, regularly updated, and presented in an interesting and reasonable way, so that SMEs can easily and rapidly make use of it. Information technologies (the Internet in particular) make it possible to design such information systems. Today, this technology is still not widespread enough, but in a very short time, the largest part of the SME-sector will be able to use it. It is reasonable, therefore, to rely already today on computer network technology in designing information systems for innovation support.

5.3 External relations concerning innovation

7) *Few SMEs have innovation partners, in particular as far as other partners than customers and suppliers are concerned:*

SMEs rarely have external relations in the process of innovation, clearly less than large firms. If there are external relations, then usually within the value chain. Of course, certain types of relations to external actors like arms-length relationships do exist in the case of many firms, but they can hardly be called 'interactive'.

Cooperative innovation projects, characterized by intensive collaboration and information exchange according to shared objectives, are very rare. It is a particularly serious deficit that the interaction with knowledge providers, both from science and technology, is very limited. Information and knowledge tends to be restricted to the well-known market leading to dependency either on strong business partners (usually dominant customers) or small markets for specialized products or services without being able to substitute if this market crumbles. Table 2 presents a brief, sketchy overview of the SMEs' external relations in their process of innovation for each of the study regions.

That small firms are less willing to cooperate than large firms is confirmed by most regional studies. It is a widespread problem that SMEs are not willing or able to cooperate in their innovation process. In Upper Austria large firms are particularly more often engaged in innovation cooperations outside the region, in Austria as well as abroad, and with partners from science and technology. Also in Wallonia and Norway SMEs are less interacting with external innovation partners than large firms. In Norway cooperations are least in firms with less than 50 employees. The Italian investigation gives some evidence that willingness and ability to cooperate correlate to some extent with the state of economic development. In general, external relations in the process of innovation are far more frequent in Lombardy than in Apulia. Firms of the latter Italian region are hardly willing or able to interact with their environment. This strong inward orientation applies more or less to all types of potential innovation partners except for suppliers.

The predominant role of customers and suppliers over knowledge providers like universities and intermediaries like technology centres can be found in most regional studies. In Upper Austria, Limburg, Denmark, Norway, and Lombardy SMEs are hardly cooperating with universities, research organizations, and consultants. In particular the Danish stainless steel-cluster seems to be extremely customer-oriented. The Norwegian study shows that partners from science are more often used by large firms and R&D-intensive firms. Lower-technology and mature industries like boat building and fish processing have almost no relations to science. There, collaboration concentrates on the local production system, but there are also barriers for innovation partnerships especially between yards and suppliers. In Lombardy suppliers are the most important sources of information about new technologies surpassing customers.

The technological level of a firm is very often the decisive characteristic distinguishing between different levels of willingness or ability to cooperate. This applies primarily to scientific partners, but to some extent also to business partners. In Upper Austria the most active SMEs regarding innovation cooperation are higher-technology and more innovative firms (mainly in electronics). Nevertheless, the general level of cooperation activity in these cases is still low. In Norway firms performing R&D are more willing or able to cooperate. This is also confirmed by the London study. It was found that SMEs of higher technology industries (computer and machinery equipment manufacturing, electrical and instrument engineering) tend to use external advice and consultancy for product/service innovation more often than food processing and business services. In Valencia universities are, in general, of little importance. But the ceramics sector uses frequently universities and public research institutes to collect innovation-related information.

Exceptions concerning the negligible role of innovation partners outside the value chain are consultants in London and technology centres in Valencia. The London case is especially remarkable, where private sector consultants belong to the most important innovation partners. They are significantly more often used than the support scheme “Business Link”, suppliers, and higher education institutions. The dominant role of clients is confirmed by the Valencia study too, nevertheless technological institutes are remarkably important, surpassing suppliers in stimulating innovation and only slightly less important than suppliers as sources of information. The case of Lombardy shows that it is particularly the smallest size class (not more than 20 employees) which needs services from technology centres most.

Table 2: Typical patterns of external relations in the innovation process of SMEs

External relations to	*Importance for SMEs in D e n m a r k*
Customers/suppliers in the region:	This was the most important type of interaction for most SMEs. Regional suppliers were also shown to be of relevance for large firms.
Customers/suppliers outside the region:	Within the relatively small territory of the Triangle Region, more than 20 per cent of new customers were located in that area. It indicates a widespread cluster of interrelated SME suppliers linked to a few corporate players. Further, when looking at both the Triangle Region and the rest of Denmark, in terms of 'new market' and 'new type of customer', the latter category was always significantly more important. Conversely, new markets are much more likely to be developed outside of the region.
Technology centres in the region:	In general, of some importance for firms.
Consultants/services:	In general, of little importance for firms.
Universities/research org. in the region:	In general, of little importance for firms.
Universities/research org. outside the region:	As far as the food processing industry is concerned, the level of co-specialised research and research-based education was relatively low. There was a very slight preference to collaborate with foreign enterprises and institutes, rather than those available in Denmark.
Regional public support institutions:	Generally not very important.
National public support institutions:	Approximately one-third of the responding firms made use of these institutions.

External relations to	*Importance for SMEs in L i m b u r g*
Customers/suppliers in the region:	The most important type of interaction for most SMEs. Regional suppliers, but not regional customers, are also relevant for large firms.
Customers/suppliers outside the region:	The most important type of interaction for large firms, less frequent in the case of SMEs, especially outside the neighbouring regions. For certain firms, however, one or two international partners may be very important. More innovative SMEs are also more often engaged in innovation partnerships with customers and suppliers and at a larger geographical scale.
Technology centres in the region:	They have few relations to SMEs, slightly more to large firms. SMEs that use them are more innovative (in terms of resources and output) than the ones that do not.
Consultants/services:	Far less important for SMEs than customers or suppliers. More frequently used than universities/research organizations and technology centres.
Universities/research org. in the region:	Of very little importance for firms in general, especially manufacturing firms. Nevertheless, there are some relations between SMEs and R&D units of large firms, not only via buyer-supplier-relations (e.g., KIC), but also where R&D units do research for third parties (e.g., DSM and the Research-voucher project).
Universities/research org. outside the region:	More important than regional science organizations, but primarily for large firms. Especially in the North of Limburg SMEs have relations with universities in neighbouring regions which have technical faculties like Eindhoven. For example in the form of trainee-aggreements. International relations are rare. If there are such relations, then only with universities located in the close neighbourhood, in Flanders, Wallonia (Liege) and Germany (Aachen).
Regional public support institutions:	In terms of frequency they are not very important. There is no difference between technology centres and innovation support institutions in this respect.
National public support institutions:	Not very frequently used, more by large firms than SMEs and more by innovative firms than less-innovative firms. Regional institutions are predominant in Limburg in delivering (European, national and regional-specific) innovation support to SMEs. Large and more innovative firms operate in a national and European system of innovation and innovation support.

Table 2 cont.

External relations to	*Importance for SMEs in Lombardy and Apulia*
Customers/suppliers in the region:	Customers and suppliers in general are an important source of information for SMEs' innovations. Suppliers are mostly located in the regional area in Lombardy and in Apulia as well. Proper forms of cooperation among firms for innovation purposes are rare in both case studies.
Customers/suppliers outside the region:	Suppliers outside the region are less important than those located within the region.
Technology centres in the region:	In both study regions over half of the investigated firms have taken contact with regional technology centres.
Consultants/services:	As far as the development of new products is concerned, SMEs ask for external assistance quite frequently in Lombardy. They are very important, especially in Apulia, in giving assistance to firms applying for innovation support.
Universities/research org. in the region:	The university is, in general, not a usual partner of SMEs. In the case of Lombardy, SMEs contact mainly departments and organisations located in the regional area.
Universities/research org. outside the region:	In Lombardy universities/research organizations located there are more important than those outside the region.
Regional public support institutions:	The contacts with public institutions are in general on a bureaucratic basis. At regional level CESTEC, which is specifically constituted for supporting SMEs in Lombardy, is evaluating the eligibility of the applications to regional innovation support laws. Little space is given to the development of innovation projects.
National public support institutions:	Not relevant.

External relations to	*Importance for SMEs in London*
Customers/suppliers in the region:	The majority of SMEs are supplying regional markets, especially in food and business services. Suppliers are less likely to be regional.
Customers/suppliers outside the region:	Larger SMEs are more likely to be involved in national/international markets, particularly firms in engineering.
Technology centres in the region:	There are no regional technology centre as such, but those technology support centres that exist are little used (according to the control group survey).
Consultants/services:	Most important source of external assistance, particularly in engineering sectors. The majority of firms meet their needs via the market, particularly with respect to technical support.
Universities/research org. in the region:	Little used overall. Those few firms that do use them are mainly high-tech. HEIs used are not necessarily within the region.
Universities/research org. outside the region:	Some use of universities and HEIs by a small minority of firms in high technology sectors.
Regional public support institutions:	There have been a number of EU supported projects in the ELLV Ob. 2 area, including a BIC that is contributing to innovative new venture creation. It is difficult to assess the overall impact, but some of these projects have found it difficult to stimulate interest from SMEs.
National public support institutions:	Business Link (BL) is quite well-known and more frequently used than other public sector providers. BL is a national initiative organised on a sub-regional basis and provides an integrated approach to business support.

Table 2 cont.

External relations to	*Importance for SMEs in N o r w a y* *a) Non R&D intensive and regionally isolated SMEs in Southern Norway,* *b) SMEs in the fish processing industry in Northern Norway*
Customers/suppliers in the region:	a) Regional customers are important for some SMEs serving the local market. However, the local market is generally not very demanding. Regional suppliers are of almost no importance. b) Of very little importance, as customers and suppliers are mainly national and international.
Customers/suppliers outside the region:	a) Demanding national/international customers are important for some local subcontractors. However, lack of systematic feedback from customers is a weak part of the innovation process in SMEs serving the final market. Contact with national/international equipment suppliers are important for process innovations in firms. Some component suppliers are also important. b) Customers are the most important sources of information for the fish processing industry. Suppliers of equipment and materials are important for process innovations.
Technology centres in the region:	a) Of no importance for SMEs. b) There are no regional technology centres which are relevant for the fish processing industry.
Consultants/services:	a) Of generally less importance than customers and suppliers, but more frequent collaborators than universities and research institutions. b) Of very little importance, even less than research institutions.
Universities/research org. in the region:	a) Very few SMEs have contact with regional research institutions. The few examples are initiated by the research institutions and triggered by policy instruments (like RUSH). b) Of some importance, as Northern Norway has a university and research organisations specialised in the fishing industry. However, few firms see these organisations as important sources of innovation.
Universities/research org. outside the region:	a) Of almost no importance, because only few SMEs of this kind use R&D based knowledge in their innovation process. b) Of little importance. However, the regional institutions (see above) are actually national organisations located in Northern Norway.
Regional public support institutions:	a) Very important for co-financing innovation projects in firms. b) Very important as a financier of innovation projects.
National public support institutions:	a) Of little importance. Although the money to support innovation projects in firms comes from national funds, they are delivered by regional organisations. b) Of some importance through branch specific research programmes.

Table 2 cont.

External relations to	*Importance for SMEs in N o r w a y* *- More tech. advanced SMEs in reg. clusters in Southern Norway*
Customers/suppliers in the region:	Formal and informal contact with local customers and users has historically been highly important, especially for incremental innovations and in some clusters. It is still of some importance. Regional suppliers are important in some clusters. Their importance is increasing, as more long term and binding co-operation, also including some innovation activity, between customers and suppliers evolves.
Customers/suppliers outside the region:	Large, mainly national customers often act as early and demanding customers, and are very important for innovation activities. Some specialised suppliers are found outside the regional cluster.
Technology centres in the region:	Of nearly no importance, except in one cluster - the technology centre TESA at Jæren - where it has been historically of great importance for process innovations.
Consultants/services:	In some cases specialised consultants are highly important as designers in the ship industry.
Universities/research org. in the region:	Generally of little importance, as they cannot fulfil the requirements in technology based SMEs which need very specialised competence.
Universities/research org. outside the region:	Of large importance in many technology based SMEs. Their importance is still increasing, as firms upgrade their innovation activities using more R&D based competence.
Regional public support institutions:	Also highly important in technology based SMEs.
National public support institutions:	Especially important for technology based SMEs, as these enter R&D-projects co-financed by the Norwegian Research Council.

External relations to	*Importance for SMEs in U p p e r A u s t r i a*
Customers/suppliers in the region:	The most important type of interaction for most SMEs. Regional suppliers are also relevant for large firms.
Customers/suppliers outside the region:	The most important type of interaction for large firms. It is less frequent in the case of SMEs, in particular with partners outside Austria. SMEs which are more innovative (having introduced products new to the market or newly developed technologies) are also more often engaged in innovation partnerships with customers and suppliers.
Technology centres in the region:	Centres have very few relations to SMEs, slightly more to large firms. Especially SMEs larger than microfirms (at least 10 employees) and belonging to traditional industries (wood/furniture, metal products) do not use their services.
Consultants/services:	Less important for SMEs than customers or suppliers, but still more frequent than universities/research organizations and technology centres.
Universities/research org. in the region:	Of little importance for firms in general.
Universities/research org. outside the region:	More important than regional science organizations, but primarily for large firms. Within the SME-sector the most active users of science partners are firms in electronics and (advanced) plastic products, firms which have developed new technologies on their own, and firms where innovative products account for an above the average share in sales.
Regional public support institutions:	In general, not very important.
National public support institutions:	Frequently used, more by large firms than SMEs. The importance for the SME-sector varies between certain industries (most important for metal, services). The national is the predominant level of Austria's innovation support system.

Table 2 cont.

External relations to	*Importance for SMEs in V a l e n c i a*
Customers/suppliers in the region:	For the final producers of the studied sectors, the most important interaction partners are suppliers within the area. For the subcontractors of these sectors, the most important partners are the customers within the area. In both cases the frequency of interacting firms is very high (90%).
Customers/suppliers outside the region:	Less important than regional customers and suppliers. But still 40% of SMEs have contacts with national and international suppliers and customers.
Technology centres in the region:	They are very important partners in the innovation process. 60% of SMEs have contacts with the investigated Technological Institutes.
Consultants/services:	Less important than technology centres. Only 26% of the SMEs indicated relations to them.
Universities/research org. in the region:	In general, very little importance for the firms.
Universities/research org. outside the region:	In general, very little importance for the firms.
Regional public support institutions:	The most important level of public support is regional. It is important for 40% of the SMEs (IMPIVA organization).
National public support institutions:	Less important than the regional institutions (only 30% of SMEs).

External relations to	*Importance for SMEs in W a l l o n i a*
Customers/suppliers in the region:	Very important type of interaction for the smaller independent SMEs. The average Walloon SME finds innovative ideas either within the firm or through market contacts (most often clients and customers).
Customers/suppliers outside the region:	The most important partner for a large number of SMEs with international markets (the rate of openness of firms in very high in Wallonia according to European standards). The category of “intra-group” relationships, i.e. relationships with clients or customer firms that belong to the same multinational firm, is also very relevant for a large group of foreign-owned SMEs, and for larger firms.
Technology centres in the region:	Few relations to SMEs, slightly more to large firms.
Consultants/services:	Private consultants have a very limited role as innovation partners for Walloon SMEs. Larger firms use them more, but the nature of the services bought is not clear.
Universities/research org. in the region:	Not distinguished, see next category.
Universities/research org. outside the region:	Universities are co-operation partners for 20% of the independent SMEs. This share is higher for SMEs which are beneficiaries of public support, showing the orientation of policies towards the linkage between research and industry. Large firms are well linked with universities, but the CIS2 inquiry does not clarify whether these links are with national or international universities. Qualitative results from the SMEPOL inquiry show that relationships with EU universities are quite frequent, as the main reasons for co-operating rest on excellence rather than proximity. The nature of co-operation varies according to the degree of maturity of the technology used in the firms: testing and procedures relating to norms and standards are more frequent forms of collaboration than joint research.
Regional public support institutions:	Regional support is relevant only for larger firms, not for SMEs.
National public support institutions:	This type of partner is not relevant any more in the federal context of Belgium, where regions have autonomy of power in the areas related to innovation support.

The study on external relations of SMEs in Limburg shows that business and professional associations, regional as well as national, can be important mediators to find innovation partners from the firm-sector in addition to the own buyer-supplier relations. In the case of Limburg these are mostly informal associations, like a kind of Rotary for regional or local entrepreneurs (cross-sector). SMEs can also find partners (and respective information and services) from the same sector at national professional associations, like the Dutch association for furniture manufacturers. In Wallonia the professional associations are especially relevant in the traditional sectors (such as steel fabrications). There they are well known to firms and can play a stimulating role in some cases. They also act as deliverers of policy instruments at occasions. Nevertheless, the real co-operation goes through the collective research centres, to which these associations are usually closely linked.

A further deficit in using external innovation partners is the low level of interactivity especially with business partners. Often these external relations in the innovation process cannot be qualified as 'interactive'. For example, relations to clients and customers seem to be rather important in Wallonia, but obviously more as sources of innovation-related information than as closely interacting cooperation partners. Especially SMEs are hardly cooperating in their innovation activities. If there are cooperations then most frequently with universities, more than with customers, suppliers, and consultants. Nevertheless, these cases are very rare. There seems to be little variance between types of Walloon SMEs in this respect. As far as interactions with universities are concerned, it has to be considered, however, that lower technology firms have more service-type relations with science like testing, real cooperations like joint research projects can only be found in some cases of higher technology firms.

è *Implications for policy:* There is an obvious need to support the capacity or ability to cooperate. For this purpose three requirements have to be fulfilled: First, there have to be sufficient and adequate knowledge providing functions in the region or the country. Such functions are lacking especially below the level of science ("low technology") and beyond technology (i.e., management, finance). Second, interaction with existing potential providers of inputs to the innovation activities of SMEs have to be mediated and stimulated. Networking with all kinds of partners (business, science, technology transfer, etc.) within the region is very important for SMEs to overcome the limits in scale and scope of their innovation capacity. Third, due to the fact that many SMEs are not aware of the advantages of cooperation or are unwilling to cooperate, the value of innovation cooperations has to be demonstrated, e.g., through information dissemination of successful cooperation projects. It is also necessary to raise awareness of the deficits resulting from a lack of interaction. This needs proactive consultancy.

8) *SMEs are more region-centred than large firms:*

In Upper Austria and Limburg the primary spatial orientation of SMEs is the region. But there is not only a difference between SMEs and large firms in this respect, also within the SME-sector the region becomes less important with growing firm size (Upper Austria, London, Lombardy). A too dominant focus on the region limits the scope of available technical information, technologies, and accessible markets. In Upper Austria this seems to be more pronounced in the case of traditional industries and the service sector. Of course, there are differences between SMEs, some involved in local production systems (e.g., the Norwegian boat industry, footwear firms in Valencia, the stainless steel sector in Denmark) and others regionally isolated interacting on the national, sometimes even international levels. In London, for example, computer and machinery equipment manufacturing, electrical and instrument engineering are less dependent on regional markets than food processing and business services.

This raises the problem of a lack of adequate partners to cooperate with in the innovation process due to the limited scope of the region. This is usually one of the most frequent reasons of SMEs not to cooperate. In Upper Austria it ranks second only to “no need”. But it can also be the other way round. In Limburg SMEs often lack the qualification as system suppliers for the metal and electrical industry and, therefore, cannot become innovation partners.

The general correlation between extraregional markets and firm size should not conceal the existence of highly specialized engineering firms which are often small as well as export-oriented (e.g., London). The problems they are facing concerning their export activities are especially serious for such firms because of the limited internal resource base.

In Italy there is - due to a pronounced core-periphery structure - a big difference in the importance of the region as a source of technical know-how for innovating firms. In Lombardy 61% of firms indicated adequate sources in the local area, in Apulia the share is only 13%. In Lombardy 39% of firms perceived themselves being a part of a local innovation system, in Apulia only 6%.

è *Implications for policy:* Support instruments which focus on the mediation of market and technology information have also to engage in making extra-regional information accessible to SMEs. Regional networks are a necessary, but not sufficient condition for stimulating innovation. To restrict the concentration on the regional information and interaction space cuts the SMEs off a wide range of potential sources of information and innovation partners. It is especially important for peripheral and institutionally “thin” regions to maintain or establish links beyond the region. Technology centres might perform the central role as an information gatekeeper channelling communication with extra-regional sources of information. They are easily accessible for local SMEs and can therefore act as the primary mediator between the regional SME-sector and a wide range of knowledge providers and potential innovation partners, business as well as science and technology, outside the region. This function, however, can be performed only if the centres have enough adequately skilled professional staff.

9) *Differences in the regional institutional settings lead to different preferable entry points for SME support:*

Examples are the extraordinary roles of technology centres in Valencia and private sector consultants/services in London. Important functions to support innovation might be missing in the overall institutional setting of a region. In some cases there is already an institutional framework established which makes it easier to add a missing function. In Upper Austria, for example, this applies to technology transfer and consultancy which is hardly performed by technology centres and a rather small university. In other cases there is not even an adequately developed institutional basis. This seems to apply, for example, to external innovation-related services in Apulia.

è *Implications for policy:* In reorganizing the innovation support infrastructure the focus should be on the already existing elements of a support system. There are no standard blueprint solutions which are adequate to any region. This means that, first, weaknesses in the institutional setting have to be removed, if they are important and not taken over by other institutions. Only in the case that certain institutions are missing at all or cannot be improved at reasonable expense new institutions have to be established. Therefore the first step would be for the support organizations to become more proactive. In the case of incubation-focused technology centres this often concerns the neglect of relations to external SMEs. In the case of direct support a frequent problem is the closed clientele. Elements are existing, but their reach has to be extended. If this is not sufficient, then the missing functions have to be added to existing institutions, broadening their range of support activities. The establishment of new institutions should be the last step, however, in order to avoid the proliferation of institutions. Any new functions or institutions have to be integrated in a coherent and complementary support system which requires continuous monitoring of the effects of the support instruments (see also chapter 5.5) and, if necessary, adequate adjustments. In this context, it is necessary not to concentrate on public support activities only. Attention must be paid also to the complementarity of public and private providers of support. Public support should not compete with private services, but concentrate on areas of market failure. Nevertheless, public activities will remain to be important, because many services are not profitable and private consultants focus on the most profitable services. As a frequent consequence, more latent deficits and long term structural weaknesses remain untouched.

5.4 Problems constraining innovation

The problems constraining or preventing innovation are very diverse depending on region and type of SME. Nevertheless, some results apply to most SMEs in general (see table 3). The analysis of barriers to innovation is further complicated by the fact that firms may be unable to consider all their problems. Some may be recognized,

some might even be overassessed, while others are underassessed, and some might be overlooked at all.

Problem patterns of lower-technology firms are usually different from higher-technology firms and, in general, more serious. According to the Walloon results, technological barriers are more serious in lower-technology, traditional sectors. In Norway lower tech-firms like boat builders have technological deficits because they rely on practical experience sufficient for incremental (often imitative) change but insufficient for more advanced innovations. The required technical know-how is certainly below research level and often adaptive in character (technologies available elsewhere adjusted to context of boat-building).

It is important not to neglect other types of problems than technical or financial which are constraining innovation. Often firms do not sufficiently recognize them. It is especially the value of cooperation for innovativeness which is underassessed by many SMEs. In Upper Austria the most frequent reason of SMEs not to interact is "no need". In addition, market research activities are rarely performed. In Apulia some firms indicated problems like a lack of market information, difficulties to cooperate with research centres, a lack of external services, and the geographical or cultural distance from sources of innovations as seriously constraining their innovation activities. Not surprisingly, in Apulia, the less innovative Italian region, more firms indicated barriers than in the more innovative region, Lombardy. But even here, the majority of firms did not consider market access or information as a relevant problem category.

Of central importance are strategic deficits and organizational weaknesses of SMEs. A frequent strategy deficit in the case of SMEs is the narrow customer focus making their innovation process dependent on their clients (Upper Austria, technologically advanced firms in Norway, Limburg, Denmark). But there are also cases where firms lack feedback from their clients (low-tech, non R&D-intensive firms in mature industries in Norway). In some regions this is reinforced by the neglect of systematic search activities concerning new market opportunities (Upper Austria, Limburg, Wallonia). In other regions, however, the willingness to enter new markets was more widespread (London). The problem 'time' is usually better recognized. The problem of daily work-overload of very few persons or even a single person in SMEs impeding or delaying innovation projects was frequently indicated in the investigations doen in Upper Austria, Norway, Limburg, Wallonia, and Denmark, less in the case of London. The potential (likely) connection to organizational weaknesses seems to be less often recognized.

Table 3: Types of problems constraining innovation in SMEs

Problem categories	*Relevance for and awareness in SMEs in D e n m a r k*
Finance/risk:	Costs in terms of employee time, investment in new equipment, and monetary input, were cited as problems of some importance, more for product innovation than for process innovation. The financing of development costs was also cited as an influencing factor, again, having more impact on the product side.
Personnel/ qualification:	The most problematic external barrier was found to be a lack of qualified staff, especially in the fields of electronic engineering, software computing and, more generally, qualifications in electronics. There were less problems in the low-tech stainless steel sector. When examining *recruitment* of qualified personnel, firms have

	some problems. The problem is marginally worse on the process innovation side.
Technology/ technical know-how:	In line with recruitment problems, firms can lack the necessary know-how, especially in the case of product innovation.
Market access/ information:	Some firms found that lack of knowledge of the market (product development) or technology (process development) was a barrier. The problem was more serious in the case of product development.
Time/organization:	Time was cited as the second strongest barrier for product innovation and the third for process innovation.
Strategy:	As part of the overall strategy, there is an implicit preference to form relationships with customers as opposed to suppliers, even though firms feel that there is a lack of suitable customers to collaborate with. Internal barriers play a strategic role when it comes to the pattern of innovation - and the innovation of new products is largely driven by the need to "keep customers". Subsidy schemes and new regulations play virtually no role in influencing strategic behaviour. Investment in competence building in 'management' is very low, lower than in other areas of business administration. It is a paradox then, that 'management'-contributions are perceived by firms to be very important for both product development and process development.

Problem categories	*Relevance for and awareness in SMEs in Limburg*
Finance/risk:	This is an obvious and often mentioned barrier, but it is not the most important one. Mainly non-innovating firms mention finance as a barrier or an excuse not to engage in innovation. Firms which are aware of the importance of innovation and which are engaged in it do not regard finance as the main barrier they had to overcome.
Personnel/ qualification:	More important to smaller and less innovative firms and in specific technological fields. Shortages on the labour market have recently become a major problem, not only for innovation and not only for small firms.
Technology/ technical know-how:	Inavailable (missing or too expensive) technology is a relevant problem.
Market access/ information:	This is a frequent problem for SMEs, especially regarding customer and supplier dependency. Firms mainly have a reactive and only scarcely a proactive attitude towards in- and output markets.
Time/organization:	The time problem is widely recognized, especially by the SMEs that do not innovate. Organizational deficits, on the contrary, are less often considered (ex ante). The innovating firms are aware of the organizational and management deficits.
Strategy:	There is little persistence and commitment to enter new markets and to diversify. Introverted innovation activities, little search for information beyond the value chain, and general reluctance to use external advice and risk capital are major strategic weaknesses.

Table 3 cont.

Problem categories	*Relevance for and awareness in SMEs in Lombardy, Apulia*
Finance/risk:	The lack of finance is a frequently indicated problem, especially by smaller SMEs (<20 employees). The high costs related to the development of innovative projects are a great concern for SMEs. This obstacle is more crucial in the case of Apulia than in the case of Lombardy since a much higher percentage of the investigated firms in Lombardy would have made the investments for the innovative project also without support.
Personnel/ qualification:	The lack of qualified personnel is perceived as an important obstacle to innovation in SMEs. Often insufficient steps are taken to face this problem in the firm's strategy.
Technology/ technical know-how:	It is not considered as an obstacle by most of the investigated firms. The production is often highly specialised, so the process of learning by doing plays a dominant role in determining the firm's success. Experience, however, is not sufficient, when new technologies are introduced.
Market access/ information:	It is not recognised as a problem by the large majority of the investigated SMEs.

Time/organization:	Many investigated SMEs face organisational problems taking steps for introducing quality certification.
Strategy:	In many firms there is a lack of awareness of the strategic role of the innovation activities they are carrying out.

