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Arne Isaksen

Regionalisation and regional clusters as development strategies in a global economy

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.sol.no/step/

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Preface

This report is prepared as a chapter in Bjørn T. Asheim and Keith Smith (eds.): *Regional innovation systems, regional networks and regional policy*. (Edward Elgar, forthcoming.) The report builds on an earlier article by Bjørn T. Asheim and Arne Isaksen. Examples from the mechanical engineering industry in Jæren are written by Asheim, who also deserves thanks for his valuable comments on the paper as a whole.

Abstract

On the basis of Norwegian empirical examples, this paper discusses whether it is possible to encourage *local* industrial development and to pursue *local* industrial policies in the face of an increasingly globalised economy. We argue that there are clear tendencies towards regionalisation in the economy, and that this represents one *possible* alternative to globalisation as a development model and as a strategy for local industrial development.

Regionalisation as a development model is closely tied to the resurgence of regional economies and especially the growth of regional clusters. These are smaller geographic areas containing several firms within the same industry, and where firms take part in various kinds of formal and informal local networks. This paper provides an overview of the most important characteristics of dynamic regional clusters. In addition, we chart the current extent and employment growth of potential regional clusters in Norway. This kind of empirical work is *one* of the necessary means for assessing whether regionalisation is in fact a suitable development strategy for (some) Norwegian regions.

Keywords: Globalisation; Regionalisation, Clusters, Regional Policy, Norway

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Regionalisation and regional clusters as development strategies in a global economy

1. Globalisation: a challenge for local industrial policies

'Globalisation' refers to the development of the world economy in the direction of increasingly supranational, functional integration run by transnational corporations (TNCs). In those sectors where these tendencies are most strongly developed (i.e., the car industry and electronics), globalisation has led to steadily increasing influence by TNCs on national industries. In part, this takes place through corporations establishing or buying firms in different areas of the world, and in part through the linking of formally independent companies to transnational corporations as subcontractors and suppliers, as is the case for a number of Norwegian firms which supply components to the European car industry. In this way large numbers of firms are linked together in networks which are directly or indirectly controlled by the headquarters of TNCs. These networks become ever closer, and firms in such global production systems are subject to strict demands; they must be innovative, cost efficient and capable of meeting corporations' strict technological demands.

Thus, the underlying message of many contemporary analyses is that the balance of power in the economy is tipped in favour of TNCs at the expense of nations and regions (Storper 1997). This implies that control over important dimensions of the economic development process in national and regional territories is being taken over by large transnational corporations.

In addition, the growth of a global economy has resulted in the broad distribution of modern manufacturing production. As a result, it is now meaningless to talk about third world countries as simply producers of raw materials and unsophisticated, labour-intensive manufacturing goods. At the same time we are seeing the homogenisation of production factors, so that - in the last instance - international competitiveness is determined by input factor prices, which usually means labour costs. This effect is amplified by deregulation and liberalisation at both national and

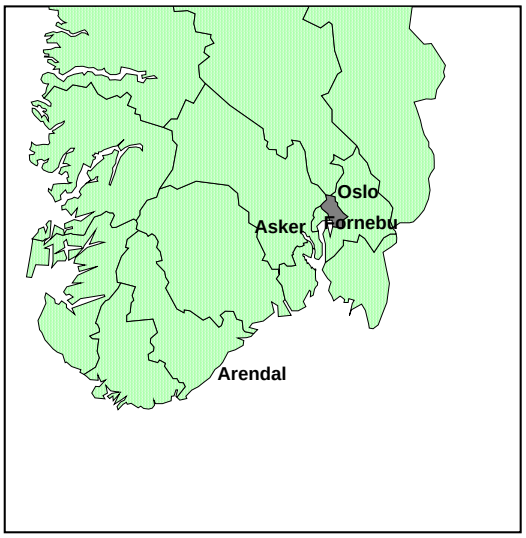
international level, by the decline in manufactured goods' life-span as well as by technological developments within communications and information technology (IT) which allow the global organisation of complex interaction between firms and within TNCs to be managed effectively (Cooke 1997).

Transnational corporations are present in many areas of the world, and they can use this geographic spread in their pursuit of greater profit. Corporations can, for instance, establish or relocate firms in favourable areas, where they have access to cheap labour, tax benefits or public capital subsidies. People in corporate management do not generally consider relocation to be a problem, as they consider their firms to be autonomous units that are not anchored to their surroundings. That is to say, qualified labour, suppliers and competencies can either be relocated with the firm or will be found or rapidly created in the new location.

The Ericsson affair: an illustration of local powerlessness in a global economy?

Transnational corporations have thus assumed a more important position in the economy, and the global strategies of such corporations play an increasingly important role in the economic development of many regions. This was clearly illustrated by the so-called 'Ericsson affair' in Norway, in early 1997. Ericsson is a large, Swedish-owned telecommunications company, with approximately 100 000 employees in 120 countries. Ericsson has two divisions in Norway; one in Asker, just outside Oslo, with more than 500 employees, and another in Arendal, further south, with between 400 and 500 employees. (See map 1 below.) Both divisions concentrate on product development; in part the development of new products and components for the Ericsson corporation, and in part the adjustment, installation, testing and servicing of Ericsson products for Norwegian clients (largely consisting of *Telenor*, the public telecommunications company in Norway). Both Norwegian divisions have the Ericsson corporation itself as their largest customer - accounting for more than half of their activity - and they compete for these development activities with other Ericsson departments all over the world.

Map 1: The location of Fornebu, Asker and Arendal



The 'Ericsson affair' refers to Ericsson's plans to move their Arendal division to the proposed Technology Park at Fornebu; the plan was to relocate both Norwegian divisions under one roof. Fornebu is the airport that currently serves Oslo and is to close in 1998 when a new airport opens. Proposals have been put forward to develop Fornebu into a technology park for organisations within all aspects of IT, namely education, R&D, administration and production/services.

Ericsson's management justified relocating the Arendal division on the grounds that bringing together all their Norwegian activities in one place would increase productivity sufficiently for Ericsson to maintain current levels of activity in Norway in the future. In addition, management argued that it was necessary to be located close to *Telenor* - their most important client - and that it is in general a great advantage to be located in the Oslo region, which houses Norway's largest IT research and development milieu.

Workers and management at Arendal, as well as local politicians, argued that relocation was unnecessary and did not represent the best solution for Ericsson. Information technology makes it possible for the Asker and Arendal divisions to co-operate without physical proximity. Opponents also pointed out the benefits of having two divisions, namely that Ericsson thus has two recruitment bases in Norway - one in a large city area (Oslo) and one in a town (60 000 residents in the town and surrounding area) - which makes it easier to attract qualified workers with different

lifestyle preferences. Wage levels are also lower in the Arendal area, and attention was further drawn to the fact that the Arendal area has an active IT milieu amongst firms and higher education institutes. Thus, the Ericsson department is far from a 'cathedral in the desert'. The resistance met by Ericsson, from employees and from the area in general led to a U-turn at a board meeting in February 1997. Ericsson's management in Norway claimed that a successful move depended on at least 80% of their employees agreeing to relocate, as the division depends on their firm-specific competence. Very few of them seemed willing to move to Fornebu.

