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Arne Isaksen

Regional Clusters and Competitiveness: the Norwegian Case

Arne Isaksen
STEP
Storgaten 1
N-0155 Oslo
Norway

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STEP group
Studies in technology, innovation and economic policy
Studier i teknologi, innovasjon og økonomisk politikk

Storgaten 1, N-0155 Oslo, Norway
Telephone +47 2247 7310
Fax: +47 2242 9533
Web: http://www.step.no/

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Preface

This report is a slightly revised version of paper presented at the 9th Nordic Conference on Small Business Research at Lillehammer 29-31 May 1996. The report will be published in *European Planning Studies*, Vol. 5, no. 1. 1997.

The report examines some of the assertions reported in the international literature on regional clusters of small and medium sized firms, namely that such clusters often experience job growth and are internationally competitive. While these assertions are based mainly on case studies of various industrial districts and other types of regional clusters, this report will analyse statistical material to see whether similar trends can be observed in Norway between 1970 and 1990. Thus, the report will identify different kinds of regional clusters in Norway in 1990, as well as employment trends in the clusters between 1970 and 1990. Questions to be considered are: do the regional clusters in, for instance, the furniture industry or the electronics industry in Norway, experience relatively larger job growth than the average in these industries? The analysis indicates that regional clusters generally are internationally competitive and also reveals that regional clusters in Norway, with some important exceptions, experience a positive trend in employment compared with corresponding sectors nation-wide.

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1. Regional clusters, a visible sign of wider changes in the economy

The growth of regional clusters of mainly small and medium-sized establishments (SMEs) in Western Europe and North America since the 1970s, has gained great interest among both academics and policy makers (Humphrey and Schmitz 1995)[1]. In the 1970s and 1980s such clusters established a strong position in the world market for both more traditional products (e.g. Third Italy) and high technology products (e.g. Silicon Valley). In some industrial sectors, regional clusters of SMEs are looked upon as more competitive than large firms.

The cluster model, based mainly on experiences from industrial districts in what has come to be called the 'Third Italy,' has aroused world-wide attention. The model seems to offer the chance to make SMEs more competitive. Indeed, "SMEs might not be at a disadvantage at all compared to large firms, so long as they are able to benefit from the advantage of clustering" (Humphrey and Schmitz 1995:4).

The apparent vitality of small firm agglomerations has resulted in SMEs and networking being one of the main targets of industrial and regional policy in many industrialised countries since 1980. There has also been a considerable interest in the basis of the success of regional clusters of SMEs. These clusters are varied, and created by different mechanisms. However, the following characteristics have emerged from this international debate:

1. Regional clusters are a concentration of firms in particular sectors and localities. These are fairly small geographical areas (often labour market areas) which are over-represented with jobs in relation to the national average within one or several adjacent industrial sectors.
2. The clusters have several (often small and medium-sized) firms in the dominant industry or industries.
3. The firms in the clusters form local production networks, which comprise subcontractors and/or horizontal co-operation between operations on the same level of the production chain. External economies are formed when several firms specialise within various phases of a production chain. The firms work together almost like a large production unit.
4. The firms may employ flexible production methods, that is, they have flexible production equipment, they use labour flexibly and/or they depend on subcontractors and other local firms in dealing with changes in production volume and products/models[2].
5. In industrial districts (which are one type of regional clusters of SMEs) activity is based on place-specific social and cultural conditions. These factors contribute to the creation of positive attitudes to the establishment of small firms, and promote

[1] We use regional clusters as a catchword for many types of specialised industrial agglomerations, e.g. industrial districts and new industrial spaces (Isaksen 1994)

[2] This is a criterion in delimiting so-called 'new industrial spaces' (Storper and Scott 1989).

co-operation between firm managers, and between firm managers and workers[3]. Since they refer to place-specific characteristics, industrial districts can only develop in certain places, where the appropriate socio-cultural conditions are present.

6. In some clusters, there exist regional innovation systems. Firms co-operate in innovation, co-operation is promoted by the existence of mutual trust, and the innovation activity and the learning process are sustained by formal institutions, such as industrial service centres, technology centres, and centres for labour training. Thus, "clusters seem to have the capacity to upgrade their production" (Humphrey and Schmitz 1995:3).

From Fordism to post-Fordism: from hierarchical firms to networks of firms

The interest in regional clusters reflects the fact that place-specific, local and regional factors have increased their significance in economic and industrial development. The growing significance of 'place' may be bound up with the crisis in the Fordist mode of production since the 1970s, and the emergence of a new form of production. A change from mass production of standardised commodities to small batch, flexible production of differentiated products is emerging, as well as a change from large, hierarchical firms to networks of firms and subcontracting arrangements[4]. Thus, the growth of regional clusters is regarded as *one* visible sign of wider changes in the economy.

