Global pipelines and diverging patterns of knowledge sharing in regional clusters

Ove Bjarnar
Associate Professor of History and Associate Professor of Political Science, Senior Researcher, Møre Research Centre in Molde, Norway.
Ove.Bjarnar@hiMolde.no

Rolv Petter Amdam
Professor of Business History, BI Norwegian School of Management, Oslo
Rolv.P.Amdam@bi.no

Paper prepared for the Regional Studies Association Annual International Conference:
Regions – The Dilemmas of Integration and Competition,
Prague 27th – 29th May 2008

Introduction

Over the last decades we have seen a major shift in the main sources of wealth in modern capitalism from natural assets, to tangible assets and to intangible resources, notably knowledge and knowledge flow (Dunning 2000). In light of the global flow of knowledge across boarders, it seems like a paradox however, that we are witnessing increasing geographical concentrations of economic activity – referred to as the paradox of "sticky places within slippery space" (Dunning 2000: 198).

Multinational corporations (MNCs) play a central role in the globalisation of knowledge flow as well as in regional clustering of economic activity. Porter–inspired cluster studies stress region–converging patterns of knowledge flow in clusters as an outcome of globalisation processes. MNCs add new knowledge to clusters and include cluster–based firms in new knowledge networks. A growing part of knowledge exchange in clusters flows through global channels and networks. Transformation processes attach economic activity in clusters to more tightly woven and global production networks, market networks and knowledge networks (Porter 1998, Enright 2000, Bathelt et al 2004, Hervik et al 2004, 2006).

At the same time, however, we may be witnessing a more penetrating institutionalisation of new forms of collaboration in clusters than before (Andersen et al 2006, Christophersen and Clark 2007, Lorentzen and Mankhe 2002, Andersen and Christensen 2005). Recent studies within a variety of social networks approaches have tried to address this central question. They have focused on a tendency towards diverging local and regional learning processes as firms are exposed to globalisation, like when incoming MNCs are buying up innovative local firms, or conversely, when local firms become MNCs themselves through foreign direct investments (FDI). It is argued that global corporations establish activity in clusters based on their own corporate managerial and administrative models. Subsequently, these models cannot be disregarded altogether in interaction with cluster based firms (de Martino et al 2006, Asheim and Herstad 2003, Andersen et al 2006).

This may create institutional tensions and dualities in regional clusters between the "hierarchy" and its weight on dissemination of formal encoded knowledge, and the cluster "milieu" which is dependent on diffusion of tacit knowledge (Asheim and Herstad 2003, Lam 1998). Clusters accumulate formal and tacit knowledge which no single business can fully contain within its organisation, and this knowledge is accessed through networking within clusters. This flow of knowledge may increasingly be influenced or replaced by institutionalisation of new forms of knowledge creation and sharing (Andersen et al 2006).

The paper will address these partly contrasting views reflected against a background of recent internationalisation processes in the maritime cluster in the region of Møre and Romsdal in Mid–West Norway. The cluster is seen as the most complete and comprehensive maritime cluster in Norway, as well as globally leading in many fields (Hervik et al 2004, 2006). In recent years, some large international corporations have entered the cluster based on acquisition of local firms. We ask to what extent the presence of international actors tends to foster knowledge flow through more exclusive non–local and global pipeline channels. Furthermore, we discuss whether global pipelines in general may be constituted around specific processes, and thus to a new extent are "closing" the hitherto open membership in knowledge flow and regional innovation.

The paper will in particular target the pipeline concept as a possible analytical tool for revealing converging and diverging processes of knowledge sharing. We apply a number of interviews with upper echelon managers operating in different sectors of the cluster and within global and local firms in order to illustrate and qualify the relevance of our conceptual approach. Also several survey–based studies of the actual cluster offer a rich empirical background for our conceptual exploration (Hervik et al 1998, 2003, 2004, 2006).

