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Innovation Policies for SMEs in Norway

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Introduction

There is general agreement that SMEs face problems in innovation which justify public intervention, and this has led to a wide range of SME-oriented actions, both in Norway and other countries. The result has been a complex mix of programmes and policy instruments, so complex in fact that it is difficult to assess what SME policy - even for a small country like Norway - actually is in practice. This paper attempts such an assessment.

The paper provides an empirical overview of industrial policy measures in Norway aimed at SMEs, particularly focusing on measures of support for innovation and R&D. The aim is to create a map of the different programmes initiated by public agencies, and try to analyse these programmes with respect to what we know about problems faced by small and medium-sized enterprises (here meaning firms with less than 200 employees) regarding innovation. That is, we try to look at the overall portfolio of SME-related policy in terms of the objectives, functions, target groups and methods of different programmes.

The basic rationale for SME policy, as with other countries, lies in the fact that Norway has a very large number of small firms, although these account for only relatively small shares of employment and output. However the SME sector is the only sector in Norway with net job creation at the present time; hence the attention paid to this sector by policy-makers. The basis for SME policy in Norway is the argument that the capabilities of SMEs in developing, managing, financing and utilising innovation and new technology are generally weak. They often lack resources even to acquire knowledge of readily available technological possibilities. However they also potentially capable of exhibiting strong innovation and employment impacts. For such reasons, the importance of SMEs has become increasingly recognised by government, and governmental intervention, e.g. financial and advisory support, is legitimised through the growth potential and employment effects stemming from SMEs (Acs & Audretsch, 1990; Ergas, 1987; Gelsing, 1992; OECD, 1993).

Methodology and sources

We turn now to the analysis of policy measures in Norway. A first problem is that it is extremely difficult to map the full range of public initiatives, and to do so would require a major research effort. This study focuses on *policy support programmes*, mainly for R&D, innovation and industrial growth and restructuring because although these are not the only measures of support in Norway, they are by far the most important in terms of resources and participation. For example, Norway has five science parks (in Oslo, Trondheim, Bergen, Ås and Tromsø) but these contain only a relatively small number of firms (around 130), many of which are subsidiaries of larger enterprises. Especially in the regional context, variations in tax policy (and in general social costs) have as a subsidiary aim the promotion of SMEs. There also exist regionally-based business advice and consultancy services. But in fact the broad thrust of policy in Norway has been around program support implemented by two

central agencies. As we shall show, these organizations and others are responsible for an extremely comprehensive set of policy instruments. This paper aims at mapping this set of instruments. We shall argue in conclusion that the main policy challenges with respect to SMEs in Norway concern the co-ordination and overall direction of these programmes.

With three exceptions, the programmes included in the study are all initiated by either the Norwegian Science Council (**NFR**) or the Norwegian Industrial and Regional Development Fund (**SND**). Budgets are computed as million Norwegian kroner (mnok). The basic sources for this are the project catalogues, programme documents, and databases of these organisations.

A basic methodological problem is that it has often not been possible to get lists of specific firms participating in any of these programmes. This can make it difficult or impossible to assess the participation of SMEs in large 'vertical' R&D programmes, for example, and it also makes it very difficult to asses the distribution of programme budgets between different types of firms. So in general we have confined ourselves to identifying the numbers of firms involved. However many of these programmes are directed exclusively at SMEs, in which case lack of lists and budget details for individual participants is not a serious problem. Where firm names are available, we have used other information sources (such as company registers) to identify the size of firms.

The programmes initiated by **NFR** are all, except for two programmes (Biotechnology and Food industry) initiated by the Division for Industry and Energy in the Council. The criterion for including DIE programmes are that they are directly linked to industrial development (not necessarily exclusively directed at R&D). The reason for including "Biotechnology" and "Food industry" belonging under the Division for Bioproduction and Refinement in NFR, is the same. Furthermore these two programmes are financed by the Ministry for Industry and Energy (NOE), thus all the programmes initiated by NFR are financed by either NOE or the Ministry for Local Government and Employment (KAD).

Some of the programmes administered by SND are funded not via the SND budget but are allocated money directly from the state budget. NFR programmes usually have a definite time-period; but some SND programmes do not a have a predefined running period. The three programmes not initiated by either SND or NFR (EKK, SMB-E and Utplass) are described in Torvatn & Munkeby (1994). In these case programme budgets have been obtained by telephone calls to programme managers or programme directors (in relevant public agencies).

Finally it should be noted that we have included only programmes involving public funding and that all budgets are accounts of public funding; this means that financial capital provided by firms or branch or other efforts on behalf of firms are not included in the budget-figures. The budget thus does necessarily not give a full picture of the money spent in the programmes. As a general rule however, both NFR and SND usually fund a maximum 50% of a project through their programmes; thus the money actually spent on the programmes will be approximately double the amount of the sums listed.

SMEs and measures for industrial development.

In recent years there has been much criticism in the Norwegian press of measures for industrial development. There exist in Norway more than 400 different direct industrial policy measures (Lorentz-Larssen, 1995). In this study we have looked only at direct policy. Evaluations of some of the sector independent programmes (see for example Falkum & Torvatn 1994; Finne, Levin & Nilsson 1993; Rolfsen 1994) have raised a number of criticisms, especially concerning the lack of coordination between programmes. First of all it can be difficult for SMEs to identify programmes that suit their needs, secondly the lack of coordination in some cases results in firms going through the same developing process through similar programmes several times.

In the following we will present the overall programmes which constitute the major part of direct industrial measures initiated as programmes in Norway. We have included around 60 programmes, and these will be presented through different tables showing:

- the institutions involved (Table 1a-b)
- programme objectives and budgets (Tables 2a-c and 5a-b) and
- share of SMEs partaking, with budgets (Tables 4a-b).

We begin with the institutions involved; the content and objectives of the programmes will be described in more detail below.