In Fordism, innovation to a great extent took place inside large enterprises, and innovation occurred more or less as a linear process (Andreassen et. al. 1995), or at the very least the linear model of innovation was the key reference point for describing innovation activity (Henry et. al. 1995). The linear model describes the innovation process as a sequence from research through development to production and marketing (Malecki 1991). The process is characterised by specialisation and separation; research and development is separated from production with little communication between them.

Specialisation and separation is also reflected in the spatial division of labour in Fordism. In the ideal-typical model, large firms locate most of their research and development in central parts of advanced countries, near universities and other research institutions, and with good access to highly qualified labour. Production of standardised commodities is typically located in branch plants in peripheral areas. These plants are barely involved in innovative activity, and have little co-operation with other local firms. Thus, they do not stimulate the formation of regionally concentrated networks of firms.

[3] These social and cultural factors are termed agglomeration economies, and are specified as a sufficient condition for the formation of industrial districts (Asheim 1992). Agglomeration economies comprise three factors (Marshall 1919): 1) reduction of transaction costs in the presence of mutual trust, 2) accumulation of skills among workers or creation of 'industrial atmosphere', and 3) as a result of 1 and 2, promotion of the innovation process.

[4] This change from Fordism to post-Fordism is nevertheless much debated. We will not enter this debate, but focus on two interrelated aspects important for the growth of regional clusters, namely, changes in the innovation process and in the locational pattern of industry.

The transition from Fordism to post-Fordism is accompanied by changes in the innovation process, in particular by "a stronger role for 'place' in ... the innovation process" (Tödtling 1994: 68-69), and in economic development. The stronger role for 'place' also reflects changes in the locational pattern of industry; especially the appearance of regional clusters of firms.

Innovation activity in post-Fordism has two characteristics; the first is that incremental innovations have increased their significance compared with the linear model of innovation; and second, that innovations take place as inter-active learning between firms and their external environment, and this environment is conceptualised in terms of 'national or regional systems of innovation' (Smith 1994).

Regarding the first characteristic, Lundvall and Johnson (1995) conceptualise the western post-Fordist economy as 'the learning economy'. Shorter product cycles, more uncertain and fluctuating markets, and increased competition have made knowledge and learning more important factors in the economy. "The economy as a whole ... is 'learning by doing' and 'learning by using'" (Lundvall and Johnson 1995: 26), and in many industrial sectors firms may carry through frequent innovations to survive.

The enhanced significance of frequent, incremental innovations increases the importance of tacit, non R&D-based knowledge, while 'pure' R&D-competence has become less important compared to its position within the linear model of innovation. Tacit knowledge is bound to people, and is transferred through informal learning in production and local communities. Thus, "important elements of tacit knowledge are collective rather than individual" (Lundvall and Johnson 1995:30). This kind of knowledge incorporates skills built up through long experience in a specific production, and is locally embedded.

Innovation through networking has become more important in post-Fordism, pointing to the second characteristic of innovation, interactive learning. Innovations require close and long-lasting co-operation between firms and institutions, and this kind of co-operation can best take place when firms agglomerate locationally, stimulating the formation of regional clusters. Co-operation must often be 'face-to-face'; meetings can be arranged at short notice when firms are located in the same area. Co-operation about innovation requires loyalty, and mutual trust and understanding, which takes time to develop (Lundvall and Johnson 1995). Mutual trust is encouraged and uncertainty is reduced when actors know the same informal rules and routines of co-operation. Rules and conventions are often the result of a long historical process in a region, and are hence place-specific. These are untraded "interdependencies between actors" (Storper 1995: 192) or "non-market externalities" (Courlet and Soulage 1995:296), and indicate that there exist "specific territorial factors capable of setting up territorial development of innovation" (Maillat 1995:157)[5].

[5] We do not argue that post-Fordism is only about incremental innovation and territorial clustering, but that these have increased in importance in comparison with Fordism.

2. The need for extensive studies of regional clusters

Research into regional clusters has nearly always been based on case studies of companies, production systems and geographical areas (Storper and Harrison 1991). The cases have usually been 'success stories'; companies and areas experiencing growth. They have been the basis for in-depth insight into the mechanisms which have created various clusters and the methods of production used.

However, case studies alone cannot provide information about the quantitative importance of regional clusters despite the fact that broad generalisations have been made. It takes more extensive studies to chart the quantitative development of such phenomena; for example, the number of such areas in existence and their share of employment in various industrial sectors[6]. It is important and necessary to do both case-studies and more quantitative studies in this field. Extensive quantitative studies may 'discipline' intensive case studies, so that too strong generalisations based on the few familiar examples are avoided. Studies of regional clusters have shown a tendency to present relationships which are contingent and historically specific for the clusters as universal"(cf. Sayer 1985).