Problem categories	*Relevance for and awareness in SMEs in L o n d o n*
Finance/risk:	Finance is the most commonly identified barrier (49% of firms with respect to product innovation), although most firms do not actively seek external finance.
Personnel/ qualification:	Shortages of skilled labour was identified by 10% of firms as a barrier to new product innovation and to process innovation. This applies particularly to engineering firms.
Technology/ technical know-how:	The majority of firms recognised the need to raise the firm's level of technology and technology competence. This applies particularly to the engineering sector.
Market access/ information:	This was not explicitly identified as a problem by our control group survey. Two thirds of surveyed firms had introduced some new marketing methods during 1993-98. 67% of control group firms had developed new markets of some type during 1993-98. However, our surveys of SMART winners and LVBIC clients confirm that the cost of marketing is a significant barrier for innovative small firms, particularly new firms.
Time/organization:	The time problem was highlighted by a minority of respondents (20% in the case of process innovation). Organisational issues were not explicitly identified in our study.
Strategy:	There is an apparently high propensity to enter new markets: 67% of control group firms had developed new markets of some type during 1993-98.

Table 3 cont.

Problem categories	*Relevance for and awareness in SMEs in N o r w a y* *a) Non R&D intensive and regionally isolated SMEs in Southern Norway,* *b) SMEs in the fish processing industry in Northern Norway*
Finance/risk:	a) This problem was indicated by several firms, in particular concerning capital to be invested in long-term projects which do not promise rapid return. b) Excessive perceived economic risks are seen as important factors hampering innovation by fish processing firms.
Personnel/ qualification:	a) Recruitment of qualified personnel to carry out innovation project is an important bottleneck for a majority of firms. Firms are aware of this problem. b) There are serious problems in recruiting (stable labour relationships), also caused by the out-migration from fishing communities and unstable working conditions in periods of recourse shortage. There is awareness of this problem in the firms.
Technology/ technical know-how:	a) Firms often have good experience-based know-how, but may lack formal know-how, necessary for more systematic innovation activity. Firms may not be fully aware of this constraint as they often only rely on step-by-step improvements. b) Lack of technical information is indicated by firms as restricting innovation, connected to a low formal competence in the workforce.
Market access/ information:	a) There is a lack of systematic feedback from the market in several firms. b) Firms often lack feedback from the final market, as they generally produce 'half-finished' products.
Time/organization:	a) How to free up personnel in the firm and make them available for innovation activity is an important constraining factor for several firms that firms seem to be aware of. b) Organisational rigidities are mentioned as the most important factor restricting the innovation process, i.e. too little flexibility to meet changes in the resource situation and the market.
Strategy:	a) In some cases entrepreneurs do not want their firm to grow to much in scale and employment which also restricts innovation activity. b) Maybe too much emphasis on process innovation and cutting costs and too little on product innovation and market research. There is a lack of co-operation with other local fish processing firms and the regional R&D-milieu.

Problem categories	*Relevance for and awareness in SMEs in N o r w a y* *- More tech. advanced SMEs in reg. clusters in Southern Norway*
Finance/risk:	This seems to be less of a problem in technology based SMEs, because they often have easier access to external funding.
Personnel/ qualification:	Problems in recruiting highly qualified and experienced workers were frequently indicated by firms. However, location in a regional cluster may facilitate the recruitment.
Technology/ technical know-how:	Generally the firms have adequate internal technological know-how. However, they indicate a lack of relevant competence in regional R&D institutions and a fear of stagnation in some national R&D-institutions as problems, i.e. a lack of potential collaborators in technological innovation projects.
Market access/ information:	Technology based firms have generally close co-operations with some large and demanding customers.
Time/organization:	Firms frequently indicate little time left for long term work on innovation projects during busy periods, as key personnel is busy carrying out the daily work.
Strategy:	In general, innovation forms an important part of the firms' strategies. The lack of close co-operation with local suppliers and other firms may hamper innovation activity.

Table 3 cont.

Problem categories	*Relevance for and awareness in SMEs in Upper Austria*
Finance/risk:	This problem was frequently indicated , especially by the smallest SMEs (<10 employees), producer services, and capital-intensive manufacturing like machinery. Firms are fully aware of this problem, sometimes even overassess it regarding available sources of funds.
Personnel/ qualification:	More important in higher-technology sectors, producer services, and less innovative firms (no innovations which are new to the market).
Technology/ technical know-how:	Inavailable technology (missing or too expensive) in some industries is a relevant problem, but frequently of low importance. Even less important are deficits in technical know-how except for higher-technology sectors. Within the firms' traditional markets, deficits seem to be recognized, but know-how required to enter into developments beyond the traditional market is rarely considered.
Market access/ information:	Deficits in this respect are often underassessed by SMEs, especially regarding customer dependency which is most serious in the case of the more innovative firms. Deficits in marketing are more frequently recognized, but here this is more serious in the case of the less innovative firms.
Time/organization:	Time problem is widely recognized. Organizational deficits, on the contrary, are less often considered.
Strategy:	There is little willingness to enter new markets and to diversify. In many firms introverted innovation activities, little search for information beyond the value chain, and general reluctance to use external advice and risk capital are strategic weaknesses.

Problem categories	*Relevance for and awareness in SMEs in Valencia*
Finance/risk:	This is a widespread problem. 50% of the investigated SMEs mentioned it.
Personnel/ qualification:	This is also a relevant problem, but less important. 28% of the SMEs mentioned it. It was more frequently mentioned by the more innovative SMEs of the ceramic sector.
Technology/ technical know-how:	In general, tjis is not a frequent problem (13% of SMEs mentioned it). It is more important in the case of the more innovative SMEs
Market access/ information:	This problem is of negligible importance (9% of SMEs mentioned it), but it might be that few firms are aware of this deficit. It was more frequently mentioned by the more innovative SMEs.
Time/organization:	Not mentioned by the firms.
Strategy:	Not mentioned by the firms.

Table 3 cont.

Problem categories	*Relevance for and awareness in SMEs in W a l l o n i a*
Finance/risk:	The majority of innovative SMEs report a lack of appropriate sources of funding as a major barrier to innovation, followed closely by the problem of high costs to innovation and by the excessive economic risk perceived to innovate. Financial barriers are also the main barriers for larger firms, but they seem to hinder the innovation process less frequently.
Personnel/ qualification:	Lack of qualified staff is an important barrier to innovation for more than one-third of SMEs. According to the interviews, this problem seems to concern more the shortage of middle-level technicians than of higher qualifications.
Technology/ technical know-how:	Lack of technological information is constraining innovation only in a few cases. It is not a main barrier, certainly not for larger firms. Newly innovating SMEs of traditional sectors express the need to access research equipment for small scale experiments.
Market access/ information:	Market information is not proposed as an important barrier for innovation in surveys. SMEPOL interviews have shown, however, that SMEs often envisage innovation from the point of view of improving processes or the use of new technology, but are not so well equipped to analyse market trends and opportunities.
Time/organization:	Interestingly (and, perhaps, not unexpectedly), in the CIS2 survey, organisational rigidity is reported twice more frequently for larger firms than for smaller ones as a barrier for innovation. Actually, it is one of the main barriers for larger firms. Is it the expression of a more acute problem in larger firms or the reflection of their enhanced understanding of the problem? The 'time' constraint mentioned by many SMEs in interviews can be interpreted as a reflection of weaknesses in strategic thinking.
Strategy:	The SMEPOL inquiry showed that one explanation for the lack of innovation dynamics is the difficulty for SMEs, and especially micro-firms, to manage growth necessary for innovation. Combining product and process innovation and company development seems to be a major difficulty for Walloon SMEs.

Small firms have typically serious growth-related problems restricting the potential to realize innovations. In London, for example, the financial problems and the need for external consultancy are strongest in the case of small firms between 10 and 49 employees and in the higher technology sector (computer and machinery equipment manufacturing, electrical and instrument engineering). Especially the size class 10 to 49 contains many firms intending to grow beyond the owner-centred management organization which is a very difficult phase for firms confronting them with serious organizational and financial problems of growth.

Referring to the problem of awareness, it is not only a certain kind of problem which might be neglected by a firm. In many cases SMEs are not aware of possible or available solutions to problems. This can be due to a lock-in situation or the lack of capacity of key persons to deal with all relevant information. The example of London shows that even in the case (risk) capital is offered, SMEs often resist to use it because of the following reasons:

- not convinced to get funding
- too expensive (interest rates)
- minimize exposure to debt
- fear to lose control (venture capital)

è *Implications for policy:* It can be seen that it is not enough to rely on those problems which the firms are aware of in order to target innovation support

adequately, but that it is often necessary to first raise awareness of potential deficits not yet sufficiently recognized by many SMEs. It is often the insufficient strategic orientation of a firm which leads to neglecting certain aspects of innovation and the related potential deficits. Strategic weaknesses should become a relevant target of innovation support. This does not apply only to the actual process of innovation, but also to the exploitation and commercialization of innovations. On the other hand, it should be avoided that problems are "oversupported", i.e., more resources are dedicated to solve a certain problem than are actually needed by the firms. This applies particularly to financial support, if it reaches primarily already innovative firms. As a consequence, support has to aim at raising awareness of weaknesses which are not sufficiently recognized by SMEs through proactive consultancy as well as collecting reliable information about the deficits/needs for support (see also chapter 5.5). If there is a routine information process on support needs and support effects in firms, then, if the results are adequately presented to the firms, this will inform interested firms about innovation problems, needs for and effects of innovation support instruments. Each firm can compare its answers with the results of the other firms. Firms can therefore deduce their position regarding problems/needs relative to other firms. This might raise awareness for problems so far neglected and it might stimulate innovation and reorganization. It could help to increase awareness for latent deficits difficult to be influenced otherwise from outside. As far as the lack of awareness regarding already available sources of support for innovation activities is concerned, instruments should provide extensive information about all sources which are able to solve certain problems, both offered within and outside the region and by private as well as by public providers. In addition, specific consulting regarding the problems to access support should be offered. Many SMEs lack the capabilities to make use of certain support instruments, even if they are interested in applying for it and belong to the targeted group.

5.5 Conclusion: Heterogeneity of SME innovation in spite of common characteristics

The studies conducted in the framework of the SMEPOL-research project make clear that providers of innovation support have to find ways to deal with the following typical characteristics of SMEs' innovation activities:

- Innovation tends to be part of a defensive strategy focusing on market niches.
- Innovation takes place in close (sometimes dependent) relation with partners of the value chain, primarily customers.
- The willingness or ability to cooperate, especially with organizations outside the value chain, is very low.
- Market research is hardly performed.
- Research is rarely conducted in the process of product development which, however, does not prevent some firms to introduce advanced innovations.

- Human capital is of outstanding importance as resource for the innovation process.
- Lack of time constrains seriously the realization of innovation projects.
- The region is the dominant interaction and information space.
- Organization, strategy, market information, innovation cooperation are often not recognized as deficits constraining the ability to innovate.

It is necessary, however, not to simplify the innovation processes of SMEs to a single typical pattern. A general finding of the studies is the heterogeneity of the SME-sector regarding their innovation activities, the resources employed, the partners used, and the problems the firms are confronted with. A certain degree of diversity as well as of flexibility of the support system is, therfore, indispensable.

è *Implications for policy:* A general finding is the heterogeneity of the SME-sector regarding their innovation activities. Effective innovation support requires reliable information about the deficits/needs for support. In this context it might be reasonable to establish a routine information process on support needs and support effects in firms. The procedure should be organized in an interactive way: Direct and frequent contact to firms informs the providers about the expressed needs of firms and the effectiveness of their support activities. This is the basis for the adjustment of the support instruments. As an additional positive effect, informing the responding firms about the results allows them to deduce their position regarding problems/needs relative to other firms, possibly raising awareness for problems so far neglected. The interactive design would likely raise the willingness of firms to participate in a repetitive survey, if the information returned to them is interesting and useful for them. Based on such information it would be possible to target innovation support for SMEs more precisely. Which are the main types of problems (financial/risk, personnel/qualification, technology/technical know-how, market access/information, time/organization, and strategy)? In which types of firms are certain problems most serious? Are adequate solutions offered and accepted or ignored, or are they not even offered? In the case of which problems is it necessary to raise awareness first, before offering support? Are there problems which seem to be “oversupported”? Support functions/instruments have to be accessible for all levels of technology and size classes, but can be particularly designed for industries which are of highest importance in a region. It is very important to avoid a support system which targets primarily high-tech firms. The system must be designed for the whole range of SMEs. The primary objective of innovation support should be to improve the capacity to innovate, not to support the already innovative firms. Support instruments should concentrate on firms which need support most, i.e., the less or not innovative firms. This requires another approach than project support, because there is an immanent focus on “winners” in this support approach. Project support is usually only accessible for firms which have already the human capital capacity to innovate but might lack funds to realize a certain development project. Other firms which lack the ability to innovate cannot benefit from such an instrument. This means that project-oriented support should be restricted to extraordinary innovation projects only, but should not be the dominant form of innovation support.

Part III: Evaluation of innovation policy instruments

Chapter 6: Results and impacts of policy instruments

Javier Alfonso Gil, Antonia Sáez Cala, Antonio Vázquez Barquero and Ana Isabel Viñas Apaolaza

Introducion

The objective of this chapter is to determine the effects and impacts of the various government-implemented policies in regard to SME improvement in innovation and market results. Evaluating policies and describing results[6] and impacts[7] is common to any action in economic policy. That is, we are dealing with means and ends and how the former influence the latter. If measurement shows that the objectives are attained, it can be asserted that the tools used were coherent and positive.

One of the greatest difficulties is that firms, far from being static, undergo constant change. If the tool used tends to remain relatively static due to institutional design, the possibilities of achieving its objectives decrease because of a growing gap between the relatively static institution and the evolutionary path of the firm. Therefore, the policies and instruments created and designed must be institutionally flexible in order to adapt to the firm in its evolution over time, as well as adjusting to different types of firms, in terms of the size of the business and the sector that it is in.

Firms are aware that "to exist in the market" requires continuous improvement of processes and products and that the best way to achieve this is through their own effort and resources. The SMEPOL reports confirm that the firms analyzed, active agents in competitive frameworks, generally reach their objectives of innovation and adaptation to technological change by means of their own resources (chapter 5). Therefore, innovation support made available by the public administration is

[6] This chapter considered the *Results* as the effects of the policy tools on its primary objectives, measured by: awareness, use and level of satisfaction of the policy tools; adjustment between policy tools' suply and SMEs' needs; and policy instruments' contribution to innovation activities and performance within SMEs clients.

[7] The *Impacts* deal with the effects (considered as longer effects) that the policy instruments have induced outside the client firms, encouraging linkages and interactive learning, both between firms and between firms and the innovation support/knowledge infrastructure (as agreed among the SMEPOL teams).

important but secondary. However, the fact that these policies are secondary to firm innovation does not mean that they are not relevant or decisive. On the contrary, in many cases, they may actually determine the success or failure of technological change in firms.

The sources of information of this chapter proceed from the seven National Reports (see the ection on this report on "Background, objectives and methodological appraoch of the SMEPOL project"). The various policy instruments have been assessed using surveys (telephone, postal and interviews) of sample groups of clients, in-depth interviews with selected clients in some cases, and interviews with administrative and business support staff involved with policy implementation. Some studies have also made use of 'control group' surveys of firms, particularly where some of the firms included have been beneficiaries of the instruments. In most cases it has also been possible to draw on pre-existing studies, conducted by government evaluation units or by consultants/academics.

There are a number of key methodological issues affecting the appraisal of policy instruments. The first relates to the difficulties involved in attempting to quantify the actual impacts of policy interventions on the firm. There may be a significant time lag before the full effects of an intervention become apparent. With respect to technology-based innovations in particular there can a considerable period of time (invariably several years) between the inception of the supported project and the commercialisation of the product. Furthermore, it may be difficult to isolate the real effects of the policy intervention (i.e. 'additionality'[8]) from a host of other factors affecting innovative performance. In some cases firms may have been beneficiaries of a number of policy tools, further complicating evaluation. Hence, quantitative data on policy impacts needs to be supplemented by the qualitative judgements of client owner/managers themselves. Qualitative indicators are also important in terms of capturing the extent to which policy instruments are contributing to the capacity of businesses to undertake innovation. In this respect an important 'process' indicator relates to the frequency and type of interchange between agencies and businesses, particularly with regard to the extent to which mutual 'learning by interacting' is being fostered. Finally, in the absence of detailed data on longer term impacts on client firms, the design of policy instruments and their manner of implementation can be examined with reference to models/elements of good practice identified by previous studies on innovation and SMEs.

6.1. Evaluation of instrument objectives according to results

[8] The *Additionality* of the policy tools is related to the changes that would not have ocurred without its implementation.

6.1.1. Results and impacts for direct support schemes

The myjority of the policy tools are related to the financial barriers for SME innovation. In this section the following Direct Support instruments are included: FFF, ERP, ERP-SME, RIP and ITF from Austria; Interest Free Revolving Loans in Wallonia; Growth Fund and Development Companies in Denmark; Italian National and Regional Laws; NT from Norway and SMART from the United Kingdom[9].

a) Aims and Target Outputs of Direct Support Schemes

- **Aims of Direct Support Instruments**

The Austrian policy instruments (FFF, ERP, ERP-SME, RIP and ITF) are direct support programs and target innovation, technology and R&D in firms. The **FFF** focuses on the beginning stages of the innovative process (applied R&D). However, its design includes more specific goals such as the promotion of international cooperation in the area of research, aid for SMEs and support for industries that, although strategic to Austria's economy, lack significant R&D programs. The Technology Programmes of the **ERP Fund** selected are the Technology Programme **ERP** and the SME Technology Programme **ERP – SME**. Their objective is not research but rather adopting and adapting technology. They target the commercialization of SME innovation, particularly, the transfer of prototypes into regular production. It is open to firms of any sector, industry or region of the country. The final goals of **RIP** are the reconversion of declining industrial areas, structural improvement and economic growth of peripheral regions. Further, the RIP is not only an innovation support instrument but one that also encourages investment and job creation. The **ITF** centers on applied R&D.

The **Interest Free Revolving Loans** in Wallonia were designed to finance R&D applied to industry through grants to innovative or potentially innovative SMEs. In practice the instrument tends to fund research rather than development projects, with the implicit aim of creating innovation with a higher degree of novelty.

The primary aim of **Growth Fund** and **Development Companies** in Denmark is to promote growth and development in firms, by improving competence, responsible and risk-sharing capital to the benefit of employment and sustainable development of society.

Italian **Laws** have been introduced in order to provide financial support for the development of innovative projects. **L.r.34/1985** was the first law produced at the regional level providing direct funding to enterprises for innovative projects. **L.r.7/1993** was introduced to modify L.r.34/1985 to differentiate the type of intervention in favour of smaller firms (less than 50 employees). **L.r.35/1996** is the

[9] LV BIC from the United Kingdom could also be included in this section.

latest instrument of Lombardia that supports local entrepreneurs in the development of innovative projects. This law provides many different instruments, which support SMEs along the innovation process.

Norway's **NT** program was designed to create new activities in firms in Northern Norway showing innovative skills. To achieve this goal, NT funds projects that strengthen cooperation among firms as well as between firms and knowledge institutions thus improving firms' competitiveness.

The United Kingdom **SMART** support program for innovation is centered on the development of new products, processes and prototypes and the stimulus of marketable innovative technologies in SMEs. It gives support to potential entrepreneurs in the initial stages of firm creation and aid to recently established micro-firms oriented toward R&D.

- **Use and Level of Satisfaction of Direct Support Instruments**

The mayority of Direct Support Tools have expanded during the nineties. In Austria a significant growth applies especially to the FFF with regard to the funds accepted for project support and the RIP grants. In the case of the ERP, while the overall loans have increased continuously in the 1990s, the funding volume of the technology programmes (the general programme and the specific SME programme) decreased after a period of a very strong growth until 1993/1994, nevertheless providing clearly more loans today than in 1990. In Wallonia Interest Free Revolving Loans represent 200 dossiers over 1995-97 relative to a total of 399 for all support instruments in the region and quantitatively becomes the most important support instrument.

Nevertheless, some Direct Support Instruments decreased significantly. In the case of the Austrian tool, ITF, the number of applications, the acceptance of projects, the amount of funds granted and the scale of projects have decreased since 1994 due to the fact that the ITF is to be replaced by a new support programme. Regarding the Danish Growth Fund the number of applications, the number of projects approved and the incoming contacts have decreased over the years. Use of these innovation support schemes are also low in the Development Companies.

In general, use of Direct Support is low outside the client samples. Nevertheless, in Italy almost 93% of the sample firms in Lombardia and 70% of the surveyed firms in Apulia knew about the existence of specific instruments available to SMEs developing innovative projects. In Lombardia almost 71% of the total answering firms applied for at least one of these tools, while in Apulia the percentage is higher (85.2%).

Clients tend to have a favourable attitude towards the Instruments and the majority of managers are generally positive and satisfied with Direct Support. Thus the general level of satisfaction with the support instruments seems to be quite high, just as most SMEs who have received support are satisfied with the benefits.

- **Target Firms by Size, Sector and Technological Level**

  Most of the Direct Support Instruments, with the exception of ERP-SME which is only accessible for firms of up to 250 employees, make no distinction between firms of different size categories. Nevertheless the proportion of SMEs in these instruments is high: in the case of FFF, SME-sized firms account for nearly 75% of the supported firms. Most beneficiaries of the ERP-programmes are SMEs. Except for the SME technology programme of the ERP - which is accessible exclusively for SMEs - the Austrian programme which focuses most on SMEs is RIP. Interest Free Revolving Loans is predominantly used by SMEs.

Regarding the SME size categories, there is more diversity among tools. For instance SMART does not deliberately target very small firms with less than 10 employees, even though the majority of clients are start-ups or micro businesses. In the United Kingdom target very small firms with less than 10 employees, Direct Support in Denmark SMEs concentrate on firms of 10 to 49 employees and Laws in Lombardia are aimed at firms with 51 to 100 employees.

Many Direct Support Tools focus on high-tech and innovative firms. In Austria FFF supports high-tech projects and innovations which are more than incremental; ITF only supports innovative projects of existing and successful companies and these projects must have a sufficiently high growth potential. In Norway the main target groups of the NT are technology advanced firms, R&D-based and new technology-based firms. In the United Kingdom SMART winners are highly R&D oriented in terms of the proportion of current income dedicated to R&D and staff time allocated to this activity.

Certain technological areas like electronics and microelectronics, information and communication technologies, medical and optical instruments, chemicals, pharmaceutical technologies, advanced and new materials and business services are predominant in receiving direct support. That leads to a situation in which some industries are under-represented. In Wallonia for Loans most low-tech industries such as food, wood, textile, leather/shoes, paper/publishing/printing are under-represented, especially in the light of their importance to the economy. In Austria, metal products, textiles, furniture and food are under-represented in the structure of the FFF-support. In Norway, the fish processing industry, an important sector of the Northern Norwegian economy, is outside NT's main target group of firms. However other instruments show a large share of firms in the lower-tech sectors. In Austria, RIP and

ERP are more relevant for lower-tech industries where machinery and manufacturers of metal and plastic products are strongly represented.

In the United Kingdom sectors which were particularly present in SMART award winners do tend to be concentrated in manufacturing sectors, including manufacture of machinery and equipment, materials production and instrumentation and medical technologies. In the case of Denmark, client firms are predominantly from the stainless steel industry. In Italy, data relative to the projects funded show the highest percentages in industrial automation, measure and control instruments and the development of other products .

b) Effects on Client Firms of Direct Support Schemes

- **Effects of Direct Support Schemes on Innovation**

As far as product innovations are concerned, in Austria the direct support schemes are actually successful in stimulating innovation. According to the objectives of the support schemes, nearly all supported firms were able to introduce some form of product innovation. But also innovations which are new to the market are more frequent in the group of supported SMEs than in the SME-sector in general. The most ambitious goal, as far as innovation is concerned, is to establish the technological basis for new products, most frequent in the case of firms participating in direct support programmes, especially the FFF and the ERP-Technology programme. In Denmark, out of 85 enterprises involved in product and/or process innovations over the last three years, 19 enterprises have used innovation support schemes in connection with product development. Approximately 37 per cent of the enterprises have been involved in product innovations and only 12 per cent of these enterprises have made use of support schemes. The contribution of Direct Support instruments to process innovations is also weak in the case of Denmark (18% of the firms have been involved in process innovations over the last three years and only 3% have made use of support schemes). This also occurs in Austria, except in the case of the RIP-programme.

A key indicator of success for product innovations, developed for NT evaluation, is the degree to which these products succeed in the market place. Sales share accounted for by new or improved products during the preceeding three years is higher among NT-firms than firms on the average. The results are positive and firms report that NT has contributed to commercialization of a significant number of product innovations. The main contribution is the extent to which NT has improved abilities and opportunities within the firms in researching markets, integrating the innovative activity with the firm's broader strategies, achieving efficient project management, etc.

Similar effects arise in the case of Interest Free Revolving Loans in Wallonia which generate important effects on innovation experience and behaviour in firms. By implementing an R&D project, firms learn about the innovation challenge and success. In Austria also more than half of the respondents claimed that the direct support initiated a continuous or intensified innovation process which extended beyond the supported project, particularly in the case of the ITF. Nevertheless, the other half of the firms did not continue to innovate, but rather still regard innovation as occasional.

- **Some Additionality Aspects of Direct Support Schemes on Innovation**

In Austria most of the firms answered that the innovation project or activity could not have been finished without support. However, the efficiency of direct support programmes regarding the stimulation of innovation may be rather low, because almost half of the firms (47%) considered the support not really necessary. Firms in Wallonia would have conducted the R&D project without the Loans, but for most of them the implementation of such a project would have taken them much longer and also the financial help enabled the company to begin the project earlier and dedicate more resources to it, thus increasing its chances of success.

In Denmark more than 75% of the enterprises found that support had no part in the initiation of the product innovation activity; in the case of process innovations, the pattern is even more extreme (90%). It is difficult to find any significant relationship between firms' use of support schemes and their innovative activity. Thus, there is no sign of any relationship between firms' investments in innovations and their use of Growth Fund and Development Companies.

In Italy a higher percentage of firms in Apulia than in Lombardy made investments which, without support, would not have been carried out: 47.7% of the answering firms in Apulia said that investments planned in the funded projects were conditional to the support obtained, while the question in Lombardia obtained only 9.4% of positive answers. In Lombardia the large majority of the firms (90.3%) would have carried out the investments planned without the funding.

The NT programme has a high degree of additionality for the one third of firms which reported that the project would not have been possible without support. Other firms answered that the project would have been delayed or implemented on a smaller scale. SMART offers additionality in two respects. First, it contributes to the development of new businesses that would not have started without the award: in 8 out of the 11 new businesses in the surveyed sample the venture would not have been able to start at that time without the grant. Secondly, out of the 29 existing businesses surveyed which received a Smart award, 35% of the projects would have been completely abandoned, 52% would have been delayed and 7% would have gone ahead on a smaller scale.

- **Effects of Direct Support Schemes on Business Performance**

Effects on Business Performance consider the overall performance of client firms, including employment, productivity, management and workforce skills, profits, sales and market shares. The performance of SMEs supported by Direct Tools has improved in various fields.

In the case of the United Kingdom more than half the managers surveyed reported that the performance of the firm had improved as a result of the SMART project. Even though nearly half said performance had not improved, almost all of these firms said they expected performance to improve at a later date. There is some evidence that SMART does contribute to improved performance, although it takes considerable time before results begin to appear, as occurs in other Policy Tools evaluated. When asked in what respect performance had improved, over a third pointed to increased profits either initially or in combination with increasing sales; 28% identified some benefits from the project in terms of jobs saved and one third of firms referred to new staff being taken on as a result of the SMART supported project.

In Austria the creation of new jobs is favoured by most Direct Support instruments. In particular the ERP programmes and the RIP consider the establishment of new jobs an important criterion for the project evaluation. These tools generated new jobs between 1990 and 1997. According to the official statistics of the ERP for 1997, all programmes together have stimulated 3201 new jobs, its general technology programme 825 and the SME programme 202. This is on average 15 jobs per project in the first two cases and 8 per project in the case of the SME programme. The RIP has generated 676 new jobs in this year which is on average 7 per project. According to the results of our survey 72% of the SMEs which have received direct support were able to create new jobs due to the support. Also in more than half of SMEs, the supported innovation projects or activities have led to rising labour productivity while capital productivity is less frequently increased by direct support.

SMEs using some Direct Support instruments identify positive benefits arising in terms of management and workforce skills. More than three quarters of SMART winners identified some positive effect in terms of management skills, particularly business planning. Furthermore two thirds of surveyed firms reported that skill levels had increased in the workforce, which they attributed to the SMART supported project. Through the Interest Free Revolving Loans human resources directly involved in the R&D project implemented have also gained experience.