Table 1a. Institutions involved with programmes as executor and commissioner.

	Institutions									
Programmes	Regions	Norwegi-an Exp. Council	Reserch Council(Div. for Ind. & E)	NHO (org.)	R&D institu-tes	Uni. & High school	SND	Con-sult.	Firms	Other public inst.
Biotechnology*			com		exe					
Food industry*			com/exe							
Nytek			com						exe	
Brønn			com/exe							
Lete			com						exe	
Gavot			com/exe							
Intof			com/exe							
Kapof			com						exe	
Ruth			com							exe
Must			com/exe							
Deep water techn.			com/exe							
Inpro			com	exe						
Expomat			com/exe							
Finkjem			com		exe					
Forfor			com		exe					
Plastics			com/exe							
Kapbio			com						exe	
Norinstall			com					exe		
Norwood			com						exe	
Norcon/norrock			com					exe		
Normin			com	exe						
Byggpro			com					exe		

Table 1b. Continued from above page...

Programmes	Regions	Norwegi-an Exp. Council	Research Council (Div. for Ind. & E)	NHO (org.)	R&D institu-tes	Uni. & High schools	SND	Con-sult.	Firms	Other public inst.
Mekanor			com/exe							
Inbit			com		exe					
Proms			com						exe	
Marinor			com					exe		
Topp			com		exe					
Prosit			com						exe	
Profit			com	exe						
Ekspomil			com					exe		
MITD			com					exe		
Git			com/exe							
Protrans			com	exe						
Best			com			exe				
Eldorado			com		exe					
Telekom			com/exe							
Services			com/exe							
Local ship transport.			com/exe							
Ros			com		exe					
Teft			com		exe					
Forny			com		exe***					
Vekst			com/exe							
Rush			com			exe				
Funk			com					exe		
Bu 2000			com	exe						
EKK		com/exe								
ETA							com	exe		
Fadder							com/exe			
Fram							com	exe		
IFU							com/exe			
Mobil			com/exe							
NT							com/exe			
Network							com/exe			
OFU							com/exe			
SMB-E		com/exe								
Unike		com		com			com	exe		
Utplass	exe					exe		exe		com**
Integrated prod. dev.							com	exe		
Multiplan		com/exe					com/exe			
Establishing grant	exe						com			

Sources: Torvatn & Munkeby (1994), NFR Programoversikt (1995), interviews with prog. managers.

Note that in order to create an overview the different institutions are brought together in ten main categories thus the actual number of involved institutions is greater than indicated in the table.
*These programmes are initiated by the Division of Bioproduction and Refinement in NFR.
**KAD.
*** Forny has been regionalised thus several R&D institutes function as operators.

In Tables 1a-b, we have listed all the included programmes according to initiating organisation (com) and operating organisation (exe). The R&D institutes functioning as operators are mainly regional institutes, but in some cases sectoral R&D institutes are involved. The main consultancy is the Technological Institute (TI), but also sectoral consultancies are used as operators. As can be seen from Table 2, NFR has placed programme management within a firm in some cases, indicating perhaps the

emphasis on engaging industry closely in the sector-specific programmes (so called user-controlled R&D-programmes). Branch organisations and other industrial organisations are included under NHO.

It is quite clear from Tables 1a-b that the Norwegian Science Council (NFR) is the main actor regarding direct policy programmes (involved in 46 of 60 programmes shown in the table). NFR functions both as a policy formulating, executing and counselling research institute with responsibilities in all fields of science. It is thus no surprise that NFR plays the most important role in relation to the sector specific programmes (nearly all the programmes NFR is involved with in table 2 are sector specific). To carry out the programmes NFR uses as mentioned both firm managers, consultancies and regional and/or sector specific R&D institutes as programme management. In some cases however (15 of 46) the programme management is also placed within the Council. NFR enjoys a large amount of autonomy, but some of the programmes are initiated on behalf of governmental agencies (mainly KAD and NOE). Furthermore the Research Council has to report to relevant ministries about programme progress/evaluations.

SND is mostly concerned with sector independent programmes (it initiates 11 programmes and operates 6). This reflects the fact that that NFR is more oriented at R&D activities and thus SND is concentrating their efforts on strategic firm development (e.g. user-producer relationships, organisational structure, networks, management etc.).

The Norwegian Export Council (NE) initiates four programmes that are mainly directed at improving Norwegian industry's efforts to export, in particular the introduction of new products, and marketing campaigns abroad.

There is in addition to the above mentioned programmes, extensive use of regional measures to improve local industry. A vital role for SNDs is to give regional support through the 19 Regions in Norway. Every Region has a division for development of industry, though with somewhat different names and structure.

There are several industrial branch organisations and most of them (28) are organised under NHO (the main organisation for industry). The overall impression is that they have few measures/programmes to develop industry. Most branch organisations do however carry out top-management programmes or seminars on their own, and these have a significant degree of SME pareticpation.[1]

In Tables 2a-c, the 60 programmes are listed according to their objective. All the programmes have as their general objective to increase industrial development and thus competitiveness. We have however in Tables 2a-c given a brief account of the more specific objectives within each programme. It is worth noting that all the technology transfer and other sector independent programmes almost exclusively aim at SMEs whereas the sector specific programmes both aim at SMEs and large firms (see Tables 4a-b below).

[1] Based on interviews with representatives from branch organisations).

Table 2a. Sector specific and sector independent programmes.