In this report we attempt to identify different types of regional clusters in Norway by use of extensive statistical material. Of course, one cannot identify the more qualitative aspects of regional clusters by statistical analysis. An understanding of the manner in which production is organised, for example whether local systems of subcontractors have been set up or flexible production methods have been used, requires more intensive surveys of firms within regional clusters. Statistical material, however, makes possible comprehensive national analyses of some aspects of regional clusters, and quantitative analyses can supplement the results from case studies.

[6] In extensive studies, a narrow range of characteristics is investigated in many individuals (people, firms etc.) to gain an overview of the frequency and extent of phenomena. Typical methods are statistical analyses and large-scale surveys of a representative sample of a population (Sayer 1992).

3. Identification of regional clusters and measuring competitiveness

The basis for identifying regional clusters is the division of Norway into 103 labour-market areas or travel-to-work areas and 39 industrial sectors. The data source provides figures for all of industry except primary industries and the public sector[7].

There are several steps in the empirical analysis. The first step is to identify regional clusters, consisting of labour market areas where:

1. The locational quotient for an industrial sector is higher than 3.0, i.e. labour market areas where an industry has at least three times as many jobs as 'expected', based on the industry's significance on a national scale[8]. These labour market areas thus satisfy the first of the characteristics of regional clusters discussed above, namely local/regional specialisation. The limit for the locational quotient at 3.0 is based on estimation. We have tried different limits, and a locational quotient at roughly 3 is seen as reasonable for our purpose (Isaksen and Spilling 1996).
2. There are at least 200 man years in the sector; a lower limit is set so as not to include many very small clusters.

By applying these two criteria it is possible to delimit 143 regional clusters Norway in 1990 with a total of just under 180,000 man-years. The clusters had approximately 20% of all man years in the country as a whole in those industries for which figures are available from the data source.

These clusters are spread throughout the country, in that as many as 74 of the 103 labour market areas had one or more than one cluster. The areas which did *not* have any of these clusters in 1990 are of two types: 1) less central and small labour market areas with a relatively high number of jobs in primary industry and few in manufacturing; 2) urban areas with comprehensive industry and a relatively high number of jobs in most industries, but without any clear specialisation within any industrial sector. Examples of these areas are outer parts of the Oslo area, but not the central parts of Oslo, which have most regional clusters. The second and third largest cities in the country, Bergen and Trondheim, have no clusters, according to the criteria applied here.

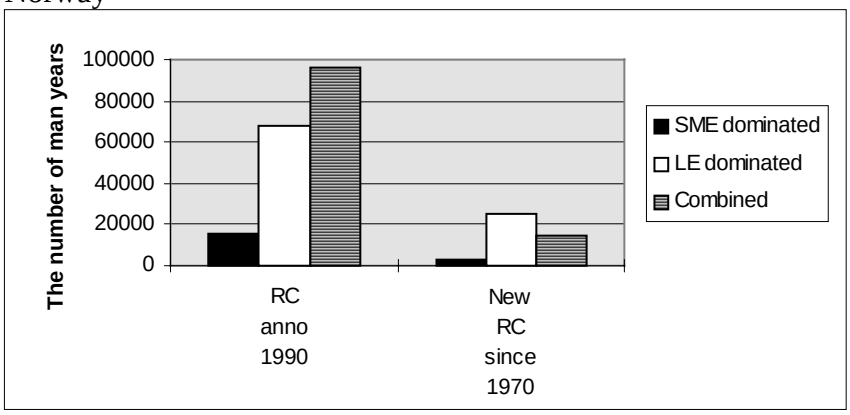
The 143 regional clusters identified are very heterogeneous. Only 24 are dominated by small and medium-sized establishments (SME dominated in Figure 1). In the Norwegian context, SMEs are establishments with fewer than 100 employees. Nor was there any sign of the appearance of new small firm clusters between 1970 and 1990. Small firm clusters are found mainly within four industries: fish processing, textiles and clothing, wood products and furnitures.

[7] The data comes from the Central Register of Establishments and Enterprises at the Statistics Norway.

[8] The locational quotient is the share of jobs of one industrial sector in in a region in proportion to the sector's share of all the jobs in the country as a whole.

Most of the regional clusters and most of the employees are to be found in clusters dominated by large firms (LE dominated in Figure 1) or with both small and large firms (Combined). The large firm clusters are mainly within the process industry and the engineering industry, and many of these clusters are based in one company towns. The combined clusters have many employees in producer services in the Oslo area.