The paper proceeds in the following vein. First, we briefly outline some of the challenges attached to knowledge flow in clusters in light of globalisation processes. Second, we introduce a modelling of the pipeline concept, structured from 1) the perspective of the incoming MNC and 2) from the perspective of the cluster based (or incumbent firm). Third, we apply this framework in order to construct two narratives of the development of knowledge flow in the maritime cluster, a "convergence" and a "divergence" narrative. Fourth, we focus on the validity of the pipeline concept in future analysis of clusters and globalisation processes. The paper is produced within a lager research project on globalisation and regional knowledge networks financed by the Research Council of Norway.[1]

Globalisation processes and knowledge flow in clusters

Assets in terms of knowledge are growingly seen as both increasable and mobile, which means that cross border augmentation of assets through FDI or strategic alliances are steadily more important means of creating larger revenues. Knowledge is different from other forms of capital. It is a heterogeneous commodity and can be put to multiple uses as different kinds of knowledge needs to be combined with several other kinds to make a product, a good or a service. As observed by Dunning (2000), the intellectual capital needed to achieve that is rarely a property of one firm, and for a firm to increase its knowledge it will often have to access external knowledge by the way of some forms of collaborative agreement. This trend is furthered by the fact that in the new knowledge economy, knowledge may be expensive, risky to apply and quickly obsolete. These risks may be reduced when you get partners or decide to operate in special environments in order to access knowledge. Hence, an expanding pattern of alliance capitalism through stakeholders' co–operation, intra–firm co–operation and inter–firm collaboration has been observed across national boarders as well as within geographical concentrations of firms. MNCs play a central role in globalisation of knowledge flow as well as in clustering of economic activity (Dunning 2000: 195–208, Claes et al 2006: chapter 8). Several studies have indicated that within the industrialised world, most MNCs have established themselves as leading participants in regional knowledge–intensive clusters (de Martino et al 2006:2, Dunning 2000: 198, Held (ed.) 2004).

Many problems have been recognised, however, within this context – especially how to conceptualise and study the flow of knowledge in clusters and regions in light of globalisation (Andretsh and Lehmann 2006, Steiner 2006, Gertler and Wolfe 2006). Although we can draw a rather general picture showing growing bond between MNCs and clusters, we still know rather little about the structure of interactive learning between MNCs and clusters, and how these structures may vary (Bathelt et al 2004: 33). And despite the growing literature

[1]Within the programme *Demokrati, styring og regionalitet* (or Democracy, governance and regional development).

dealing with the role of MNCs in clusters, there are apparently few contributions that systematically view the interdependency of MNCs and actors within regional clusters. This may seem like a puzzle all the time it is claimed that MNCs establish themselves in clusters in order to access knowledge, and that subsidiaries located in clusters make greater contributions to the parent company than subsidiaries not located in clusters (Enright 2004, Birkinshaw and Hood 1998, Dunning 2000).

Moreover, studies that depict and analyse institutional tensions and dualities between global and local companies in clusters are even more wanted. Some recent studies have, however, focused on a tendency towards lessened dependence on local learning processes as firms and organisations are increasingly exposed to internationalisation (de Martino et al 2006, Asheim and Isaksen 2000, Asheim and Herstad 2003). They address sub–processes within the broader movements of internationalisation and globalisation that evolve when incoming MNCs are buying up innovative local firms, or conversely, when local firms become MNCs themselves through FDI (Asheim and Herstad 2003).

A number of specific sub–themes within a wider set of questions fostered by globalisation have also recently been set forth by for example Wolfe and Gertler (2003: 1071) and de Martino et al (2006: 15): How dependent are local firms on unique local knowledge assets and what is the relative importance of local versus non–local knowledge flows between the actors? Is it true that, all in all, local or international firms in clusters with outside operations are, as a group, less embedded within the regional cluster than those lacking external activities? Are firms acquired by outside MNCs also less inclined to interact with the local community? When elements of local value chains become part of global corporations' value chain, will this further even more lessened local reliance? (de Martino et al 2006:16).

Some scholars have recently drawn the attention to the fact that steadily more knowledge in clusters flows through global channels and networks (Andersen et al 2006). They study cluster dynamics in light of "transformation pressures". They note that globalisation exposes all economically related activity in clusters, not the least including knowledge sharing, to a new extent. Such activity is increasingly attached to tightly woven and global production networks, market networks and knowledge networks. Consequently, they say, we are witnessing a more penetrating institutionalisation of new forms of collaboration and new managerial solutions and perspectives than ever before (Andersen et al 2006: 9).

When, for example, companies establish subsidiaries in a local cluster, the flow of knowledge may be affected by the perspectives of the global actor. Here, we define global actors as MNC which are present at different continents. Andersen et al (2006: 10) for example draw attention to the presence of larger fashion houses in the shoe district in Italy. Trough control over design and distribution they affect the balance between competition and cooperation among actors in the cluster. In general, Andersen et al (2006: 13) conclude that global corporations establish activity in clusters based on their own corporate managerial and administrative models. Subsequently, these models cannot be disregarded altogether in interaction with cluster–based firms. On the other hand, also local firms may loosen their bonds to the cluster, since knowledge production and dissemination is not so much linked to

physical or structural capital (like certain production facilities) as has been hitherto the case (Andersen et al 2006: 16).