Programme	1995 budget	Objective
Biotechnology and food industry		
Biotechnology	28,6 MNOK	Promote commercialisation of R&D results
Food industry	29,1 MNOK	Promote R&D efforts as bases for market oriented and profitable production and distribution of high quality food
Total	**57,7 MNOK**	
Energy sector		
Nytek	17,2 MNOK	Product development
Total	**17,2 MNOK**	
Oil and gas sector		
Brønn	9,0 MNOK	Reduce operating costs and extend life-time of oil and gas fields
Lete	5,0 MNOK	Improve methods and reduce costs in locating oil and gas
Gavot	5,0 MNOK	Develop equipment to improve Norway as a gas supplier in Europe
Intof	1,0 MNOK	Improve technological competence in Norwegian offshore industry through research cooperation with Netherlands, UK and New Foundland
Kapof	26,5 MNOK	Commercialise new science-based results in offshore technology
Ruth	12,0 MNOK	Increase competence around oil extraction
Must	10,0 MNOK	Reduce costs of building and running small oil fields
Deep water technology (DWP)	5,0 MNOK	Cost effective and safe exploitation of oil fields deeper than thousand meters
Total	**73,5 MNOK**	
Processing industry		
Inpro	2,1 MNOK	Develop competent personnel at the Norwegian Technical University (NTH) as a service for firms
Expomat	82,8 MNOK	Productivity gains and product development in order to improve annual turnover in firms
Finkjem	32,0 MNOK	Improve science base in order to double production value in industry by year 2000
Forfor	4,1 MNOK	Improve products and processes to meet environmental demands

Table 2b. Continued

Plastics (plaststøp)	2,3 MNOK	Develop and implement technology to improve competitiveness
Kapbio	3,0 MNOK	Commercialise science results
Total	**126,3 MNOK**	
Building and construction industry		
Norinstall	9,5 MNOK	Focus on a systemic view and flexibility in the building and construction industry
Norwood	20,0 MNOK	Create horizontal and vertical cooperation within the wood and furniture industry
Norcon/norrock	26,7 MNOK	Increase firms own efforts to do R&D to increase exports and internationalisation
Normin	6,0 MNOK	Coordination of R&D in industry in order to improve utilisation of R&D results
Byggpro	10,7 MNOK	Improve competence and productivity for the building and construction industry and its customers
Total	**73,8 MNOK**	
Mechanical engineering industry		
Mekanor	29,0 MNOK	Cooperation between firms in order to bring home, adapt and deploy technology developed abroad
Inbit	16,0 MNOK	Secure state of the art technology in Norwegian IT firms through firm cooperation
Proms	10,0 MNOK	Product development to increase exports
Marinor	8,0 MNOK	Reduce building time for ships with 30% and man-hours with 40% in ten years
Topp	16,0 MNOK	Productivity growth in high-tech industries
Profit	6,6 MNOK	Productivity growth in SMEs in high-tech industries
Prosit	9,0 MNOK	Develop Norwegian IT industry with the processing industry as a demanding user
Expomil	27,0 MNOK	Develop technology to reduce polluting emission to air and water
Total	**121,6 MNOK**	

Service sector		
MITD (maritime IT)	10,0 MNOK	Develop new business concepts and information systems using cooperation between suppliers, classification companies and authorities
Git	10,0 MNOK	Improve access, coordination between users and decrease use of barriers to geographical IT systems
Protrans	4,5 MNOK	Improve technological and organisational solutions to reduce logistics costs in transportation
Best	6,0 MNOK	Improve competitiveness through the use of information and telecommunication technology
Eldorado	1,5 MNOK	Creation of networks in high speed data- and telecommunications
Telecom	14,5 MNOK	Triple exports from Norwegian teleindustry
Services (tjenesteyting)	3,0 MNOK	Create economies of scale, economies of scope and interactive learning through networks
Local ship transportation (LST)	4,0 MNOK	Create competitive logistics and develop new products and services
Ros	2,0 MNOK	Focus on health, environment and safety as means of competition
Total	**55,5 MNOK**	
Technology transfer programmes		
Teft	25,0 MNOK	Create linkages between SMEs and R&D institutes
Forny	15,2 MNOK	Commercialise science results from the institute sector (new establishments)
Vekst	5,5 MNOK	Diffuse and deploy new technologies to SMEs
Rush	6,0 MNOK	Utilise R&D results in SMEs with little or medium R&D competence
Total	**51,7 MNOK**	

Continues on next page...

Table 2c. Continued from above page...

Programme	1995 budget	Objective
Sector independent programmes		
Funk	4,5 MNOK	Develop technical aids for functionally disabled people (reduce import)
Integrated product development (IPD)	6 MNOK	Reduce development time and use of resources connected to product development.
BU2000	12,0 MNOK	Increase cooperation between firms through development of organisational processes
EKK	23,0 MNOK	Motivate SMEs to increase efforts on foreign markets
SMB-E	40,0 MNOK	Increase number of SMEs exporting and increase exporting efforts in SMEs already exporting
Multiplan	10,0 MNOK	Increase Norwegian supplies to the UN and other world aid organisations
Unike	8,5 MNOK	Increase SMEs sales as subsuppliers to domestic and foreign firms (primarily Nordic)
Mobil	5,0 MNOK	Move scientists from the institute sector to industry
Utplass	6,0 MNOK	Create linkages between høyskoler and SMEs in Northern Norway
Eta	15,0 MNOK	New establishments based on the deployment of new technologies
Establishing grant (EG)	108,5 MNOK (94)	Create more and better establishments thus creating lasting and profitable employment effects
NT	18,1 MNOK	Strengthen industry in the north of Norway through technology diffusion and creation of innovations
Fram	25,0 MNOK	Strategic planning. Objective: Increase profits in small firms by 5% within one year from completed participation
Network programme (NWP)	43,0 MNOK	Stimulate the creation of lasting and tight relations on a commercial bases between SMEs
Fadder	3,0 MNOK	Create linkages between high-tech firms and R&D institutes in Northern Norway
IFU	32,5 MNOK	Strengthen firms R&D competence through networks between suppliers and customers (SMEs)
OFU	147,0 MNOK	Improve public services through effective user-producer relationships between public sector and industry
Total	**507,1 MNOK**	

Sources:Torvatn & Munkeby (1994), NFR Programoversikt (1995) Division for Industry & Energy, 1995-budgets for Division for Industry & Energy and Division for Bioproduction & Refinement (NFR), programme brochures and interviews with programme managers.