Figure 1: The number of man years in different types of regional clusters (RC) in Norway



Regional clusters and international competitiveness, measured by revealed comparative advantage

Many of the identified regional clusters are to be found in industries where Norway has a high export rate, measured by the revealed comparative advantage index (OECD 1994). Revealed comparative advantage measures the country's share of exports from each sector in relation to exports of all manufacturing sectors,compared to the average in the 13 OECD countries. For example, Norway has a revealed comparative advantage of more than 8.5 in shipbuilding (Table 1), meaning that Norway has eight and a half times as high a share of exports coming from shipbuilding than the average amongst the OECD countries.

Table 1: Industrial sectors in Norway with revealed comparative advantage higher than 1,0, and information about regional clusters in these sectors

			Share of all jobs in the sectors to be found in the regional clusters	
Industrial sectors	Revealed comparative advantage	The number of regional clusters in 1990	1970	1990
Ships	8.57	12	31.6	60.6
Petroleum refining	4.55	3	48.4	78.4
Basic metals	3.91	30	74.0	78.4
Pulp and paper	2.03	8	55.9	74.4
Wood products	1.37	9	25.2	34.9
Furniture	1.37	5	22.8	34.1
Food (i.e. fish)	1.35	14	55.1	65.9

Table 1 displays the industries where Norway has a revealed comparative advantage higher than one. These are industries where Norway has a higher share of exports than the OECD average. There are two important observations to be made here:

1. The sectors where Norway has a high comparative advantage are at the same time sectors with many regional clusters. 90 of the 124 regional clusters in the manufacturing industry are in these sectors, which is an over-representation since these sectors have one third of the number of manufacturing jobs in Norway. Thus, Norway's export specialisation industries tend to agglomerate locationally.
2. In the same sectors, the regional clusters increased their share of all jobs in these sectors between 1970 and 1990. In shipbuilding, for instance, the clusters increased their share of all jobs in this sector in Norway from about 30 to 60%.

Thus, many regional clusters are competitive; they have a relatively high export rate, and they increase their share of all jobs in the export specialisation sectors. So what is the connection between high export rates, regional clusters and relative growth? According to Storper (1992) an increasing share of exports from nations originates from 'technology districts'. These are areas where technological learning takes place, which stimulates product innovations, and thus creates competitiveness and is the basis for export. In the same way Porter (1990) points out that clusters - firms and industries linked through vertical or horizontal relationships - "work best when the industries involved are geographically concentrated" (p. 157). Territorial agglomerations therefore provide the best context for learning and innovation (Asheim 1995).

Thus, does Table 1 give a "statistical proof" that regional clustering leads to increased international competitiveness? In Norway, most of the industrial sectors with high export rates are resource intensive industries. The basis for competitiveness is raw materials such as oil and gas, fish, wood and large amounts of hydro electric power, although thedevelopment of high competences in research and development in many of these industries in national institutions (Reve et. al. 1992) has contributed to the formation of national innovation systems. This implies that regional clusters have developed because Norway has resources asthe basis for exports. In addition, most of the identified regional clusters in petroleum refining, basic metals and pulp and paper have one or only a few firms in these industries, signifying that horizontal co-operation between *local* firms is not the basis for competitiveness in these clusters.

In the other sectors in Table 1, where the regional clusters most often have many firms in the same sectors, territorial agglomerations of firms may create competitiveness and export, as argued by Storper and Porter. We cannot, however, verify if and how international competitiveness is created in regional clusters by means of the statistical analyses performed in this report. Nevertheless, some case studies show that co-operation between local firms and institutions has been the basis for innovation activity and competitiveness (Asheim and Isaksen 1995).

4. Regional clusters with many firms in the same industrial sector

The regional clusters given most attention in the literature are those with many (often small and medium sized) firms formed into local production systems, comprising subcontractors, and horizontal co-operation between firms as well as with institutions. It is not possible to delimit these kind of regional clusters by using only statistical data. That would require more comprehensive information on every single firm. Nevertheless, we will introduce two more criteria to carry the analysis one step further:

1. The regional clusters must have 10 or more establishments in the dominant industrial sector, i.e. the sector (or sectors) where the locational quotient is higher than 3.0 in a labour market area. In clusters with 10 establishments and more, there are of course better chances for local horizontal co-operation between firms in the same industries than in clusters with only a few firms.
2. The regional clusters must be dominated by industrial sectors where vertical disintegration of the production chain may occur. Vertical disintegration is one important characteristic of the new form of regional clusters which has received a lot of attention since the 1970s (Henry 1992). Disintegration means that a local subcontracting system can arise and that the firms can achieve external flexibility.