Two opposing interpretations of the Arendal division can be found in the conflict between Ericsson's Oslo management and employees. On the one hand we find the management view of the 'portable' firm, and on the other, the employee view of the firm anchored to its location, because the division at Arendal is knowledge-based. In the latter view, competitive advantage is conferred through the competence and experience of employees rather than, for example, access to raw materials or cheap electricity.

Ericsson's division at Arendal is one small element in a world-wide corporation, and the Ericsson affair can therefore be placed in a globalisation perspective. Ericsson's relocation plans clearly illustrate how vulnerable local areas can be to the strategic decision-making of TNCs. At this point we should also note that an area could draw great advantage from containing firms that are a part of TNCs; firms may have greater opportunity for development than they would have as relatively small national companies. As part of TNCs firms have greater access to capital, competence, technology and partners for co-operation. In addition they have access to a brand name and a sales and marketing apparatus.

Although globalisation tendencies are only really fully developed in the car and electronics industries, most observers agree that these trends are real. If this is true, then local economic development and regional policy face substantial challenges. Arendal has seen the growth of a significant - by Norwegian standards - IT sector, both in terms of number of employees (700 in addition to more than 400 at Ericsson), number of firms (10-15) and in terms of educational capacity (with for instance a technical college specialising in information technology). Nevertheless the area

experienced the threat of globalisation at close quarters. The question posed amongst others by the Ministry of Local Government and Labour (responsible for regional industrial policy in Norway) was: How can we manage to create “self-sufficient” industrial milieus outside the central areas in Norway, if not even the IT sector in Arendal should be able to succeed in this?

2. Regionalisation as an alternative development tendency in the economy

There is, however, disagreement on the extent and consequences of globalisation. This concerns firstly, whether globalisation represents a qualitatively new phenomenon in comparison to ‘traditional’ internationalisation, and secondly, whether alternative economic trends can be found in the international economy. In this paper we argue that there are such alternative trends, which we will call regionalisation. Regionalisation refers to economic activity dependent on resources, which are specific to individual places (Storper 1997). In these places interactive learning occurs in which asymmetric information and unique knowledge is created and absorbed in a way that creates competitiveness for firms and local production systems.

In the following we describe a number of important aspects of regionalisation, and discuss whether this perspective presents a realistic alternative to globalisation as a development strategy in creating internationally competitive firms and industrial milieus in the Norwegian regions. In spite of clear globalisation trends overall, a parallel process of regionalisation has led to increased interest in the role of the regional and local level in studies of industrial development over the last ten years. Increased interest in regional level activities reflects heightened interest in three classic questions: Why are some regions more economically successful than others, repeatedly generating new products that cannot easily and rapidly be imitated by others? Why do internationally competitive industries tend to be concentrated in a small number of countries and regions (Hassink 1996)? What is it that creates growth in these successful areas?

Attempts to answer these questions increasingly highlight the importance of local and 'non-economic' factors in explaining 'success stories'. However, these 'non-economic' factors are considered to be central to economic development, and Storper and Salais (1997), for example, no longer want to consider them non-economic, but rather put them at the centre of economic processes. Factors put forward as success criteria include:

- Mutual trust and co-operation between firms and between management and employees within firms.
- Local traditions in the establishment and running of small enterprises - so-called entrepreneurial spirit.
- Work-force competence - not necessarily formal qualifications, but rather competence gained through long term experience of a particular production processes.
- Collective learning processes and the free flow of information between firms - i.e. that firms take part in learning networks.
- Different kinds of technology centres are conducive to positive economic development.

All these factors emphasise the way in which agglomerations of firms are anchored in local economic, social and cultural structures; structures which have a bearing on their competitiveness. These are assets that cannot easily or rapidly be created or imitated in places that lack them (Storper 1997).

Regional clusters as a development model

That so much importance is attributed to local and regional conditions is primarily a result of the many studies that examine the conditions that characterise particularly successful areas or industrial milieus. These areas do vary, but we can group them together under the term *regional clusters*. A regional cluster may be defined as a geographically bounded concentration of *interdependent* firms, which means that the firms form a local production or social system. Rosenfeld (1997: 10) explains the interdependence as "active channels for business transactions, dialogue, and communications" between firms in the area, and that the firms "collectively share common opportunities and threats".

From around 1970, many regional clusters in Western Europe and the US experienced growth, at a time when manufacturing employment declined in these

countries as a whole. In the 1970s and 80s a number of these areas established themselves as strong players on the global market, both with regard to more traditional products as well as high-tech products. (Industrial districts in Central- and North-eastern Italy may provide the best examples of the former, Silicon Valley in California is the best known example of the latter.) In a number of manufacturing sectors these regional clusters of often small and medium sized enterprises were considered more competitive than large companies.

The development of regional clusters has been subject to intense scrutiny by researchers and policy-makers responsible for industrial and regional policy. The development model based on Italian experiences in particular has met with great international interest, as many of the industrial districts seem to flourish despite the trends of globalisation. However, the analyses of developments in the Italian regions (and in similar regions elsewhere) are not entirely unproblematic. Subject to debate, for example, is the question of the likelihood that such areas will be able to survive as local production systems in an ever more global economy. There are signs of the appearance of powerful *lead firms* introducing more asymmetrical inter-firm networks within the industrial districts, firms in the districts substituting local subcontractors with (cheaper) subcontractors from other areas, and the remote control of key firms in the districts by outside corporations (Harrison 1994). However, the experiences of such areas do suggest that it is possible to create locally based growth in networks of small and medium sized enterprises, *if* conditions are suitable and support is provided for firms on a number of strategic issues.

What then are the characteristics of successful regional clusters? Although these areas differ in many ways, a number of characteristics can be identified (cf. Rosenfeld 1997). The most significant such characteristics will be discussed in the following.

1. Specialisation

Regional clusters are specialised within one or more industries. They are limited geographical areas (often labour-market regions) with a relatively large number of firms and employees in a particular group of industries, and where many of the firms are locally owned.

2. Local networks

Firms in regional clusters form local networks, often in the form of production systems. We are thus not talking about single, isolated firms, but firms that co-operate in a number of different ways. Production systems first and foremost tend to incorporate sub-contractors, but there may also be horizontal co-operation between firms in the same production stage. We are also talking about so-called learning networks, i.e. where firms do not simply buy components from one another, but learn from each other and, for example, develop products together. This reflects a more general point where innovation processes are understood in terms of interactive learning processes, both within firms and between firms in the supply chain. The integrated supply chain has proved to be an important mechanism for generating and disseminating knowledge and problem-solving capacities between firms (Morgan 1996). Besides, communication rules, 'social proximity' and appropriate institutions in specific agglomerations may be important to successful co-ordination of inter-firm networks (Storper 1997).