The pipeline concept

According to recent research, so called "local buzz" is an essential channel for transferring knowledge within clusters (Andretsch and Lehmann 2006, Steiner 2006, Gertler and Wolfe 2006). Local buzz arises from physical co–presence. It incorporates both the broad general conditions that exist when it is possible to glean knowledge from intentional face–to–face contact as well as the more diffuse forms of knowledge acquisition that arises from chance or accidental meetings and the mere fact of being in the same location. Buzz is the mechanism that facilitates the circulation of knowledge inside the cluster and thus supports the functioning of networking.

Pipelines, on the other hand, have so far been referred to as channels of communication used in distant interaction between firms in clusters and knowledge–producing centres located at a distance. The effectiveness of these pipelines, it has been argued, depends on the strength of pre–established social relationships and the quality of trust that exists between the firms in the different nodes involved (Bathelt et al 2004). There is increasing evidence to suggest that even in the most advanced clusters a growing part of the knowledge base is not exclusively local. The emphasis in the Porter model on local demand from sophisticated and demanding customers is also contradicted by a growing body of empirical and analytical research. The weight on local demand conditions holds even less when it is transferred to the regional level where the definition of the clusters' boundaries is problematic (Gertler and Wolfe 2006). Furthermore, many MNCs are embedded in a variety of specialised clusters in many locations, often around the globe (Wolfe and Gertler 2003: 1078).

The pipeline concept is, however, so far hardly elaborated in cluster analysis to a level where it can function well theoretically or analytically. No clear definition can be found. We propose to define pipelines not only as global connections, but moreover as channels operating inside clusters, that to a varying extent experience a tension between open and more closed forms of memberships in knowledge flow. Some pipelines may possibly be closing dissemination processes at the expense of the open membership characterising knowledge flow in cluster dynamics. We propose that the main function of pipelines in cluster dynamics is to open up channels for transferring knowledge between different institutional settings, from a global setting, often represented by MNCs in clusters, to a local cluster–based setting, and vice versa. Pipelines may therefore be conceptualised as *interpretative and transforming contexts* that arise especially because it is highly difficult to diffuse tacit knowledge from the one setting to the other. Pipelines may thus act as mechanisms and channels between these settings, and inside MNCs and clusters respectively. They may be transcending cluster boundaries in a manifold of ways.

At the same time as pipelines are opening up some channels for knowledge flow, they may also develop as more closed arenas incorporating only a selection of actors inside the cluster. New knowledge may, for example, be developed within a cluster setting, however mainly through cooperative projects inside units and R&D resources located within the MNC

itself. Such projects may benefit from more indirect relations to the cluster, but little knowledge may actually be diffused in direct form from the projects to cluster firms. Corporations may also tap knowledge from their presence in clusters in more ad hoc than systemic ways, its recombination into novel knowledge may, however, be taking place inside strategic and 'closed' alliances. Learning processes inside the corporations may, furthermore, systematically be more 'programmed' also inside clusters to fit internal knowledge management structures, while processes of knowledge flow within clusters are more unpredictable, open and open–ended (Lorentzen and Manhke 2002). Nevertheless, to some extent the rationale for MNCs being in the cluster necessitates some sort of interpretative and transforming contexts to be established in order to transfer codified and tacit knowledge between the cluster milieu and the corporation.

These questions are connected to some other important aspects very recently discussed by Christophersen and Clark (2007), namely power relations in firm networks and global networks. It appears that a MNC may be embedded in clusters in such a manner that systemic relations are altered in favour of internalising knowledge and innovation capacity inside the MNC. They analyse power relative to regionalised SMEs, and conclude that MNCs are able to use their power to get to key production resources. MNCs influence regulatory policy in terms of their strong position in clusters, they argue, thereby affecting which innovations are commercialised and how knowledge is diffused. MNCs also drive the innovation agenda within publicly supported research centres and centres of expertise or excellence. Finally, they say that MNCs may dominate the regional labour market and compete with SMEs for the most valued segment of the skilled workforce.