Tables 2a-c must be seen in connection with Tables 3a-b below, where the programmes are grouped by objectives and total budgets in each group. As can be seen from Tables 2a-c, the range of programmes in both sector specific (39) and technology transfer and sector independent programmes (21) is widespread, however the key objectives can be reduced to a few, as shown in Tables 3a-b. The sector independent programmes have the largest total budget for 1995 with a financial frame of 507,1 MNOK. Note however that OFU (147 MNOK) and EG (108,5 MNOK) alone accounts for 255,5 MNOK, or more than half of the total. Of the sector specific programmes the processing industry (126,3 MNOK) and mechanical engineering industry (121,6 MNOK) receives most in 1995.

Table 3a. Programmes grouped according to objectives.

Sector-specific programmes	
Increase R&D efforts/ use	Finkjem, Norcon/Norrock*
Increase technological competence	Intof, Ruth, Inpro
Increase managerial/ organisational competence	Byggpro*, MITD*, Ros
Technology diffusion (across sector)	Plastics*, Normin, Mekanor*, Best
User-producer/ networking (vertical and horizontal interfirm linkages)	Norinstall, Norwood, Mekanor*, Inbit, Prosit*, MITD*, Git, Eldorado, Services
Exports/ internationalisation (increase efforts/ sales)	Norcon/Norrock*, Proms*, Telecom
Commercialise science-based results	Kapof, Kapbio
Increase productivity	Expomat*, Byggpro*, Topp, Profit
Reduce costs of production	Brønn, Lete, Must, DWT, Marinor, Protrans
Product development (incl. services)	Nytek, Gavot, Expomat*, Forfor, Plastics*, Proms*, Prosit*, Expomil, LST
Sector-independent programmes (incl. "technology transfer" programmes)	
Increase R&D efforts/use (bridgebuilding)	Teft, Utplass*, Fadder
Increase technological competence	Utplass*
Increase managerial competence	Fram
Technology diffusion	Vekst, Rush, NT
User-producer/ networking (vertical and horizontal interfirm linkages)	BU2000, Unike*, NWP, IFU, OFU
Exports/ internationalisation (increase efforts/ sales)	EKK, SMB-E, Multiplan, Unike*
Commercialise science-based results	Forny, Eta*
Reduce costs	IPD*
Product development	Funk, IPD*
New establishments	Forny*, Eta*, EG

Source: Same as for Tables 2a-c.
*Appears twice, incl. in both budget figures in Table 3b.
Note that the programmes Biotechnology and Food industry are not included.

When linking Tables 2a-c and 5a, it is possible to get an idea of the different priorities concerning objectives within each industrial sector. The programmes aimed at the oil and gas sector seem to concentrate on reducing costs of production and increasing technological competence in the industry, whereas the programmes aimed at the mechanical engineering sector mainly focus on user-producer relationships and product development. This is interesting since the importance of user-producer relationships in connection to product development is emphasised by Lundvall (1992), due, as mentioned, to the possibility for extensive inter-active learning through such relations.

The programmes aimed at the service sector appear to concentrate their efforts on interfirm linkages, while to some extent the programmes for the building and construction industry mainly focus on product development.

Regarding the sector independent programmes the main emphasis is put again on interfirm relations, but also on internationalisation and exports. An empirical study[2] of SMEs has shown that 80% of all interfirm cooperation aimed at innovation and involving user-producer relations were domestic. Another study[3] of large internationally oriented firms (in Germany, Sweden and Britain) found that export relations will only advance as far as the exchange of products or services demands, whilst domestic relationships went into more general competence building. This seems likely to be even more valid for SMEs.

Nine programmes are concerned with bridgebuilding between industry and R&D institutes ("increase R&D efforts/use/bridgebuilding" and "commercialise science-based results") and from Table 3b below, we can see that these programmes have a collective 1995- budget of 152,4 MNOK. It is however likely that most of the sector specific programmes includes some degree of contact between R&D institutes and firms thus the actual budget is somewhat higher.

From Table 3b below, it becomes apparent that for all programmes taken together the single largest category both in terms of number of programmes (14) and in terms of 1995-budget (351 MNOK) is the user-producer and networking group. In much innovation studies literature (see for example Lundvall (ed.), 1992; Porter, 1990) the importance of interfirm linkages is stressed. It is claimed that much of the inputs needed for cumulative learning comes from relations with customers, suppliers and also competitors (see comments on SMEs and networks above); in this sense these programmes have a secure analytical rationale.

Note that programmes focusing on product development, productivity and exports are rather large in terms of 1995-budgets.

[2] Håkansson, H., Corporate Technological Behaviour - Co-operation and Networks. Routledge, 1989. Here from Lundvall (1992).

[3] Hallén et al., Relationship Strength and Stability in International and Domestic Industrial Marketing. Industrial Marketing & Purchasing, Vol. 2 # 3, 1987. Here from Lundvall (1992).

Table 3b. Number of programmes in groups of objective and 1995-budget.