In developing overall performance in SMEs, expansion of the market share is also emphasized. In Austria this applies to all types of instruments, but internationalization and the diversification into new markets is more frequent in the case of firms participating in Direct Support programmes. A positive effect on internationalization seems to be a specific advantage of the ERP-SME-Technology programme. As a contrast, the expansion within the same market is more typical for other ERP-programmes and RIP. Also access to an Interest Free Revolving Loan has the potential to generate significant effects on market position. Thus, for successful projects, interest-free revolving loans have a strong impact on time-to-market and, in turn, on firm performance and market position.

c) Long Term Effects and Impacts of Direct Support Schemes

It is difficult to evaluate the longer term impacts of direct support instruments for reasons given earlier, in particular: the time lag between the inception of the supported project and the commercialisation phase and the difficulty in isolating the real effects of the policy instrument from a host of other factors. Nevertheless, one way of gaining an impression of the wider effects of policy instruments is to focus on the extent to which they appear to encourage closer linkages and interactive learning, both between firms and between firms and the innovation support/knowledge infrastructure.

In addition the effects of the obtained public funds must be considered, due to the need to understand whether the funded projects gave new perspectives to the firms or just represented a means of reducing the financial weight of the project itself. The latter occurred in Lombardia where most of the firms obtaining at least one supported project said that public funding did not create new perspectives for the firm's activity. On the contrary, in Austria and Wallonia direct support generated important effects on firm innovation experience and behaviour. Links between firms and direct support tools help SMEs in their future innovation activities. Interest Free Revolving Loans help firms learn about the challenge of innovation and success.

Stimulating cooperation among firms is rather frequent (indicated by approximately half of the supported SMEs) in Austria, especially in the ERP-SME-Technology programme and the RIP which seem to be more effective than the other programmes in initiating cooperation with other firms. As to types of partners, continuous cooperation with research institutions are less frequent than with other firms. Moreover Austrian direct support tools are successful in inducing spillover effects on other firms in the form of improved products or services.

Another possible impact on firms outside the user group occurs through the mobility of personnel, as in Norway, where employees working on NT-supported projects left to work in other firms. Another impact arises from the establishment of new firms that are in some way linked to NT projects. Almost half of the supported firms were involved in some form of spin-off. In a few cases new production technology diffused to other firms gave rise to increased earnings and competitive advantages for several firms.

Regarding links between university and SMEs, SMART has facilitated some spin-outs from universities in London. It is interesting to note that a recent innovation in the case of the SMART Scheme is the introduction of network clubs at a regional level in an attempt to facilitate a sharing of experience between firms and to encourage co-operation.

NT is to an increasing extent matching funds with other programmes aimed at commercializing results from R&D and fostering a strategic basic research programme for marine bio-technology. NT staff provides such expertise from outside the programme, thereby linking the firms to their most relevant R&D institutions and consultants. The programme seems to be well adapted to the challenges met by industry in Northern Norway as well as the need to diversify and develop the industrial structure of the region. The funding of specific innovation projects combined with close follow-up has been highly supported by both industry and other initiatives inter-linked with the NT-programme. The NT-programme seems to fulfil a valuable role insofar as firms do not innovate in isolation but in active relation to other firms.

♦ **Direct Support Schemes: Main Features**

a) The performance of SME supported has improved in various fields: employment, productivity, management and workforce skills, profits, sales and market shares.
b) The low additionality of some financial instruments.
c) A tendency to focus on R&D in isolation without sufficient integration with other forms of support necessary for the innovation process, particularly with respect to marketing and commercialisation.

6.1.2. Results and impacts of Technological Centres and tools and tools fostering technological diffusion

A second barrier to SME innovation regards the lack of technological information and know-how. This section studies the following Technological Centers and Programmes fostering technological diffusion: In Austria the R&D-oriented technology centres SWP and FAZAT and the facility-oriented technology centres GTZ, TZL, TZI and TZS; the technology centers and service centers in Lombardia and Apulia, in Norway the Rush programme and in Spain the four technological institutes AICE, AITEX, AIJU and INESCOP.[10]

a) Aims and Target Outputs of Technological Centers and Tools Fostering Technological Diffusion

♦ **Aims of Technological Centers and Tools Fostering Technological Diffusion**

The Software Park Hagenberg (SWP) and the Research and Training Centre for Labour and Technology Steyr (FAZAT) are two R&D-oriented technology

[10] Bl, LVCs and LV BIC from the United Kingdom could also be included in this section.

centres located in Upper Austria. **SWP** is a technology and research centre for software development and related services and it was planned to comprise a mix of university institutes, companies and technical college courses. The center **FAZAT** is located in one of the old industrial areas of Austria. Although the original plan was to establish an incubation centre, today the project is a technology centre with a technical college. Its consulting activities deal with the attraction of firms to the region and with the support for start-ups and for existing companies regarding technological and organizational improvements to enable growth. In addition, the Austrian evaluation included four facility-oriented technology centres in Upper Austria. The Incubation and Technology Centre Wels (**GTZ**) is an incubation centre which provides infrastructure. An important role of the technology centre is training and consulting services related to start-ups, the structural improvement of firms and the application for R&D-support. The Technology Centre Linz (**TZL**) and the Technology Centre Innviertel (**TZI**) offer infrastructure and basic facility services. The latter offers some additional consulting services such as measurement technologies, quality management, application for R&D-project-support, and database and patent inquiries. The Technology Centre Salzkammergut (**TZS**) is a Techno Park, still in the phase of foundation.

The finality of the Danish Technological Centers **GTS** is to provide SMEs with the possibility of accessing new knowledge and technologies through support in the development of projects related to technologies, entrepreneurial strategies and organization. GTS Institutes are to be seen as suppliers of knowledge to the Danish business community.

As regards other **Technological and Service Centers,** in Italy the intermediate structure operating to encourage innovation support for SMEs is the Tecnopolis/CSATA/Novus Ortus in Bari. It represents a model of technological park based on supply side, starting from the existence of academic competences in Computer Science and Engineering at the University of Bari. The center provides research and technological transfer, technological services in the field of informatics, training activities, services supporting innovation and location services.

In Norway **RUSH** aims at ecouraging the college staff to enter into contract and development work for industry and to strengthen relations between institutions of higher learning and industry. Moreover, the idea is to indirectly enhance development of the business community and value added production.

The ultimate goal of the four Technological Institutes selected by the Spanish team (**AICE, AITEX, INESCOP** and **AIJU**) was to encourage competitiveness in SMEs in the ceramic, textile, footwear and toy sectors located in the area. Also, these instruments have two intermediate goals: modernization of the industrial fabric and

diversification of production in the firms. To reach these objectives, services such as training, information, technical and technological advice, technological transfer and R&D projects were provided.

- **Use and Level of Satisfaction of the Technological Centers and Tools Fostering Technological Diffusion**

Most technological centers and diffusion of innovation programmes show positive trends in terms of number of clients, users, services rendered and awareness. For instance, the volume of RUSH activity, which include registered industrial contacts, contracts for various services and the economic value in turnover, is showing a positive development. Also there have been positive trends in the rapid mobilization of college staff and the persistent increase in staff involved in the four colleges participating in the programme. In Spain from 1989 to 1996, both firms associated with the four Technological Institutes and the clients of their services increased considerably, as did the volume of services rendered by the four centers. As regards GTS in Denmark, a market analysis carried out in 1997 indicated an awareness level of 55% an increase over 46% in 1996. In Italy most of the surveyed firms (63.3%) have made contacts with at least one Centre.

In Austria, the facility-oriented technology centre GTZ stands out. In its role as an incubation centre, the number of new firms has exceeded expectations. Since the early nineties the R&D-oriented technology centre SWP has also been continuously expanding. Regarding the use of services of the Upper Austrian technology centers, most of the surveyed firms are located in the centres. As far as external firms are concerned the R&D-oriented centres are less frequently contacted than the facility-oriented ones. However, the use of all technology centres is rather low: Only 19% of all SMEs use them. Within the set of SMEs with innovation support the services of technology centres are less frequently used than direct support programmes (35% versus 90%).

The general level of satisfaction with the support tools seems to be high, particularly in the cases of Spain and Lombardia. The Spanish Technological Institutes show a high degree of effectivity in adapting to innovation support needs as expressed by SME entrepreneurs in the four sectors studied. Eighty-two percent of them point out that services offered by the Institutes adapted to their specific innovation needs. In general, the ensemble of services rendered by the Institutes adapt to the firms' expectations (in 87.7% of the cases) and the level of satisfaction achieved is good and very good for 85% of the firms. In Lombardia the large majority (85.9%) of firms contacting Technology Transfer or Service Centres are satisfied with the help obtained and define their degree of satisfaction at a good level. In Apulia a percentage of 63.3% of the firms contacting at least one Centre declared they were helped by the Centre and

defined the degree of satisfaction as somewhat lower: for 37.5% of the firms it was sufficient, for 33.3% it was good and 25% considered the satisfaction level low.

- **Target Firms by Size, Sector and Technological Level of the Technological Centers and Tools Fostering Technological Diffusion**

  In general firms using technological centers and diffusion of innovation schemes are predominantly SMEs of traditional and service sectors. The primary target group of GTS enterprises is defined as SME and most of them are in the size class of 10-49. It is highly focused on SMEs, which is justified by the predominance of SMEs in the region. The same patterns arise in Italy and Austria, where the technology centres are most often used by the smallest SMEs (respectively less than 20 and 10 employees). The service sector is also important in the case of Italy, due to the increase of SME demand for services over the last years, especially in the area of computer science and robotics. In Austria service companies are the most frequent users of technology centres and only a few firms located in such centres are not service firms. Regarding industry differences SWP-firms belong to the software and industrial mathematics fields, automation and telematics dominate the activities of FAZAT. In most facility-oriented centers software and data processing firms are predominant.

The four Technological Institutes selected in Spain have their principle clients in the areas where they are located and target SME in the footwear industry (INESCOP), in ceramic activities (AICE), in the textile sector (AITEX) and in toys (AIJU). Although the Technological Institutes concentrate their provision of services in the Region of Valencia, in the last three years, they have had to search for new markets, catering to firms in the rest of Spain and abroad. Likewise, the Institutes have had to work not only with SMEs but also with larger firms[11]. Nevertheless, most of their clients are SMEs located in the same specialized areas as the Technological Institutes. In the case of RUSH the regional emphasis is also important when SMEs in regional clusters form the main target group. The SME profile of RUSH activities is firms with less than 100 employees. RUSH's main target groups are non-R&D intensive SMEs and parts of the institutional infrastructure (national R&D institutions and state colleges).

b) Effects of Technological Centers and Tools Fostering Technological Diffusion on Client Firms

[11] As an example the UK Team found that some Technological Centres are catering for the needs of large firms as well as SMEs in their study of Regional Technology Initiatives (RTIs) in the English regions (Smallbone et. al. 1999).

- **Effects on Innovation of Technological Centers and Tools Fostering Technological Diffusion**

Concerning SME product and process innovations, policy tools included in this section seem to have a limited impact, although in many cases they contribute to the improvement of existing products and processes among supported SMEs. In Spain approximately 58% of the firms indicate that services provided by the Technological Institutes have helped them innovate. Promotion of innovation was particularly high in the case of AICE, both in creation of new products and in the improvement of existing products. All Austrian instruments seem to have a positive impact on product innovations. However, product innovations are less frequent in the case of SMEs supported by technology centres. Inducing process innovations is not the most influential area of these tools either, but, in the case of firms supported by technology centres, most process innovations are adoptions of existing technologies. An important effect of these technology centers may be found in the stimulation of a continuous or intensified innovation process within client firms. However, the survey shows that only less than half of the firms indicated this longer lasting effect. Improvement in this respect is certainly possible.

- **Some Additionality Aspects of Technological Centers and Tools Fostering Technological Diffusion**

Additionality aspects have an important role among firms supported by Technological Centers and tools fostering diffusion of innovation. In Austria the most frecuent answer as to the need of SMEs to use support instruments in order to carry out their innovation activities is that the innovation project or activity could not have been finished without the support. Technology centres are more often necessary to realize innovation projects than direct support. Services provided by Spanish Technological Institutes affect innovation within the firms in 58% of the cases: services contribute to introduce product innovations in 39% of the clients, improve existing products 31%, introduce process innovations 24% and improve existing processes 18%. Regarding instruments that foster diffusion of innovation, the Norwegian tool, RUSH, has a high degree of additionality. However, support tools in Denmark are an exception. There is no sign of any relationship between firms' investments in innovation and their use of support schemes. Thus, it is difficult to find any significant relationship between firms' use of GTS and their innovative activity.

- **Effects on Business Performance of Technological Centers and Tools Fostering Technological Diffusion**

The most important positive effects of the Technological Centers are those related to information, consulting, training and technical and technological services. In Spain, these services provided by the Technological Institutes have contributed to improvement of product quality, level of skills of the work force and competitiveness in the client firms. In the case of AICE, their services have also facilitated the modernization of the productive process, improvement in productivity and the diversification of production in firms of the ceramics sector. In textiles, the use of AITEX's services has facilitated modernization of the productive process, an increase in sales and greater access to foreign markets. In the toy sector, AIJU's services have influenced sales positively and in the footwear sector, firms cooperate more efficiently thanks to the services of INESCOP. In Austria the provision of technical know-how, technical services and infrastructure contribute to increase productivity level and growth. The supported innovation projects or activities have led to an improvement of productivity in many firms. 41% of the firms indicated an increase in labour, 32% in capital productivity. The creation of new jobs is also encouraged by the technology centres (indicated by 46% of firms). But all these effects are less frequent here than in the case of direct support.

c) Long Term Effects and Impacts of Technological Centers and Tools Fostering Technological Diffusion

Technological Centers allow one to argue in favour of public support policies based on the notion of impact, that is, beneficial effects outside the firms receiving support. Thus cooperation with other firms and knowledge institutions and coordination with other regional, national and international programmes and centers, are considered in this section.

In Spain one of the characteristics of the sectors studied is the interaction and interdependence existing among the firms. Final consumer goods producers tend to outsource, relying on a large number of firms to execute the various stages of the production process. As a result, when the Technological Institutes enter into a service relationship with some of these firms, they establish at least indirect relations with many other firms in the sector, that benefit from the support. Cooperation with other firms is a quite frequent consequence of innovation support in the case of Austrian firms using the services of technology centres. As to the types of partners, continuous cooperation with research institutions is less frequent (23%) than with other firms (46%). Spillover effects on other firms, most often in the form of improved products or services, were frequently claimed too.

One of the strengths of technological centers is their connections to other international centers of this type and the knowledge transferred to firms through them. In Spain it is important to recognize the role of the Institutes in diffusing international, national and regional information among the firms of the local economy. For instance the group of SMEs belonging to the sectors targeted indicate that they are highly informed of the various innovation support programs existing in local, regional, national and European areas. Almost 93% of the firms' entrepreneurs say that they were adequately informed on some of these programs. Also in Denmark the GTS often joins forces with other international, national and regional programmes and players. It is thus a key to the strategy of GTS to integrate resources from different regional, national and EU partners in order to meet the needs articulated in the region. The "STAR" project is prescribed as a good example of an attempt to integrate regional actors and mobilise resources in the regions to the benefit of regional business development. Activities for fostering cooperation programmes with firms belonging to other regions, the creation of an interface between research institutions and needs of local firms, represent the main areas of intervention of the Italian technological centers.

In the case of instruments fostering the diffusion of innovation, the Norwegian RUSH has tried to improve coordination with other programmes and support systems, but only the college of Vestfold could initiate a strategy of scale, aimed at paving the way for increasing the level of external activity in the region. The other colleges had more

difficult contexts to handle. We have already indicated policy learning and changes in the support system as impacts of the program. However, the direct impact of RUSH may be considered to be minor.

RUSH, as well as GTS and the Italian and Spanish technological institutes, are suited to regional clusters because they focus on encouraging collaboration among firms, cluster of firms and regional R&D milieus. In these cases, especially in Spain and Denmark, the diffusion of information, knowledge and innovations between the instruments and their client firms is determined by the integration of these centers in the productive and social fabric through proximity and the frequency of contacts between firms and the Institutes. The Institutes' strong points, then, are their proximity to the firms. Due to their feeling for the technological and collaborative patterns within the area, the interaction with local firms with different positions in the regional production system as well as with other supporting institutions, actors, regional development agencies, the building of social capital around specific areas of competence and repeated exchange and adaptation processes lead to a learning process between the network of clients and the instruments.

Technological Centers and Diffusion of Technological Knowledge Schemes: Main Features

a) The Technological Centers have a limited impact as far as SME product and process innovations are concerned, although in many cases they contribute to the improvement of existing products and processes among supported SMEs.
b) Additionality aspects have an important role among firms supported by Technological Centers and tools fostering diffusion of innovation.
c) The integration of the Technological Centers in the productive and social fabric foster the diffusion of information, knowledge and innovations through proximity and the frequency of contacts between firms and these centers.

6.1.3. Results and impacts of policies based on Innovation Mangement and Brokers

Policies based on Innovation Management and Brokers offer advice and consultancy to SMEs. The following tools are considered in this section: TICs from Denmak, KIC in Limburg, TEFT in Norway and BL, LVCs and LVBIC in the United Kingdom.

a) Aims and Target Outputs of Policies based on Innovation Management and Brokers

- **Aims of Policies based on Innovation Management and Brokers**

The Danish instruments, **TICs,** were created in order to modernize and renovate Danish SMEs by providing technological support and putting these firms in touch with other agents involved in innovative activities. They comprise a network of regional based advisory-centres that support industrial development in Denmark through activities in the 15 regional centres. Basically this is done as a broker between enterprises and a variety of technical and managerial consultants, experts, laboratories and research institutions.

In Limburg, **KIC**, aims to strengthen relations of technological cooperation between the large firm OCÉ and the subcontracted supplying SMEs. This instrument fucoses on inter-entrepreneurial cooperation among suppliers and clients. The final objective is to encourage these SMEs to learn from others belonging to the cluster existing around OCÉ and improve their technological level to be able to compete. It can be characterised as cluster-policy, focusing on learning how to innovate.

The two main objectives of **TEFT** in Norway are in the area of business development and infrastructure development. On the one hand, TEFT contributes to enhancing the capability of SMEs both in central and peripheral areas to initiate and carry out R&D projects. On the other hand TEFT helps R&D institutions to reorient themselves increasingly toward activities relevant for SMEs, in such a way that cooperation with smaller firms increases and that the knowledge base in these institutions becomes more accessible to all SMEs. Thus this tool tries to initiate behavioural changes in firms as well as in R&D institutions.

Some of the main objectives of the **BL** from the United Kingdom are to provide support services for firms, promote innovation and put firms into contact with suppliers of services and institutions that finance innovation activities. The original purpose of BL was to focus on supporting growth potential in established businesses rather than to focus on new or very young firms. BL provide advice on innovation and technology to innovative SMEs who show growth potential and aid them in identifying sources of innovation support.

The **LVCs**, studied in the United Kingdom, target SMEs and attempt to promote innovation, new technologies, new designs and entrepreneurial expansion in order to stimulate industrial and commercial growth in the area and the establishment of innovative and high technology firms. The **LVBIC**, also in the United Kingdom, focuses on the provision of intensive support for innovative firms, with emphasis on technological opportunities, product innovations and commercialization of innovative ideas.

- **Use and Level of Satisfaction of Policies based on Innovation Management and Brokers**

Various behaviours related to the use of the policy tools can be identified. Between 1994 and 1998 TEFT exceeded its target number of firm visitations by a good margin, was slightly behind on its number of technology projects and had a higher average firm share regarding financing of projects that targeted. In the case of TICs in Denmark, 55% of SMEs in the target group used the TIC system once or several times a year. Among the enterprises joining the questionnaire for the SMEPOL study only 8% have used the TIC, while 40% knew about it and 12% had been in touch with the TIC. In the case of LVCs, the pattern of clients contacts for the 62 clients who participated in the survey was: 42 the prodesign center, 32 the telematics support centre, 13 the technology transfer centre and 12 the teaching company scheme unit. The penetration of most of these initiatives measured by the number of firms assisted is typically small and awareness of the LVCs within the study region is low: LVCs 22% and LV BIC 24% (firms of the control group). Moreover the tools were used by fewer firms: LVCs 2%, LVBIC 0%. Nevertheless there are some positive experiences in the United Kingdom: BL was used by a significant minority of firms (28%) and awareness was at 81%.

Although in general the number of firms supported by these instruments based on innovation management and brokers is low, the level of satisfaction seems to be positive. In the case of TEFT, the overall result indicates a certain mismatch between the latent needs on the demand side and the reproducing mechanisms on the supply side, as 73% of the firms report a good linkage between TEFT and the firms' business plan and 85% of the firms report that they collaborated easily with the TEFT researchers. In the United Kingdom among the BL clients there is a high level of satisfaction with the support they received. A third of the firms rated the services as excellent, and a further 49% as good. Only 13% described the services as average and 4% as poor. As far as LVCs and LV BIC are concerned the results also indicated a high level of satisfaction. In the case of LVCs 60% of clients rate the service as excellent or good, 13% as average, and 10% as poor or very poor. Most of the interviewees were very positive in their assessment of the help they had received from the LV BIC. Three quarters of those interviewed considered the quality of support overall to have been excellent or good.

- **Target Firms by Size, Sector and Technological Level of Policies based on Innovation Management and Brokers**

The main target group of brokers and instruments based on innovation management are SMEs. As to size distribution, LV BIC assisted clients are predominantly micro-enterprises; in the case of the BL half of the innovating firms assisted were in the 10-49 size, over a third were in the 1-9 size band and 14 % in the 50-250 band; the main target group of TEFT was SMEs in the range of 10-100 employees; and the target group of the TIC network is mostly SMEs between 0 and 200 employees.

For the most part, policy tools studied in this section concentrate their activity in the manufacturing and service sectors. For instance, TEFT targeted industrial sectors were identified as the range of Norwegian industry, especially in sectors with low or medium R&D intensity. The traditional focus of TEFT in general is persistently on metal and equipment producing firms, sectors that account for approximately 33% of Norwegian industry. In Denmark, TIC's activities are mainly in manufacturing firms, with a primary focus on technology-oriented manufacturers and knowledge based service enterprises.

Almost two thirds of innovative firms which have sought help from BLs are manufacturing rather than service firms. The manufacturing firms were distributed across a wide range of sectors, although most numerous were businesses involved in the manufacture of metal products, general and specialized engineering. The client firms which were in services were also spread across a wide range of activities, although firms in other business services and software consultancy were the most numerous. In addition a key aspect of the BL approach is to target SMEs with growth potential. In the case of LVCs the surveyed clients were spread across a wide range of sectors, with some bias towards service sectors. The main groupings of clients were in software, technical consultancy, wholesaling, food, clothing, and furniture. The kinds of services provided by the LVCs are more likely to be relevant to technology followers rather than to technology leaders.

Finally the profile of surveyed LVBIC clients is different. Firms cover a variety of activities, with many of them involving applications of advanced technology in robotics, telecommunications, electronic engineering and geo-informatics, but with few involving relatively simple technical ideas.

b) Effects of Policies based on Innovation Management and Brokers on Client Firms

- **Effects on Innovation of Policies based on Innovation Management and Brokers**

Effects on innovation involve results related to product and process innovation as well as market innovations. The result varies among the policy instruments. For example, as mentioned above, in Denmark, only 12% of the enterprises involved in product innovations have made use of support schemes. In the case of process innovations the percentage is lower (3%).

On the contrary, firms supported by Norwegian TEFT report significant improvements in products and production technology, as well as increased R&D intensity and capability. The participation in TEFT had led to the following impacts: improvement in existing products (43%), new products to the firm (35%), improved production technology (40%), increased R&D (41%) and increased R&D capability

(59%). The effects relate mainly to increased knowledge about new technology or more general knowledge about managing development projects, increased learning ability, as well as changed attitudes and routines in firms and institutions.

> Similar effects are inferred by BL in the United Kingdom. BL plays an important role in helping firms overcome barriers that SMEs were facing. Just under a third of firms said that the assistance they had received from BL had enabled them to overcome particular difficulties relating to making innovations. A substantial proportion of BL clients had been involved in making changes to their products and services over the 1993-98 period. BL clients introduced one or more completely new products or services (41%), modified one or more of their products or services (49%) and introduced a completely different range of products or services (22%). Turning to changes in production processes, 79% of BL clients made some change in terms of technology or organizational changes, 69% of firms were involved in making technological changes and 43% with making organizational changes. But the most important effect of BL appears in terms of helping client firms develop marketing innovations and to exploit their innovative effort. BL clients were involved in opening up new geographical markets (57%) over the period. The main development was through exporting, with 46% of the firms opening up new international markets. In addition 60% of the BL clients have developed new types of customer in the period and 64% have introduced a new method for promoting their products and services. The comparatively high level of market development activity among BL clients should not be surprising in view of the fact that half of them received assistance from BL in the area of marketing, indicating that a high proportion were seeking to expand the markets for their products/services. This is an area where BL services would appear to be beneficial to client firms.

In Limburg KIC induced a more integrated approach to the internal innovation process, as innovation became part of the overall business strategy for most of the interviewed firms.

- **Some Additionality Aspects of Policies based on Innovation Management and Brokers**

Additionality aspects also vary among tools based on Innovation Management and Brokers. On the one hand, some instruments, such as TIC and BL have a low degree of additionality. In the first case in Denmark more than 75% of the enterprises found that support has no part in the initiation of the product innovation activity. In the case of process innovations the pattern is even more extreme, namely more than 90% of the enterprises. It is difficult to find any significant relationship between firms' use of support instruments and their innovative activity. In the case of BL in United Kingdom only 12% of the firms considered that they would not have gone ahead with

the improvements. Thus, 88% of the firms would have gone ahead with the project in some form or another. It appears that BL intervention makes relatively little difference as to whether firms go ahead with innovations or not as most interviewed SMEs consider that they would have gone ahead with the project, possibly using other sources of external assistance.

On the other hand, in some cases there is a higher level of additionality in firms that would not have gone ahead without the help. For example TEFT showed a high degree of additionality. Also most client firms viewed the LV BIC as a unique and important resource for innovators and indicated that their projects would probably not have gone ahead without this support. In cases where innovation support involves finance and/or new venture creation (such as LVBIC), there is clearer evidence of projects proceeding with support that would not have done so without it. In Limburg KIC has helped to transform SMEs from "jobber" to "co-maker" and "main-supplier". In some cases it has speeded up an already present development and for others it has initiated it.

- **Effects on Business Performance of Policies based on Innovation Management and Brokers**

BL is fulfilling their objectives since, in terms of both changes in sales turnover and employment over the period 1993-98, the surveyed firms were growing, and in some cases rapidly. The median increase in sales turnover was 66% and 69% of the firms increased their employment. In terms of profitability, 78% of BL clients made a pre-tax profit during 1997/98. Overall 41% of the client firms surveyed were able to point to ways in which the performance of the business had benefited from BL assistance. In fact, 16% of firms considered that the assistance had had a positive impact on sales turnover growth, employment generation and profitability, and a further 11% thought that there had been a positive effect on at least two of these aspects. Just under a third of the firms considered that the assistance had helped them protect existing jobs within the firm, and a quarter claimed to have been able to create new jobs as a result. BL assistance does appear to be having a beneficial effect on employment in at least half of client firms. A quarter of firms overall thought that the assistance had helped them to increase sales turnover and/or improve their profitability. In addition 54% of the interviewed BL clients considered that they had benefited in other ways from the help that they had received. Of these, a third considered that they had benefited in terms of assistance with the overall development of the business, and a further quarter considered that it had helped them to identify key issues affecting the future development of the business.

c) Long Term Effects and Impacts of Policies based on Innovation Management and Brokers

The degree to which the supported firms engage in new procurement of R&D services is an indicator of impact. Firms which enter into continuing relations with the same R&D institutions also enter into significantly larger projects. This is the case of TEFT in Norway, that creates the foundations both for further external participation as well as increased R&D intensity in the firms. From the point of view of research engaged through TEFT projects, 68% of them report that contact with the respective firms persisted beyond completion of the TEFT project and 48% indicated that this concerned the planning of a new project. In sum, the results indicate that the general model of TEFT increases R&D and continuing demand for R&D services and works reasonably effectively, producing continued relations between the two parties.

Other possible impacts of policy instruments on the regions' innovation capability is by means of their ability to encourage interactive learning through co-operation between firms, between knowledge institutions and between SMEs and external organizations and programmes.

Regarding contacts between firms LVBIC is a successful example. Clients located at the incubation units of LV BIC spoke of the value to them of being in close proximity with other innovative small businesses. The key point here is that clients know by experience that physical proximity to other innovative businesses offers the possibility of new business opportunities, facilitates exchange of knowledge and is conducive to learning.