Christophersen and Clark (2007: 1225) confirm the impression that much of the pipelines and policy–oriented literature view global firms as hub firms that connect local networks to global ones, enabling cluster–based firms to expand and specialise. Several authors have challenged this idyllic picture by suggesting a network paradigm in which relations within innovative regional economics are infused by power relations (see also Kristensen and Zeitlin 2005). Christophersen and Clark (2007: 1226), argue, however, that contemporary regional theory neglects the competition between MNCs and local SMEs, and say that MNCs may have the upper hand in shaping the innovative potential of many regional innovation systems. MNCs may, likewise, be removing resources from the region via rationalisation and restructuring rather than inducing regional growth (Dawley 2007, Benneworth 2006). Market power combined with large in–house administrative and competence resources may lead these firms to dominate the local institutional framework (Christophersen and Clark 2007: 1227, see also Boschma and Lambooy 2002). Due to international competition and the pressure to reduce risks and costs, they also have to focus on innovations that they can control and render new products with large potential growth in the short term (West and DeCastro 2001).

Such mechanisms may shift the regional balance between flow of tacit knowledge through cluster networks and formal knowledge through pipelines in favour of the last. On the other hand, pipelines may, as mentioned, open up channels for cluster firms so they can access new knowledge. They may profit from being included into global networks, like market networks, R&D networks, sales networks and knowledge diffusing networks. In cases

where MNCs act as hub firms in the cluster, this opening process is evident and revealed in recent literature (Dunning 2000, Enright 2000). The essential question remains to be answered, however, to what extent these pipelines diffuse knowledge in an open manner to the cluster, and to what extent they are capable of disseminating tacit knowledge. We will discuss this question from two perspectives, as seen from the MNC and from the cluster.

Pipeline formation - from the MNC perspective

Lorentzen and Manhke (2008) distinguish between two main types of learning effects in clusters. Clusters may on the one hand be characterised by local specialisation of labour, labour markets, production and institutions. Such specialisation may provide a fertile ground for vertical and horizontal spill–over of knowledge, and ultimately for direct knowledge transfer between actors through bilateral business relations. Such relations will often be vertical, so that spill–over of knowledge stems from demands and feed back from customers and specialised suppliers. They may, however, also be more horizontal, like when firms in clusters establish bilateral relations for sharing non–strategic knowledge, or for example engage in strategic R&D alliances (Lorentzen and Mahnke 2002: 5).

Nevertheless, in order to benefit from cluster dynamics, firms need to invest in the creation and maintenance of a common cognitive platform. Sharing a cognitive framework is a basis for more indirect relations between firms, be it social relations and interaction, or so called third party relations, such as common suppliers or service providers. While Lorentzen and Manhke (2002: 6) argue that direct relations allow for in–depth transfer of knowledge, indirect relations, they say, give a special opportunity to monitor a wide and flexible range of information and knowledge. This channel is essential, since the knowledge flowing through direct relations is expected and searched for, while indirect relations is more open to the unexpected and may inspire new combinations of knowledge and innovation.

In order to ripe the benefits of both relations and type of channels, an incoming MNC must access the common cognitive framework underlying the cluster dynamics. In order to plug into the cluster's knowledge flow MNCs tend to do this via a local firm by selecting acquisition as an entry mode. Local autonomy of the subsidiary is, subsequently, seen as an advantage to forge a bridge between the MNC and the cluster milieu. Even if acquisition is chosen as an entry mode, however, it may be difficult to become a part of the indirect network relations, and sceptical local firms may also be "hiding" social norms or principles of communications. Regional clusters represent forms of knowledge flow where pieces of complementary knowledge are dispersed among individuals and firms in a community of associated actors (Porter 1998, Enright 2000, Andersen and Christensen 2005). Knowledge is often bound to personal experience and social relationships. This increases its internal circulation, but may at the same time impede its external accessibility. Knowledge is thus represented in a complex and interconnected form. As memory systems, clusters are characterised by localised practices, routines and norms of interaction among members.

Thus, knowledge located in regional clusters cannot be easily transferred and applied in the MNC context. The essential key is to become a participant in the clusters knowledge flow, since the competence accumulated in the cluster cannot be accessed directly. The ability to become a part of the local relational fabric is seen as a decisive factor for the process of

accessing unarticulated knowledge. Socialisation is, hence, a key word in this respect (Nooteboom 1999).

However, specific information providers both within clusters and the MNC may act as gatekeepers and prevent diffusion. This may also be coupled to differences in managerial traditions and perhaps a need to keep specific know how from leaking. Establishing a variety of pipelines, might, subsequently, become an important interface in the effort of the MNC to establish a necessary interpretative and knowledge transforming context.