Sector-specific programmes	
Increase R&D efforts/ use	2 programmes (total 1995 budget 58,7 MNOK)
Increase technological competence	3 programmes (total 1995 budget 15,1 MNOK)
Increase managerial/ organisational competence	3 programmes (total 1995 budget 22,7 MNOK)
Technology diffusion (across sector)	4 programmes (total 1995 budget 43,3 MNOK)
User-producer/ networking (vertical and horizontal interfirm linkages)	9 programmes (total 1995 budget 108 MNOK)
Exports/ internationalisation (increase efforts/ sales)	3 programmes (total 1995 budget 51,2 MNOK)
Commercialise science-based results	2 programmes (total 1995 budget 29,5 MNOK)
Increase productivity	4 programmes (total 1995 budget 116,1 MNOK)
Reduce costs of production	6 programmes (total 1995 budget 41,5 MNOK)
Product development (incl. services)	9 programmes (total 1995 budget 161,4 MNOK)
Sector-independent programmes (incl. "technology transfer" programmes)	
Increase R&D efforts/use (bridgebuilding)	3 programmes (total 1995 budget 34 MNOK)
Increase technological competence	1 programme (total 1995 budget 6 MNOK)
Increase managerial competence	1 programme (total 1995 budget 25 MNOK)
Technology diffusion	3 programmes (total 1995 budget 29,6 MNOK)
User-producer/ networking (vertical and horizontal interfirm linkages)	5 programmes (total 1995 budget 243 MNOK)
Exports/ internationalisation (increase efforts/ sales)	4 programmes (total 1995 budget 81,5 MNOK)
Commercialise science-based results	2 programmes (total 1995 budget 30,2 MNOK)
Reduce costs	1 programme (total 1995 budget 6 MNOK)
Product development	2 programmes (total 1995 budget 10,5 MNOK)
New establishments	3 programmes (total 1995 budget 138,7 MNOK)

Source: Same as for Tables 2a-c.

If we try to relate the programmes to the problems faced by the different types of SMEs (high-fliers, low technology innovators and non-innovators), it seems that the majority of the programmes are directed at high-fliers and/or low technology innovators. The programmes cover the most important factors of competition as listed above (for innovative firms with an annual turnover of less than 200MNOK), i.e. product atrributes and charactistics, customer specifications, delivery time/security and product price. These factors are covered through programmes targetting at respectively product development, user-producer relationships, logistics, productivity and reducing costs of production (see Tables 2a-c and 5a-b). The problem identified especially for the non-innovators were lack of both managerial and technical skills and a general lack of efficiency regarding the production process and logistics. If we then look at the programmes it is apparent that only one programme deals exclusively with the management and implementation of strategic planing, namely FRAM. There are however other programmes dealing with managerial and technical competence either directlyu or indirectly (Intof, Ruth, Inpro, Byggpro, MITD, Ros and Utplass), thus the total 1995-budget for competence-oriented programmes is 68,8 MNOK. However not all of these programmes are directed exclusively at SMEs (see Tables 5a-b below).

One of the important experiences to be derived from earlier programmes is that in relation to SMEs it is often necessary to abate the "technology-part" of the programme and focus more on "basic" managerial and technological skills.[4] Another important lesson to be learned from experiences from completed programmes is that SMEs often have problems in seeing and defining the technological problems they encounter and the possibilities for solutions found in R&D institutes. Furthermore the major part of SMEs lack both technological and adaptive skills to foresee the effects of a technological development process themselves, thus in cases where new technology implies radical internal changes, SMEs will tend to need external help in putting these changes into a strategic context (Kvam, 1995).

If we look at problems faced by SMEs in relation to innovation at a more general level, which besides the above mentioned mainly are problems of financing innovative activities and high riskin relation to innovatio projects, there is no doubt that the programmes are appropriate. Firstly, firms are offered financial support and secondly, projects are examined carefully before any support is granted,[5] thus it is likely that initiated projects have a great chance of being succesfull. Furthermore most programmes offer a wide range of advisory services to the participating firms, either through other contract partners (such as consultancy firms and R&D institutes) and/or through programme management. In Tables 4a-b below, the programmes are listed according to number of SMEs and large firms (200>) participating as contract partners.

[4] Arbo, 1993; Grøvlen (programme manager for Teft), interviewed June 1995; Torvatn, interviewed June 1995.

[5] There seems however to be a general tendency in the sector independent programmes to relax selection criteria when facing recruitment problems.

Table 4a. Total budget, running time and SME participation in programmes.

Programme	Firms as contract partners[6] (1995)	Total budget[7]	Running time
Energy sector			
Nytek	17 of 20 are SMEs (85%)***	85,2 MNOK	1995 - 1998
Oil and Gas sector			
Brønn	12 of 16 are SMEs (75%)*	68,2 MNOK	1994 - 1999
Lete	12 of 16 are SMEs (75%)*	34,3 MNOK	1994 - 1997
Gavot	9 of 11 are SMEs (81,8%)	33,9 MNOK	1994 - 1998
Intoff	Only SMEs	9,8 MNOK	1992 - 1995
Kapof	33 of 43 are SMEs (76,7%)	110,1MNOK	1991 - 1996
Ruth	Only SMEs**	57,7 MNOK	1992 - 1995
Must	9 of 15 are SMEs (60%)	44,7 MNOK	1993 - 1997
Deep water technology	6 of 9 are SMEs (66,7%)	66 MNOK	1995 - 1999
Processing industry			
Inpro	Only large firms	7,1 MNOK	1993 - 1996
Expomat	Only large firms	457,7 MNOK	1991 - 1996
Finkjem	Only large firms	181,3 MNOK	1991 - 1996
Forfor	5 of 21 are SMEs (23,8%)	41,2 MNOK	1992 - 1996
Plaststøp	12 of 15 are SMEs (80%)	6,2 MNOK	1993 - 1995
Kapbio	Only SMEs**	9 MNOK	1994 - 1996
Building and Construction			
Norinstall	9 of 12 are SMEs (75%)	34,4 MNOK	1994 - 1997
Norwood	16 of 26 are SMEs (61,5%)	58,2 MNOK	1993 - 1996
Norcon/ Norrock	11 of 19 are SMEs (58%)	114,6 MNOK	1992 - 1996
Normin	34 of 39 are SMEs (87,2%)	18,3 MNOK	1993 - 1996

[6] In cases where one firm participates in several of the projects ranging under a programme, the firms are counted only once.

[7] All numbers are in total for running time. Total budget accounts for total public budget, thus financial or other efforts (e.g. manhours) provided by the firms are not included.

Table 4a (Cont.)