Concerning links with knowledge institutions and between SMEs and external organizations and programmes, most of the instruments play an important role. In Denmark TIC Vejle finds that they are linked to the industrial development strategy provided by the region. Also it maintains ties to the national TIC network intact, partly because these links are essential to foster new programmes and tools. Norwegian TEFT helps link SMEs to other relevant policy tools or R&D institutions, thus playing a co-ordinating role in the regional support system. The LV BIC appears to be important as a network broker for clients who would not otherwise have the time and resources to develop their own contacts. It is valued as a node for accessing other networks, including other sources of specialist expertise such as universities and other government and EU support programmes. For instance the LVBIC facilitates access to government support schemes, notably SMART, and a number of clients had been directed to sources of advice within universities. BL might be seen as contributing to the development of a support infrastructure that links a public sector initiative with market-based private sector consultancy services which is conducive to innovation in SMEs. Three quarters of the firms were directed to other sources of specialist expertise by the BL advisers. BL also helps SMEs engage with national and global information and learning networks as well as local ones in order to increase firms' competitiveness in the global marketplace.

Nevertheless in the United Kingdom, while there is some evidence of policy measures contributing to increased network activity, the overall impact is limited by the small scale of all but the BL. The key role of the instrument with respect to the innovative capability of the region's SMEs is to help increase their market orientation and the contribution to increase the use of external assistance and consultancy by SMEs.

The most successful experience among tools based on Innovation Management and Brokers as far as long term effects and impacts are concerned is KIC in Limburg. Furthermore it is especially relevant to the region, because there are a lot of industrial SMEs which lack codifying skills and Limburg also lacks a sound public R&D infrastructure. By creating co-operative structures which promote interactive learning within the region, SMEs have the opportunity to prove their competence in co-development and engineering and to learn from other firms involved in the cluster. Thus regional SMEs have the chance to upgrade themselves.

Policies based on Innovation Management and Brokers: Main Features

a) The level of satisfaction of SME with these policy tools is positive, although the number of firms supported is low.
b) There should be a trend toward the creation and use of these kind of instruments.
c) Concerning links with knowledge institutions and between SMEs and external organizations and programmes, most of the instruments play an important role.

6.1.4. Results and Imapcts of Mobility Schemes

This section includes the policy tools related to human resource barriers for SME innovation. The Mobility Schemes analyzed are: FIRST and RIT from Wallonia and KIM from Limburg[12].

a) Aims and Target Outputs of Mobility Schemes

♦ **Aims and Use of Mobility Schemes**

FIRST from Wallonia aims to strengthen the scientific and technological potential of firms. It enables companies to gather knowledge that will be most relevant to engage in innovation with a high degree of novelty. It was created with the goal of increasing firms' scientific and technological potential by contracting young researchers who work part-time in the firm and part-time in a research laboratory and whose wages are funded by FIRST over a period of two years.

[12] The LVCs from United Kingdom could also be included in this section.

The goal of **RIT** in Wallonia is to increase the capacity of human resources thus encouraging the development of innovative projects. The RIT aims to help start innovation activity in firms through the strengthening of human resources.

The Mobility Scheme **KIM** in Limburg, is designed to promote internal processes for innovation and mobility of human resources as well as impulse technological transfer and diffusion of technical and management skills from institutions of higher education to firms. In order to achieve these goals, KIM funds the initial stages of technological innovation in SMEs through reduction of labor costs or contracting a recent university graduate for one year.

FIRST is by order of importance the second most frequently used instrument in Wallonia. Statistics on the use of FIRST instrument indicates that it has more than doubled the number of dossiers initiated from 1995 to 97. On the other hand RIT has a low level of use throughout the 3 years under consideration. In Limburg, 44 % of all the participants already knew of KIM before their application.

- **Target Firms by Size, Sector and Technological Level of Mobility Schemes**

The chemical sector stands out in terms of FIRST support consumption, followed by other high-tech sectors such as electronics and the business service sector. The more low-tech or traditional sectors like textile wood or leather are few. FIRST is highly relevant for both high-tech and low-tech firms with a long-term innovation strategy that intend to build a knowledge base within their company as a source for future innovation activity. In practice, the instrument predominantly reaches firms that are most advanced in innovation. It is predominantly used by SMEs, although SMEs were not specifically targeted.

RIT specifically targets SMEs. Each sector has at least accessed one RIT over the 3 years, including sectors that are considered as low-tech or traditional. The instrument reaches the type of firms that it implicitly targets; non-innovators but with innovation potential. It is highly relevant to non-innovating or newly innovating SMEs.

Two-third of firms participating in KIM had less than 20 employees. The average size in the National Schemes is 16 employees. However, the size-criteria for the KIM-Limburg scheme is less strict than in the National scheme and the average size of the participating firms is 19 employees. In addition KIM-scheme seems very relevant to participating firms, since in 20 of the 30 firms there was one employee holding a university degree and at the other 10 firms there were none.

b) Effects of Mobility Schemes on Client Firms

As far as additionality aspects and effects on innovation and business performance are concerned the Mobility Schemes seem to have positive results. In Limburg many of firms' innovation activities would not have taken place without the KIM project. An indication of the effect of KIM on the innovative behaviour of the participating firms is based on the following perception: 30% of the firms claim that the innovation would not have taken place without the KIM-project; 50% of the participants said the project had speeded up or extended the innovation; 20% claimed the project had not yet had a clear influence. The most successful effect of KIM is that it has lowered the barrier to employment of persons holding university degrees, since a large majority claims it would not have hired a graduate to fulfil the innovation task and 79% of the projects did result in an extension of the employment contract after the labour cost subsidy had stopped. The success of KIM is in lowering the barriers for small, knowledge-extensive firms to enter the higher segment of the labour market. Firms appeared to have a more positive attitude towards high-educated employees and towards innovation than before. Also the interviews indicate positive effects of the presence of the KIMer within the firm.
In Wallonia the main effects of FIRST relate to training and knowledge as well as access to external resources for R&D. Theoretically it enables the employment of high-quality researchers, which could otherwise not have been afforded by the company. This case constitutes an important additionality to the set of direct support instruments in Wallonia. The RIT stimulates the employment of staff that is more highly qualified (i.e. often engineers) than existing staff within SMEs, and the firm would not have been able to employ such staff without support. The latter constitutes the main additionality of the scheme, from which most other benefits derive. The RIT has a potentially high behavioural impact on SMEs. The employment of an innovation and technology manager often marks the beginning of continuous innovation activity, through creation of an R&D unit and increased human resources. RIT clearly influences the decision of non-innovative SMEs, often in traditional sectors, to engage in innovation activity. For most beneficiaries, access to RIT has accelerated this decision. For the least innovative ones, the impact was strongest: strengthening of human resources, creation of an R&D unit, SME growth. Moreover a number of RIT beneficiaries displayed substantial growth in the 1980's, which corresponds approximately to the initiation of innovation activity. RIT is at the origin of this development: innovation activities opened up new market opportunities and generated employment.

c) Long Term Effects and Impacts of Mobility Schemes

FIRST's strong point is clearly its potential to generate impacts. The instrument encourages a long-term approach to innovation and enables acquisition of generic knowledge that can be applied to a variety of products as well as enable the development of products with a high degree of novelty. In the long run FIRST, more than any other instrument at work in Wallonia, could be the source of radical

innovations. On the other hand RIT fits in well with the internal nature of the innovation process in Walloon firms. This increases relevance but limits change in behaviour with regard to extra-firm interaction. An important impact of the tools is that, generally, firms that have benefited from a RIT as their first innovation support have later on accessed other support instruments.

In Limburg KIM addresses the large category of firms which are driven by a learning-through-producing behaviour. Thus for several reasons KIM is especially relevant in the case of Limburg. A positive further impact within two regional KIM-schemes, is the creation of a network of 'knowledge carriers'. The 'knowledge carriers' (KIM'ers) in those regions organised meetings where they could discuss all kinds of subjects and exchange experiences from their individual projects.

Mobility Schemes: Main Features

a) FIRST encourages a long-term approach to innovation.
b) RIT fits in well with the internal nature of the innovation process in Walloon firms.
c) KIM addresses the large category of firms which are driven by a learning-through-producing behaviour.

6.2. Why do Some Policy Tools Work Better than Others?

By means of a benchmarking process of the four groups of policy tools analyzed we have selected the instruments from each group that have been most successful in eliminating barriers to innovation in SMEs. Moreover, the selection of these instruments was effected in function of their results in the area of aims and target outputs, use and level of satisfaction, target firms by size, sector and technological level, effects on client firms (innovation, additionality and business performance), long term effects and impacts.

Two good practices of the SME innovation support policy designs were chosen and the strong point of each one was described in the area of key issues relative to policy and interactive learning, adaptability and flexibility, responsiveness of policy to firms of different types and different stages of development, subsidy element, participation of firms in the design and management of the tool, ability to identify needs of the firms, complementarity between policy instruments and network activity.

- From the Direct Support Tools we selected the **NT** from Norway and the **SMART** from United Kingdom. NT is matching funds with other programmes and links the firms to their most relevant R&D institutions and consultants. Thus the strong point of this instrument is its *complementarity* between different policy tools. The

NT programme seems to fulfill a valuable role insofar as firms do not innovate in isolation, but rather in active relations. SMART shows evidence of policy learning and *adaptations* aimed at addresing the financial problems of SMEs.

- From the second group of policy tools we selected the **Technological Institutes** in Valencia (Spain) as one of the good experiences. Entrepreneurial *participation* (voice) in Institute management as well as cost for the use of its services (*subsidies* average 40% of the cost of services provided) contributed to adjusting supply and demand for innovation support. As a consequence, competitiveness of area firms has improved. It is for this reason that cost and voice in the policy tools are so important. Except in cases of "new industry and enterprise", the concept of cost to firms reinforces the idea that subsidies granted by the administration are a collective good and, as such, cannot be subject to opportunist acts of "rent-seeking". Policies based on total gratuity of subsidies for innovation encourage misuse of public funds, while policies designed to provide services at a cost to firms will indirectly reveal the benefits of innovation to the firms. Likewise, entrepreneurial voice in the design of instruments of innovative action will tend to avoid policies that do not correspond to the industrial reality. Introducing measures such as entrepreneurial participation necessarily brings policies nearer to the existing socio-economic reality and also compensates lack of industrial and innovative maturity in a given territory. Among this type of tools we also selected the **GTS** from Denmark. Like the Italian and Spanish Technological Centers, this instrument is *flexible* in the sense that it is suited to regional clusters since they focus on encouraging collaboration between firms, clusters of firms and regional R&D milieus. In these cases, the diffusion of information, knowledge and innovations between the instruments and their client firms is determined by the integration of these centers in the productive and social fabric through proximity and the frequency of contacts between firms and the Institutes.

- Among Policies based on Innovation Management and Brokers, we selected the **BL** from the United Kingdom and **KIC** in Limburg. BL plays an important role in helping firms overcome barriers that SMEs were facing and the main effect appears in terms of helping client firms to develop marketing innovations and to exploit their innovative effort. Thus its *responsiveness* to firms that need to exploit the results of their innovations is the strong point of this policy tool. In addition, it contributes to increased *network activity*. The other good practice is KIC in Limburg, whose objective is to strengthen relations of technological cooperation between the large firm OCÉ and the subcontracted supplying SMEs. By creating co-operative structures which promote *interactive learning* within the region, SMEs are able to to show their competence in co-development and engineering and to learn from other firms involved in the cluster.

- The policy tools selected as the good practices among the mobility schemes is **KIM** also from Limburg and **RIT** from Wallonia. The successful of KIM is its *ability* to identify SME needs, lowering the barriers for small, knowledge extensive firms to enter the higher segment of the labour market. The RIT is specifically targeted at SMEs and it reaches the type of firms that it implicitly targets: non-innovators with innovation potential. The r*esponsiveness* to non-innovating firms with innovation potential, often in traditional sectors, is the strong point of this instrument since it allows firms to engage in innovation activity through the reinforcement of their human resources.

Chapter 7: Coherence of innovation policy instruments

Poul Rind Christensen, Andreas Cornett and Kristian Philipsen

7.1. Introduction

Almost all national SMEPOL studies have stressed, that the formation of an integrated or coherent innovation policy system is a necessary condition in support of a successful regional innovation system. However, coherence is an ambiguous notion, and can be understood in various ways. Tentatively the essence of the notion is that a coherent innovation policy provides solutions on specific issues in an integrated way and that customers or the target group perceive them as coherent (see chapter 7.2).

Policy-makers and planners have tried to implement this ambition through steering measures and incentives. Traditional bureaucratic systems, focusing on top-down relationships rely on various measures of hierarchic governance, often with a lack of flexibility. Flexible response to changing external stimuli is the stronghold of decentralised systems. The lack of co-ordination and coherence of the policy-implementation are potential weaknesses following from systems decentralisation.

Fundamentally, there is a basic contradiction between the aim of responsiveness to diversified regional needs as well as to dynamic changes in clients' needs and conditions on one side and on the other side the aim to build co-ordinated programmes for the sake of scope and administrative simplicity and transparency.

Based on this proposition this chapter has several purposes. In section two a detailed discussion on the concept of coherence is provided in view of responsiveness and co-ordination. Coherence is considered important in support policy programming and the evaluation studies of policy programmes. Therefore it is important to take into account differences in the planning tradition on which the concept builds and consider to what extent do we have to ‘re-invent’ the concept, when perspectives in support programming and the perspectives of evaluation are changing.

In the third section the focus will be on specific aspects of coherence in programmes revealed in the national studies of the SMEPOL project. The regional perspective taken in the evaluation has the implication that regional diversity will be confronted with national perspectives in policy programming. An analysis of demand and supply side aspects of innovation policy becomes crucial in this respect. Thirdly, this evaluation has a focus on SMEs and their responsiveness to innovation support programmes. This leaves us with the basic question of efficient delivery systems and thus the issue of proximity to SME clients.

The country studies carried out have suggested that the dynamics of Post-Fordist society lead to a number of difficulties for traditional types of innovation management and innovation policies. Therefore, in section four a dynamic setting is briefly discussed. Based on this discussion an integrated view on coherence in the policy process is put forward. This section ends by providing some theoretical perspectives.

Chapter 7 concludes with a discussion on how to conceptualise coherence in policy programming so that it matches the industrial dynamics of our society.

7. 2. On the concept of coherence

In a regional innovation system perspective at least two aspects of coherence seem to be important. Coherence from an administrative point of view denotes that we have an unequivocal relationship between means and goals. With regard to implementation this notion is similar to traditional concepts of societal planning. This is revealed in section 7.2.1 below.

Seen from a client or demand side perspective the concept becomes more muddy, since the individual firms participating in innovative projects will interpret coherence in idiosyncratic ways. The projects are defined by the specific needs generated from current activities and the situation, which shape their needs more than the generic characteristics of the system. This schism is important when examining regional innovation policy from the demand side perspective.

In figure 7.1 below these two aspects of coherence are sketched out together with other central aspects of innovation policy in Western Europe, where the issue of decentralised vs. centralised policy frameworks, in this case, the top-down/bottom-up distinction, is an important public policy issue. The figure below will be used as an initial classification of

innovation policy. In a second step, a classification of the nature of the policy (linear vs. interactive) will be added. (See figure 7. 2).

Although the bottom-up approach tends to be fuelled by the proximity to and thus awareness of specific client needs, bottom-up processes may easily be formed in a closed circuit of vested interests and support paradigms embedded within different regional actors of the innovation support system. On the other hand the top-down processes may in practice evolve into partiality based on vested interests and differences in outlook held by different central planning agents. To sum up, the bottom-up approach focuses on regional initiatives and the needs of the business community, while the top-down approach deals with the implementation of national programmes and measures in a regional or, say, sectorial setting.

Figure 7.1 General Aspects of Coherence

	Top-down	Bottom-up
Coherence from a demand side perspective	**Scope and integration in the implementation and delivery of programmes** (interactive learning among actors with different positions in the support system)	Effectiveness in customising programmes to clients needs. Raising clients' awareness of programmes (interactive learning with lead clients and the business community)
Coherence from a supply side perspective	Effectiveness to reach objectives. Efficiency in co-ordination of programmes (internal 'departmental' learning)	Framing and tailoring of programme packages matching diversified needs (interactive learning between central administrators and actors in the down-stream delivery system)

7.2.1 The roots of the concept

Although coherence is one of the key concepts in the evaluation of policy programmes and support schemes, it is seldom referred to in conceptual terms. Most often the concept is defined in negative terms, stressing the lack of coherence. In its generic form the concept is defined in the Encyclopædia Britannica (1999) as '*systematic or logical connection or consistency'* or *'integration of diverse elements, relationships, or values'*. Basically, coherence thus means that we have links between different elements, together constituting a holistic unit. The functioning of the whole system depends on the system being coherent and the elements working together properly. This concept of coherence can be linked to production systems, policies or business strategies, but does not necessarily require formalised links (i.e. demand side coherence is established if the users perceive the policy measures as a comprehensive offer). In a study on corporate coherence D.J. Teece et al. (1994) states that a firm exhibits coherence when:

". . . its lines of business are related, in the sense that there are certain technological and market characteristics common to each. A firm's coherence increases as the number of common technological and market characteristics found in each product line increases. Coherence is a measure of relatedness. A corporation fails to exhibit coherence when common characteristics are allocated randomly across a firm's lines of business."

D.J. Teece et al. (op.cit., p. 4)

Although the term coherence is referred to in empirical studies and evaluations on industrial policies, the concept of coherence is difficult to trace in the literature of the social sciences not to mention literature inside the tradition of planning. It is thus unclear in which planning tradition the concept was born. The literature on strategic planning, thus, revealed no references on the concept. There is also no presence of this concept in reviews and directories of public planning. The traditional notion of coherence is, at the outset, difficult to associate with feedback processes inherent in interactive or decentralised concepts of programming processes. Therefore changes in the theoretical perspective about the way that we conceive the innovation activity also leads to new ways of conceptualising coherence.

The essence of the concept is that a coherent innovation policy provides solutions on specific issues in an integrated way (supply-side coherence) and that 'customers' or the target group perceive them as coherent (demand –side coherence). The concept of coherence is thus important as far as it is conceived to be critical in respect of efficient and successful innovation policy programming.

The dilemma inherent in the supply- and demand-side of coherence is that although a programme may be found as being well-integrated with other programmes and is seen to be efficient in terms of achieving the balance between means and ends, it also has to match the needs perceived by the targeted client group. This does not merely imply that they have to know about it and value it. It also implies that delivery processes are executed in ways perceived as efficient by SMEs.

In terms of a full scale - and idealised - evaluation perspective, a successful programme is associated with an outcome that fulfils all aspects sketched out in figure 7.1. If the demand side aspect of coherence is not sufficiently met then policy implementation will fail. This may, for example, be caused by a lack of awareness and usage or by low perceptions of utility. If supply-side coherence is weak, the innovation policy becomes vulnerable to competing programmes in the business development system, i.e. programmes focusing on issues other than innovation.

7.2.2. Conceptualisation in a dynamic setting

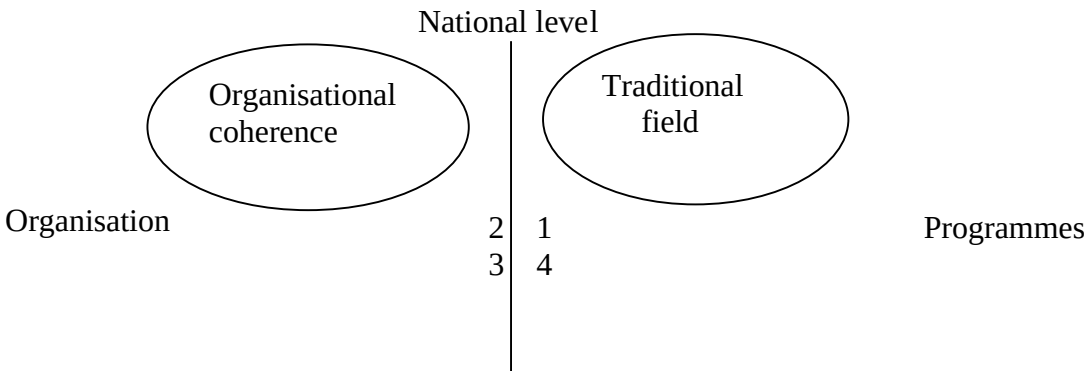
The ability to keep coherence between the programming (supply-side) and the organising of programme implementation according to the changing needs of the target groups of the programme (demand-side) is the core essence of a dynamic and interactive system of innovation policy.

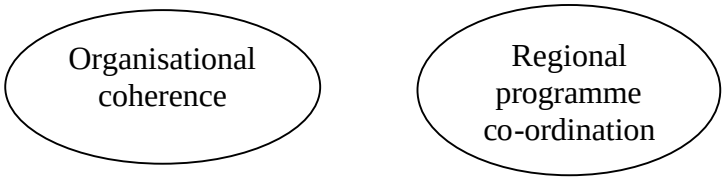
Therefore a major emphasis should be placed on the conceptualising of coherence. In the SMEPOL study a coherent innovation policy system is defined as one in which individual programme elements can be organised and combined in a way to form a coherent tool for solving specific problems of innovation. Internal coherence deals with the adequacy of the means and the organisational set-up to attain objectives; external coherence describes the integration of individual programmes into the whole support system.

Focus is thus on policy processes and the relationships between instruments in a regional setting. Included in this conceptualisation is not only the internal and external coherence of each of the policy programmes investigated, but also the organisational set-up, linking policy formulation with that of delivery and implementation. The aim is to reveal the change of perspective, when a regional innovation system perspective is taken and when a dynamic - learning - perspective is introduced in the analysis of the innovative activity of small and medium sized enterprises. This approach is sketched out in figure 7.2 below.

The aim of the figure is to illustrate that in the traditional 'linear' notion , evaluations and discussions on policy programming is taking place predominantly in the first quadrant. In this setting discussion is on coherence of programmes. A more dynamic setting is envisaged in the second quadrant. In this setting organisational coherence gains momentum indicating a growing emphasis placed on external coherence at the national level of policy programming. In the third quadrant, emphasis shifts to the regional dimension and thus the co-ordination of the innovation policy delivery system. Co-ordinated action at the regional level - quadrant 4 - is, by and large, conditioned by co-ordinated delivery organisation at the regional level.

Figure 7.2 Coherence in a Spatial and an Organisational Perspective





Regional level

When the regional dimension is included in the evaluation of innovation support programmes, the number of actors involved expands. Their positions in the field of overall programming tend to become highly differentiated, as does their frame of reference. Therefore, their perspectives on, and interpretation of, how the innovation support programmes function, will differ strongly. It is in this perspective of fractionalised views and perspectives that vertical as well as horizontal learning cycles among actors with different perspectives, positions and outlooks in the system becomes of vital importance to the production of coherence. The establishment of learning cycles between the regional level and the national level in the system of innovation policy programming as well as between the business community and the policy making community has therefore been stressed as a fundamental condition for a working innovation system in most national studies.

Contradictions – or "trade-offs" – between internal coherence and the need for rapid and flexible adaptations to changing environmental conditions constitutes barriers for a regional system of innovation, targeted to meet the needs of SMEs as well as the general business community of the region considered. Flexibility and coherence are seen to be preconditions for an interactive system of innovation, but are also important in more traditional linear (top-down) oriented systems.

7.2.3 Planning and direction of the policy process

The top-down aspect of innovation policy and thus coherence has to be interpreted in the tradition of public planning and policy implementation. This means that innovation policies in this tradition do, to a large extent, rely on bureaucratic measures like rules, administrative routines and procedures, delegation and co-operative measures. At the same time it is a system of vested interests embedded within, say, ministries and similar fields of responsibility. The traditional system operates with a system of

governance based on budgets, specific orders or the setting of targets. In figure 7.3 below the principal aspects are summarised.

Figure 7.3 Systems of governance in the public (planning) system

<table>
<tr><td></td><td>Specific programmes</td><td>General programmes</td></tr>
<tr><td>Direct governance</td><td>Orders, rules</td><td>Targets, Programmes</td></tr>
<tr><td>Indirect governance</td><td colspan="2">Information, dialogue
Budgets
Guidelines</td></tr>
<tr><td></td><td colspan="2">Recruitment, Procedures</td></tr>
</table>

Source: Based on Lennart Lundquist, Förvaltningen i det politiska systemet, Studentlitteratur,
Lund 1974

Elements of this conceptualisation can often be found in innovation systems, in particular within the linear tradition, in which the top-down perspective prevails. Direct governance, as outlined in figure 7.3, is most often closely associated with the linear models of planning. On the other hand the "interactive approach" is to be associated with a planning environment dominated by indirect governance (bottom-up).

In many respects the dimensions of the planning processes summarised in figure 7.2 above can also be found in systems of innovation policy. A hierarchic organisation will provide coherent decision making rules, form an effective bureaucracy using top-down approaches and predominately direct and specify measures.

In a network-based system the patterns of incentives differ strongly from those of the hierarchy. Independent bodies and actors pursue their own objectives and they judge the programme and its implementation in light of their own agenda. Programming thus has to rely on collaborative ventures formed by mutual adaptation and co-ordinated action based on information exchange and dialogue, i.e. mainly indirect means of governance, substituting rules and direction with frameworks and incentives as indicated in the notion of ‘Indirect governance’ in figure 7.3.

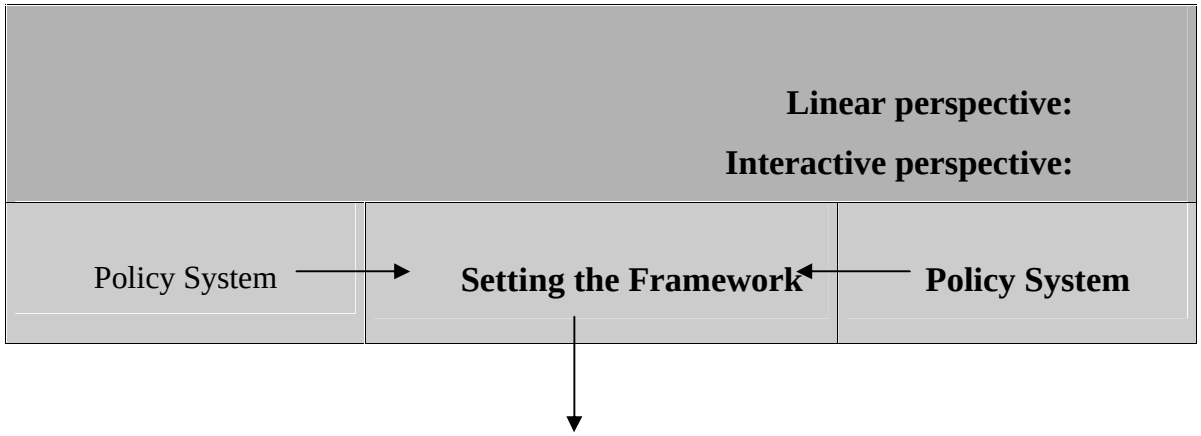
The nature of this policy-system can be bottom-up, top-down, or, most often, a combination of the two.