   When selecting those industries of current interest here, we have excluded only those industries where vertical disintegration obviously cannot occur[9]. The industries excluded are first and foremost process industries where the production technology does not permit extensive vertical disintegration of the production itself. We also exclude stone cutting since in Norway this industry involves the production and export of stone blocks, and thus does not give rise to subcontracting along the production chain (Halvorsen et. al. 1994). Nor in service industries such as wholesaling, and restaurants and hotels is it meaningful to talk about vertical disintegration of the production process.

The geographical location of regional clusters

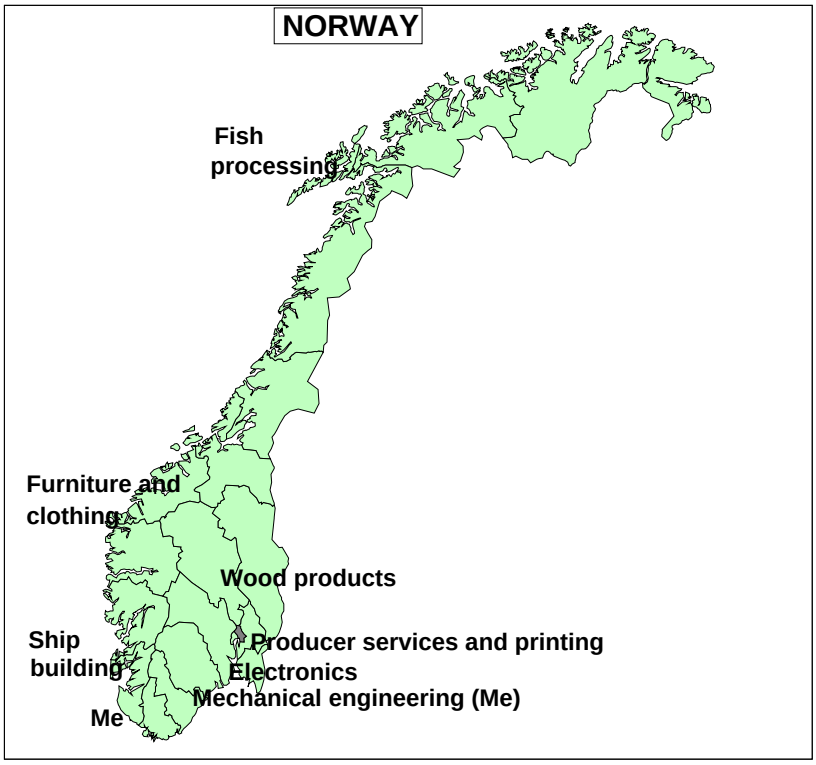
By applying these two criteria, we have delimited 41 regional clusters in 1990 with 54.300 man years in *manufacturing industries* and three clusters in *producer services* with just over 33.700 man years. In most sectors the regional clusters have their own distinct geographical location. Twelve clusters in fish processing are located along the western and northern coastline (Map 1). Six clusters in shipbuilding are concentrated on the west coast in 1990, while the Oslo fjord area had two important clusters in this industry in 1970. In the north-western part of Norway, in the region named Sunnmøre, there were also three clusters in furnitures and two in textiles and clothing.

The area in and around the capital of Oslo has three regional clusters, in the electronics and electrical industry and producer services respectively. The south-eastern part of Norway also have seven clusters in mechanical engineering, while

[9] Thus, this is a qualitative criterion dependent on the author's judgement.

there is also one important cluster in this industry in Jæren, south of Stavanger in the south-western part of Norway. Finally, the inner part of eastern Norway has five clusters in wood products.

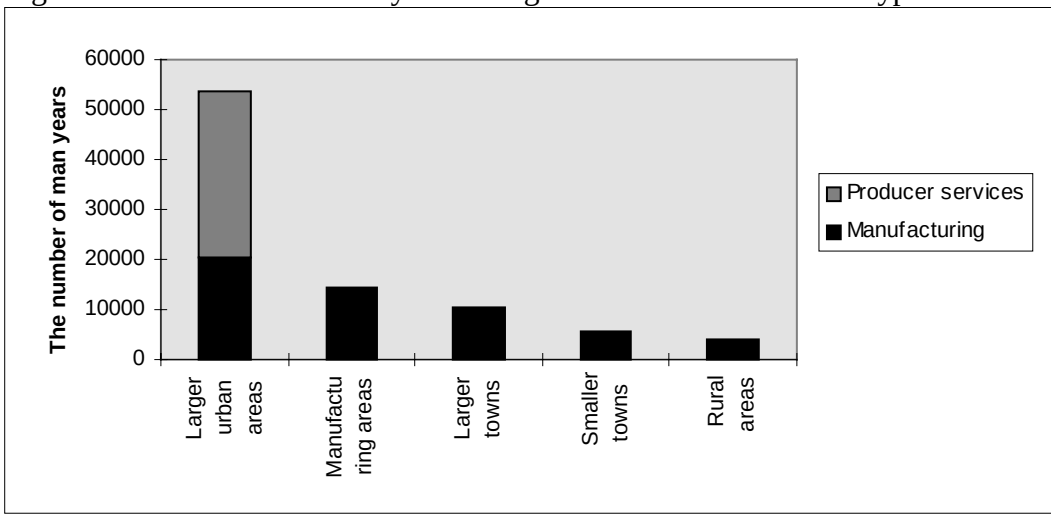
Map 1: The typical location of regional clusters in different industrial sectors in Norway in 1990