Byggpro	19 of 27 are SMEs (70,4%)***	48,8 MNOK	1991 - 1995
Mechanical engineering industry			
Mekanor	12 of 19 are SMEs (63,2%)***	91,7 MNOK	1994 - 1997
Inbit	59 of 87 are SMEs (67,8%)	59,5 MNOK	1993 - 1996
Proms	9 of 14 are SMEs (64,3%)	20 MNOK	1994 - 1997
Marinor	16 of 17 are SMEs (94%)	23,3 MNOK	1993 - 1995
Topp	9 of 39 are SMEs (23%)	73,2 MNOK	1992 - 1995
Profit	Only SMEs	6,6 MNOK	1994 - 1996
Prosit	6 of 8 are SMEs (75%)	31 MNOK	1993 - 1996
Ekspomil	17 of 20 are SMEs (85%)	99,7 MNOK	1992 - 1996
Service sector			
MITD	9 of 29 are SMEs (31%)	40 MNOK	1994 - 1997
Git	20 of 25 are SMEs (80%)***	36 MNOK	1994 - 1997
Protrans	28 of 44 are SMEs (63,6%)***	33,6 MNOK	1993 - 1996
Best	Only large firms	28,2 MNOK	1993 - 1997
Eldorado	No firms so far	6 MNOK	1993 - 1996
Telekom	6 of 8 are SMEs (75%)***	60 MNOK	1994 - 1998
Tjenesteyting	No firms so far	58 MNOK	1995 - 1999
Nærskipsfart	7 of 14 are SMEs (50%)	57 MNOK	1995 - 1998
Ros	19 of 38 are SMEs (50%)	24,2 MNOK	1993 - 1997
Technology transfer programmes			
Teft	Only SMEs	123 MNOK	1994-1998
Forny	Only SMEs	75,6 MNOK	1994-1998
Vekst	Only SMEs	16,5 MNOK	1994-1996
Rush	Only SMEs	24 MNOK	1995-1998

Table 4b. Continued from above page...

Programme	Participating firms (1995)	Total budget	Running time
Sector independent programmes			
Funk	Only SMEs	33 MNOK	1990-1997
Integrated product development	Only SMEs	not available	1995-
BU2000	Only SMEs	72 MNOK	1994-1999
EKK	Only SMEs	not available#	1986-1995
SMB-E	Only SMEs	not available#	since 1988
Multiplan	Mainly SMEs (95%)##	30 MNOK	1994-1996
Unike	Only SMEs	12 MNOK	1994-1997
Mobil	Only SMEs	15 MNOK	1994-1996
Utplass	Only SMEs	21 MNOK	1994-1996
Eta	Only SMEs	59,9 MNOK	1991-1996
Establishing grant	Only SMEs	not available#	since 1989
NT	Only SMEs	100 MNOK	1993-1996
Fram	Only small firms (5-20)	150 MNOK	1992-1997
Network programme	Only SMEs	not available#	launched 1995
Fadder (supervisor)	Only SMEs	25 MNOK	1987-1996
IFU	Only SMEs	not available#	1994-1997
OFU	Mainly SMEs****	not available#	since 1986

Sources:

NFR, Division for Industry & Energy: Programoversikt 1995. Interview with representative from TBL, 23.10.1995. The counts of SMEs are based on lists of participating firms obtained from the programme managers for each programme, we then looked up the firms in "Financial information from the largest companies in Norway 1995" where number of employees for each firm is stated (1993-numbers, which may have caused inaccuracies in the count, since some firms may have "crossed the border" between large and SME since 1993). In the count we have not included R&D institutes, branch organisations and public institutions. In the cases were the firm was not listed in "Financial information...." we have assumed the firm to be small or medium-sized.

*The programmes Lete and Brønn are operated together until the end of 1997, thus there are all in all 16 firms participating in the two programmes.
**Mainly directed at R&D institutes and/ or scientists.
***Many of the participants are R&D institutes or industrial organisations, thus not included in the figures.
****In 1994 the OFU-contracts were distributed across firm sizes as follows:
0-19 employees: 30 projects: 49,4 MNOK
20-99 employees: 14 projects: 14 MNOK
100> employees: 15 projects: 41,8 MNOK
The frame available in these programmes is determined annually.
95% SMEs is an estimation from the programme manager.

Tables 4a-b show the share of SMEs participating as contract partners in sector specific and non-sector specific programmes. There are many firms that participate

in the programmes indirectly, e.g. as subsuppliers, or via participation in a single project in a programme (there are often several projects in one programme). Thus the number of firms involved in the programmes can be substantially higher than expressed through Tables 4a-b. As can be seen from Table 4a-b, the sector specific programmes involve both SMEs and large firms (31 of the programmes) in most of the cases, but some programmes involve solely large firms (Inpro, Expomat, Finkjem and Best) and some solely SMEs (23 programmes, mostly sector independent). The technology transfer and other sector independent programmes (horizontal programmes) involve almost only SMEs. These programmes often focus on increased use of R&D results in industry, and it seems reasonable to assume that there is a greater need (greater potential) for R&D stimulation in SMEs than in large firms.

Many firms participate in several programmes (this is especially the case concerning large companies and to a lesser degree SMEs). This might reflect both that firms have had earlier success in participation of a programme and thus have incentives to participate in new programmes or that it is difficult to recruit new firms for participation, so new firms (with no or little experience in R&D) have difficulties in seeing the benefits of participation. Firms that have participated in one programme are easier to engage in new programmes. The participation in programmes often depends on the extent of risks and costs (the higher the public support the easier the recruitment of firms). Nevertheless public support in some programmes is designed to avoid continuos support in the future, so the support for the individual firm is decreasing during the participation of the programme.

Table 5a. Share of SMEs participation and budget for programmes.