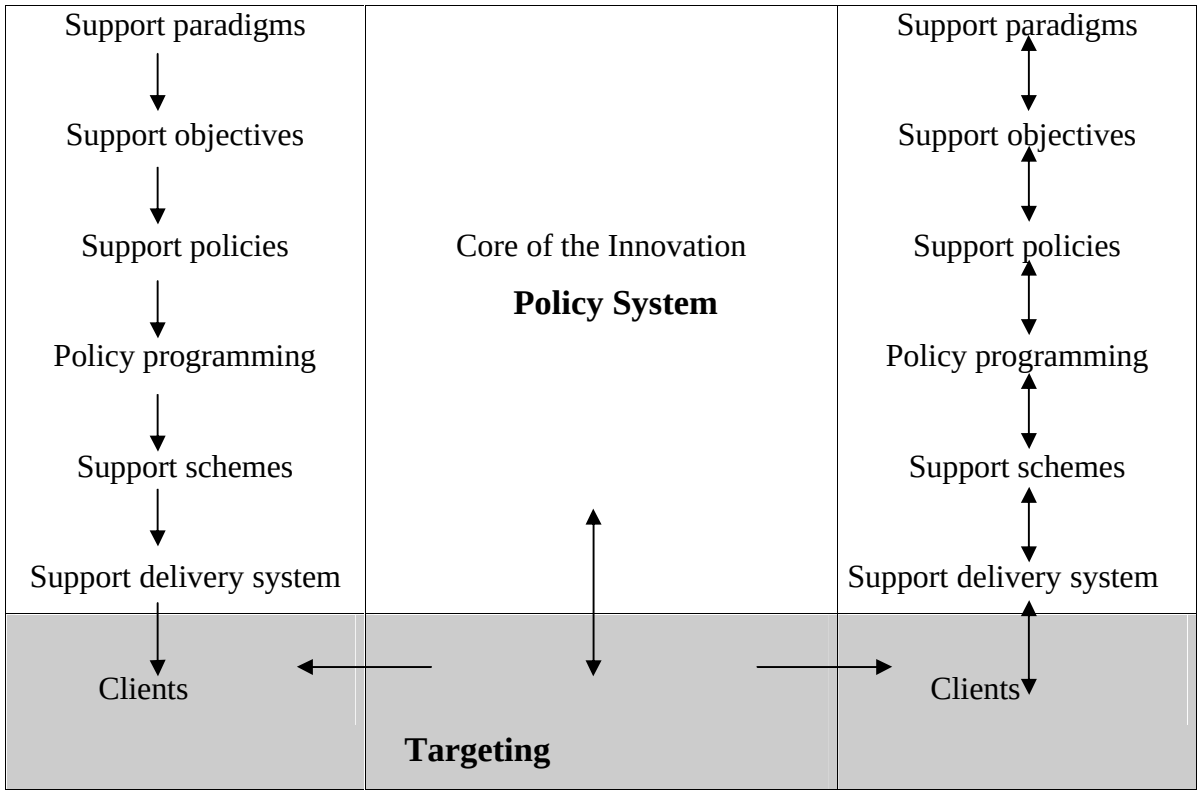
7.2.4 Internal coherence

A tentative definition of internal coherence has to focus on the internal logic of the instruments and policies of innovation, meaning that means and action planned – and executed – are in support of the aims put forward. This is particularly the case when discussing internal coherence within a linear perspective. Most of the concepts discussed in the country-survey deal with this notion, which is similar to traditional models of internal rationality used in the above mentioned planning traditions. Coherence, from an interactive perspective, is much more complex and it can at least be questioned whether or not it is possible or fruitful to make a strict delineation to distinguish between internal and external coherence in this case. The rationale of internal (programme) coherence can be illuminated as a hierarchical correspondence between different tiers in the policy programming process as illustrated in figure 7. 4. Basically, the core of the innovation policy system is set in between the framework formed by the policy system and the targeting of clients' needs.

In the linear model the down-stream arrows are the dominant ones. From an interactive perspective both directions of the arrows are considered to be important. Depending on the nature of the programme they may be extended by feedback loops between all elements. Before turning to external coherence it is necessary to specify the nature of innovation policy clients. The business community and industry and in particular SMEs are the direct targets of the innovation support policy. However, innovation policy also aims indirectly to improve regional growth potential and the development of, say, employment and social welfare benefits, through the creation of comprehensive regional innovation systems.

Figure 7.4 Internal Coherence in a Vertical perspective




Support paradigms
Support objectives
Support policies
Policy programming
Support schemes
Support delivery system
Clients
Core of the Innovation
Policy System
Targeting
Support paradigms
Support objectives
Support policies
Policy programming
Support schemes
Support delivery system
Clients

7.2.5 External coherence

From the traditional linear perspective external coherence tends to be conceptualised as the horizontal co-ordination of related programmes embedded with different ministries. The introduction of a regional perspective brings a vertical dimension into focus. This means the co-ordination of programmes and action, from international and national sources (the EU and national governments) through to regional and local bodies pursuing their own targets. These regional and local bodies often play a key role as the 'down-stream' delivery system in proximity of the targeted SME clients.

The vertical dimension thus comes up in the form of organisational co-ordination among the various actors involved, from initial programming to final implementation and evaluation among the clients and target groups. When small firms are focused on, demand side perceptions of coherence in the policy programme are naturally included.

Therefore, from an interactive perspective, external and internal coherence tend to become more and more amalgamated, since the interactive dialogue and way of co-ordinating the process will alter all features of the concepts simultaneously. The contextual frame of reference may differ, as may the administrative tradition in which the notion of coherence is rooted. Therefore, a few number of key questions have to be addressed in the light of these differences in the national framework of reference. These questions are:

- How has the regional innovation support system evolved and how is vertical co-ordination between the levels then brought about in the national studies?
- How does the view on coherence change when a dynamic perspective is introduced?
- To what extent has a tradition for learning processes become institutionalised?

7.3 The Notion of Coherence in the SMEPOL National Studies

Coherence in innovation policy as stated in the previous sections depends on supply side as well as demand side features of the sector analysed. In particular, it is worth stressing that the outcome of a particular study has to be evaluated in terms of a temporal perspective and territorial space. A wide range of factors, internal to the system as well as external, determines

the national systems of innovation. Coherence is also affected directly when EU-programmes are integrated into the national and regional system of innovation. This is not always supportive in terms of SME participation as the quote indicates:
"During its life some of the most burdensome regulations for small firms have passed through the Council for Ministers without so much as a peep from DG 23..."
(Storey 1994, p.266)

Large countries tend to have more heterogeneous systems of production than smaller countries, which is resulting in less coherent national systems of innovation. Therefore, the formation of regional innovation systems and thus also regional responsiveness in policy programming and action tend to gain importance. This may be seen as one of the reasons why analytical focus tends to narrow in on regional innovation systems. Regional innovation systems tend to be of a more integrated and coherent nature than national systems, implying also that the dimension of support policies has the option of a stronger coherence.

7.3.1 Perspectives on coherence in the SMEPOL national studies

In *the Austrian study* coherence is understood as: ". . . the overall adequacy and effectiveness of the investigated support instruments in stimulating and improving the innovative performance of SMEs". Internal coherence deals with the adequacy of the means to attain objectives; external coherence describes the integration into the whole support system.

The internal coherence of the investigated direct support programmes is quite satisfactory. However, in some cases, especially the RIP-programme, there are inherent contradictions regarding targets for innovation and employment/regional development. The technology centres are more difficult to assess in this respect. The R&D-oriented centres are successful regarding the stimulation of R&D and innovation. These are explicit objectives. The facility-oriented centres, on the contrary, are aiming more at incubation, an objective that is well achieved, but does not focus much on the degree of innovation or the intensity of R&D. This is not to be considered a lack of internal coherence as far as the centres are concerned. Such an inconsistency can only be argued for the technology/innovation policy.

External coherence is also achieved as far as the existing direct support instruments are concerned. Their activities are well co-ordinated. Nevertheless, there are elements lacking which are necessary for a

comprehensive innovation support system (e.g. venture capital, innovation management consultancy, focus on firms, which lack the capabilities to innovate). Referring to the technology centres the main weakness in external coherence is the lack of relationships with external firms. The centres are concentrated on the firms located there leading to a lack of regional embeddedness.

In *the Norwegian study* internal coherence is conceptualised as the link between objectives, goals and targets of the policy instruments and the means to achieve these. The concept is internal to the programmes considered, and seems to have strong similarities with the concepts of (bounded) rationality used in public administration. Regarding external coherence, an interesting point of the Norwegian study is:

"A general conclusion from the evaluation of the three policy tools is that learning does take place and that this in a way has reduced the external coherence of these programmes (especially NT and TEFT) since they were implemented."
(Isaksen et. al. 1999, p. 239).

The notion of external coherence in the Norwegian study refers to the embeddedness of the individual policy instruments into the general support system, and the extent to which new ideas and results of the policy are built into the system. This seems to indicate a shift towards a more dynamic and interactive system of innovation. The price is a lower or a reduced level of external coherence of programmes. In the longer run, probably also affecting internal coherence. In the terminology of this paper this tendency represents a turn towards a more responsive typology of bottom-up processes and, probably, also a stronger demand-side driven system of innovation. Overall both external and internal coherence is seen to be satisfactory in the Norwegian case. TEFT & NT fulfil reasonable requirements to the level of internal coherence between means and goals of the programmes. Only RUSH has a rather mixed record, mainly due to the size of the programme and the limited means involved. With regard to external coherence RUSH meets the target set with regard to implementation, but it has a weak element of co-ordination built into the programme. The latter is often solved by on-site co-ordination at the regional level. TEFT as well as NT are seen to have achieved a satisfactory level of external coherence with the exception of some modest problems considering the implementation of TEFT.

In the *Dutch programmes* the record of coherence is envisaged as rather mixed. Internal coherence is mainly dealing with means and goals (objectives) of the programme being analysed. External coherence is a wider concept dealing with whether the programme is linked to other

policy measures and instruments seen from the policymakers' (supply-side) as well as the customers' (demand side) perspective.

The scores on coherence, external as well as internal, in the Dutch-Belgium study of Walonia (B) and Limburg (NL) are judged as rather mixed. Internal coherence (modest or poor in RIT) and external coherence and co-ordination are generally weak in all programmes considered.

The *British study* addresses two aspects of coherence. The notion of internal coherence is mainly discussed as a matter of co-ordination and comprehensiveness of targets and instruments:
"Nevertheless, since on balance each measure has a distinctive purpose and target group, with a degree of internal coherence, there is a degree of complementarity"
(Smallbone et. al 1999, p. 218)

In the latter part of the quotation, external coherence between different programmes is seen as key to good performance. The Business Link system in particular seems to provide tools for the creation of a coherent system of business services covering commercial as well as technical aspects, which, according to the summary of the UK report, leads to the following conclusive notions:
"The holistic approach of innovation adopted by BL means that SMEs which are seeking help with product development or particular technical problems may end up receiving assistance with the marketing of their products and service, ensuring that they reap the full commercial benefits from their innovations".
(Smallbone et. al 1999, p.5)

With regard to linking SMEs to other public innovation support programmes and linking them to the Higher Education Sector, the BL system is less successful. But it does seem to be the case that the BL system in particular is well received by its clients. This does leave us with an indication that BL-like systems serve well as local and regional deliverers of innovation assistance to SMEs.

So, in contrast to, for example, the Danish study, in which local and regional bodies tend to act individually in their approach to client enterprises, the UK system seems to function in coherent ways at the regional level. The Business Link system represents a framework aiming at the improvement of external coherence between individual programmes and between the supply-side and the demand side of the innovation system. An interesting feature of the British study is the introduction of

new aspects of coherence, the relationship between the support system and the market.

Since the overall SMEPOL study has a regional as well as a SME perspective, it is suggested that the concept of coherence needs to be expanded to cover not only a horizontal perspective – typically associated with the national level - but also, importantly, to focus on vertical co-ordination as well. In other words, there is a need to expand horizontal understanding to include a regional level and a need to include the ways in which vertical co-ordinations are brought about, through links of learning between the national and the regional level.

7.3.2 Regional perspectives on coherence

As indicated the regional aspect of coherence is addressed differently in the national studies. The Danish study focuses on the importance of providing an adequate regional system of policy delivery. The pivotal role of Business Links in the UK system underscores the same argument. The regional application of national programmes in the Austrian study, as well as the Norwegian White Paper on regional policy from 1993, stresses the importance of the regional focus of innovation policy, at least when looking at on-site implementation:

"The White Paper on regional policy, however, brings this into a wider framework based on an acceptance that knowledge is a key factor for the future industrial development, a tight coherence between the national strategies for enhancing competence and the regional political efforts. A key objective for the regional policy is 'to contribute to increased accessibility and improved exploitation of the national instruments'"

(Isaksen et. al. 1999, p. 197)

The main objectives are to secure accessibility to national programmes for business in all regions, and not that all regions should develop a self-sufficient system of knowledge and innovation.

Correspondence between the policy programmes launched, and the way in which SMEs understand these programmes, as well as correspondence between R&D policies and innovation programmes, are the most important features of regional coherence. It is necessary to stress that we are dealing with demand-side as well as with supply-side coherence. For the evaluation of the specific programmes this means the programmes have to be seen in their specific context including the regional policy setting and the business community as well as the target enterprises of the programme. External coherence has to be viewed from a regional and a national perspective. The integration of related policy programmes may be

provided at the national as well as at the regional level, but overall (regional) coherence can be achieved only if this condition is fulfilled. Qualitative differences may be conceived in terms of the regional innovation perspective.

7.4 Coherence reconsidered

Uncertainty can no longer be considered an imperfection. It has to be seen as a basic condition for small as well as large firm innovation. Studies of successful regions suggest that actors and firms participate in loosely coupled systems of innovation, which co-evolve in dynamic ways. Firms' innovative activities are often highly interdependent. In such a dynamic context, a range of programmes may easily develop aiming at filling gaps and niches of envisaged needs. However, since a broad range of instruments may confuse clients and lead to unintended slack in the programmes, it is found to be of importance that the policy programming is flexible, i.e. is able to respond to changing contextual and situational conditions. Therefore, not only programming, but also the organisational framework, is considered to be of importance. This is seen to be in contrast to traditional ways of conceptualising coherence, since the sole focus seems to be with programmatic coherence.

7.4.1An integrated view on the coherence of innovation support instruments

The concept of coherence that is reported in section 2 indicates that coherence of innovation policy is a heterogeneous concept, which varies with administrative traditions and contextual matters. In practice the interactive innovation systems in particular seem to have a less straightforward internal (top-down) organisational set-up leading to lower scores for this dimension. Therefore learning aspects in the set up of innovation support schemes as well in the co-ordination of programmes and delivery has gained importance.

The national studies undertaken point to a number of aspects of importance when it comes to the governance, guidance and organisational implementation of successful innovation support programmes in a dynamic setting. A few of these experiences are summarised below, with the aim of highlighting different aspects of the policy processes and system building.

1. A number of programmes demonstrate that *overall support paradigms followed have evolved out of political and institutional traditions in the country*, which were highly context specific and idiosyncratic. The paradigms may have guiding values at different levels of the programme organisation. The Danish case of the technological service-system may illuminate the role of common paradigms for coherence of activities. In Denmark the Approved Technological Service Institutes (GTS) have evolved into a dual system based on a long tradition of public support for the diffusion of new technological knowledge. The peculiar thing about the system is that it has, for many years, had to achieve a balance between a public utility function on the one hand, and a public demand that the institutes activities should be run on commercial - non-distorting - lines, on the other hand. As J.F.Christensen et al. (1996) writes:

   "It is not at all obvious that a country should have such institutes. Actually it is only a few countries, which have a similar structure with a network of institutes, which are neither purely market-based nor massively funded by the state"

   J. F. Christensen, et al. (op sit, p. 10)

2. Another issue is how *support paradigms are followed and their guiding values at different levels of the programme organisation*. A good example of the alteration of principles, according to the tier of government, is Austria. Instruments offering direct support like grants and loans dominate the national innovation support system of Austria. The funding programmes and the responsible institutions are organised along the linear innovation model, providing financial resources for certain stages in the innovation process (research - development - commercialisation). At the regional level, innovation and technology policy focuses more on elements of the interactive innovation model. At present, this applies primarily to technology centres. Most centres concentrate on incubation, but some also comprise R&D and training/education. More recently, technology transfer and the stimulation of clusters have become new important strategies of the regional government.

3. The next issue is *how the learning perspective is included into the system and brought into operation.* It can be difficult to highlight the learning perspective implied in the processes framed by innovation support schemes. However, the Norwegian case presented in section 7.3.1 is an illustrating case in point. In this case internal learning processes among actors involved in the programmes tended to lower external coherence of the instruments implied. Another case in point is

found in the UK country report in the British Smart Award Scheme. The programme provides a good example of policy learning as a result of experiences gained from implementation since the scheme was first piloted in 1986. Policy learning occurs both as a result of formal assessment and of more informal and ongoing interaction between government officials responsible for the Scheme within each Government Regional Office and with recipient firms. Inter-regional policy learning is also furthered through interaction and sharing of experience between government officials in different regions. There is little evidence, however, of policy learning based on interaction with advisors and organisations outside the Smart Scheme itself.

There have been a number of recent developments aimed at addressing some of the identified shortcomings of Smart. The most important are that Smart winners help to address some of the problems commonly experienced by innovative small firms, facilitating mutual support and learning between award winners. Following earlier criticisms of the overly stringent conditions of the Scheme, in 1999 the Smart scheme was expanded to include three further elements, (i) *Micro Projects* - low cost technology based innovations in businesses with fewer than 10 people; (ii) *Technology Reviews* - expert reviews to help SMEs benchmark themselves against best practice technology in the sector; and (iii) *Technology Studies* - for SMEs to help identify technological opportunities which may lead to innovative products and processes. This is likely to have the effect of making the Scheme more appropriate to a wider range of SMEs, and to reinforce learning cycles.

4. How *innovative dynamics* are envisaged is highlighted in Norway. At a general level, the programmes aim to generate new behaviour and knowledge in firms (and also in R&D institutions and colleges in the cases of TEFT and RUSH). That is, the programmes aim to teach firms to use R&D institutions and to organise and carry out innovation projects. The programmes' methods and activities reflect these targets; attachés and case handlers visit firms, analyse firms' innovation needs, recruit firms to the programmes. Finally they connect firms with relevant R&D milieus and researchers and support firms' innovation projects.

5. *The changing role of Vertical co-ordination* is highlighted in a number of country studies. Vertical co-ordination, defined as the links between bodies at the national and at the regional level, can be obtained in different settings. Vertical co-ordination in Spain *within* the region (Comunidad Valenciana) between the IMPIVA (regional public policy

fostering industrial development in the region), the Technological Institutes (regional level), and the firms is an obvious example. With regard to the Technological Institutes in the Region of Valencia an example of vertical co-ordination within a region is the collaboration between the IMPIVA organisation and the Technological Institutes, as well as the links between firms and the Technological Institutes which are a strong advantage of these policy tools. Moreover they are also involved in national and EU policies through the channelling and management of national and EU funds in order to finance innovation activities within SMEs in the region.

6. *The changing role attached to Vertical co-ordination* is illuminated in the case of the 15 regional Technological Information Centres (TIC) in Denmark. The Danish Technological Institute(s) (DTI) ran them since 1974. In 1996 they gained a separate legal and operational status. In order to secure a uniform nation-wide service and in order to support the development of new information support programmes, the 'TIC-Denmark' was formed in 1996 as a co-ordinating body. However, in 1999 it came to an agreement between the government and the union of county councils, that the county councils were to fund half of the budgets provided for each of the TICs. In exchange the county councils gained decisive influence on the activity profile of the centre located in their region. In conclusion one can say that a highly diversified regional support system is evolving at the expense of a uniform system based on national defined objectives and activities. A regional integration of innovation schemes directed at SMEs tend to substitute vertically co-ordinated schemes. In consequence the 'learning cycle' co-ordinated by 'TIC-Denmark' is vanishing, while a tighter learning regime between actors at the regional level is expected to evolve.

7. Various modes of *regional co-ordination* have been shown throughout the studies. A prominent feature in the Norwegian innovation support system is 'TEFT'. This body has a special role in the support system at a regional level by co-ordinating its instruments with other policies and programmes. This should occur when the attachés visit firms and analyse their situation and needs. Firms should be directed to policy tools and to R&D institutions other than the four participating in the programme. The NT programme also relates to other initiatives. TEFT in Northern Norway is integrated into NT, and NT co-operates tightly with FORNY (a national programme of commercialisation of research results in R&D-institutions) as well as with regional programmes like MABIT (a research and industrial development programme in marine

biotechnology). Recent reforms in some Danish regions have highlighted regional co-ordination between the traditional state-operated TIC's and the regional business development agencies.

The way innovation support programmes are organised differs from country to country as indicated in the above examples. The degree of central governance and funding is usually closely related to the general style of government, see figure 7.2 above. Sectorial programme co-ordination can be found in all countries, and is often found to be in contradiction to regional needs, as can be seen in some of the Danish and Austrian examples mentioned above, but also exhibiting degrees of variation from region to region as well as within countries.

7.4.2 Theoretical perspectives inferred

Inspired by Mintzberg and Waters (1985), who emphasise the evolutionary aspects of strategy making, policy programming can be envisaged as a pattern, i.e. a stream of actions. By this definition innovation policy programming is 'consistency in behaviour, whether intended or not'[13]. The emphasis on consistency in behaviour gains importance when talking about a policy-producing system, which comprises several autonomous organisations and where a dynamic perspective is employed.

Also, the implication of Mintzberg's and Water's notion *'a stream of action'* is that policy programming cannot exclusively be seen and understood as a plan, or an intended outcome, because unintended action will always appear and interfere with intended plans. Policy programmes and their realisation are, thus, the combined result of intended (or designed) activities and emergent actions. Therefore, we may envisage an intended policy programme, which is designed with coherence strongly in mind, and a realised policy programme, which consists of intended as well as unintended elements, i.e. elements that emerge in spite of, or in the absence of, intentions.

Basically, it is hard to think of an intended policy programme to be fully realised. It is also hard to think of a policy programme where the outcome is solely based on random inputs i.e. that intentions are fully absent. Therefore, in practice there will always be a larger or minor gap between (internal) coherence ex ante and coherence ex post. Granted the proposition that coherence is a key to efficiency in policy programming, those factors producing the gap between coherence ex ante and ex post are of crucial importance in a dynamic setting. Therefore, any evaluation

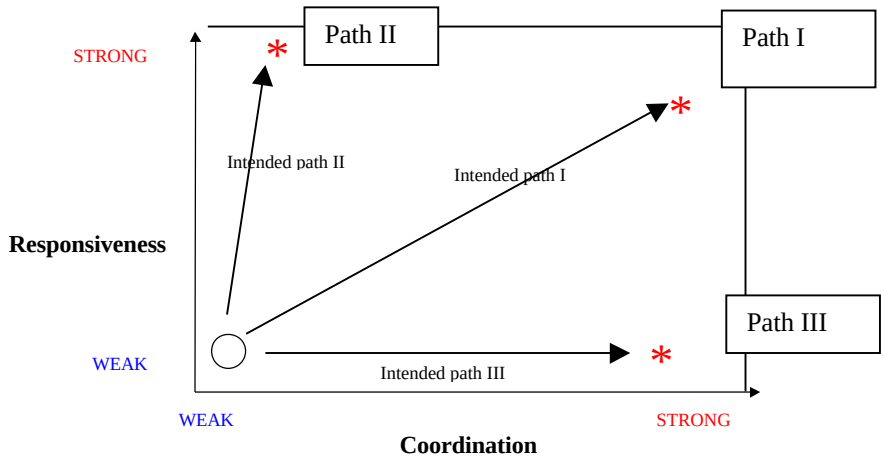
[13] Quote from Mintzberg et al. (1995), page 14.

attempt to measure programme efficiency thus means that efficiency has to be measured against ex post and not ex ante coherence according to the concept of this chapter. Bounded rationality based on actors' diverse positions in policy programming is probably one of the most critical factors in systems with many actors and contexts. Their view on what ought to be the intended path will, inevitably, tend to differ.

However, seen as a stream of action, two pathways tend to prevail in policy programming. In one path the issue of responsiveness is a central issue. Huge differences in the regional industrial context as well as administrative and political traditions founded on a philosophy of regional autonomy may promote this strand. Also a stronger element of socio-economic change may favour this strand. In the other stream, central co-ordination is a key issue. It may be caused by traditions favouring a strong central planning agency or by the squeeze on public spending and claims on public service provision.

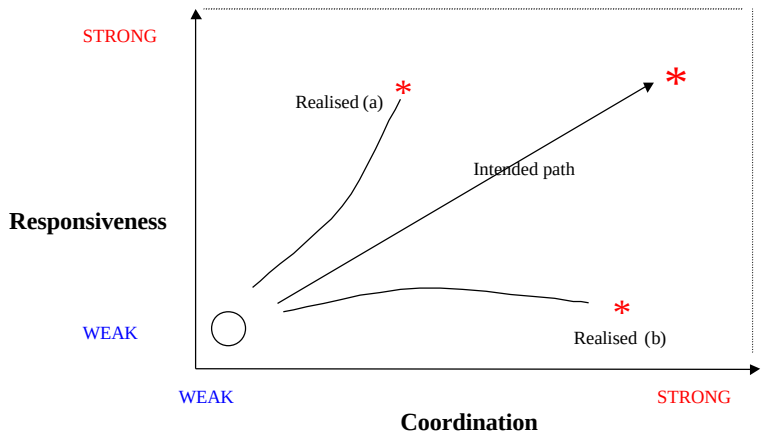
In figure 7.5 below the ‘idealised’ intended path is illustrated as an intended stream of action in which strong co-ordination goes hand in hand with a strong element of responsiveness (Path I). From an ex ante perspective coherence is then very much a question of how to integrate streams of action with diverse actors centrally as well as on a decentralised basis. From a combined perspective, coherence in policy programming is then how to frame and guide behaviour in such a way as to balance needs of responsiveness to SME clients with administrative needs of co-ordination. In some national innovation systems a strong tradition for responsiveness prevails (Path II). In other notions, central co-ordination is seen as the guiding line (Path III).

Fig. 5 Different Intended Path of Support



However, although all nations ex ante may basically work out similar intended paths of programming, the stream of action is influenced by a number of influential forces embedded in the context of each nation. Therefore, realised programmes will deviate from intended programmes in a number of respects, as visualised in figure7.6 below.

Fig. 6 Intended and Emerging Support Programmes



As already indicated in table 3.4. in chapter 3, there are pronounced differences in the way innovation support policy programmes are organised in the nations participating in this study. Differences in the administrative traditions and differences in the organisation of territorial space are major causes of these differences.

At the same time differences in, for example, the balance of power between the state – including different national bodies and agencies - on one side, and local and regional bodies involved in regional industrial policy issues that focus on SMEs on the other side, influence the way support programmes are realised.

Some nations have a long tradition and a strong political agenda for a high degree of (intended) regional responsiveness (Norway), although programmes are nationally initiated, designed and executed. Other countries seemingly have a weak tradition for regional initiatives (UK, Denmark), although policy programmes included in the UK case does demonstrate how national and even international initiatives may be realised in response to regional initiatives and needs. The Danish case of TICs does demonstrate a major change in the intended path of programming promising major changes in realised support programmes as well.

In yet other countries the regional bodies seem to be so strong that intended support programming is biased towards regional responsiveness at the outset. In such cases the issue of co-ordination tend to be realised in a regional more than a national context. This is for example the case of the Spanish programmes on Technological Institutes in the Valencia region.

The Austrian realised innovation support schemes are positioned along different lines in figure 7.6. In accordance with the nature of most of the programmes being national ones applied in a regional context (top-down) they tend to be realised with a strong emphasis on co-ordinated action. The TC’s alone are realised almost along the intended path (centre) with intermediate levels of responsiveness and co-ordination.

In the Belgium programmes in Wallonia neither responsiveness to changing SME needs nor co-ordination with other programmes can be judged to be of major concern. In this way the Belgium study demonstrates a case in which an intended path tends to be realised almost as expected, due to a restrictive programme not open to adaptation. But they are all indicated to be realised in the lower left corner of figure 7.6, indicating that responsiveness as well as co-ordination is weak.

The Dutch study brings forward a case (the so-called KIM scheme) in which co-ordination as well responsiveness to SME needs has been growing. It also included a scheme (KIC) in which a growing responsiveness to large firms' needs was realised, while other elements of the scheme were integrated with other support schemes addressing SMEs.

Regarding the Danish innovation programmes the TIC is of special interest, since a major change in intended path of support programming has taken place. The TIC has recently moved from the lower right (b) to the upper left (a), reflecting the fact that bottom-up features are becoming more and more predominant following reduced state involvement in TIC's. The question is if this change in intended path also will lead to a greater responsiveness to SME needs, or only lead to a growing responsiveness to the regional policy agenda.

In contrast to the Belgium schemes in which the regional programme organisation has no role to play at all, the regional programme organisation is seen to play an important role for a successful implementation of schemes in the Dutch case. In the Italian as well as in the Austrian case, the role of the regional programme organisation is judged to be much more mixed for a successful implementation of programmes.

In the realised stream of action favouring responsiveness external coherence tends to be considered a key issue, while internal coherence tends to be considered of prime importance in systems where the regional programme organisation is seen to have a modest role for a successful implementation.

7.5 Conclusions

The concept of coherence is only weakly represented in public planning theory. Likewise, the concept is largely absent in the theory on strategic planning and management. It is, seemingly, mostly used in applied evaluation studies and it seems to be strongly linked to traditional conceptions of policy programming. The country studies carried out suggest that the concept of coherence is useful in application, but that it has to be conceptualised in a dynamic as well as a regional setting.

The national studies carried out also most often stress huge differences between intentions emphasised in the programmes and the stream of action realised. Therefore it is a major conclusion that organisational coherence is of greater importance than ex ante programmatic coherence. Several reasons can be found. First of all, it was found that organisational coherence is an essential prerequisite for the creation of intensive communications about the intentions of policy makers and the views of regional bodies and actors on regional needs and implementation policies in respect of the delivery of programme-packages. Secondly, and related to this, the creation of organisational coherence is important for stimulating

learning among actors, programming funding, and motivating actors involved in the implementation of programmes.