Pipeline formation – from the cluster perspective

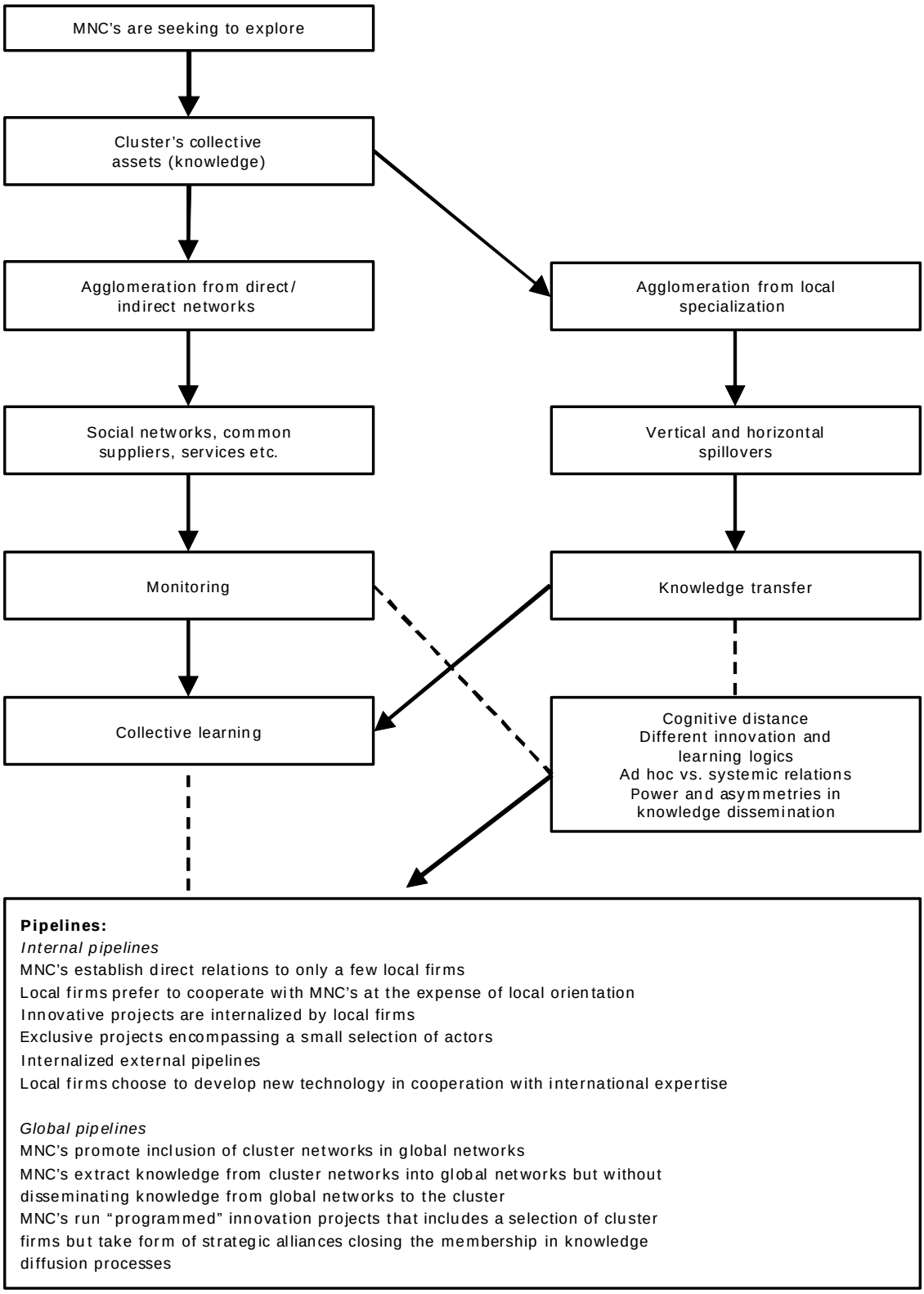
According to de Martino et al (2006) limited research has been carried out to analyse the impact of firm internationalisation on cluster relationships from and 'inside – out' perspective, especially to determine whether internationalisation of locally established firms, either in form of foreign operations or increasing interaction with global actors in the cluster, weakens the systemic relationships within the cluster. De Martino et al (2006) study the Rochester photonic cluster in the US, and find that as locally established firms internationalise, they tend to reduce their degree of local collaboration and interaction. However, the balance between local vs. non–local cluster relationships is influenced by the manner in which firms elect to develop their organisational capabilities.