Firm participation	Total budget (MNOK)	1995-budget (MNOK)
Only large firms	674,3	122,9
1%-50% SMEs	235,6	36,1
51%-60% SMEs	159,3	36,7
61%-70% SMEs	377,8	95,2
71%-80% SMEs	380,2	85,8
81%-90% SMEs	237,1	55,2
91%-99% SMEs	53,3*	165,0
Only SMEs	822,9**	424,4***
Total	2940,5	1021,3

Source: Tables 2a-c and Tables 3a-b.

Table 5b. Share of SMEs participation and budget for programmes.

Firm participation	Total budget (MNOK), cumulated	1995-budget (MNOK), cumulated
Only large firms	674,3	122,9
50% or less SMEs	909,9	159,0
60% or less SMEs	1069,2	195,7
70% or less SMEs	1447,0	290,9
80% or less SMEs	1827,2	376,7
90% or less SMEs	2064,3	431,9
99% or less SMEs	2117,6	596,9
100% or less SMEs	2940,5	1021,3

Table 5c. Share of SMEs participation and budget for programmes.

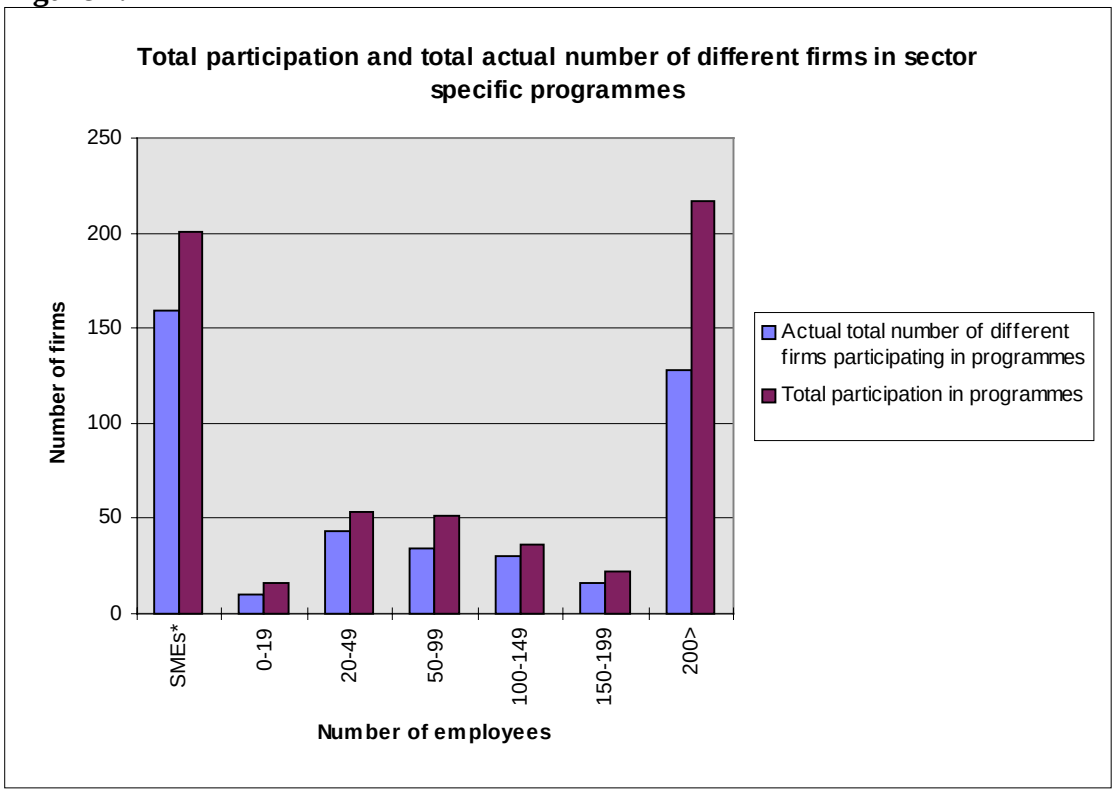
Firm participation	Total budget (MNOK),cumulated	1995-budget (MNOK),cumulated
Only SMEs	822,9	424,4
91% or more SMEs	876,2	589,4
81% or more SMEs	1113,3	644,6
71% or more SMEs	1493,5	730,4
61% or more SMEs	1871,3	825,6
51% or more SMEs	2030,6	862,3
1% or more SMEs	2266,2	898,4
0% or more SMEs	2940,5	1021,3

Source: Tables 2a-c and Tables 3a-b.

Tables 5a-c show the budgets in relation to participation of both SMEs and large firms. If we compare the number for “only SMEs” and “only large firms”, the difference in total budget is relatively small (respectively 822,9 and 674,3 MNOK). When looking at the budgets for programmes with 51% or more SMEs however, we can see that these programmes dispose of more than two thirds of total budgets for all programmes. If we use the 1995-budgets, programmes with more than 51% SMEs get almost 85% of funding in these programmes. But we are, as noted above, unable without further work to analyse the actual distribution of funds between firms of differenbt sizes. It is impossible to determine the exact amount of money available for each SME and each large firm on the bases of the above data.

In looking at programme participation across firm sizes, there appears to be a large number and propotion of very small firms particpating. In Figures 1 and 2, the category ‘SMEs’ refers to small firms which do not appear in the various business registers which have been used for the tables above. These firms are presumably rather small (0-19 employees) since their annual turnover is too low for them to be included in “Financial Information...”. If this is so, then the distribution of paerticipation among firms may be very asymmetrical, with extensive programme participation by very large and very small firms.