Thirdly, in a dynamic setting there is a need for programmatic flexibility in order to respond to changing or diversified needs of client enterprises. This flexibility can in principle be by way of an organisational set-up that favours programmatic integration of key support tools that target different barriers to innovation among SMEs at the regional level. In terms of the ‘stream of action’ perspective taken above, flexibility may thus be attached to two separate phenomena, namely, the flexibility in programming (i.e. the acceptance of deviation from intended pathways) and the organisational flexibility.

The extent to which clients' views, and the views of those involved in up-front delivery system, are included in the programming, is of importance, since these views act as guideposts for programmatic performance in several respects, not least that of learning alongside the chain constituting the innovation support delivery system, including the clients.

Part IV: Conclusion

Chapter 8: Towards a new paradigm for innovation policy?

Claire Nauwelaers and René Wintjes

Introduction

The variety of regional contexts and the diversity of firms' abilities, attitudes, driving forces and barriers towards innovation - as it was enlightened in the other chapters of this report - prevents us to aim for one permanent 'best practice' policy, valid for each and every situation. This is not to say, however, that nothing general can be concluded, in response to the question of how to improve the efficiency of policy tools to support innovation in SMEs. The comparison between the results of the analyses of almost forty innovation policy tools, in 11 European regions, based on the same conceptual background, has delivered responses to this crucial question. They form a rich scope of opportunities for better practice regarding the policy process of addressing innovation of SMEs in their regional context. If one may call the shift from a linear model of innovation towards an interactive one, a shift in paradigm, then we may consider what we have evidenced in SMEPOL, as a tentative shift towards a new innovation policy paradigm. The aim of this chapter is to enlighten the main elements of such a new policy paradigm.

The points of departure of this policy-oriented study is that innovation is a good thing (both on regional as well as firm levels) and that there is a call for public intervention in order to get more of it. As a background, based on the literature, the first two chapters build on these basic assumptions.

Chapter 1 argues on the importance of SMEs as a target group for innovation policy, and provides three distinctive characteristics of SMEs, which allows us to elaborate on arguments and implications for innovation policy addressed to SMEs. These distinctive characteristics (compared to larger firms) are : a limited resource base, a distinctive organisational culture linked to the proximity between ownership and management, and a lower ability to shape their external environment. These characteristics are at the roots of the more informal, uncodified character of management and innovation practices in SMEs, which call for distinctive policy approaches. According to this view, the thrust of policy approaches should be twofold : to increase the availability of external resources for SMEs and to develop their internal, absorptive and learning capacities. This points to the crucial role of intermediaries able to codify SMEs' needs, working on the basis of personal trust

relations, to the value of "peer" networks as learning channels, and to the key role of human capital in SMEs.

Chapter 2 claims the importance of the regional dimension of innovation and this regional dimension also provides us some general arguments and implications for innovation policy. The discussion of clusters in that chapter, develops the thesis that proximity linkages can be instrumental in developing "learning firms" and "learning regions". Broadening and extending the concept of clusters towards the one of development coalition, points to a broader scope for innovation policy too, i.e. that of supporting the social and cultural aspects of innovation, enhancing social capital as a key element behind well-functioning regional innovation systems. Developing collective capacities and networking practices at local level follows logically as policy aim, under this view, but this should also be complemented with support to the development of linkages at national and international levels, in order to avoid being trapped into too strong ties, possibly leading to lock-in situations.

The conceptual framework for policy builds on these two chapters, as the policy reflection takes as a point of departure, the nature of SMEs and the role of the regional environment.

For the operational translation of broad policy orientations, we use the findings of the SMEPOL empirical analyses, as developed in the subsequent chapters : chapter 3 for the analysis of the variety of regional contexts in the SMEPOL areas of study, which we use to build up context-sensitive policy recommendations, chapter 4 on the typology of policy instruments, which allows us to develop the main thrust of our policy argument into more precise guidelines for each type of instrument, and chapter 5 on the patterns of innovation in SMEs, which illustrates how the generic attributes of SMEs translate into specific barriers and assets for innovation. To build up our recommendations, we also considered the reflections on results and impacts, and "good practice elements" of policy tools, as developed in chapter 6, as well as the thesis put forth in chapter 7, on the importance of combining responsiveness and co-ordination in the programming, organisation and implementation of policy.

This chapter is organised as follows.

Based on the empirical findings achieved in this comparative research, sections 1 and 2 support the SMEPOL claim for a new innovation policy paradigm and propose a shift in rationale (section 1) and broad orientations (section 2) for innovation policy, addressing SMEs in their regional context. These sections use the notions of market failures and system deficits, which show up as barriers to innovation processes in regions and SMEs, and focus on what we may call government failures, shown by the evaluation of instruments.

In section 3, we endeavour to go further than general policy guidelines, by providing elements of good practice of a more operational nature, differenciated by type of policy instrument. This section is conceived as a basis for practical benchmarking exercises, to be carried by policy designers and implementers[14].

The key argument of this policy chapter is synthesised in section 4, where a stylised view on the content of a sound regional innovation policy for SMEs is presented.

Section 5 deals with the question of how to build a coherent portfolio of policies, taking into account both regional situation and specific SMEs needs in terms of innovation. The key message delivered is that there is no "one-size-fits-all" policy portfolio. Consequently, priority setting between the variety of policy tools available, both of a traditional and a fashionable nature, appears as a key task for policy designers.

The concluding section draws the lessons from the whole exercise of evaluating, in a comparative fashion, a variety of policy tools, within a common conceptual framework. One salient element of the conclusion is the need for more "policy intelligence" in this complex field.

8.1. The rationale for policy intervention in innovation : Failures in communication, barriers to innovation and boundaries to learning in SMEs and their regions

Whether we talk about markets, systems or governments in relation to innovation, it all concerns communication, a process of exchanging information and knowledge. In order to be useful and valuable to others in a firm, market, system or government administration, technological (and other) knowledge has to be diffused and policy lessons have to be learned.

The typical and traditional approach to communication in business and economics focuses on markets where price mediates supply and demand. The "neo-classical" government typically communicates power based on a hierarchical position vis à vis the economic agents they govern. Moreover, in accordance with traditional market-hierarchy dichotomies, the typical argument for government intervention is where markets fail in communication. Either the market or the government would provide the best solution and, in general, interactive communication is not considered to be of vital importance in the process of finding and reaching solutions. The linear perspective dominated even before it had been applied to innovation.

[14] Such exercises are beyond the scope of this study, but are in preparation as a follow-up. From this, interactive learning between academics and policy makers is expected as a promising way of improving both policy practice and analytical capabilities in the area of innovation policy.

If everybody knows in advance what (products, resources, technologies, capabilities etc.) we are talking about and everybody would agree on its (present and future) economic value, the market is perfectly able in communicating supply and demand. In these situations there is no need for communicative interaction. Whether the 'demander' or the 'supplier' names the price the market will in a linear response come up with the proper answer. For the exchange of certain goods or services the price may be the only aspect that has to be communicated. However, when knowledge or innovation is concerned, the market or price mechanism may not function very well for several reasons.

Following the logic for policy, a central question for a policymaker is : how do I recognise where and when markets fail, so where and when do I intervene? If it is perfectly clear to policy makers where markets fail, and it is widely agreed upon, what the governed region additionally 'needs' and 'has to offer' (and more specifically what firms 'need' from their region including its government and what firms have to offer their region and its policy goals), then there is no need for interaction, because everything is clear and there is no knowledge left to be codified. There is only information to be passed on, and since interaction is costly, e.g. in terms of time and energy, linear and top-down communication is likely to be more efficient.

However, dealing with the uncertainties attached to knowledge and innovation, economic and policy agents may want to communicate more than price or authority. The traditional concept of markets and (state) hierarchies with their anonymous, linear and formal communication, fails to incorporate this. A reason why both markets and hierarchies as co-ordination and communication mechanisms may not function very well regarding innovation is related to the uncertainties attached to predicting the future. The market may fail to predict the economic value of new technologies, new products, new resources, new firms or new entrepreneurial capabilities. Typically, the market will, for instance, not be able to value a start-up firm. Although policy makers have difficulties in predicting the future either, this kind of market failure is a widely accepted justification for public intervention through, e.g., a generic national policy tool like a tax-reduction scheme. The latter seems relevant to 'protect' these young, new entrepreneurial experiments, providing them a chance to prove themselves and to convince the market (customers but also financial and labour markets for instance) of their potential, and moreover to convince the government of their potential contribution to the region and its policy goals. The same arguments may hold for new sectors or technologies or a young regional cluster of firms, or even older non-innovative firms that want to, and are trying to become innovative. The most obvious role for policy makers with regard to innovation is perhaps to support 'new people' providing them the chance to learn by educating them before they convince the labour market of their economic value.

Other aspects where market obviously fail, is in communicating certain environmental and social costs and benefits. If economic agents do not take these kind of ‘costs’ into account, governments may want to intervene and extend the boundaries of the rationality of the agents they govern, e.g: by influencing their cost-benefit-calculations with environmental taxes.

The justification for traditional technology or R&D policy is based on the macro-level argument that, when the social effects are taken into account, there is under-investment in R&D. The risk and uncertainty attached to R&D by private actors calls for public intervention because, at the macro-level, it is considered worthwhile to publicly take the risk for the sake of society, e.g., by financing public R&D in universities or, again, by influencing private, micro-level cost-benefit calculations with tax-deduction facilities or subsidies.

The idea that there is a role for policy makers if markets fail, does not imply that policy makers are perfect, but that the above mentioned general or structural market failures may very well be effectively and efficiently addressed by generic policy instruments, designed and delivered at the national policy-level. And to diffuse this information on needs and support, linear communication seems appropriate. However, knowledge differs from information. For instance, distance does not seem to be a barrier to the transmission of information, but in the transmission of knowledge it does.

The background chapters have stressed the importance of the tacit dimension, the informal, uncodified and disembodied aspects of the knowledge concerned, both at the regional level and for SMEs. This underlines the localised nature of knowledge spillovers. The linear communication using the old market-hierarchy approaches fails to address this. Proximity matters to knowledge spillovers and interaction between regional agents (both private and public) matters in dealing with the uncertainties attached to innovation processes in regions and SMEs. So, if it is not well articulated, nor commonly agreed upon what a region or its SMEs 'need' and what they have to 'offer' (for instance to each other) the linear, formal communication and a top-down co-ordination may not function very well. The variety of situations regarding innovation, SME's and regions call for communicative interaction. Local discussions, private and public-private ones, can shed more light on the uncertainty issues. Exchanging tacit visions, converging ideas and co-ordinating investments decisions (public, private and public/private ones) may provide the knowledge base for an innovation strategy concerning SMEs and their regions.

Especially concerning innovation processes in regions and SMEs, the concept of systems (or networks or clusters) seems more appropriate to model the reality than the traditional concepts of markets and hierarchies. A regional innovation systems approach stresses the importance of diffusion of knowledge and interactive learning

within the region as a system. The non-anonymous relations, the complementarity of activities, and the historical setting is stressed, which specifies the regional context and the profile of its SMEs. It provides the regional system its identity.

The specific characteristics of the regional system calls for a fine-tuning in innovation policy. Macro-level arguments and linear policy solutions may not be relevant at regional system and firm level, because of heterogeneity. More R&D for instance may not be the relevant solution to each firm or region and not each region may for instance face problems identified at the European level, like the “European paradox” of good performances in public research and bad performances in innovation. A regional innovation system without a university, for instance, may clearly face different kinds of problems and policy opportunities. In one region the university research may not be relevant to SMEs at all, whereas in another region it may be very relevant to a certain group of SMEs, but they may for some reason be totally unaware of it. So, each regional system will in some respect have its own ‘failures’ and potential which can be translated into policy challenges. In chapter 3 these system-failures have been categorised in three types : a low density of institutions (regional "thinness"), a fragmented system and ‘lock-in’ situations.

In order to find out and articulate what a particular region or firm needs or what is lacking concerning innovation, regional proximity and communicative interaction may be needed to address the tacit and latent aspects. Providing R&D tax-reduction or subsidies may also not be enough to change the rationality (nor the boundaries) of SMEs regarding innovation processes.

Innovation is instrumental to regional development, and innovation policy has in fact become the main regional development policy in many European regions. The desired effects of such a policy may be regional employment, industrial restructuring, competitiveness et cetera. So there are some general arguments for regional innovation policy. But what are the arguments for the choices within innovation policy : which policy calls for a regional design and which support should be delivered by a regional institution ? What are the specific arguments to select which aspects, and which firms (and sectors or technologies) of the region to address and which aspects of firms to support ? Besides the importance of learning from interacting with the agents they govern, it is important that policy makers learn from their previous actions (learning-by-doing). Policy makers may fail in this respect and they may also fail to diffuse their policy lessons to authorities at a higher level or another region. Policy lessons have to be learned, that is : failures and successes have to be acknowledged and communicated. The failures in communication and learning highlighted in the SMEPOL study may be referred to as government failures.

8.2. Policy lessons from the evaluation of 40 innovation policy tools in 11 European regions

Having discussed the rationale for policy intervention in innovation, this section deals with the content of such policies, proposing general rules for their design and implementation (section 2.1) and observing how these rules are applied in practice in the case study regions (section 2.2).

8.2.1. Basic principles for innovation support policies

Building on the conceptual and empirical findings of the SMEPOL project, we come up with the following proposal :

Since the main distinguishing features of the majority of SMEs, with regard to the innovation process, is that : they have a limited resource base, need external orientation to understand and (pro-actively) adapt to their environment, and engage in innovation on an informal mode, the main role of innovation policy, which aims to increase the capacity of a region and the capabilities of its SMEs to innovate, is to foster interactive learning within the firms and within the region. This calls for an interactive mode of policy intervention.

Of course, this statement stands as a quite bold generalisation of both SMEs characteristics and policy challenge. Some SMEs have a quite advanced knowledge base (it is the case e.g. with NTBFs), others have developed excellent innovation management capabilities, and some firms in niches really shape their business environment rather being dependent on it. Also, there are problems of another nature which impede SMEs to innovate, such as the need for risk financing[15] or the necessity to access technological state-of-the art. The meaning of this proposal is to point to orientation of policies, needed to address the key needs of the majority of SMEs in most regions, and which are not properly taken into account in traditional policy approaches. This does not imply that more linear approaches and tools are not relevant, but rather, it puts the latter in perspective, if the aim is to foster innovation as an instrument of regional development as whole. It means that providing resources to innovate (finance, technology) is not sufficient if the firms do not possess the managerial and organisational abilities to deal with the innovative process (Cobbenhagen, 1999). The view of an "automatic" flow of technological resources through the firm, or from the R&D sector into the firm, is denied here, while increased attention is given to the innovation process (within and around the firm) itself, in a broader sense.

Fostering interactive learning, as a policy goal, should not be read in a dogmatic egalitarian sense, limiting the view to the development of "Third-Italy" type of networking and relationships, as an ideal way to foster that process. Hierarchical relationships might be very relevant ways to achieve such an objective, depending on

[15] Even there, in most cases, the problem is not so much the existence of risk capital funds but the accessibility of these for SMEs engaged in risky, and sometimes weakly formalised projects.

the environment. The role of geographical proximity might be important to nurture these learning relationships, but it is not a necessary ingredient everywhere. The point here is that being open to outside sources of knowledge, and having the capacity to integrate these with internal knowledge in the firm on a continuous mode, is a key to the innovation process. Such an objective has implications both on the supply-side (outside resources should exist, be organised and accessible to firms) and on the demand side (the firm's absorption capacity and its willingness to entertain links with the outside should be enhanced). Developing strategic capabilities, at firm, organisation and policy levels, lies at the heart of this challenge.

The idea of an interactive mode of implementation of policy means not only that services should be both designed and delivered in co-operation with the beneficiaries - i.e. the criterion of "voice" in policy instruments, as detailed in chapter 6 - but also, that the policy implementers can be partners in the supported action or project, so that learning can happen both ways between policy implementers and firms - what we called "communicative interaction" in section 1 above. This way, the tacit nature of innovation in SMEs is better approached than in more hierachical policy modes.

8.2.2. The application of the basic principles in the SMEPOL study areas

If the statement above is the challenge for policy in theory, how does it compare with practice, as experienced in the regions covered by the SMEPOL study ?

The horizontal overview and comparison between the analyses of forty policy tools in 11 European regions, show that such a challenge is hardly met by the policies at work in these regions. Both the content and the modes of delivery of policies are in most cases not interactive and would not fit the coherence criterion as developed in the previous chapter.

More precisely, the SMEPOL analyses deliver the following picture, expressed under 8 general findings. For each general finding, we illustrate the general trend observed, but we mention also interesting counter-examples when available.

1. The general situation is that linear tools are dominating the policy scene, but that everywhere an evolution towards more interactive support is visible.

Example from Belgium

"One can analyse the actual state of the emerging Walloon innovation policy as follows : this policy is in fact founded on two different paradigms - broadly speaking the linear and the interactive views on innovation - the former being embodied in the "mainstream" policy (including the instruments analysed above), while the latter is translated in the "fringe", an unarticulated and rather fuzzy set of initiatives, trial-and-errors efforts, inspired by the "localised externalities" approach and much less linear in scope."

SMEPOL Belgian report (Nauwelaers et. al. 1999)

Example from Austria

"The Austrian innovation support system is dominated by a few funding organisations, mainly offering direct support like grants and loans withn the framework of several programmes. Institutions and programmes are organised along the linear innovation model. (However) There are serious doubts about the efficiency of traditional direct support for R&D and innovation."

SMEPOL Austrian report (Kaufmann and Tödtling 1999)

Counter-Example from the Netherlands

"The 'interactive' content of Limburgs' innovation policy is largely due to the RTP-Limburg initiative. The RTP-framework and the way Limburg has implemented it has led to an extension of the 'interactive' policy. 'Interactive' instruments are not 'delivered' on paper at the front door, but are mainly implemented in personal communicative interaction with the actors involved. The regional intermediates Syntens and LIOF play a vital role in the implementation of Limburgs 'interactive' policy.

SMEPOL Dutch report (Nauwelaers et. al. 1999)

2. Policy instruments in general do not form a system : lack of co-ordination and of synergies between tools at work in one environment is the rule.

Example from Italy

"It seems that there are a lot of overlapping in missions of different institutions working within the region Apulia, with a lack of capability of coordination for what concerns the Apulia Region institution."

SMEPOL Italian report (Garofoli 1999, Ed)

Example from Denmark

"None of the actors have made strategy and action oriented links between the forthcoming knowledge-based economy and the attempt

to formulate a coherent learning and innovation programme. Most initiatives are of a single programme nature. A stimulating strategy trying to integrate and co-ordinate the diverse innovation schemes is lacking".
SMEPOL Danish report (Christensen et. al. 1999)

3. Few policy instruments are designed and implemented in an user-oriented mode, taking both expressed and latent needs of users into account : the majority of tools are developed in a reactive, top-down fashion and at best consider expressed (but not latent) needs. However, in cases where "voice" of users is taken into account, the tools become much more user-oriented.

Example from Italy
"Tecnopolis represents a typical model of technological park based on supply-side, starting from the existence (and redundance) of competences (…), always postponing the moment of monitoring the potential needs of local (or external) firms to facilitate interaction between research centre and economic activities."
SMEPOL Italian report (Garofoli 1999, Ed.)

Counter-Example from Spain
"Local entrepreneurs belong to the "Consejo Rector", the governing body of the Technological Institutes, so that they participate in the design of activities and policies (…) The Institutes' strong points are their nearness to firms, their connections to other international centers of this type and the knowledge transferred to the firms through them (…) The Technological Institutes show a high degree of effectiveness in adapting to innovation support needs as expressed by the entrepreneurs of the SMEs in the four sectors studied."
SMEPOL Spanish report (Vázquez Barquero 1999)

4. Policy learning is still rare and underdeveloped. If it occurs at the level of organisations, it takes place on an occasional, not routinised way. Intense policy learning practices may however result in undesirable volatility in the policy system. At the other extreme, it seems unjustified to maintain a range of tools that are virtually not used by firms. The challenge lies in fine-tuning the policy tools without letting firms suffer from the instability of the system.

Example from Austria

"Most support instruments are not evaluated systematically. Of course, there is an ongoing learning process in the institutions about the effects of support activities, about problems and needs of firms regarding their innovation processes. But it is based on personal experience and information exchange, the learning process is not institutionalised or routinely organised."
SMEPOL Austrian report (Kaufmann and Tödtling 1999)

Counter-Example from the Netherlands
"National policy-makers have learned from several regional innovation policy-initiatives and integrated them into the national innovation-policy. The analysed KIM- and KIC-schemes are good examples from Limburg of this bottom-up policy learning process."
SMEPOL Dutch report (Nauwelaers et. al. 1999)

Counter-Example from Norway
"Policy learning takes place from evaluations in the support sytem. Thus, TEFT and NT have been changed during their "life", partly as a response to knowledge acquired through evaluations. TEFT also carried out monitoring research, which is implemented in the new REGINN programme too. RUSH, being an experimental programme, in particular, would need procedures for systematic evaluations and learning, however lacking in this case"
SMEPOL Norwegian report (Isaksen et. al. 1999, Eds.)

5. There is an emerging new tendency of developing "overall schemes", gathering into a single programme or instrument and organisation, a set of tools traditionaly proposed separately to companies. This approach[16] is promising in that it fits well with the perception of innovation within firms.

[16] The question if it is better to gather all the components of support into one single scheme, or keep those components separated, but have them well co-ordinated, cannot be answered independently of the context. It might be more natural in "thin" regions (such as Northern Norway) to gather all supports into a single scheme, but this might not be possible/desirable in more dense regions.

Example from the Netherlands

"The 18 Syntens organisations are the most important intermediary organisations in the Netherlands (and thus Limburg) for innovation policy addressed at SMEs. The role of the ICs gradually changed from bringing technology to regional SMEs (technology push) to an intermediate role of 'broker', and more recently it fulfils the role of 'organiser, animator or coach'. The 'new' organisations are more able to deliver 'all-round' service and support to SMEs and they go by the new name of 'Syntens: an innovation network for entrepreneurs'."

SMEPOL NL report (Nauwelaers et. al. 1999)

Example from Norway

"NT provides also a more all round support for innovation than the other programmes, that concentrate on a single component in the innovation sytem (…)NT focuses on firm's innovation projects, and tailor-make support to firms' specific needs, both technological and non-technological support."

SMEPOL Norwegian report (Isaksen et. al. 1999, Eds.)

6. The majority of instruments aim at improving or facilitating existing innovation projects, rather than inducing new innovation practices : providing grants for R&D, e.g. seems to induce a rather small incremental behavioural effect (in terms of strategy, management or culture regarding innovation, co-operation and interactive learning). Therefore, the additionality of such policy instruments is questionnable. The question of penetration rate of the tools in the business sector is not always addressed in policy settings, e.g. where a "picking-the-winner" approach is taken : a focus on the visibility of results may act as detriment to the value-added of the scheme.

Example from the UK

"*There is a mismatch between the characteristics of entrepreneurs and SMEs in the Lee Valley area (…) and the eligibility criteria for the (SMART) scheme. Its competitive nature, using national assessment criteria, which are weighted towards new to the industry innovations, has meant that relatively few projects from within the Lee Valley have qualified. As a result, the SMART scheme is not making much contribution to raising the level of innovation in SMEs in this area".*

SMEPOL British report (Smallbone et. al. 1999)

Example from Austria

"In general, financial support seems to be actually "overeffective"(…) This is especially obvious in the case of the more innovative SMEs. This raises the question, if there is a significant share of the applied funds lost to firms and projects which do not really need them, but take them along as a welcome additional source of funding ."

"A special problem of the direct support programmes seems to be the emergence of long-term stable relations to a special clientele consisting in well-known innovative firms".

SMEPOL Austrian report (Kaufmann and Tödtling 1999)

7. Very often, tools designed at regional level have a closed view on the relevant sources of knowledge useful for firms, as the boundaries of the system are defined in administrative terms. But if tools are user-oriented, there is no need for such a restricted view.

Example from Begium

"Most of the "fringe" initiatives work under irrelevant geographical limits, of an administrative nature, and imposed by the sources of public funding : provincial limits, Objective 1 or 2 zones, ... which do not necessarily correspond with the natural areas of actions of the targeted firms."

SMEPOL Belgian report (Nauwelaers et. al. 1999)

Example from Denmark

"The national/international client issue tends to oveshadow the issue of a regionalized technological service system. Most respondents approached tend to disregard the regional issue as a relevant issue with the argument that the service units will be too small. If every region is going to have a service centre, then the GTS system will lose economies of scale as well as of scope".

SMEPOL Danish report (Christensen et. al. 1999)

8. Overall, there is a decreasing order of importance in the available policy support, of the 5 following types of main innovation problems / needs for innovation support reported by SMEs (as they were expressed in chapter 5 of this report) :
   - Ø Finance /risk
   - Ø Technology /technical know-how
   - Ø Qualifications/personnel
   - Ø Market access/information

- Ø Time constraints/Organisation/Strategic capabilities.

The lack of "market orientation" of the policy tools, or their lack of focus on the commercialisation aspects of innovation are particularly put in evidence by the SMEPOL study.

Example from Begium

"There is a need to reinforce further the human skills component of innovation. The take-up of existing human resources schemes is quantitatively limited, so there is a need to also upgrade externalisation capacities of firms to other sources than universities or knowledge source institutions, to favour better commercial capacities within the firm, and to support strategic capacities for SME managers on a wider scale, introducing more innovation management tools and creative thinking in SMEs."

SMEPOL Belgium report (Nauwelaers et. al. 1999)

Counter-Example from the UK

"The emphasis of BICs is on the commercialisation of innovative ideas. In this respect, BICs aim to provide a comprehensive package of support for innovative new ventures and existing projects. In emphasising the commercial application of innovation, BICs also aim to address the weakness which has been consistently identified in small technology based firms, of an over emphasis on technical development at the expense of marketing and general management skills."

SMEPOL British report (Smallbone et. al. 1999)

8.3. Strengths, weaknesses and ways to improve innovation policy instruments

The preceding section drew horizontal conclusions from the analyses carried out on innovation policy tools in 11 European regions. Broadly speaking, the message was that the general principles for sound innovation policies were not met in most of the cases studied. In this section, we try to go further by asking the following question : How could the studied tools, taken individually, be altered so as to get closer to these principles ?

In chapter 4 of this report, the innovation policy instruments have been classified, according to their nature, under five types, reflecting the different goals and targets of these policy instruments. We use this typology for our reflection, however broadening it to cover also non-technical resources of the firm :

1. Direct support schemes for R&D and innovation projects;
2. Technical personnel introduction schemes;
3. Technology centres and schemes fostering technological diffusion to SMEs;
4. Mobility schemes for researchers;
5. Innovation Brokers and innovation advisers.

It should be noted here that such a view on innovation policy instruments is quite restrictive, since a wide range of other types of tools are acting on innovation behaviour: training support, investment support, fiscal and regulatory rules, environment regulations, competition policy, etc. We focus here on the type of tools that have been subject to analyses in the SMEPOL study, without pretending that they cover the whole range of relevant policy instruments.

The aim of this section is thus to see how, under each type, policy instruments could be transformed so as to evolve evolve more in accordance with the new paradigm for innovation policy, as expressed in section 2 above. For each category, we remind the relevant schemes studied in SMEPOL (as described in chapters 4 and 6), we propose a synthetic view on the main challenges to be met by these schemes, and we enlighten possible lessons to be learned across instruments. The reader is referred to chapters 4 and 6 for a detailed descritpion of each instrument. The directions proposed below are seen as bases for practice-oriented benchmarking exercises involving policy-makers themselves, and, possibly, beneficiaries.

8.3.1.Direct support schemes for R&D and innovation projects;

- **Relevant instruments** : FFF, ERP, ITF and RIP in Austria - Development companies and Growth Fund in Denmark - SMART in UK-Recoverable advances in Wallonia - Equipment loans in Italy - National and Regional grants or loans, tax ded demonstrate effectiveness of services with a long term and rather fuzzy impact

- **Main challenges :**
  - Ø Lower fragmentation of support according to various aspects of innovation process, take a longer term view on support (ensure complementarity with awareness-raising, market-oriented, innovation management, commercialisation, … support)
  - Ø Increase additionality (broaden and renew client base to pick up less obvious clients) without losing focus on innovation
  - Ø Introduce more policy learning in these traditional policy tools
  - Ø Work in complementarity with risk capital

Cross-instruments lessons :

- Ø NT has several good practice elements to offer to other schemes, combining high responsiveness and high co-ordination, and using an interactive mode of delivery of the support : high degree of policy learning, witnessed by incorporation of lessons from evaluations in subsequent programming periods, focus on learning on how to innovate in companies; all-round support covering financial, technical, commercial, managerial, organisational …needs; long term coaching of firms; policy implementers act as partners to the firms (presence in the Board of companies); attention paid to foster linkages between firms and other agents, etc.
- Ø SMART could evolve towards incorporating more consideration on marketing issues, notably by developing better co-ordination with Business Links.
- Ø BIC takes equity in order to secure long term support to companies (and payback).
- Ø The Network of SMART winners introduce an inter-firm dimension in an otherwise very "introverted" tool.
- Ø Development Corporations in Denmark ensure a sparring partner function for supported firms, in addition to provinding funds.
- Ø More policy learning could be introduced in the recoverable advances scheme in Wallonia, though external evaluations, focusing on the analysis of reasons for success and failures in the supported projects.