The spread of regional clusters is demonstrated in Figure 2, showing that all types of regions in Norway have some clusters[10]. However, the vast majority of jobs are found in the large urban areas, reflecting that all three clusters in producer services are located in the Oslo region. The large urban areas also have most jobs in regional clusters in manufacturing industries. These jobs are to be found in three relatively large clusters, namely printing and publishing and electronics in the Oslo area and ship building (and oil platforms) in Stavanger. Otherwise, there are far more jobs in regional clusters located in manufacturing areas and larger towns than in the two most peripheral types of areas; viz. smaller towns and rural areas. The location of regional clusters in Norway, then, does not fit in with the assertion in the literature that one important feature of European regional clusters of SMEs is reported to be their growth in former relatively marginal and underindustrialised areas, outside the heartland of Fordist capitalist production (Humphrey and Schmitz 1995).

[10] The grouping into five types of area is based on the industrial structure and centrality of municipalities in 1970, i.e. at the start of the study period. *Large urban areas* include labour market areas in and around the five largest towns and cities in Norway. *Manufacturing areas* have traditionally had a great deal of manufacturing and / or mining. *Large towns* include labour market areas where the central urban area usually had between 10,000 and 50,000 inhabitants in 1970. In the *smaller towns* the central urban area had between 5,000 and 10,000 inhabitants. The *rural areas* include the rest of the country and comprise peripheral labour market areas, often dominated by the primary industries.

Figure 2: The number of man years in regional clusters in different types of area



Trends in employment in the regional clusters 1970-1990

In five of the manufacturing sectors the regional clusters showed better growth in employment between 1970 and 1990 than corresponding sectors nation-wide (Figure 2)[11]. These are ship building, machinery industry and furniture industry, where the regional clusters grew while the sectors lost jobs in Norway as a whole. In fish processing and wood products the regional clusters had slightly smaller job losses than the national average, while in metal products the job losses were slightly greater in the clusters.

As for the three remaining sectors, the considerable decline in employment can be attributed to losses in a few, and centrally located clusters, reflecting the national deconcentration of jobs in Norway in the 1970s and 1980s. In textiles and clothing most of the decline took place in Bergen, which lost 5.400 jobs. The reduction was faster than in Norway as a whole, and Bergen's share of jobs in textiles and clothing nation-wide fell from almost 20% in 1970 to 13% in 1990.

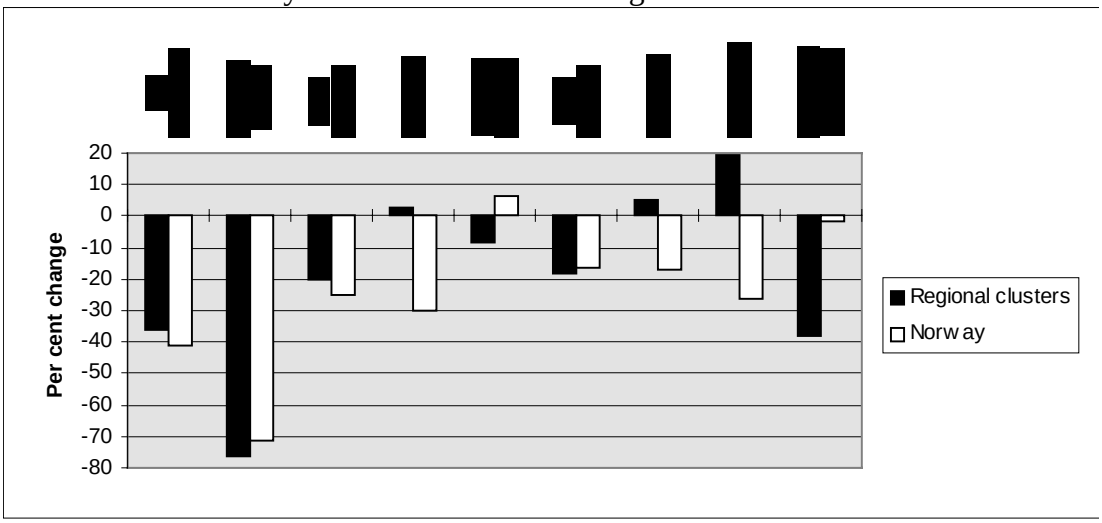
In the electronics and electrical industries there were extensive losses in Oslo. In 1970 the municipality of Oslo had 25% of the total number of jobs in the electronics industry and just over 40% of the jobs in the electrical industry compared with barely 8% and 10% respectively in 1990. The three other regional clusters in these industries, all located near Oslo, experienced considerable growth in employment. The great losses in regional clusters in the electronics and electrical industry are therefore only representative of Oslo, not the few other clusters in these industries in Norway.