In line with a more social interaction perspective on cluster relations they anchor the framework in the milieu concept and say that viewed systematically, the milieu is a complex network composed primarily of informal social relations that enhance local innovation through synergistic and collective learning processes (De Martino et al 2006: 6. See also Camagni and Capello 1998, Cooke 2002, Camagni 2004). By incorporating firm growth strategies in their analysis they succeed in forging a link between the social networks approaches and the business strategy approaches (Porter–inspired), between broader milieu effects and classical agglomeration effects. However, changing patterns of collective learning and interactive innovation can only be depicted against a broader background of social interaction. This finding is, though, based on the investigation of formal linkages between institutions, not so much on studying informal structures as well.

Most of the companies in the study say that the readily available supply of trained engineers and technical workers is one of the top factors for staying in the cluster. Moreover interesting is that only those executives from firms with non–local facilities or from firms with parent companies based outside the region report that they attract non–local specialists into the region to fill internal positions. Nevertheless, the same companies say that the vast majority of such personnel are locally recruited.

On the other hand, companies that are units of larger companies tend to be more internationally oriented. Firms with outside operations are, as a group, less embedded within the regional cluster than those lacking external activities. They report less interaction in manufacturing, subcontracting, supplier relations and design (de Martino et al 2006:16). Firms acquired by outside MNCs are also less inclined to interact with the local community. It seems to be clear that there is a correlation between the degree of firms increasing organisational capabilities as they mature, spurred by inwards or outwards internationalisation, and lessened reliance on cluster relations.

Figure 1: Pipelines as a function of different cognitive contexts



When elements of local value chains become part of global corporations' value chain, this further even more lessened local reliance. The form of acquisition and degree of subsidiary autonomy, however, matters. Firms that are not integrated into the operations of the MNC

report a higher degree of local collaboration. Moreover, it is important to ask whether this implies a shift from systemic to more ad–hoc relations, and whether such a shift would likely be changing learning processes in the cluster in terms of increasing diverging processes. While many of these aspects are not explored by de Martino et al (2006), such questions are more thoroughly addressed in a recent study of MNCs in a Norwegian cluster. All in all, though, the findings in the Norwegian study are largely consistent with the picture drawn of the photonics cluster in Rochester.

Asheim and Herstad (2003) studies MNCs role in the Jæren area in South–Western Norway, where, among other things, high tech robots for the car industry are produced. In general the cluster is characterised by new and mature firms that are quite dependent on the knowledge accumulated in the clusters' networks to carry out process innovations through supplier and design collaboration. In the late 1980s, the global corporation ABB bought the local firm Trallfa Robot, at a time when this local company had 50 percent of the European market. A central motive for the buy in was to tap into the clusters pool of competence. It was seen as a unique combination of tacit knowledge and social skills, which again was combined with localised codified knowledge.

The largest incoming MNC in the cluster, ABB, is characterised as an embedded hierarchy. It moved production from Germany to Jæren, and gained substantial market shares in the US and in Asia. Its operations depend substantially on local intimacy and interaction in order to reap the benefits of the synthetic knowledge pool. On the other hand we see the same patterns as described by de Martino et al (2006). The increasing need for more specialised knowledge that can be acquired through international corporate networks drives internalisation of knowledge production and knowledge flow. It is indicated that the ability to utilize external international knowledge and disseminate it through internal corporate networks and hierarchy have at the same time reduced its ability or willingness to communicate this knowledge in the cluster.

The situation is probably best conceptualised as "institutional duality". Subsidiaries are drawn between local embeddedness and localised learning and the MNC headquarters need to standardise, formalise and internalise knowledge flow for reasons of greater efficiency. Within the same framework, it is increasingly recognised, however, that actors within the MNC may have multiple visions of the content and context of the knowledge transfer (confer for example Kostova and Roth 2002). Lervik 2008 nevertheless shows convincingly that international management and strategy research has been short of perspectives on how knowledge is created and shaped by specific institutional and cultural contexts both in home and host settings and is thus only imperfectly transferable.

Organisations characterised by an explicit knowledge base tend to have formal structures of control and coordination and highly standardised tasks and work rules. By contrast, organisations with a tacit knowledge base will exhibit a decentralised structure and use informal coordination mechanisms. Subsequently, hierarchical MNC organisations may internally have certain diffusion structures, competence bases and corporate cultures that make the interaction difficult with the diffusion in clusters dominated by more operative adhocracies that are relying more heavily on knowledge accumulation in external networks. It should be fair to argue that MNCs and cluster–based firms mutually are more constantly

exposed to forms of institutional dualities between being in clusters in terms of systemic vs. more ad–hoc relations.