8.3.2. Technical personell introduction schemes

- **Relevant instruments :** KIM in Limburg, RIT in Wallonia

- **Main challenges :**
  - Ø Increase penetration rate of the schemes
  - Ø Increase additionality of the schemes, i.e. their role in changing behaviour in SMEs, rather than responding mainly to financial considerations
  - Ø Upgrade flexibility of the schemes, to adapt them to firms' characteristics (nature of innovation process, level of formalisation achieved, etc.)

- **Cross-instruments lessons** :
  - Ø The RIT scheme can usefully take lessons from the neighbouring KIM scheme and be transformed to : focus the selection criteria in order to ensure the introduction of a new function and new profile in the firm; extend the RIT support to marketing competences, and combine this scheme with the support of "mentors" who "sell" the scheme (heping firms expressing their needs) in order to ensure its success.

8.3.3. Technology centres and schemes fostering technological diffusion to SMEs

- **Relevant instruments :**GTS and TIC in Denmark - Austrian Technology Centres - Spanish Technology Centres - RTC in UK - Tecnopolis in Apulia and Service centres in Lombardy - TEFT and RUSH/REGINN in Norway

- **Main challenges :**
  - Ø Reconcile self-sufficiency on financial side with public service mission (awareness-raising in SMEs, etc.);
  - Ø Combine role of developing supply-side and respond to demands;
  - Ø Make the technology advisers evolve from a "consultant" mode (transferring existing knowledge from their shelves to the firm) towards a "process consultant" mode (working together with the firm on its transformation process, bringing in relevant knowledge -taken from anywhere- when necessary and adapting it to the particular situation). That is, developing a demand-led approach in these centres;
  - Ø Reconcile openness with context sensitivity : while proximity might help, it should not mean that support need necessarily to be delivered from sources in proximity; a key role of technology centre is to help firms find ways to relevant sources worldwide.

- **Cross-instruments lessons**
  - Ø TEFT's attachés perform a firm analyst function, which help them evolve towards a more demand-oriented mission than if they were only in charge of transferring knowledge available in their centre, to the firms.
  - Ø The Austrian centre Software Park Hagerberg succeeds in performing a mix of the following functions : R&D, industrial development, teaching, incubation, etc., which in the end favours interactive learning between researchers from the private and public sectors, enterprises managers, engineers, and students.
  - Ø The Spanish Technology centres are well embedded with the local industrial fabric, with entrepreneurs being present at conception and implementation of the services to be delivered by the centres (they have "voice" in the policy). This could offer a way to follow for, e.g. the Tecnopolis centre in Apulia, which suffers from a lack of linkages with business needs.
  - Ø The UK Lee Valley Centre works in co-operation with the Business Links, in order be able to offer a more complete support to firms involved in an innovation project, beyond their technological needs. This helps the former to evolve from a technology-led support towards more client-centered support.
  - Ø REGINN's approach is to support firms clusters rather than individual firms, which adds the "interactive learning" dimension to the support.

8.3. 4. Mobility schemes for researchers

- **Relevant instruments :** FIRST-Enterprise in Wallonia - FFF scheme for student stays in firms in Austria - Mobility scheme in Denmark

- **Main challenges :**
  - Ø Focusing schemes on companies' needs rather than providing opportunities for financing research in the education's sector
  - Ø Ensuring a sufficient take-up of the scheme
  - Ø Ensuring additionality of the scheme
  - Ø Upgrading behavioural impact of the scheme in the longer term, in terms of developing lasting collaborative patterns between research and industry

- **Cross-instruments lessons :**
  - Ø For the First-Enterprise scheme, extend the scheme to collaboration with other firms (rather than restricting it to public research laboratories) and to non-technological matters (managerial, strategic, marketing). Supplement this scheme with a new scheme for access to laboratories equipment by SMEs.

8.3. 5. Innovation Brokers and Innovation Advisers

- **Relevant instruments :** Business Links and BICs in UK- TIC in DK - Syntens and KIC in Limburg - TEFT in Norway

- **Main challenges :**
  - Ø ensure a user-oriented mission while broker has a vested interest in the system
  - Ø professionalise such a, often loosely defined, job; develop the skills of brokers in making tacit needs apparent
  - Ø improve the value-added to a "pure" brokerage service
  - Ø maintain an innovation focus and avoiding downgrading to "basic" business development support
  - Ø reach micro-enterprises and less obvious clients
  - Ø demonstrate effectiveness of services with a long term and rather fuzzy impact

- **Cross-instruments lessons :**
  - Ø The "fringe" tools in Wallonia (and other schemes) may learn from Business Links : they succeed in maintaining a holistic view on innovation and in carrying out a signposting function. The function of "Personal Business Adviser" might be used as a basis to define more precisely the mentoring function developed on an ad hoc basis by several actors.
  - Ø Syntens evolved from pure brokers towards pro-active advisers, and added to their initial technological concern, competences in human resources development and strategic management. They also have been entitled with a mission to reach new clients for their services.

- Ø The quite innovative KIC scheme could provide lessons (on the positive and negative sides) to the numerous policy makers interested in developing cluster policies in their region.

Although the above suggestions for schemes improvement are presented per category of tools, we need to stress that one of the most promising approach in the design of innovation policy lies in the development of tools that cross the boundaries of this typology : technology centres that also perform broker and innovation coach functions, direct financial support schemes that go along with support to human resources of innovation management, mobility schemes embedded in wider support to innovation projects, etc. A move towards more interactive, responsive and flexible innovation policy, entails this in many cases.

8. 4. A synthetic view on policy directed at innovation in SMEs in a regional context

Throughout the national reports, this final report and in the discussion above, we have witnessed the heterogeneity of policy instruments aiming at fostering innovation in SMEs. The instruments have various goals, such as linking SMEs with R&D producing institutions or, for instance, reinforce human resources within companies. The support also comes in various forms, like direct financial support, or services from technological centres or brokers, or under the name of cluster policy. Some policies clearly have a national origin while others may be classified as regional. Moreover, and perhaps of more fundamental importance, the policy instruments touch on different entry points of the individual innovation path of firms. Or even different phases of the (collective) innovation path of the regional system these firms may belong to. For instance, the abilities and attitudes vis-à-vis innovation of firms targeted by awareness raising instruments differ from the abilities and attitudes addressed by "linear" instruments. Some tools might help to create the necessary awareness and capabilities in firms, so they can afterwards be supported with more standardised schemes when they have moved further on their learning curve. A proper sequence of instruments becomes then more appropriate than a search for universally and permanently adequate tools. This also touches on the relevant mix of ‘cost’ and ‘voice’ in relation to the results of the policy tools (see chapter 6) and the relevant mix of responsiveness and co-ordination in relation to coherence within policy systems (see chapter 7).

The evidenced diversity, of cause, is not a surprise considering the diversity among SMEs, their regional contexts and most of all the innovation processes (recall chapter 1-5). Notwithstanding this multilayered diversity, we can construct a simple, crude two-dimensional classification of the policy instruments, which presents a synthetic view along two key issues concerning a shift or change in policy paradigm. We have

classified the SMEPOL instruments according to the two following key fundamental characteristics :

- *Target level of support* : firm-oriented or (regional) system-oriented.

With the term system we explicitly refer to regional systems. This does not imply that national or global systems or networks are irrelevant bases for economic co-ordination, but it expresses the claimed importance of the regional environment for innovation in SMEs. Some tools focus on innovation and learning within firms while others focus on crossing firm boundaries, aiming for externalities or synergies stemming from complementarity within the region as an innovation system. The logic behind (regional) system-oriented support is based on the idea that the innovation capacity and performance of a regional system may be larger than the 'sum' of the internal innovation capacity and performance of the individual 'members' of the system.

- *Form and focus of support* : focused on allocation of resources as inputs for innovation or focused on learning aiming for behavioural additionallity.

At the one extreme the policy approach is to raise the endowment, the stock of given resources (in firms and regions) as inputs for innovation. In a reactive mode of intervention the policy instruments aim at increasing innovation capacity by making the necessary resource inputs available. The principal idea is that the window of opportunities and problems towards innovation and support are clear and that given the lack (and need) of certain resource-inputs, policymakers increase the innovation output by allocating resources, that is, providing the innovation inputs or increase their availability (again internally within the firm or externally, within the region).

At the other extreme are the instruments which focus on learning, trying to change behavioural aspects like the organisational culture, the innovation strategy, management, mentality or the level of awareness. They focus on creating or changing the windows of opportunities and problems concerning innovation and innovation policies. The according mode of intervention is a pro-active and inter-active one. The principal idea is that the involved agents (private and public, individually or collectively) learn by doing, by using and by interacting. Doing innovation, using resources and interacting with others improves the awareness, the behavioural routines and the rationality towards innovation (and innovation policy). These tools focus on the throughput, along the innovation process and again also the innovation policy process.

Each of the four quadrants can be traced back to its own theoretical background or tradition ranging from atomistic to holistic approaches and solutions from neo-classical and evolutionary traditions. The typology incorporates them all, and in fact we suggest that in practice none of them is irrelevant in aiming for a change in

innovative performance. ‘Linear’ tools directly aim for more innovation performance, while ‘interactive’ tools address innovation behaviour, but addressing behaviour is only meaningful if, in the end, it results in better performance.

Every policy in principle aims at changing behaviour. Policy makers can affect the innovative behaviour of firms directly via subsidies and individual projects or indirectly via the provision of ‘hard’ or ‘soft’ public infrastructure and institutions like universities or a technology centre. In a neo-classical reasoning, providing subsidies as an input to the innovation process is an intervention method to affect the innovative behaviour of firms directly by influencing the choices based on the cost/benefit calculations of the agents. An input-subsidy for R&D or for hiring an expensive high-educated employee for instance affects the decisions regarding resource allocation immediately.

A more evolutionary approach to policy incorporates learning. In this respect subsidies for R&D can provide a learning experience. Within a ‘learning-to-innovate’ framework, policy support can get an innovation process started and support a change in the innovative behaviour in firms or regions. The support may also result in the static effect of more innovation output, but more importantly it aims for dynamic effects, effects which goes on after the support stops. The argument for policy then becomes temporal. Timing and the ex-ante conditions become important. The reasoning behind policy rather becomes a pro-active than a re-active one. The difficulty with re-active policy is to know exactly what is needed by the firm or the region. Some expressed needs may be ‘over-supported’ (recall chapter five) while others may be latent, neglected, tacit and not supported. The articulation of the need then has to become part of the policy process, albeit in an interactive way. Merely providing the resource inputs that the policymakers think are relevant may not be enough to induce a real change in future behaviour.

Using the two dimensions, we construct a simple classification of policy tools in four categories, and we try to fill in the SMEPOL instruments, see table 8.1. This classification is of course caricatural, since many real policy instruments would lie somewhere between the extremes of the approaches and targets mentioned. Nevertheless, we suggest it can be used to examine under which paradigm issues the 40 SMEPOL policy instruments are developed and implemented.

The A type of instruments may be classified as more ‘traditional’ while D type of instruments seem more fashionable, but this does not mean that instruments in one of the four quadrants are intrinsically better than instruments in any of the other quadrants. There are still sound arguments for each and every type of tools. The question turns more into a question on the choice of the appropriate policy portfolio, anticipating the needs of the region (see section 5 below). Concerning the resource oriented tools A and C, the national policy level may in many cases be more relevant

than the regional policy level, especially if the support is needed at firm level and the lack of (internal or external) resources for innovation is not region specific.

Table 8.1 : Classification of policy instruments studied in SMEPOL
along two policy paradigm dimensions

	Form and focus of innovation support	
	input resources *(reactive tools allocating inputs for innovation)*	*behavioural additionality* *(proactive tools focusing on learning to innovate)*
Target level of support firm-oriented	RIT-type of instrument Traditional R&D subsidies & loans (FFF, ERP,…) Innovation grants (ITF,RIP) Risk capital Growth Fund (DK) Training subsidies Incubators with "hard" support (cf. Austria) Research centres Traditional "reactive" Technology centres Transfer units in universities Technology transfer schemes **A**	KIM – type of instrument Loans for competence development Management advice (TIC) Risk capital with sparring partner function Incubators with "soft" support BICs, Innovation centres (Syntens) "Pro-active" Technology centres Audits, monitoring needs Innovation Coach Innovation management training Techno-economic intelligence schemes SMART **B**
(regional) system-oriented	**C** FIRST -Mobility schemes research-industry RUSH Subsidy for co-operative R&D projects Subsidy to promote use of business services Collective, User-oriented Technology or Innovation centres (GTS,Lee Valley,Valencian, SWT and FAZAT)	D Pro-active Brokers, match-makers : e.g., TEFT and BL Cluster policies (KIC) Support for firms networking NT programme, REGINN Local strategic plans Schemes acting on the culture of innovation RTP and RIS/RITTS kind of programmes

The relevance of A,B,C as well as D type of tools not only relates to different regional conditions, like the intensity of existing co-operation practices, for instance. It also relates to the various identified distinctive characteristics of SMEs (see chapter 1) which have to be dealt with. The size-related characteristics affect the needs for support as well as the way the support can be delivered effectively. SMEs' limited resource base, for instance, finds a response in A or C type of tools. The A type focusing on raising endowment within firms, and C type of tools raising endowments of the innovation system the SME is part of, or is 'invited' to be part of. SMEs' distinctive organisational culture and management practices receive a better response in B type of tools, which try to influence certain attitudinal and behavioural aspects within the SMEs. Less ability for SMEs to shape their environment, compared to larger firms, might be addressed by D type of tools. These tools have to tackle the external uncertainties smaller firms are typically faced with, by enhancing the capacity of the firm to understand its environment and to become part of it (e.g., by forming clusters). That is, to become pro- and interactive members of a regional innovation system rather than staying passive, unaware and incapable to adapt or to influence others towards adoption. This calls for external awareness, and tools which teach SMEs how to identify, value, use and develop regional resources and interact with resource-owners.

The correspondence between the distinctive characteristics of SMEs regarding innovation and the various policy approaches shows first of all that every of the four types of policy instruments is relevant and secondly that the instruments have to be conceived starting from SMEs needs, expressed as well as latent ones.

The main outcome of the SMEPOL study, achieved through comparing the SME innovation patterns analysis with the results of the policy instruments analysis, is that the policy tools are too much concentrated in category A in table 8.1, and that there are few instruments in category D. All types of instruments are relevant to different types of firms and different types of environments (and at different points in time), but the main gaps in the support systems in the SMEPOL cases, are to be found in category D. In order to conduct a change in perspective, it seems necessary, however, in most cases to first develop instruments of the B and C type, before the system and agents become apt to implement and absorb D-type instruments.

As stated before, in any specific regional situation, there will probably be a need for a mix of A,B,C and D-types of instruments. For example, A- and C-type instruments will still be particularly relevant for NTBFs and spin-offs. B-type instruments could be used for less innovation-aware firms : building internal capabilities is a necessary step in most cases before being able to participate in a D-type instrument in interaction with other innovating agents.

If a region does not have a lot of innovative SMEs, providing ever more resources to the same group of innovative firms seems less appropriate than extending the number of innovators by approaching non-innovating SMEs with B-type of tools. Enhancing their learning process and preparing them for more interactive behaviour can sub-sequentially be supported by C or D-type of tools. If there is no lack of innovators but they seem to innovate in relative isolation, C-type of tools might create more openness and stimulate the use of external resources in the region.

There are several arguments to develop linkages between tools of the various categories. In general, however, the proactive provision of internal and external learning experience with B and D type of instruments respectively, will create new clients, and new resource needs which may subsequently be effectively addressed with the reactive provision of internal or external resources. The other logical sequential link refers to the fact that a certain level of internal resources and learning experiences are needed before system oriented tools can be effective. This calls for the need of excellent co-ordination, and the development of synergies between all tools at work in the environment.

The question of the phasing of instruments becomes interesting in such a perspective, especially if we consider that it is appropriate, coming from a situation where A-type dominates, to apply first B- and C-type of instruments before being able to offer D-type instruments to the firms. As mentioned above, "linear" as well as "interactive" policy tools should co-exist in a policy system, depending on the position achieved by firms on their innovation path. It is interesting to note, in this respect, that the Italian D-type tools, focusing on developing partnerships and local strategies, could not be absorbed in their particular context, due to a lack of favourable conditions to access such schemes. The question of transition from more traditional tools to more advanced tools is thus crucial.

This discussion also links with the question of the relevance of different levels of authorities for the various policy activities like design, adaptation, learning, implementation and evaluation. Pro-active tools imply more freedom of action at regional level, while reactive tools are more adapted to higher levels of authorities. In the KIM and KIC schemes, for example, awareness-raising and the creation of capabilities is managed at the regional level, and regional scheme managers can then link the firms to national and European support.

8. 5. The challenge of customising a policy portfolio to regional specificity's

Coming back to the need to take full account of the differences in regional context and firms diversity, the last section of this chapter reflects on the following key question at the heart of the SMEPOL project : how should policy makers re-design

their policies, seen as systems, taking into account the specific problems faced by their regional economy?

8.5.1. The identification of policy portfolios

Regional differences call for a tailored mix of policy instruments. This section, therefore, reflects on the question of the appropriate policy portfolio to be developed in a regional context. For this, characteristics of the region as a whole and SME-specific challenges for innovation are taken as the point of departure to discuss this question. To achieve the objective of identification of policy portfolios, we propose under table 8.2 below, a picture of the situation, which combines the results of the analyses gathered in chapters 3 and 5 of this report, i.e., the analysis of the main potential deficits of regional innovation systems, and the analysis of the main firms barriers with regard to innovation. The reader is referred to the detailed arguments on these elements in the respective chapters. The combination of regional and firm's deficits should form the basis for the design of policy intervention.

The aim of table 8.2. is to enlighten possible policy responses to certain innovation barriers, deficits or challenges at regional and firm level. Each cell of this table contains two elements : the objectives of policy tools and examples of appropriate instruments (existing ones or new ones, as delivered by the benchmarking exercise). It is meant to be purely illustrative, and not a definitive view on policy responses.

Such a table shows clearly that there is no "one-size-fits-all" policy system : it depends on the problems and opportunities to be addressed in the existing context. It also shows the need for policy to provide longer term and holistic support to innovation in all its aspects. But it is nevertheless possible to develop recommendations per category of firms problems (horizontal lines in the table), per regional context (vertical lines in the table), and per type of policy tool (within each cell, every tool can be benchmarked against the broad guidelines for policy and against similar tools of the same type).

Facing such a table of possible instruments, it becomes clear that the main role of the policy maker becomes the setting-up of priorities according to the perceived problems in its region, in line with the main orientation set to the economic development policy of the region. Strategic capacities at policy level are key to such an exercise. We address this question in section 5.2. below.

Table 8.2: Policy responses to regions' and SMEs problems with innovation: an illustration of possible policy objectives and tools

SMEs' **Innovation Barriers**	**REGIONAL INNOVATION SYSTEM PROBLEMS**		
	Organisational thinness	**Fragmentation**	**Lock-in**
Financial Getting capital when markets prefer secure investments with short term return	*Attract and retain innovating firms.* *Foster firms to go global, link them to international partners and external financial resources*	*Coach firms in linking to finance sources.* *Foster specialisation by combining technological support and finance* *Support the formation of sector-specific Venture capital funds*	*Ensure long term finance for "overall" innovation project* : risk capital, NT *Support new firm creation* :seed capital *Address succession problems* *Restructure mature industries by attracting FDI and promoting international partnerships*
Technological Screening for technological options, Adapting state-of-the-art to own situation	*Link firms with technological resources outside the region* Promote collective sourcing and investments in collective resources: Technology centres *Use private R&D centres as technology resources for other firms:* ResearchVouchers	*Provide bridge between firms and technological resources* Brokers, TEFT, TIC *Provide "accessible" technology* : RUSH *Finance firms to access technology centres* :	*Push firms to seek for new technology options:* *Foster access to resources outside the region:* International partnerships *Restructure the technology support infrastructure towards new technologies and sectors*
Human resources Using qualified resources in firms; Investing in training	*Attract/retain highly skilled workers* *Support collective training programmes*	*Foster exchange of codified and tacit knowledge* FIRST, Teaching Company Scheme *Foster intra-firm nodes for co-operation* : FIRST-Enterprise	*Develop creative capacities of workers* : Training schemes *Free personnel for innovation* RIT KIM

Openness and learning attitude Learning from others; Developing antennas to the outside	*Promotion of networking between firms, and clusters at every geographical scale* Network of SMART winners	*Foster a more collaborative spirit and more strategic orientation in the regions* Regional Development Agencies	*Help SMEs evolve towards more creativity and autonomy in production* Supply-chain learning, KIC Demonstration projects *Combine funding with interaction stimulation* NT
Strategy & Organisation Formalisation of innovation strategy Difficulties in commercial orientation of technological projects	Support firms in linking to international input and output markets *Develop systemic character of innovation support* : network brokers	*Help firms identify, articulate and "de-bundling" their needs :* Innovation coach (BL) NT as a holistic tool Invite firms collectively to help in formulating a regional innovation strategy: RIS/RITTS	*Open windows of opportunities for SMEs* : techno-economic intelligence promotion schemes Innovation management training

8.5.2. The need for learning governments

The main condition for the usefulness of table 8.2. as a tool to re-design innovation policies targeting SMEs, is that on the policy side too, learning processes are at stake. In trying to create learning firms within learning regions there is a need for learning governments.

This implies four things in particular :

- that the regional situation, that is, the particular needs and opportunities (for innovation support) of SMEs and the RIS as a whole are well mapped, communicated and understood by policy designers;
- that the objectives set to policy instruments are clearly expressed ex-ante in a global coherent framework and that the expected results are measurable;
- that the results and impacts of the instruments are monitored properly and then evaluated by an independent, third party;
- that lessons from the evaluation are acknowledged and diffused and that they are confronted with the policy aims, in order to adjust the policy approach and its instruments accordingly.

In most of the regions studied in SMEPOL, deficiencies have been noted in all the aspects listed above :

- a detailed knowledge of the specificity's of the regional innovation system is often absent, not properly diffused in a language understandable by policy makers, or not updated with sufficient regularity;
- effects of policies are often measured in a "funds consumption" approach only;
- evaluation is not built in the design of the programmes;
- no real independent evaluation of results and impacts are undertaken in most cases;
- pilot, bottom-up experiments are not really assessed, and there is thus a failure to capture lessons from the best experiments and diffuse these more widely;
- and policy learning is in general underdeveloped.

Interaction and learning in the policy system also means for example that bottom-up experiments, pilots, could be organised as a sort of competition, where the successful schemes receive visibility and are diffused. Otherwise, lessons are not captured properly.

Conclusion

Drawing on the SMEPOL findings we have questioned in this chapter how policy directed at innovation in SMEs can be improved. After discussing several rationales for policy we came up with some lessons based on benchmarking the detailed analysis of policy tools. The next challenge was to lift the discussion to a more abstract level again, that is, did we witness an actual shift in policy paradigm or did we find arguments which call for a new policy paradigm?. Our conclusion is that we have witnessed some shifts in practice (which made the inter-instrument benchmarking possible), and that we have found sound arguments which support our claim that a shift in rationale is needed to improve the policy directed at innovation in SMEs.

More precisely, we used table 8.1 in section 4 to discuss the way to combine tools that are reactive or pro-active and target internal processes in SMEs, towards tools that are proactive and target the externalisation of SMEs or the functioning of the RIS. Using the typology of instruments presented in chapter 4, we undertook a benchmarking exercise that delivered concrete suggestions for improving or re-orienting individual policy tools.

We also proposed a reflection on policy mixes in section 5, using table 8.2., showing clearly that similar SME problems need to be tackled differently according to the regional context, but also that there is scope for importing elements of good practices from one context into another.

With this discussion, we can conclude that such an analysis, with the three key features of :

- Matching the context and SME needs's pictures with the policy tools in each region;
- Confronting the policy tools with the lessons of theory;
- Comparing results achieved with a range of policy instruments in different environments,

is suitable for improving SME innovation support policies in the EU regions.

The best way to evolve in such a direction however, would be to undertake such a strategic benchmarking exercise with the active participation of policy makers and policy implementers themselves. Theoretically sensible ideas could then be confronted with reality. To a certain extent, this has been started within the SMEPOL project itself, with the organisation of workshops in the regions, where the theoretical results were discussed with policy makers. Several ongoing initiatives from the European Commission, such as the Trendchart of Innovation initiative with its benchmarking panels of policy makers, can be welcome as a promising step in such a direction. Complementary actions need to be developed to foster the development by the regions of innovation profiles, and raising visibility of lessons learned with pilot policy instruments, etc.

References

Amin, A. (1998), An institutionalist perspective on regional economic development. *Paper* for OECD conference on regional development, Borås, Sweden, 29. January 1998.

Amin, A. and K. Robins (1991), These are not Marshallian times. In Camagni, R. (Ed.), *Innovation networks: spatial perspektives*. Belhaven Press, London/New York (105-118).

Amin, A. and N. Thrift (1994), Living in the Global. In Amin, A. and N. Thrift (Eds.), *Globalization, Institutions and Regional Development in Europe*. Oxford University Press (1-22).

Amin, A. and N. Thrift (1995), Territoriality in the global political economy. *Nordisk Samhällsgeografisk Tidskrift*, No. 20: 3-16.

Amin, A. and P. Cohendet (1999), Learning and adaptation in decentralised business networks. *Environment and Planning D: Society and Space*, 17: 87-104.

Andersen, P.H. and P.R. Christensen, (1998*), Den globale udfordring – Danske underleverandørers internationalisering*. Erhvervsfremme Styrelsen, København.

Archibugi, D. and J. Michie (1995), Technology and innovation. An introduction. *Cambridge Journal of Economics*, 19: 1-4.

Asheim, B.T. (1994), Industrial districts, inter-firm co-operation and endogenous technological development: the experience of developed countries. In *Technological dynamism in industrial districts: An alternative approach to industrialization in developing countries?* UNCTAD, New York and Geneva, 91-142.

Asheim, B.T. (1996), Industrial districts as 'learning regions': A condition for prosperity? *European Planning Studies*, 4,4: 379-400.

Asheim, B.T. (1998), Learning regions as development coalitions: Partnership as governance in European workfare states? *Paper* presented at the Second European Urban and Regional Studies Conference on 'Culture, place and space in contemporary Europe', University of Durham, UK, 17-20 September 1998.

Asheim, B.T. (1999): Innovation, social capital and regional clusters: On the importance of co-operation, interactive learning and localised knowledge in learning economies. *Paper* presented at the European Regional Science Association 39th European Congress, Dublin, Ireland, 23-27 August 1999. (Forthcoming in GeoJournal, 2000).

Asheim B. (1999b), The territorial challenge to innovation policy: agglomeration effects and regional innovation systems. In Asheim B. and Smith K. (eds.), *Regional Innovation Systems, Regional Networks and Regional Policy*, Edward Elgar, Cheltenham (Forthcoming).

Asheim, B.T. and A. Isaksen (1997), Location, agglomeration and innovation: Towards regional innovation systems in Norway. *European Planning Studies*, 5, 3: 299-330.

Asheim, B.T. and P. Cooke (1998), Localised innovation networks in a global economy: A comparative analysis of endogenous and exogenous regional development approaches. *Comparative Social Research*, Vol. 17, JAI Press, Stamford, CT, 199-240.

Asheim, B.T. and P. Cooke (1999), Local learning and interactive innovation networks in a global economy. In Malecki, E. and P. Oinäs (Eds.), *Making connections*. Ashgate, Aldershot (145-178).

Bank of England (1996), *The Financing of Technology-Based Small Firms*. Bank of England, October

Becattini G. (Ed.) (1987), *Mercato e forze locali: il distretto industriale*, Il Mulino, Bologna.

Becattini G. (Ed.) (1989), *Modelli locali di sviluppo*, Il Mulino, Bologna.