The idea of 'learning networks' can be illustrated by an example of a regional cluster in Norway, namely the electronics industry in Horten, which is a medium sized town with 23,000 inhabitants, about 100 kilometres south of Oslo (Asheim and Isaksen 1997). The driving forces in the electronics industry in Horten are 4-5 large systems firms. These firms have their own, internationally recognised brand name products. The systems firms carry out very little production internally, instead they specialise in product development, sales and marketing, whilst production is carried out by contract suppliers which are often located in Horten. The current tendency is towards closer co-operation between systems firms and suppliers. Previously, contact was often limited to pure market transactions - selling and buying - where the systems firms' only goal was to obtain the lowest prices possible for components and modules. The 1990s have seen a clear tendency towards development of more long-term and extensive co-operation between systems firms and contract suppliers in Horten. This can be seen in the fact that suppliers take part in the product development process of systems firms at ever-earlier stages, amongst other things to ensure that the components that are developed can also be produced efficiently. The systems firms gain considerable advantage in using contract suppliers. For instance, handing out

production means that systems firms can concentrate around core activities that are often linked to product development, market research and sales rather than actual production. Suppliers on the other hand are highly competent in production, product testing, purchase and administration of materials; systems firms gain access to this competence through handing out production. Use of subcontractors provides a significant, often decisive, advantage in cases of establishing *new* systems firms. The systems firms gain access to components, purchasing and production, thus allowing the new firm to concentrate on the market and product development.

3. R&D and educational institutions

A third characteristic is that successful regional clusters include R&D institutes and educational institutions within relevant subject areas for firms in the cluster. These include local technology centres, specialised service centres, colleges and so on. This characteristic is first and foremost relevant in regional clusters dominated by industries where innovation is to a certain extent formal-science based. Thus, in Italian industrial districts (incremental) innovations have been accomplished with only modest investment in R&D; it is mainly 'innovation without R&D' (Gottardi 1996).

The presence of for example publicly funded, planned technology centres suggests that growth is not simply the result of spontaneous processes but that both private and public sector activities play an important role. These are tools and instruments which, at times, have emerged through trial and error, resulting in the establishment of institutions and means to suit the economic structure and cultural and institutional context of the particular region.

This point can also be illustrated by a Norwegian example, this time from the mechanical engineering industry at Jæren, an industrial district south of Stavanger on the south-western coast of Norway (Asheim and Isaksen 1997). This area has seen the establishment of two different types of technology centres, which have played an important role in the development of mechanical engineering firms in the region. The first, TESA ("Technical Co-operation"), was established as long ago as 1957. This organisation, established by local firms to promote technological development amongst member firms, was made up of medium sized, export-oriented firms whose

primary products were agricultural machinery. This co-operation has led amongst other things to Jæren becoming the Norwegian centre for robot technology, with locally specific competence on this technology established in the area. The use of robots in manufacturing is also far more extensive in this region than in the rest of the country. TESA member firms have extremely high export-shares, and the firms themselves ascribe much of their competitiveness to the technological co-operation of TESA firms.

TESA was further involved in the establishment of JÆRTEK (Jæren Technology Centre) in 1987. JÆRTEK aims to contribute to the education of workers, as well as teachers and students from the technical colleges, in prospective technological areas important to the firms of the region. JÆRTEK was, for example, one of the first to install full-scale Computer Integrated Manufacturing equipment (CIM). The CIM-concept has later spread to other member firms, amongst them *Kverneland*, a producer of agricultural machinery. This investment has contributed to increasing Kverneland productivity and has helped to make this local firm the largest producer of ploughs in Europe.

4. Qualified work force

A further characteristic of successful regional clusters is a well-qualified work force. Competencies should be found amongst all staff, and not be restricted to management, executives and engineers. Competence in marketing, administration and strategy are at least as important as technological competence. In addition, it is important to have both professional R&D competence as well as less formal, experience-based competence - so-called tacit knowledge.

5. Access to competent financial institutions

Another important characteristic is access to competent capital. By this we mean access to financial institutions that are familiar with the situation in the relevant industry and can bring competence to the firms.

Points 2 to 5 refer to important actors in dynamic regional clusters:

- Firms at different stages in the value-chain;

- R&D institutions with activities tailor-made to the dominant sector(s) of an area;
- a work force with broad range of competencies;
- educational institutes suited to the needs of local firms, and
- competent capital.

In addition, public authorities will play an important role in initiating and financing much of the activity that takes place. These actors are also the most important actors in regional innovation systems; innovation activity is carried out interactively between firms and knowledge suppliers, and supported by education and training, transfer agencies, financial institutions and policy institutions. The presence of these actors contributes to creating dynamic agglomeration economies in an area; i.e. heightened prospects for technological learning to take place through information spill-over (Harrison et. al. 1996).

6. Cooperation between firms and other institutions

Another characteristic of the ideal type successful regional cluster is close co-operation between local firms and between firms and a variety of other institutions (cf., the Jæren-example above). This means that actors are part of a regional system, and indicates further that the economic life of a region is based on certain social and cultural conditions. Any close co-operation between firms and institutions, as well as within firms, demands the establishment of a certain degree of mutual trust between people, and that the area is characterised by an "us-and-them" attitude and a common vision of the future. In addition, suitable 'meeting-places' are important, i.e. institutions that unite people and make possible the informal exchange of experiences and ideas. This point is emphasised as a particularly important criterion for the success of Silicon Valley (Saxenian 1994).

7. Contacts to knowledgeable milieus elsewhere

A further characteristic is that firms in successful regional clusters are also in contact with industries and competence milieus elsewhere, so that firms have access to competencies which may supplement local competence. Industrial milieus can become locked-in to established technologies and dated products and solutions unless they receive impulses and competence from outside, which can stimulate technological upgrading and product development.

This point can also be illustrated by an example from a Norwegian regional cluster, namely the glass-fibre boat industry in Arendal (this is the same region from which we took the Ericsson example). Arendal's boat building industry was very competitive at an early stage and actually dominated much of the European boat industry during the 1960s and early 70s. However, the area has since lost its dominant position.

The numerous small firms in the region have not managed to renew their production methods. (The area has approximately 25 yards, all small and medium sized, and nearly all of them started and owned by local entrepreneurs). Boats are moulded today in much the same way as they were in the 1960s, and the yards (with a few exceptions) now simply imitate foreign design. One of the reasons for the decline in competitiveness is that the local boat building industry has been based, since the 1970s, almost exclusively on local, informal and experience-based competence. There has been an almost total lack of professional administrative and technical competence in the industry. Despite the important role played by the glass fibre boat industry in the region since 1960, there has until recently been no local education which mirrors the industry's needs. There is no local technology centre á la TESA; the yards have had little horizontal co-operation; and there have been few attempts to access national-level competencies.

In order for this local industry to survive in any meaningful way it will be necessary to increase competencies as well as to upgrade both technological and organisational aspects of production. Firms in the region need assistance with these matters from outside actors. Individually, the small yards are unable to complete this kind of upgrading, and there is thus a need to establish joint solutions to solve bottlenecks in many firms at the same time. This example shows that it is often necessary to supplement the informal competence of small-firm regions with R&D competence; by establishing contact between regional industrial milieus and national centres of specialised competence.