In printing and publishing Oslo made up the only regional cluster, and lost jobs. The great job losses in Oslo and Bergen demonstrate the national deconcentration which took place in Norway, as in many other countries, in the 1970s and 1980s. The central areas of the country suffered a far greater decline in manufacturing than less

[11] Figure 2 includes both stable clusters, which could be delimited as regional clusters according to our criteria both in 1970 and 1990; new clusters which have arisen during the period; and 'extinct clusters which have disappeared during the period i.e., clusters which satisfied the criteria in 1970, but not in 1990.

central areas. However, an industrial restructuring took place in central areas, in so far that the Oslo area gained new jobs in the petroleum industry and producer services.

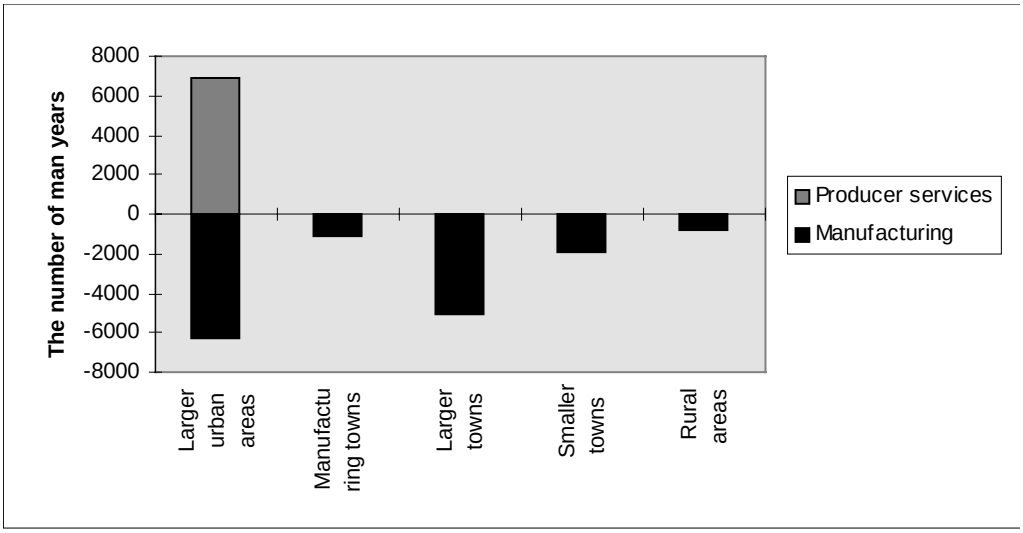
Figure 2: Percentage change in the number of man years 1970-1990 in regional clusters and in Norway in different manufacturing sectors



If we disregard the substantial job losses in some centrally located clusters, the remaining regional clusters in many manufacturing sectors experienced a positive trend in employment. Even in sectors with considerable job losses throughout the country (e.g. shipbuilding, machinery industry and furnitures) there are several expanding regional clusters.

In all, the regional clusters in manufacturing lost more than 15.000 man years from 1970 to 1990 (Fgure 3). The decline occurred mostly in larger urban areas and larger towns. The job loss in larger urban areas reflects the national deconcentration of manufacturing jobs, which is compensated for by the concentration of the growing producer service sector in these areas. The job losses in larger towns chiefly reflects heavy losses in two 'distinct' regional clusters of ship building along the Oslo fjord.

Figure 3: Changes in the number of man years in regional clusters in different types of area 1970-1990.



5. Conclusions

This report has analysed statistical material with the aim of investigating job growth and competitiveness in regional clusters in Norway. The analyses imply that the clusters, with some exceptions, are competitive, signifying that being in a regional cluster makes a significant difference to firms. Industries with high export rates, measured by the revealed comparative advantage index, have most regional clusters, indicating that firms in these clusters produce a considerable share of Norwegian exports. If we disregard the substantial job losses in some centrally located clusters, the remaining regional clusters most often experienced a positive trend in employment compared with corresponding industries nation-wide. However, in this connection, we must tone down the significance of small and medium sized firms and SME-clusters, since in Norway this is limited to establishments with fewer than 100 employees. Of greater quantitative significance are areas where there are several large establishments or both small and large establishments.