Becattini G. (1998), *Distretti industriali e made in Italy*, Bollati Boringhieri, Torino.

Bellandi, M. (1994), Decentralised industrial creativity in dynamic industrial districts. In *Technological dynamism in industrial districts: An alternative approach to industrialization in developing countries?* UNCTAD, New York and Geneva, 73-87.

Bessant J., S. Caffyn, J. Gilbert, R. Harding., and S. Webb (1994), Rediscovering Continuous Improvement. *Technovation* 14, 1: 17-29

Bessant, J., S. Caffyn and S. Austin (1995) Continuous improvement and organisational learning. *Paper* presented at the R&D Management Conference, 20-22 September, 1995, Pisa, Italy.

Birch D. (1979), *The Job Generation Process*. MIT Press, Cambridge, Mass.

Bonaccorsi, A. and A. Lipparini (1994), Strategic partnerships in new product development: An Italian case study. *Journal of Product Innovation Management*, 11,2: 135-146.

Bower, G. H. and E. R. Hildegard (1981), *Theories of Learning*. Prentice Hall, Engelwood Cliffs, NJ.

Brusco S. (1982), The Emilian Model: Productive Decentralisation and Social Integration. *Cambridge Journal of Economics,* 6, 2.

Brusco S. (1989), *Piccole imprese e distretti industriali*, Rosenberg & Sellier, Torino.

Camagni, R. (1991), *Innovation Networks: Spatial Perspectives*. Belhaven-Pinter, London.

Capron, H. et. al. (undated), National innovation systems. Pilot study of the Belgian innovation system. Studied carried out for the Belgian Federal Office for Scientific, Technical and Cultural Affairs (OSTC) in the context of the OECD Working Group on Innovation and Technology policy.

Carson, D. (1991). Research into Small Business Marketing. *European Journal of Marketing*, 9: 75-91

Castro, E. de and C. Jensen-Butler (1993), *Flexibility, routine behaviour and the neo-classical model in the analysis of regional growth.* Department of Political Science, University of Aarhus, Denmark.

CEC (1987) *Job Creation in Small and Medium Enterprises*, Programme of Research and Actions on the Development of the Labour Market: Summary Report, Brussels, Commission of the European Communities.

Christensen, J.F. (1996), *Teknologisk Service: Tendenser og udfordringer. En diskussion af GTS-Institutternes værdi for Danmark*. Institutrådet, København.

Christensen, P. R. et. al. (1999), Innovations & Innovation Support for SMEs. The Triangle Region of Denmark. *SMEPOL report no. 2*. Centre for Small Business Research. Southern Denmark University, Kolding

Cobbenhagen, J., F. den Hertog and H. Pennings (1994), *Succesvol veranderen: kerncompetencies and bedrijfsvernieuwing*. Kluwer Bedrijfswetenschappen, Den Haag.

Cohen, W. M. and D. A. Levinthal (1990), Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly*, 35: 128-152.

Cooke, P. (1994), The co-operative advantage of regions. *Paper* presented for the conference on 'Regions, institutions, and technology: Reorganizing economic geography in Canada and the Anglo-American World', University of Toronto, September 1994.

Cooke, P. (1995), Planet Europe: network approaches to regional innovation and technology management. *Technology Management*, 2: 18-30.

Cooke, P. (1998), Introduction. Origins of the concept. In Braczyk, H.-J. et. al. (Eds.), *Regional Innovation Systems*. UCL Press, London (2-25).

Cooke, P. and K. Morgan (1998), *The Associational Economy. Firms, Regions, and Innovations*. Oxford University Press, Oxford.

Cosh A. and A. Hughes(1994), Size, financial structure and profitability: UK Companies in the 1980s' In Hughes A. and D. Storey (Eds), *Finance and the Small Firm.* Routledge, London.

Cosh, A., J. Duncan and E. Wood (1996), Innovation: Scale Objectives, and constraints. In Cosh, A. and A. Hughes (Eds.), *The changing state of British Enterprise; growth innovation and competitive advantage in SMEs 1986-95*. ESRC Centre for Business Research, University of Cambridge.

Crevoisier, O. (1994), Book review (of Benko, G. & A. Lipietz (Eds.), Les regions qui gagnent, Paris 1992). *European Planning Studies*, 2: 258-260.

Curran J (1993). *'TECs and Small Firms: Can TECs Reach The Small Firms Other Strategies Have Failed to Reach?*. Paper presented to the All Party Social Science Group, House of Commons, April.

Curran J. and R. Blackburn (1994*). Small Firms and Local Economic Networks: the Death of the Local Economy?* Paul Chapman Publishing, London.

Cyert, R. M. and J. G. March (1963), *A Behavioural Theory of the Firm*. Prentice- Hall, Engelwood Cliffs, NJ.

Davies, A. (1995), Local Economies and globalisation. *Paper*. OECD

Davis S.J and J. Haltiwanger (1992), Gross Job Generation, Gross Job Destruction and Employment Re-Allocation. *Quarterly Journal of Economics*, 107: 819-863

Dosi, G. (1988), The nature of the innovative process. In G. Dosi et al. (Eds), *Technical change and economic theory*. Pinter Publishers, London (221-238).

EC (1995), *Green Paper on Innovation*. Bulletin of the European Union. Supplement 5/95. Luxembourg.

EC (1999), Second European Report on S&T Indicators 1997. *Report*. European Commission. EUR 17639.

Edquist C. and B.-Å. Lundvall (1993), Comparing the Danish and Swedish Systems of Innovation. in Nelson, R. R. (Ed.) (265-298).

EIM (1994), *The European Observatory for SMEs: Second Annual Report*. Zoetermeer, EIM Small Business Reassert and Consultancy.

EIM (1997), *The European Observatory for SMEs: Fifth Annual Report*. Zoetermeer, EIM Small Business Research and Consultancy.

Ellis, H. C. (1965). *The Transfer of Learning*. Macmillan, New York.

Encyclopædia Britannica (1999). International version (CD).

Ennals, R. and B. Gustavsen (Eds.) (1999), *Work organisation and Europe as development coalition*. John Benjamin's Publishing Company. Amsterdam-Philadelphia.

Estes, W. K. (1970), *Learning Theory and Mental Development.* Academic Press, New York.

Fendel R. and M. Frenkel (1998), Do Small and Medium Sized Enterprises Stabilise Employment? In *Zeitschrift für Wirtshafts- und Sozialwissenschaften* (ZWS), 118, 2: 163-184.

Freeman, C. (1993), The political economy of the long wave. *Paper* presented at EAPE 1993 conference on 'The economy of the future: ecology, technology, institutions'. Barcelona, October 1993.

Freeman, C. (1995), The 'national system of innovation' in historical perspective. *Cambridge Journal of Economics*, 19: 5-24.

Gaffard J. C. (1992), *Territory as a specific resource: the process of construction of local systems of innovation*. Latapses, Nice.

Garofoli G. (1983), *Industrializzazione diffusa in Lombardia*. Irer - Franco Angeli Editore, Milano (2 ediz. Iuculano, Pavia, 1995).

Garofoli G. (1989), Industrial districts: structure and transformation, *Economic Notes*, 1: 37-54.

Garofoli G. (1991), *Modelli locali di sviluppo*. Franco Angeli Editore, Milano.

Garofoli, G. (1992) (Ed.), *Endogenous Development and Southern Europe*. Avebury, Aldershot.

Garofoli, G. (1999) (Ed.), SMEs, innovation trajectories and policies: the case of Lombardy and Apilia. *SMEPOL report no. 3*. Dipartemento di Economia Politica e Metodi Quantitative. Universtá degli Studi di Pavia, Pavia.

Garofoli G. (1999b), Sistemi locali di impresa e performance dell'impresa minore in Italia. In Traù F. (Ed.), *La questione dimensionale nell'industria italiana*. Il Mulino, Bologna.

Glasmeier, A. (1994); Flexible districts, flexible regions? The institutional and cultural limits to districts in an era of globalisation and technological paradigm shifts. In Amin, A. and N. Thrift (Eds.), *Globalisation, institutions, and regional development in Europe*. Oxford University Press, Oxford (118-146).

Gottardi, G. (1996), Technology strategies, innovation without R&D and the creation of knowledge within industrial districts. *Journal of Industry Studies*, 3: 119-134.

Grabher, G. (1993), Rediscovering the social in the economics of interfirm relations. In G. Grabher (Ed.), *The embedded firm. On the socioeconomics of industrial networks.* Routledge, London (1-31).

Granovetter, M (1973), The strength of weak ties. *American Journal of Sociology*, 78, 6: 1360-80.

Granovetter, M. (1985), Economic action and social structure: The problem of embeddedness. *American Journal of Sociology*, 91,3: 481-510.

Gregersen, B. and B. Johnson (1997), Learning Economies, Innovation Systems and European Integration. *Regional Studies*, Vol. 31,5: 479-490.

Haraldsen, T. (1995), Spatial conquest – the territorial extension of production systems. *Paper* presented at the Regional Studies Association conference on 'Regional Futeres: Past and present, east and west', Gothenburg, May 1995.

Hassink, R. (1996), Technology Transfer Agencies and Regional Economic Development. *European Planning Studies*, 4, 2: 167-184.

Hawkins, P. (1994), The Changing View of Learning. In Pedlar, M. and Boydell, T (Eds.). *Towards the Learning Company: Concepts and Practices*. Burgoyne, McGraw-Hill: Europe. (9-27)

Hoffman, K., M. Parejo, J. Bessant and L. Perren (1998), Small firms, R&D, technology and innovation in the UK: a literature review. *Technovation*, 18, 1: 39-55.

Holmes, J. (1986), The organization and locational structure of production subcontracting. In Scott, A. and M. Storper (Eds.), *Production, work, territory*. Allen & Unwin, Boston (80-106).

Howells, J. (1996), Regional systems of innovation? *Paper* presented at HCM conference on «National systems of innovation or the globalisation of technology? Lessons for the public and business sector», ISRDS-CNR, Rome, April 1996.

Håkansson, H. (1992), *Corporate technological behaviour. Co-operation and networks.* Routledge, London.

Isaksen, A. et. al. (1999) (Eds.), SME policy and the regional dimension of innovation. The Norwegian report. *SMEPOL report no. 5*. STEP Group, Oslo

Kaufmann, A. and F. Tödtling (1999), Innovation Support for SMEs in Upper Austria. *SMEPOL report no. 1*. Institute for Urban and Regional Studies. Vienna University of Economics and Business Administration, Vienna.

Keeble D., C. Lawson, H. Lawton-Smith, B. Moore and F. Wilkinson F. (1997), Internationalisation Processes, Networking and Local Embeddedness in Technology-Intensive Small Firms. In Ram M., Deakins D., and Smallbone D. (Eds) *Small Firms: Enterprising Futures.* Paul Chapman Publishing, London.

Kelly, G. A. (1955), *The Psychology of Personal Constructs*, Vols 1& 2. Norton.

Koschatzky, K. (1999), National versus regional systems of innovations – Crossborder linkages and learning between Baden-Württemberg and Alsace. *Paper* presented at the NECSTS-99 Conference on 'Regional Innovation Systems in Europe', San Sebastian, Spain, 30 September – 2 October 1999.

Krugman, P. (1991), *Geography and trade*. Leuven University Press, Leuven.

Lageman B. and K. Lobbe (1999), *Kleine und Mittlere Unternehmen im Sektoralen Strukturwandel*. Untersuchungen des RWI, Heft 28, Essen.

Lane, P. J. and M. Lubatkin (1998), Relative Absorptive Capacity and Interorganisational Learning. *Strategic Management Journal*, 19: 461-477.

Lazonick, W. (1993), Industry cluster versus global webs: Organizational capabilities in the American economy. *Industrial and Corporate Change*, 2: 1-24.

Lazonick, W. and M. O'Sullivan (1996), Sustained economic development. *STEP Report* No. 14, The STEP group, Oslo.

Leborgne, D. and A. Lipietz (1988), New technologies, new modes of regulation: some spatial implications. *Environment and Planning D: Society and Space*, 6, 263-280.

Leborgne, D. and A. Lipietz (1992), Conceptual fallacies and open questions on post-Fordism. In M. Storper and A.J. Scott (Eds): *Pathways to industrialization and regional development.* Routledge, London (332-348).

Leborgne D., Lipietz A. (1992b), Flexibilité offensive, flexibilité defensive. Deux stratégies sociales dans la production des nouveaux espaces économiques. In G. Benko and A. Lipietz (Eds.), *Les régions qui gagnent. Districts et réseaux: les nouveaux paradigmes de la géographie économique*. Presses Universitaires de France, Paris.

Lundquist, L. (1974), *Förvaltningen i det politiska systemet*. Studenterlitteratur, Lund.

Lundvall, B.-Å. (1992), Introduction. In B.-Å. Lundvall (Ed.), *National systems of innovation.* Pinter Publishers, London (1-19).

Lundvall, B.-Å. (1996), The social dimension of the learning economy. *DRUID Working Papers*, No. 96-1. Aalborg University, Aalborg.

Lundvall, B.-Å. and B. Johnson (1994), The learning economy. *Journal of Industry Studies*, 1,2: 23-42.

Lundvall, B.-Å. & S. Borras (1997): *The globalising learning economy: Implications for innovation policy*. Office for Official Publications of the European Communities, Luxembourg.

Malerba, F. (1993), The National Systems of Innovation: Italy. In Nelson, R.R. (Ed.) (230-259).

Malmberg, A. (1997), Industrial geography: location and learning. *Progress in Human Geography*, 21, 4: 573-582.

Malmberg, A. and P. Maskell (1999), Guest editorial: Localized learning and regional economic development. *European Urban and Regional Studies*, 6, 1: 5-8.

March, J. G. and H. A. Simon (1958), *Organisations*. Wiley, New York.

Mariussen, Å. (1977), Immobil kunnskap og globale innovasjonssystem. *Paper*. Nordland Research, Bodø.

Markusen, A. (1996), Sticky places in slippery space: A typology of industrial districts. *Economic Geography*, 72, 3: 293-313.

Maskell, P. et. al. (1998), *Competitiveness, Localised Learning and Regional Development. Specialisation and prosperity n small open economies*. Poutledge, London and New York.

Mintzberg, H., J. B. Quinn and S. Goshal (1995), *The Strategy Process. European Edition*. Prentice Hall. London.

Mintzberg, H. and J. A. Waters (1985), Of Strategies, deliberate and emergent. *Strategic Management Journal*, pp 257-272

Morgan, K. (1997): The learning region: Institutions, innovation and regional renewal. *Regional Studies*, Vol. 31, No. 5, 491-503.

Nauwelaers, C. et. al. (1999), SME Policy and the Regional Dimension of Innovation: The cases of Wallonia and Limburg. *SMEPOL report no. 4*. MERIT, Maastricht University, Maastricht.

Nelson, R. R. (1993) (Ed.), *National Innovation Systems. A Comparative Analysis*. Oxford University Press, New York, Oxford.

Nelson, R. R. (1993), A Retrospective. In Nelson, R. R. (Ed.) (505-523).

Nelson, R. R. and N. Rosenberg (1993), Technical Innovation and National Systems. In Nelson, R. R. (Ed.) (3-21).

Nelson, R. and S. Winter. (1982), *An Evolutionary Theory of Economic Change*. Harvard University Press, Cambridge, MA.

Nonaka, I. & P. Reinmöller (1998), The legacy of learning. Toward endogenous knowledge creation for Asian economic development. *WZB Jahrbuch 1998*, 401-433.

OECD (1993), *Small and Medium-Sized Enterprises: Technology and Competitiveness*. Organisation for Economic Co-operation and Development, Paris.

OECD (1998), *Issues paper*. International conference on "Building competitive regional economies: Up-grading knowledge and diffusing technology to small firms". Modena, Italy 28-29 May.

OECD (1999a), *Managing National Innovation Systems*. OECD, Paris.

OECD (1999b), *Science, Technology and Industry Scoreboard 1999. Benchmarking Knowledge-based Economies*. OECD, Paris.

Patchell, J. (1993), From production systems to learning systems: lessons from Japan. *Environment and Planning A*, 25: 797-815.

Pavitt, K., M. Robson and J. Townsend (1989), Technological accumulation, diversification and organisation in UK companies, 1945-1983. *Management Science* 35: 81-99.

Pedler, M. et al (1991), *The learning company*. McGraw-Hill, London..

Perroux, F. (1970), Note on the concept of growth poles. In D. McKee et. al. (Eds.), *Regional economics: Theory and practice*. The Free Press, New York (93-103).

Pike, F. and J. Tomeney (1999), The Limits to Localization in Declining Industrial Regions? Trans-National Corporations and Economic Development in Sedgefield Borough. *European Planning Studies*, 7,4: 407-428.

Piore, M. and C. Sabel (1984), *The second industrial divide: Possibilities for prosperity*. Basic Books, New York.

Polt, W. (1997), Evaluation of Technology and Innovation Policies – in search of best practices. *Platform Technology Evaluierung*. No. 5, November.

Porter, M. (1990), *The competitive advantage of nations*. Macmillan, London.

Porter, M. (1998), Clusters and the new economics of competition. *Harvard Business Review*, November-December: 77-90.

Pyke, F. (1994), *Small firms, technical services and inter-firm cooperation*. International Institute for Labour Studies, Geneva.

Pyke F., Sengenberger W. (Eds.) (1992), *Industrial Districts and Local Economic Regeneration*, International Institute for Labour Studies, Geneva.

Reve, T. et al. (1992), *Et konkurransedyktig Norge*. Tano, Oslo.

Rosenfeld, S.A (1997). Bringing Business Clusters into the Mainstream of Economic Development. *European Planning Studies* 5, 1: 3--23.

Rothwell, R. (1983), Innovation and firm size: A case for dynamic complementarity; or, is small really so beautiful? *Journal of General Management*, 8(3).

RTP-Limburg (1996), *RTP-Limburg – Working Document*. Province of Limburg, Maastricht.

Sadler-Smith, E., I. Chaston and D. P. Spicer (1999), Organisational Learning in Smaller Firms: An Empirical Perspective. *Paper* presented at 3rd International Conference on Organisational Learning, 6-8 June 1999, Lancaster University, UK.

Schmidt, E.M. (1995), *Betriebsgroesse, Beshäftigtenentwicklung und Entlohnung. Eine ekonometrische Analyse für die Bundesrepublik Deutchland.* Campus, Frankfurt, New York.

Seaton, R. A. F. and M. Cordey-Hayes (1993), The development and application of interactive models of industrial technology transfer. *Technovation* 13, 1.

Sengenberger, W., G. Loveman and M. Piore et. al. (1990) (Eds.), *The re-emergence of small enterprises. Industrial restructuring in industrialised countries*. International Institute for Labour Studies, Geneva.

Smallbone, D., R. Leigh and D. North, D. (1993), The use of external assistance by mature SMEs in the UK: some policy implications. *Entrepreneurship and Regional Development,* 5(3): 279-295.

Smallbone et al (1998), Targeted support for new and young businesses: the case of North Yorkshire TEC's 'Backing Winners' programme, *Journal of Small Business and Enterprise Development* 5, 3: 199-207

Smallbone, D. et. al. (1999), SME Policy and the Regional Dimension of Innovation: UK National Report. *SMEPOL report no. 7*. Centre for Enterprise and Economic Development Research. Middlesex University Business School, London.

Smith, K. (1994), New directions in research and technology policy: identifying the key issues. *STEP Report*, No.1, STEP Group, Oslo.

Smith, K. (1997), Economic infrastructures and innovation systems. In Edquist, C. (Ed.), *Systems of Innovation. Technologies, Institutions and Organizations*. Pinter, London, 86-106.

Smith, K. (1999): Industrial structure, technology intensity and growth: issues for policy. *Paper* to DRUID conference on National innovation Systems, Industrial Dynamics and innovation Policy, Rebild, Denmark, June 9-12, 1999.

Stacey, R. D. (1996), *Strategic Management & Organisational Dynamics.* London: Pitman, pp 21-49; pp 62-64.

Stöhr, W. B. (1990) (Ed.), *Global Challenge and Local Response. Initiatives for Economic Regeneration in Contemporary Europe.* Mansell, London.

Storey D. (1988), The Role of Small and Medium-Sized Enterprises in European Job Creation: Key Issues for Policy and Research. In Giaoutzi M., Nijkamp P. and Storey D. *Small and Medium Size Enterprises and Regional Development.* Routledge, London and New York (140-162)

Storey D. (1994), *Understanding the Small Business Sector*. Routledge, London.

Storey D. and S. Johnson (1987), *Job Generation and Labour Market Change*. Macmillan, London.

Storey D. and N. Sykes (1986), Uncertainty, Innovation and Management. In Burns P. and Dewhurst J. (Eds), *Small Business and Entrepreneurship.* Macmillan, London.

Storper, M. (1995), Regional technology coalitions: An essential dimension of national technology policy. *Research Policy*, 24: 895-911.

Storper, M. (1997), *The regional world. Territorial development in a global economy*. The Guilford Press, New York and London.

Storper M. (1999), Regional economies as Relational Assets. *Paper* presented to the International Conference 'Local Development in Europe: new paradigms and new schemes of economic policy', organised by Formas, Cattaneo University-Liuc, Insubria University, Varese, 1-2 October 1999.

Storper, M. and R. Walker (1989), *The capitalist imperative. Territory, technology, and industrial growth*. Basil Blackwell, New York.

Storper M, and B. Harrison (1991), Flexibility, hierarchy and regional development: the changing structure of industrial production systems and their forms of governance in the 1990s. *Research Policy*, 20: 407-422

Storper, M. and A. Scott (1995), The wealth of regions. *Futures*, 27,5: 505-526.

Teece, D.J., R. Rummelt, G. Dosi and S. Winter (1994), Understanding corporate coherence: theory and evidence. *Journal of Economic Behavior and Organization*, 23: 1-30.

Tether, B. S., I. J. Smith and A. T. Thwaites (1997), Smaller enterprises and innovation in the UK: the SPRU Innovations Database revisited. *Research Policy*, 2: 19-32.

Tidd, J., J. Bessant and K. Pavitt (1997), *Managing Innovation: Integrating Technological, Market and Organisational Change*. John Wiley, Chichester.

Tödtling, F. and A. Kaufmann (1999), Innovation Systems in Regions in Europe – A Comparative Perspective. *European Planning Studies*, 7, 6: 699-717

Varaldo, R. and L. Ferrucci (1996), The evolutionary nature of the firm within industrial districts. *European Planning Studies*, 4, 1: 27-34.

Vázquez Barquero, A. et. al. (1999), SME policy and the regional dimension of innovation: The Spanish report. *SMEPOL report no. 6*. GIDIT, Departemento de Estructura Económica y Economía del Dessarrollo, Universidad Autónima de Madrid, Madrid.

Walker, W. (1993), National Innovation Systems: Britain. In Nelson, R.R. (Ed.) (158-191)

Weinstein, O. (1992), High technology and flexibility. In Cooke, P. et al. (Eds.), *Towards global localisation*. UCL Press, London (19-38).

Wolters, A. and M. Hendriks (1997), Monitoring science and technology Policy III. MERIT, Maastricht.

Wyer P. and G. Boocock (1996), *The Internationalisation of Small and Medium Sized* E*nterprises*: *An Organisational Learning Perspective.* Paper presented to the 7 th ENDEC World Conference on Entrepreneurship, Singapore, 5-7th December 1996.

Dissemination of results

The wider aim of the SMEPOL project is to inform policy makers in the studied regions and at national and EU level about ways in which policies and initiatives can be improved. The project has also produced results of interest to other researcher, in particular to those performing analyses and evaluations of innovation policy support systems and specific instruments.

The strategy for dissemination during the life-time of the SMEPOL project has involved different methods:

1) An important feature of the project is its participative character: the evaluations of the policy instruments are to some extent carried out in partnership with policy-makers in charge of designing and implementing the schemes, and with firms, and organisations in the support system as an 'interactive policy design' process. Thus, the evaluation studies have included personal meetings, interviews and discussions with policy-makers at national and regional level, with managers and case-handlers of the actual policy instruments, as well as with entrepreneurs, firm managers and officials of Association of firms. These persons are all potential users of results from the SMEPOL project, which are thus involved in the project form the very beginning. It did vary between the national research teams how many and what kind of meetings that were carried out, but together more than fifty meetings are arranged. The meetings have included brief presentations of the SMEPOL project, in some cases to ensure interest and co-operation from regional governments in the project, as well as discussions of policy instruments and/or the overall innovation support system in the regions.

   The evaluation studies also involved interviews with a lot of firm mangers. In Valencia alone personal interviews in 100 enterprises were carried out. Firm managers are indirectly potential users of results from the project, as the project may lead to changes in specific policy instruments or in the design of the overall innovation support system.

   Although evaluators should keep their independence in any case, this is not contradictory with an approach that tries to seek the involvement of policy-makers, firms and support organisations in the definition of the evaluation's aims, and the discussion of its results. Thus, an important experience from the SMEPOL project is the usefulness of involving policy makers themselves in benchmarking and evaluations exercises.

2) Dissemination of results to national and regional policy-makers has also occurred in different types of workshops. Thus, the national research teams have arranged themselves or participated in workshops/meetings to present and discuss

preliminary and final results of the SMEPOL research. Besides policy-makers, participants in the workshops have often been representatives from Associations of firms and firm leaders. Until now about 60 workshops to disseminate results from the SMEPOL project have been arranged (see Appendix 1 for a detailed list of workshops), which involve a large effort in this project to stimulate personal communication between researcher and policy-makers.

3) The national evaluation studies resulted in seven national reports. These reports (or parts of the reports) have been distributed to the relevant national and regional policy-makers. These reports also form the basis for the other dissemination activities, as presentations in workshops, papers for conferences and scientific articles.

The seven national reports are:

- Kaufmann, A. and F. Tödtling (1999), *Innovation Support for SMEs in Upper Austria*. Institute for Urban and Regional Studies, Vienna University of Economics and Business Administration, Vienna. SMEPOL report no. 1

- Christensen, P. R., A. Cornett and K. Philipsen (1999), *Innovations & Innovation Support for SMEs – The Triangle Region of Denmark*. Centre for Small Business Research. Southern Denmark University, Kolding. SMEPOL report no. 2.

- Garofoli, G. (1999) (Ed.), *SMEs, Innovation Trajectories and Policies: the Case of Lombardy and Apulia*. Dipartemento di Economia politica e metodi Quantitativi. Universitá degli Stidi di Pavia, Pavia. SMEPOL report no. 3

- Nauwelaers, C., N. Schall and R. Wintjes (1999), *SME Policy and the Regional Dimension of Innovation: The cases of Wallonia and Limburg*. MERIT, Maastricht University, Maastrich. SMEPOL report no. 4

- Isaksen, A., B. T. Asheim and S. O. Remøe (1999) (Eds.), *SME policy and the regional dimension of innovation*. The Norwegian report. STEP Group, Oslo. SMEPOL report no. 5.

- Vázquez Barquero, A., J. Alfonso Gil, A Sáes Cala, A. Viñas Apaolaza and M. Atinza Úbeda (1999), *SME policy and the regional dimension of innovation: The Spanish report.* GIDIT, Departamento de Estructura Económica y Economía del Desarrolla. Facultad de Ciencias Económica y Empresarialas, Universidad Autónoma de Madrid, Madrid. SMEPOL report no. 6.

- Smallbone, D., D. North, I. Vickers and I McCarthy (1999), *SME Policy and the Regional Dimension of Innovation: UK National Report*. Centre for Enterprise and Economic Development Research. Middlesex University Business School, London. SMEPOL report no. 7

4) The seven national reports are distributed by the relevant university department or research institute. However, the reports can also be downloaded from the SMEPOL Web-site: http://www.step.no/Projectarea/smepol/. Password: data/index.) The Web-site has aimed to inform policy-makers and other researchers about the project.

5) The national research teams have so far published or prepared for publication around 15 articles in journals or edited books, and around 10 reports or working papers (Se the list in Appendix 1). These publication involve dissemination of results to the 'academic world' as well as to policy makers.

6) Presentations of papers on Conferences involve mainly dissemination of results to the 'academic world'. About 15 papers have so far been presented at scholarly conferences (Appendix 1), of which some are turned into papers to be submitted to referred journals.

The dissemination of results will continue after completion of the project. The plan includes:

(i) Efforts to have the final report published as an edited book in English. The Spanish team also plan to publish a book in Spanish based both on the Spanish national report and the SMEPOL synthesis report.

(ii) A number of further papers will be submitted to referred journals in the first half of 2000.

(iii) Efforts are made to present results from the project in one of subgroups meeting of the RITTS-RIS Network.

(iv) More workshops targeting national and regional policy-makers will also take place.