However, during 1997 an important technological development has taken place, which may hold great potential for the local boat building industry. A small, local offshore engineering company has purchased rights to a new moulding technology

from the American company Du Pont. This represents a significant import of new technology. The rights acquired include production of leisure boats and rescue boats. With some economic support from local government, the plan is to adapt the technology for use in the boat building industry, to industrialise the technology and establish a new local plant to carry out moulding work for yards, as well as producing offshore products. The technology gives lighter and more solid boats and also almost eliminates toxic gases from the moulding process.

8. Innovativeness

The final feature of dynamic regional clusters -- which is itself a result of the features listed above -- is that such clusters have high levels of innovation. To be able to compete on global markets production systems in regional clusters have to be innovative. The innovativeness comprises both the creation of new firms as well as changing existing firms. For example, local production systems make firm-level specialisation possible, as firms concentrate on core activities 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. A high level of competence amongst firms also makes it easier for them to be demanding customers and partners to R&D institutions and suppliers. High levels of competence at all levels within firms can also lead to smaller, incremental innovations, where employees discover better production methods, or identify new product solutions. A high level of competence is also a prerequisite for the successful establishment of new firms, as actors establish firms in areas where they have experience and competence. Establishment of new firms and innovative activity are further stimulated in areas dominated by entrepreneurial spirit, i.e. where dominant attitudes encourage new ways of thinking and new activities. In this way many different factors interact to create growth. This reflects a view commonly held by researchers, which sees advanced forms of technological learning as both localised and territorially specific and relying on territorially specific institutions (Storper 1997).

Regionalisation as a development tendency in the post-Fordism learning economy

This description of the ideal-typical, successful regional cluster highlights important elements of regionalisation as a development model. These are elements that must be present if these kinds of locally based developments are to succeed. However, regionalisation also refers to broader economic tendencies. More specifically, it refers to the transition from Fordist mass production to the post-Fordist model of industrial production and localisation. This transition can be seen in the increasingly important role played by networked, flexible small and medium-sized enterprises, and in a shift from standardised mass production to more tailor-made production of quality goods.

These changes have, in the first place, hastened the transition from vertical integration to vertical disintegration of the production chain within local and global production systems. Secondly, these changes have affected the localisation pattern in manufacturing, increasing the geographical agglomeration of sectors and firms that favour flexible production methods. Regional clusters can thus be understood as *one* visible outcome of important changes in the industrial development of advanced industrial countries. Further, this is a phenomenon that is expected to increase in scope. One possible strategy to increase wealth and employment in a region - if local conditions are favourable - may be to concentrate on establishing and developing regional clusters of co-operating firms and institutions. Such a strategy would be sensible due to the fact that *successful* regional clusters provide the best basis for innovative industrial activities[1].

The importance of local learning for innovative activity and industrial development can be illustrated by the case of ABB Flexible Automation in Jæren (Asheim and Isaksen 1997). At the end of the 1980s, when the firm was bought by the Swedish-Swiss corporation ABB, the original firm supplied approximately fifty percent of the European market for painting robots in the car industry. If ABB had pursued its usual strategy of restructuring, the corporation would have transferred production of robots at Jæren to Västerås in Sweden, where ABB produces handling robots on a larger

scale. However, instead of following their usual strategy, production capacity and work-force at Jæren have been increased; the Jæren division now meets approximately 70% of demand for painting robots in the European car industry and 30% of US demand. ABB continued to invest in Jæren in part because of the specific, tacit knowledge of the work force, and in part because of the interactive, learning-based knowledge of robot technology developed in the organisation TESA.

Why does Ericsson not see the possibilities inherent in regionalisation?

The example of ABB in Jæren shows that global corporation can exploit regionalisation tendencies. By this we mean that global firms may find it sensible and profitable to maintain some activities, and some innovative activities too, in individual dynamic regional clusters. In such areas they have access to a competent work force and specialised local competence, and new ideas can come about through contact and co-operation between e.g., skilled workers, engineers and researchers.

Ericsson's plan to move their Arendal division to a future IT-centre at Fornebu arose from quite different modes of thinking, however. The management did not believe in Arendal as a possible dynamic regional cluster in the IT-industry, while they considered that the closed down airport at Fornebu and the Oslo region had this potential. Ericsson's globalisation perspective can be clearly seen also in the demands made by management to local politicians and the Arendal region once they had decided, after all, to remain in Arendal. Their demands were first and foremost for faster air and road communications, as well as a reduction of rents. These are typical means used within the globalisation approach, namely to make an area as financially attractive as possible in order to bring in firms from outside. There are of course huge gains if the right firms are brought into the area. However, most areas fail in this zero-sum contest with other places, and one is faced with the threat of possible future 'Ericsson affairs', if, further down the road, other areas are able to offer better communications, lower rents, lower wage rates and public subsidies.

[1] This is discussed more fully in Asheim and Cooke (1997), where it is emphasised that: Innovations are interactive learning, learning is a local process and agglomerations are the basis for learning and competitiveness.

Improved communications are of course important in this case. However, this is by no means the most important aspect when we choose to consider the case from a regionalisation perspective. The main aim, in fact, would be to develop Arendal's IT industry - that is, the region's IT firms and schools - in the direction of an *IT milieu*. The vision would be to wean the area off its dependence on the small number of significant divisions of non-local companies[2] to create a more locally-based development rooted in the united efforts of an entire milieu; a milieu of co-operating firms, schools, research institutes and other competence centres. At the end of 1997, the management of Ericsson in Norway also expressed a modified aim to contribute in developing an IT-milieu in Arendal, by means of close co-operation with the technical college, encouraging spin-offs and start-ups, and possibly outsourcing from the Arendal division.

The effects of this kind of development would be twofold. Firstly, the local IT industry would be more robust and multifaceted, and consequently less vulnerable in the face of a future 'Ericsson affair'. Secondly, the chances of a future 'Ericsson affair' would in fact be diminished; companies such as Ericsson would be more strongly anchored in an innovative IT milieu, and from the point of view of innovation it would be important for the company to remain in that milieu. This kind of milieu would be able to provide highly competent employees, proximity to an active research and training milieu, specialised local competence, partners for co-operation and so on. However, this vision is dependent on a local development model that is based on alternatives to the globalisation perspective.

3. Is regionalisation a realistic alternative for Norwegian regions?

Thus far we have argued in favour of regionalisation as an alternative development model to globalisation -- and as an alternative strategy by which to increase the international competitiveness of Norwegian industrial communities, using the Ericsson affair to illustrate a number of important points. However, the question remains whether regionalisation is a realistic alternative strategy for Norwegian

[2] The majority of IT firms in Arendal are owned by larger national or international companies.

regions. Is it possible to create this kind of dynamic, innovative industrial milieu in several Norwegian areas?

In two reports which have played a significant role in discussions on regional economic policy in Norway, the sociologist Ståle Seierstad argues against regionalisation as a realistic alternative, on the grounds that regionalisation trends are weak in Norway (Seierstad 1995 and 1996). Seierstad argues that on the contrary there are clear trends towards the fragmentation of local industrial milieus. Local networks are weakening and the economic activity of Norwegian regions is being integrated into national networks of firms. Local industries are fragmented by declines in local firm networks, while, at the same time, firms are establishing links with their own, individual, national networks. Firms often specialise in narrow product niches with geographically broad markets, and subsequently need to establish partnerships with important customers, suppliers and R&D institutes that are often in other regions.