References

Andreassen, L.E. et. al. (1995) Conclusions, in Andreassen, L.E. et. al. (Eds.) *Europe's Next Step. Organisational Innovation, Competition and Employment*, pp. 321-332. Frank Cass, Essex and Portland.

Asheim, B.T. (1992) Flexible Specialisation, Industrial Districts and Small Firms: A Critical Appraisal, in Erneste, H. and V. Meier (Eds.) *Regional Development and Contemporary Industrial Response: Extending Flexible Specialisation*, pp. 45-63. Belhaven Press. London.

Asheim, B.T. (1996) Industrial districts as 'learning regions'. A condition for prosperity? *European Planning Studies*, 4, pp. 379-400.

Asheim, B.T. and A. Isaksen (1995) Spesialiserte produksjonsområder mellom globalisering og regionalisering, in Olberg, D. (Ed.) *Endringer i arbeidslivets organisering*, pp. 61-97. FAFO-rapport 183, Oslo.

Courlet, C. and B. Soulage (1995) Industrial dynamics and territorial space, *Entrepreneurship & regional development*, 7, pp. 287-307.

Halvorsen, K. et.al. (1994) *Et konkurransedyktig Vestfold*. NIBR-rapport 1994:6. Norsk institutt for by- og regionforskning, Oslo.

Henry, N. (1992) The New Industrial Spaces: Locational Logic of a New Production Era, *International Journal of Urban and Regional Research*, 16, pp. 375-396.

Henry, N. et. al. (1995) Along the road: R&D, society and space, *Research Policy*, 24, pp. 707-726.

Humphrey, J. and H. Schmitz (1995) Principles for promoting clusters & networks of SMEs. *Discussion Paper* Number 1. Small medium enterprises programme. United Nations Industrial Development Organization.

Isaksen, A. (1994) New Industrial Spaces and Industrial Districts in Norway: Productive concepts in explaining regional development? *European Urban and Regional Studies*, 1, pp. 31-48.

Isaksen, A. (1996).. Towards increased regional specialization? The quantitative importance of new industrial spaces in Norway, 1970-1990, *Norsk geogr. Tidsskr.*, 50, pp. 113-123.

Isaksen, A. and O.R. Spilling (1996) *Regional utvikling og små bedrifter*. HøyskoleForlaget, Kristiansand.

Lundvall, B.-Å. and B. Johnson (1995) The Learning Economy, *Journal of Industry Studies*, 1, pp. 23-42.

Maillat, D. (1995) Territorial dynamic, innovative milieus and regional policy, *Entrepreneurship & regional development*, 7, pp. 157-165.

Malecki, M. J. (1991) *Technology and economic development: the dynamics of local, regional, and national change*. Longman, Essex.

Marshall, A. (1919) *Industry and trade*. Macmillan, London (Fourth Edition, 1923).

OECD (1994) *Manufacturing Performance: A Scoreboard of Indicators*. OECD, Paris.

Porter, M. (1990) *The Competitive Advantage of Nations*. Macmillan, London, Basintoke.

Reve, T. et. al. (1992) *Et konkurransedyktig Norge*. Tano, Oslo.

Smith, K. (1994) *New directions in research and technology policy: Identifying the key issues*. STEP-report 1-94. STEP-group, Oslo.

Sayer, A. (1985) Industry and space: a sympathetic critic of radical research, *Environment and Planning D: Society and Space*, 3, pp. 3-29.

Sayer, A. (1992) *Method in social science. A realist approach*. Routledge, London.

Storper, M. (1992) The limits of globalization: technology districts and international trade, *Economic Geography*, 68: pp. 60-93.

Storper, M. (1995) The resurgence of regional economies ten years later. The region as a nexus of untraded interdependencies, *European Urban and Regional Studies*, 2, pp. 191-221.

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, pp. 407-422.

Storper, M. and A.J. Scott (1989) The geographical foundations and social regulation of flexible production complexes, in Wolch, J. and M. Dear (Eds.) *The power of geography: how territory shapes social life*., pp. 21-39. Unwin Hyman, London.

Tödtling, F. (1994) The Uneven Landscape of Innovation Poles: Local Embeddedness and Global Networks., in Amin, A. and N. Thrift (Eds.) *Globalization, Institutions, and Regional Development in Europe*, pp. 68-90. Oxford University Press, Oxford.

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Storgaten 1, N-0155 Oslo, Norway
Telephone +47 2247 7310
Fax: +47 2242 9533
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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.