Thus, again, in order to access this knowledge residing in the corporation, cluster–based firms will have to develop different forms of pipelines as an interpretative context. Merging the two aspects, formation of pipelines from the MNC and the cluster–based firm respectively, we argue that the collective forms of learning and knowledge diffusion will be put under pressure as a consequence of internationalisation processes. Pipelines emerge as context for bridging different modes of knowledge and modes of knowledge management, but may inevitably create a tension between open and more closed processes of knowledge flow.

A convergence narrative of knowledge flow

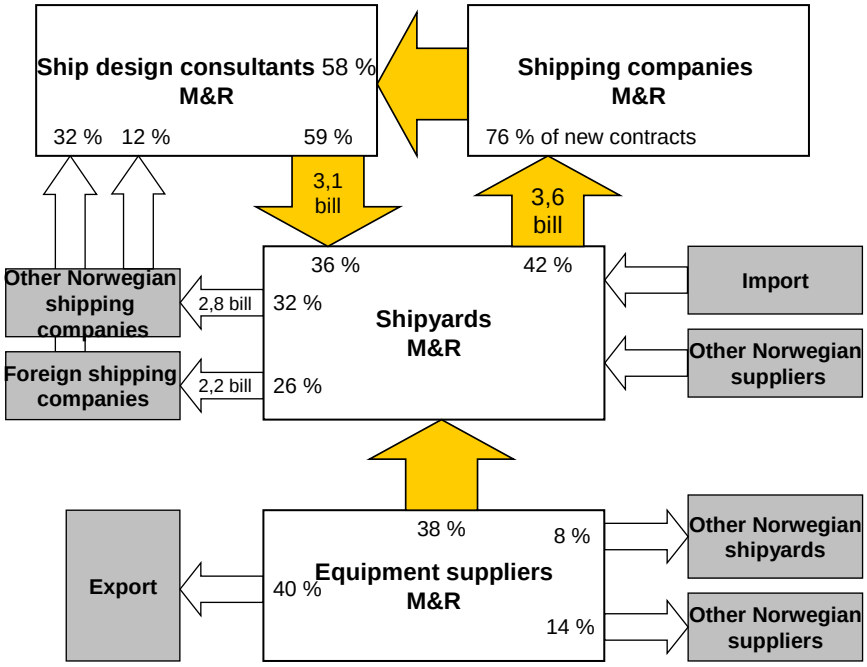
The maritime cluster in Møre and Romsdal in Mid Western Norway is not only seen as the most complete cluster in Norway, but also world wide leading in this area. Up to the present, a highly international deep sea fishing fleet has been at the core of the clustering process inside the region, and has moreover produced international success concepts for production of factory trawlers, modern combined ring net and trawler vessels, vessels for automatic driven long line fishing, and supply and offshore service vessels (or Platform Supply Vessels, shortened PSVs) for the oil industry (Bjarnar, Berge and Melle 2006).

Over the last few years the cluster has witnessed a substantial internationalisation, and export has soared especially due to the Platform Supply Vessel segment. In 2006 this maritime cluster had approximately 18 000 employees, and the value of sales amounted to 31 billion Norwegian kroner this year. Several survey studies have over the last decade depicted the success of the cluster in terms of cooperative patterns and knowledge sharing, especially a tight interplay between ship owners and shipping companies, shipyards and equipment suppliers, and ship design consultants (Hervik 2000, Hervik et al 1998, 2003, 2004, 2006). Especially due to the offshore service sector the region's shipyards are fully provided with ship delivery contracts at least throughout 2010. A 2006 survey (Hervik et al 2006) that concentrated on the role of the supply service sector within the maritime cluster contains data from 13 regional offshore service shipping companies (out of a national population of 25 such companies), 12 regional shipyards (out of 22 in Norway), 139 equipment suppliers and 14 ship design consultants (out of 22 on national basis). In addition the region is a national centre for the deep see fishing fleet, with ship owners operating 90 modern vessels.