Seierstad does recognise that in many areas we can clearly identify regional industrial milieus. The tendency is, however, for previously integrated local milieus to fragment. This is due to distance becoming less of a hindrance, and to the fact that industrial competencies are brought in from the national arena. In addition, standardisation of competencies, components and products, makes local co-operation and proximity to related firms less necessary, as important input factors can be brought in from elsewhere. This results in a situation where “locally integrated industrial milieus are the exception, while local disintegration is the rule. Current globalised markets are disintegrating local industries” (Seierstad 1996: vii, our translation).

Seierstad undoubtedly identifies developments that are important in Norwegian regions. An attempt to map the technological knowledge bases of major Norwegian industries consequently reveals that these knowledge bases are of a national and global character. (See table 1 below.) Knowledge-bases have been mapped at the industry or product-field level. This is accessible knowledge that in principle is available to all firms. Of course, there are important tacit dimensions to knowledge, i.e. the non-codified skills embodied in staff and routines and habits in the firms.

However, table 1 only considers codified technological knowledge at industry or product-field level[3].

In addition, table 1 maps the transfer of technology from R&D institutions and via the purchase of equipment. Almost all the industries rely on a national knowledge base consisting of universities, technical colleges, research institutions and branch research institutes, and an overwhelming number of the institutions are located in Norway's four largest cities. In some industries (e.g. machinery and equipment) the national technical institutions primarily co-operate with technologically sophisticated and financially strong parts of the industry, generally speaking large firms. Long-lasting relationships are maintained between firms and R&D institutions.

Public initiatives have been taken to create national systems made up of R&D institutions and principal firms. This is perhaps most obvious in the petroleum sector; here a national industry has been created, capable of extracting North Sea petroleum reserves. Two main policy instruments have been used; concession rules and the establishment of technology agreements, i.e. co-operation in technology development between oil companies, Norwegian firms and R&D institutions, running from 1979 until 1993. Aquaculture is the subject of substantial technological spill-over from other industries, especially the petroleum sector. Norway is building up considerable knowledge bases in high-tech fields such as acoustics, optics, electronics and information technologies and applying them in aquaculture as well as fishing. Thus, core learning activities in especially the petroleum sector have propulsive effects on other sectors.

Although the industries mainly rely on national R&D institutions, pharmaceutical firms generally find their relevant R&D institutions abroad. More than half of these are universities, hospitals and research teams located either in the US, Great Britain, Germany, Austria or France. On the other hand - especially in the hydro electric power sector - Norwegian companies are exporters of knowledge, acting as consultant engineers, constructors and suppliers of equipment to development

[3] Table 1 is based on empirical work done by members of the STEP Group in 1996 and 1997. The work has been carried out by Thor Egil Braadland (petroleum), Eva Næss Karlsen (hydro power), Espen Dietrichs and Keith Smith (aquaculture), Trine Bendix Knudsen (food processing and graphics), Thierry Lamury (chemical and pharmaceutical), Trond Einar Pedersen (machinery and equipment)

projects in other countries and in particular in developing countries. Due to Norway having early deregulated the trade of electric power, IT-based tools for planning and trade of electric power is also a growing export article.

On the other hand, most of the industries rely on global knowledge bases accessed via international suppliers of equipment, with their related consulting activities including installation, test running, service and maintenance, training and skill development. The petroleum and hydropower sectors are the main exceptions, as national suppliers of equipment dominate these sectors. The reason for this may be found in the rather protectionist policy of developing a national industry able to exploit important Norwegian natural resources. In hydroelectric power this has resulted in a large number of specialised suppliers and close relationships between the developers of power stations, research institutes and producers of equipment.

Norwegian service firms also have a procurement function. For example, as there are no manufacturers of larger machine tools in Norway, Norwegian firms are either dependent on national traders' procurement, or they are obliged to import from international manufacturers of machine tools. In industries such as food processing and graphics the main source of knowledge seems to be the purchasing of equipment and intermediate goods. In the food processing industry nearly all suppliers are located in the Oslo area; however, nearly all of the equipment originates from abroad. In the graphics industry interaction with suppliers is typically close and long-term and generally concerns issues such as technology, training and exchanges of ideas.

Table 1: The location of important organisations in the technological knowledge base in different Norwegian industries

Industry	Location of R&D institutions	Location of suppliers of equipment and intermediate goods
Petroleum extraction	National (mainly located in Norway's four largest cities)	National (partly established via political initiatives)
Hydro power	National (concentrated in Trondheim and Oslo)	National
Aquaculture	National (mainly knowledge spill-over form other industries	Global
Food processing	National (including only a few national organisations)	Global (via traders in the Oslo area)
Chemical (basic industrial)	National (but mostly global for branches of TNCs)	Both global and national
Pharmaceutical	Mainly global	Global
Graphics	National (mainly organisations in Oslo and a nearby city; Gjøvik)	Global (including close and long-term interaction with suppliers of equipment)
Machinery and equipment	National (partly linked to public technology transfer instruments)	Global (including producers of machine tool with traders in Norway)

Source: The STEP Group 1997

Table 1, however, only tells part of the story about firms' and industries' innovation processes. The emphasis is on formal institutions, on scientific-engineering skills and national technology policy. Firms' innovation activity can not only be analysed at the level of industrial sectors. Innovation is mainly a firm level activity. Firms build up and rely on firm-specific knowledge in their innovation process, and this firm-level knowledge base is integrated with industry-level knowledge bases. The knowledge bases of particular firms are highly localised, and specific to very distinct product characteristics (Smith 1994). Firm-specific knowledge is bounded and tacit; it is embodied in people and is not easily transmittable. It may be the result of long lasting cumulative learning processes in the firms. The specific and localised character of firm-level knowledge means that firms' competence has definite limits, however, and firms may easily run into problems in innovation which lie outside their area of competence.

By emphasising the standardisation of competencies -- which thus weakens the need for firms to be localised in any particular area -- Seierstad also seriously underestimates the social and territorial aspects of learning and innovation. The importance of firm-specific knowledge means that uncodified, tacit knowledge

continues to play an important role in innovative activity, despite steadily increasing scientific knowledge and the growth of research and development activities (Senker and Faulkner 1996). Tacit knowledge comprises that knowledge we have of a phenomenon that we are unable to communicate through speech or writing. We may, for example, have knowledge about *how* a technique works, without knowing exactly *why* it works in that way. Tacit knowledge is difficult to communicate, as it is possessed by people and transferred through informal learning at work and in local communities (Lundvall and Johnson 1995). Tacit knowledge has a strong application-oriented content, it is a result of learning from experience, by doing, by using or by interacting.

Tacit knowledge is particularly important for smaller, gradual changes to products and processes (incremental innovations) in daily activity. Unique, local competence can therefore be an important factor in creating an innovative industrial milieu in a region. In Italian industrial districts aspects of tacit knowledge are not 'owned' by any particular firm, but belong to the district as a whole as one of it's 'intangible' resources (Gottardi 1996).