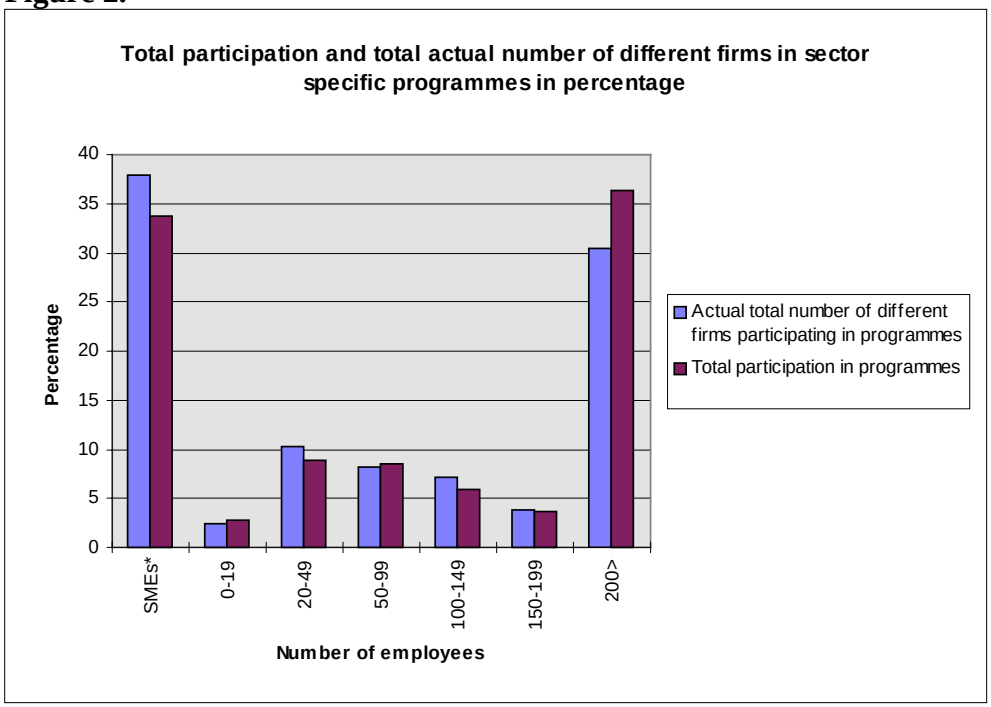
Figure 1.



Source: The figures are based on the same information used in Tables 2a-b.
*Includes firms not listed in "Financial Information...".

Figure 1 shows that many firms participate in several programmes. This is especially the case for the group with large firms (more than 200 employees) and to a lesser degree SMEs.

Figure 2.



Source: The figures are based on the information used in Tables 2a-b.

Figures 1 and 2 show that the number of firms is concentrated in both ends of the figure (0-19 and 200 >). This suggests that SMEs and large firms cooperate or that they participate in programmes adapted to their size. The case seems to be that a few large firms play the leading role (locomotives) and SMEs join as contract partners/ subcontractors or suppliers/subsuppliers. This in turn implies that many SMEs gain access to industrial networks through large companies.

Concluding comments.

Developments in Norwegian industrial policies have followed the same path as other OECD-countries with increasing emphasis on innovation and technology both through direct and indirect measures.[8] Technology diffusion and increase in competences are the key elements of Norwegian policy strategies. One of the main aims of Norwegian innovation and technology policies is to stimulate R&D efforts, both regarding expenditure and utilisation, in industry (Regjeringens Langtidsprogram 1994-1997, St.meld.nr. 4 1992-1993).

The importance of learning is obviously recognised by the Norwegian policy makers. What might not be so obvious however is whether or not the tools employed in the programmes are appropriate for stimulating continuous learning processes in the firms (and other relevant parties). Innovative processes are complex and go through a great deal of intertwined phases. This implies that firm development is not a linear process; firms can face very different problems at different stages of the innovation process and the evolution of the firm. The programmes, however, tend to focus on single aspects of a development process. This means that the programmes do not take into account the totality of firm needs. Furthermore the measures often focus on a single project while the firms might be working parallel with various development projects at the same time.

Given the administrative complexity of R&D and innovation programmes, it is easy to see why this should be. But it also suggests that two other programme possibilities should be considered. The first is a greater emphasis on multi-function programmes, where the programme can deliver services and inputs according to the developmental situation of the participating firm. The second is a need for more explicit coordination and interaction among the programmes themselves, with the possibility of shifting firms between programmes according to need. In general the coordination problem appears to be a serious one. It has at least two dimensions. First, is the overall programme portfolio adequate in relation to the needs of the SME sector in Norway (in terms of industrial structure, basic technologies, characteristic innovation problems)? Secondly, is there an adequate flow of information between the programmes, so that their efforts are complementary, and their impact is maximised?

[8] For an account of OECD policies, see OECD (1992a).

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STEP group

STEP-gruppen ble etablert i 1991 for å forsyne beslutningstakere med forskning knyttet til alle sider ved innovasjon og teknologisk endring, med særlig vekt på forholdet mellom innovasjon, økonomisk vekst og de samfunnsmessige omgivelser. Basis for gruppens arbeid er erkjennelsen av at utviklingen innen vitenskap og teknologi er fundamental for økonomisk vekst. Det gjenstår likevel mange uløste problemer omkring hvordan prosessen med vitenskapelig og teknologisk endring forløper, og hvordan denne prosessen får samfunnsmessige og økonomiske konsekvenser. Forståelse av denne prosessen er av stor betydning for utformingen og iverksettelsen av forsknings-, teknologi- og innovasjonspolitikken. Forskningen i STEP-gruppen er derfor sentrert omkring historiske, økonomiske, sosiologiske og organisatoriske spørsmål som er relevante for de brede feltene innovasjonspolitikk og økonomisk vekst.

The STEP-group was established in 1991 to support policy-makers with research on all aspects of innovation and technological change, with particular emphasis on the relationships between innovation, economic growth and the social context. The basis of the group's work is the recognition that science, technology and innovation are fundamental to economic growth; yet there remain many unresolved problems about how the processes of scientific and technological change actually occur, and about how they have social and economic impacts. Resolving such problems is central to the formation and implementation of science, technology and innovation policy. The research of the STEP group centres on historical, economic, social and organisational issues relevant for broad fields of innovation policy and economic growth.