Regionalisation thus emerges as an alternative development model to globalisation, for the creation of innovative regional industrial communities, i.e. communities holding some unique, place-specific knowledge that cannot be rapidly created in new places. However, regionalisation and globalisation must also be understood as parallel developments. Transnational corporations buy existing firms, locate their daughter companies or 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 clusters (Mariussen 1997). The pursuit of this kind of strategy by TNCs extends the reach of global production systems whilst simultaneously providing market and development opportunities for firms in regional clusters. TNCs are increasingly aware that they can profit from exploiting unique local knowledge and creativity in some areas (Davis 1995). Thus, the global economy and transnational corporations are in many ways based on flows of goods, services, information and knowledge between places with very specific contributions to the global system. Firms become competitive through the mobilisation of location-specific resources in different places, for

example by tapping into other firms' expertise through take-overs, subcontracting or strategic alliances. In this sense, the global economy is a mosaic of regional economies (Storper 1997).

Seierstad (1995) does certainly recognise the fact that regionalisation provides a possible strategy for local industrial development in Norway. Local production systems have been identified in Norway, where unique competence has been established in networks of firms and institutions (Asheim and Isaksen 1997). Jæren is one example where locally developed competence has been significant for the international competitiveness of local firms. The question remains, however, whether regionalisation is a possible strategy only for a small number of locations in the Norwegian periphery. Is regionalisation limited to the few, well-known anecdotes, or is this a more general tendency?

4. Regional clusters in Norway: extent and development

In order to answer this question we will chart the extent of different kinds of *potential* regional clusters in Norway, with the use of extensive statistical material. Statistics alone will not allow us to identify regional clusters with the various characteristics mentioned above. The extent of local co-operation within firms, between firms, and between firms and institutions, for example, will only be uncovered through intensive case studies. But by using extensive quantitative studies we will gain a broad overview of various aspects of regional industrial development. The number of potential regional clusters and developments within these can provide useful indication of the viability of regionalisation as a development strategy for the Norwegian regions.

The regional clusters will be identified on the basis of the following three criteria:

1. Regional clusters consist of labour-market regions. These are made up of aggregates of local municipalities, which are intended to form joint housing and labour markets. Norway is divided into 103 labour market ('travel to work') regions.
2. The regions are further defined according to their specialisation in one or more industrial sectors. We categorise according to 39 industrial sectors, and regions are considered 'specialised' where the localisation quotient for a sector is greater

than 3.0. Such a quotient shows that a region has more than three times as many jobs in this sector than would be 'expected' in relation to the Norwegian average[4]. Various measures have been tested, and a localisation quotient of approximately 3.0 seems sensible with respect to the aims of our analyses (cf. Isaksen and Spilling 1996: 78-80).

3. The next step is to apply a size criterion. To be denoted a potential regional cluster, the regions must include a minimum of 200 jobs (actually full time equivalents) and must have at least 10 firms in the 'dominant' industrial sector -- i.e. the sector constituting the region's specialisation. This criterion ensures that the smallest areas are not included, and also excludes most of several *one-company-towns* in Norway – local communities dominated by one large firm.

The three criteria above allow us to identify 62 potential regional clusters in Norway in 1990. These, then, are labour-market regions where we find industries with location quotients greater than 3.0, and where these industries also have more than 200 jobs and 10 firms in the region. Note that these regional clusters fall under the industrial sectors for which our data source (the central register of establishment and enterprises at Statistics Norway) provides data. This covers most of the private sector excluding primary industries and certain service industries.

Of the 62 appointed regional clusters, 55 were manufacturing based. These accounted for 63000 jobs in 1990, if we only include jobs within those sectors constituting the regional specialisation. Thus these production areas accounted for approximately 22% of Norwegian manufacturing employment in 1990. This type of analysis suffers from a significant weakness, in that we are limited to studying the situation in the statistically delineated industrial sectors and not in production systems which cross sector borders. Firms in the dominant sector(s) of a regional cluster may have suppliers in many other sectors, in which case a far greater number of firms and employees could be included in the potential regional clusters.

Of the remaining seven regional clusters, two were in the oil sector, three in business services and two in other service industries. Several of these areas had large numbers of jobs within the dominant sector, so that these areas as a whole accounted for 75500 jobs.

[4] Localisation quotient is calculated as share of employment per sector in relation to the sector's share of employment at a national level. Where a sector is equally important at regional and national level, the quotient will be 1.0. Where a sector for example has a 5% regional share as opposed to a 2% national share, the regional localisation quotient will be (5:2) = 2.5.

Job growth in regional clusters

Regional clusters are generally considered to provide an environment conducive to innovative activity. This reflects -- amongst other things -- the possibilities for close co-operation between neighbouring firms and other actors, as well as the possibilities to build up unique local competencies within a particular field. There are also, however, many examples of regional clusters which have stagnated and 'disappeared'.

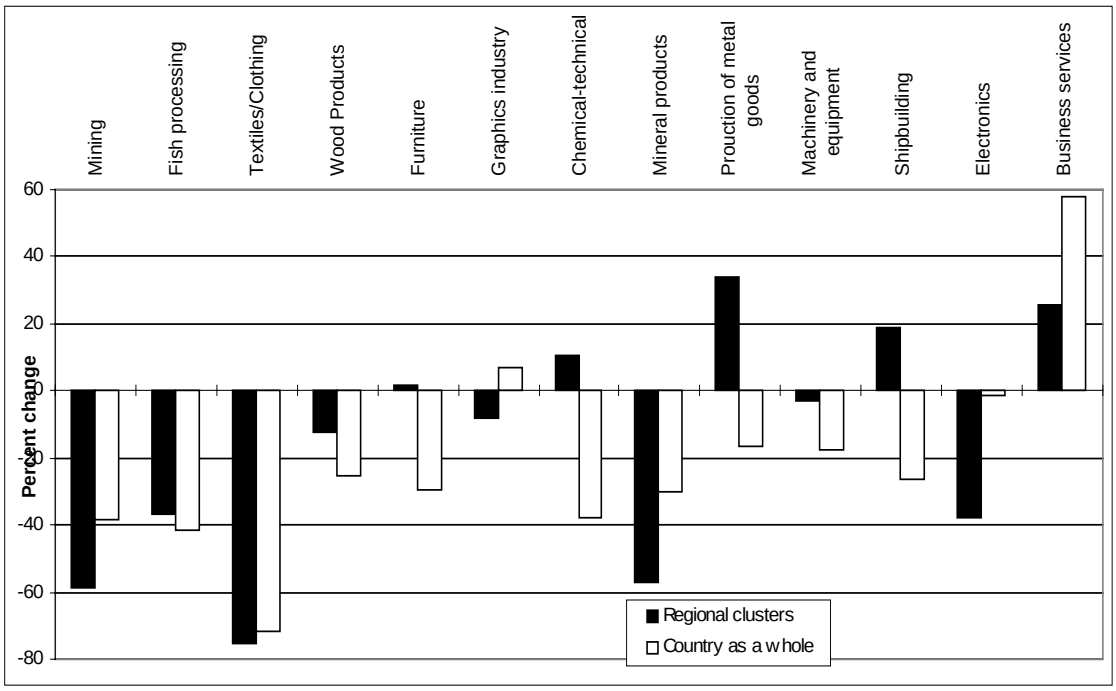
What then of the potential regional clusters which we have identified in Norway? It is not possible to evaluate the true potential for growth and innovation in these areas on the basis of statistical work alone, and the areas identified are of course extremely different. We can, however, examine job change in the appointed regional clusters in relation to the country as a whole. Are these areas experiencing growth?

Looking first at the period 1970 to 1990, regional clusters in manufacturing lost 14000 jobs, or 18%. This decline is greater, however, for the same sectors in the country as a whole in this period (26%).

Developments are extremely different in different industries. 7 of the 13 industrial sectors in figure 1 display better employment rates between 1970 and 1990 in the regional clusters than in the country as a whole[5]. These are firstly furniture, chemical-technical production, metal goods and shipbuilding, which had increasing or stable employment figures whilst nationally, employment decreased. In addition, fish-processing, wood products and machinery regional clusters show slower decreases than the country as a whole.

[5] Figure 1 includes both 'stable' regional clusters, which could be classified as regional clusters according to our criteria in both 1970 and 1990, 'new' clusters which have emerged during the period examined and 'ex-'clusters which fulfilled the criteria for regional clusters in 1970 but not in 1990.

Figure 1: Percent changes in employment 1970 - 1990 in regional clusters and the country as a whole, by industrial sector



Mining and mineral products experienced relatively greater job losses in the regional clusters than in the country as a whole. For business services, growth was significantly slower in regional clusters than in the country as a whole. This reflects the fact that growth in this industry was greatest outside of Oslo during the 1970s and 80s, despite the fact that Oslo still accounted for a large share of employment in this sector in 1990 and a large share of the growth between 1970 and 1990.

In the three remaining industries, significant falls in employment must be attributed to losses in a few centrally located regional clusters. For textiles, much of the decline took place in the Bergen area (the second largest city in Norway), where 5400 jobs were lost between 1970 and 1990. These declines were more rapid than for the country as whole, and Bergen's share of employment in textiles fell from almost 20% to 13%. In the graphics industry, Oslo provided the only regional cluster. This area accounted for 40% of employment in graphics in 1970, falling steadily until 1990.

The electronics industry (here also including electrical industry) experienced substantial job losses in the Oslo region. Oslo (municipality) accounted for 25% of the country's jobs in electronics and approximately 40% of jobs in the electrical

industry in 1970, as opposed to only 8% and 10% respectively in 1990. The three other regional clusters, all located near Oslo (Asker/Bærum, Drammen and Horten), showed growing employment and a better development than the electronics industry at a national level.

Job losses in certain industries and regional clusters in Oslo and Bergen reflect the geographical decentralisation of Norwegian manufacturing throughout the 1970s and 80s. The traditionally most industrialised areas suffered the relatively largest job losses in manufacturing. A restructuring of the economy in central areas also took place, however, as the Oslo area developed new regional clusters in the petroleum sector and business services. If we disregard the substantial losses suffered in a few central production areas, we find a relatively positive trend in employment in the potential regional clusters between 1970 and 1990.

The period 1990 - 1994 also saw a slightly better development for regional clusters than for the country as a whole. Regional clusters in manufacturing showed a small growth in employment of 3300 jobs (5.8%), while the equivalent sectors on a national basis experienced decline (-2.9%)[6].

Employment growth was significantly stronger in regional clusters than in the country as a whole in fish processing, textiles, furniture and electronics. (Cf. figure 2.) The Textiles segment shows particularly striking growth rates in regional clusters with an increase of 600 jobs. Much of this growth may be due to the relocation of firms from Bergen to surrounding areas. In any case, the areas around Bergen showed significant growth in textiles industry in this period. The three other textiles regional clusters (Ålesund, Stranda and Ulsteinvik, all located in north-western Norway) however, also display reasonably strong job growth in this period.

In the electronics industry, four of the regional clusters (Asker/Bærum, Horten, Arendal and Stavanger) experienced strong growth in employment, while employment declined in this industry in Norway as a whole between 1990 and 1994.

[6] Figures for 1990 and 1994 are not entirely comparable. In 1990, employment is calculated as number of full time equivalents (man years) , whilst in 1994 it is calculated as average number of employees per year. The consequences are not significant for our use of the data, however, as we are comparing developments in regional clusters and the country as a whole between 1990 and 1994.

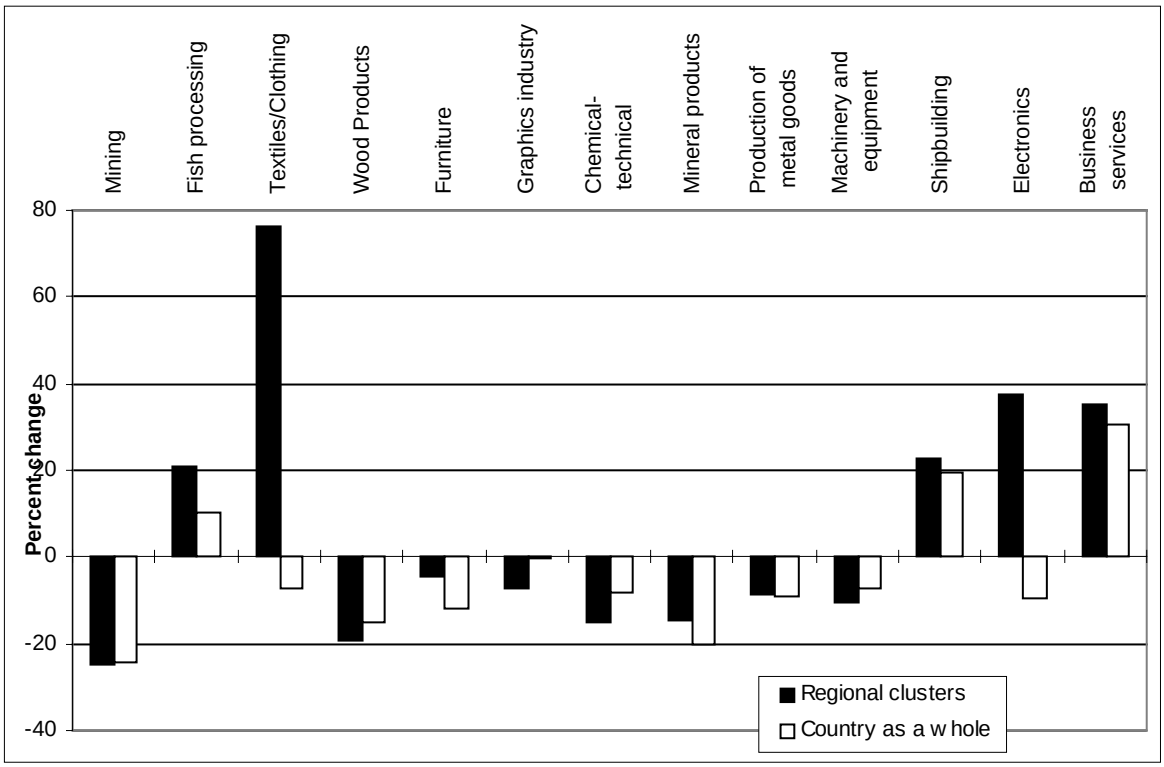
In the sectors mining, wood products, mineral products, metal goods, machinery, ship-building and business services, developments in employment in the country as a whole were roughly mirrored in the regional clusters. For two sectors only (graphics and chemical-technical products), growth was clearly weaker in the regional clusters.

Summary of the statistical analysis

The aim of the above statistical analysis of potential regional clusters was to gain greater insight into the extent of this phenomenon in Norway, as well as to examine employment growth in these areas. On the basis of statistics alone we are unable to delineate regional clusters in those cases where for example firms enter into local production networks. To do so would require more detailed study of these areas. We have, however, established a broad overview of several aspects of the development of regional clusters.

Our statistical analysis shows that there are a number of potential regional clusters in Norway, and that many of these display positive developments in employment compared to the country as a whole. This suggests that firms may in fact experience competitive advantage as a result of being located in regional clusters; thus the well-known ‘anecdotes’ may indicate more general patterns. Our analysis also provides a degree of quantitative support for regionalisation as a trend. It further indicates that regionalisation may be a relevant development model for several Norwegian regions. At the very least, we find that certain elements are already in place, in the form of regional specialisation and a certain number of firms and employees within the dominant sector, as well as, perhaps, firms from other sectors which act as suppliers to the dominant sector.

Figure 2: Percent changes in employment 1990 - 1994 in regional clusters and the country as a whole, by industrial sector



5. Regionalisation as development model and policy

Globalisation and regionalisation perspectives give rise to different development models for local areas, and will also result in different strategy recommendations. Globalisation is largely an exogenous or 'top-down' growth model, where growth comes from the outside. Local areas should, in this approach, make themselves more attractive by, for example, providing access to a highly qualified and/or flexible work force, and by providing incentives in the form of grants and loans to new firms. In this way areas can compete for 'portable' firms.

In contrast, regionalisation is an endogenous or 'bottom-up' growth model. On the basis of this type of model, it is important to establish local learning processes in networks of firms and institutions such as technical colleges, research institutes and technology centres. It is these kinds of learning processes that can create unique local knowledge bases. Thus, since economic development fundamentally is about creation of knowledge specific resources, the creation of local learning networks, as well as network connections with competence milieus outside the local area in order to

receive outside impulses, would be a recommended strategy from a regionalisation perspective approach.

Do the identified potential regional clusters, however, constitute a sensible target group for industrial and regional policy in Norway? General knowledge about these types of areas suggests that this *may* be the case. These areas have many firms in the same 'narrow' industrial sector, and may incorporate local production systems with, for instance, subcontractors in a number of different industries. Thus these areas may contain several firms with similar problems, and the industry or production system as a whole may suffer from particular bottlenecks. An important aim of policy activities in many regional clusters has been to tackle such bottlenecks through sector-wide solutions.

Development in successful regional clusters, such as the Italian industrial districts, is based among other things on policies that support networks of - often small - firms rather than individual firms. These experiences lead to suggestions that "industrial policy for small firms must recognise that a focus on networks, rather than on single firms, can be a more productive avenue for public policy and investment" (Humphries 1996: 248). The fact that rapid transfers of knowledge take place between locally co-operating firms is also an argument in favour of support for local networks of firms rather than individual firms. This is perhaps the greatest advantage of clustering, namely "the ability of their members to learn quickly from each other - and to forget the outdated practices that can delay innovation" (Rosenfeld 1996: 10). Even in a more global economy and with new information technology that increases the possibilities of rapid exchange of information, proximity still matters in some way, as learning is partly a localised process. Contacts and exchange of ideas and information can occur quickly and at low costs when actors are located in the same area.

Network approaches and support for regional clusters of small and medium sized enterprises (SMEs) is also based on an understanding of the fact that small size and lack of resources may not be the greatest obstacle to innovative activity in small firms. The problem may instead be that firms are isolated, and have little contact with other firms, R&D institutes etc. It has further been pointed out that contact such as

this is generally established within local industrial milieus, “thus underlining the significance of the territorial dimension of enterprise support policy” (Morgan 1996: 62).

Regional clusters form in many ways an entirely new target group for economic policy-makers. This entails a shift of focus from individual firms to local/regional systems of firms. Such a policy will encompass a number of elements. One important element is to improve and adapt technological support systems to firms in a local area, because “smaller firms - particularly those that lack the resources and incentives to develop their own training, research or engineering departments, depend heavily on local services” (Rosenfeld 1997: 20).

Other, more general aspects of Norwegian industry indicate that it may be sensible to adopt a strategy aimed at stimulating regional clusters. Firstly, such a policy can be justified on the grounds that SMEs play an important role in Norway’s economic structure, a point which is particularly true for sectors often considered to be traditional, low-tech and medium-tech according to OECD classification (Isaksen and Smith 1997). The vast majority of regional clusters identified in our statistical analysis are found in these sector-types. Many traditional-sector SMEs are, however, innovative and expanding, and activities in traditional sectors are based on the use of complex and advanced technologies as shown in our sketch of industries’ knowledge bases above. Access to use of advanced technology is decisive for innovative activity and long-term development of many traditional small and medium sized enterprises. As a rule, traditional SMEs have to rely on access to technology and competence outside the firm, as they do not possess the competence, time or money to carry out their own research and development to any substantial degree.

Further, traditional SMEs are considered to be more dependent on local and regional industrial milieus for their development than is the case for larger firms and more resourceful SMEs which are better placed to co-operate with actors in national and international R&D milieus (Chabbal 1995). Regionally based strategies which can stimulate innovative activity in traditional SMEs can thus be important for development in many Norwegian regions and particularly for regional clusters, as these contain large numbers of firms exploiting the same knowledge bases and

technologies. These kinds of strategies are aimed at creating exactly a local support system for firms. An important additional means will be to link firms to national and international innovation systems. This makes it possible for firms in regional clusters to benefit simultaneously from uncodified place-specific knowledge in the clusters, and the codified more generally available knowledge of the global economy.

Conclusion

In this paper we have argued that regionalisation is a tendency taking place parallel to globalisation. The regionalisation perspective further represents an alternative development model for local industrial development, with clear implications for what are important tools in local level policy. The 'Ericsson affair' clearly illustrates the difference between globalisation and regionalisation as development models.

The paper has further identified a series of *potential* regional clusters in Norway, many of which display positive developments in employment when compared to the same sectors on a national level. We suggest that this indicates the suitability of regionalisation as a development model for local policy in many Norwegian regions. The model, however, does not suit every situation. For enterprises which are not a part of - or do not have the opportunity to take part in - regional clusters or other types of regional production systems, other policy instruments than regionalisation-based will be more appropriate. Seierstad (1995) identifies amongst other things the importance of policy instruments tied to financing and organisation of product development and marketing, stating that in particular one should "concentrate on increasing the ability of smaller firms to handle super-regional and international co-operation and contractual relations" (Seierstad 1995: 69, our translation).

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

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.