The 12 shipyards supplied new ships in 2006 valued at 8,6 billion kroner, 42 per cent of this value was attached to ships delivered to the 14 ship owners in the cluster itself that was included in the survey (vs. only 22 per cent in 2002). For these 14 companies this local supply of new ships covered over 76 per cent of their total expenditures on new ships (vs. 62 per cent in 2002). These data indicate that the interplay and interconnectedness between shipyards and shipping companies has become even more intense over the last four years. The mentioned surveys depict the ship design consultants as the main carriers of knowledge. They interact extensively with ship owners, and act as a kind of sales corps for local shipyards and suppliers. Valued in terms of contract prices, 36 per cent of the contract assignments was generated inside the cluster by the clusters own ship consultants. This ratio has been steadily

growing over the last years, again indicating that interaction between actors has been strengthened (Hervik et al 2006: 12).

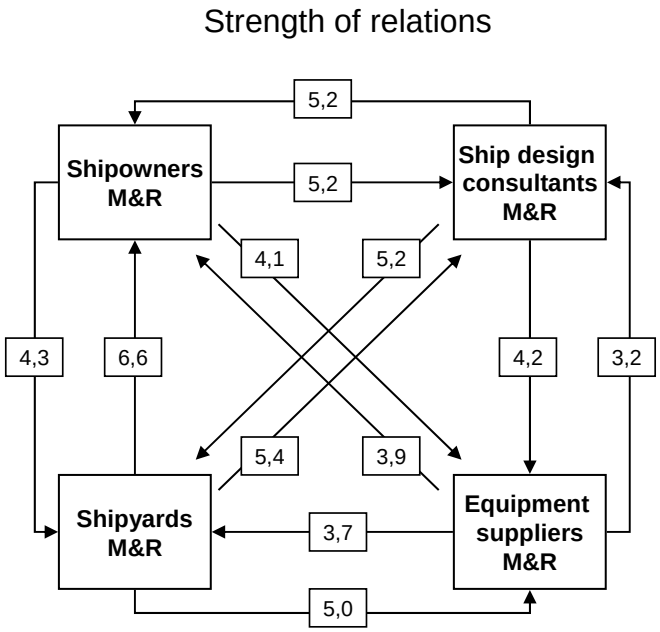
Figure 2: Cooperative effects in the maritime cluster of Møre and Romsdal (Hervik et al 2006)



The 2006 survey asked the actors how they perceived the strength of their relations to other actors, scored from one (low importance) to seven (very important). The findings, illustrated in fig. 3 below, suggest not only that there is an extensive flow of knowledge between the actors in the cluster; it also indicates an intensified regional knowledge flow in a period when both outward and inward internationalisation globalisation in the cluster has grown rapidly. In general, the soaring demand from Asia for shipbuilding and offshore vessels has led to a growing demand for use of Norwegian shipbuilding capacity. Especially industrial growth in China has fostered a fast growing demand for ships and equipment for offshore petroleum related activities.

Not only has the regional cluster experienced an increasing inwards internationalisation but also a stronger internationalisation of local firms. In terms of knowledge flow, recent studies have warned against this trend. Establishments abroad may lead to transfer of local knowledge from the cluster to competing actors in other countries through the setting up of subsidiaries or production units. R&D competencies and capacities can be acquired where it is best, and is not bound to Norwegian or regional institutions. The case is different when it comes to flow of local knowledge and innovative capacity, since innovation requires close interaction between institutions and end users like within the regional cluster (Hervik et al 2004: 16).

Figure 3: Relations between actors in the maritime cluster of Møre and Romsdal (Hervik et al 2006)



Within shipbuilding, there has been a tradition for establishing foreign operations and setting up of production abroad over many years. The use of labour from low cost countries in the cluster has also increased, although a precise statistics is lacking (Eldring 2004, Ødegård 2005). The production process is such, however, that crucial competencies are maintained in the cluster, not the least attached to flow of knowledge. Norwegian shipbuilding in general is characterised by end products (ships) that are highly individual solutions, and the low degree of standardisation also means that a lot of capital is bound to each individual product. The production process thus demands a highly developed organising and management of each process and a well developed flow of parts, knowledge and solutions throughout the process.

Since a large part of the production of parts now takes place abroad, the shipyards have focused even more on effective flow of work and knowledge, and on project management aiming at improved integration and control of internal and external flow of work processes and knowledge. The shipyards own production is, besides this, largely connected to the final assembly of parts and equipment, much of the latter is still produced within the cluster. Many of the workers in the shipyards' production have work experience from the equipment supply sector or from being sailors or fishermen, and they have as such a broad and also rather specialised knowledge, formal as well as tacit, that the yards are dependent on. This local or cluster related experience based knowledge is not readily substituted by recruiting foreign workers (Hervik et al 2004: 19).

Outward and inward internationalisation has increased substantially within the shipyard sector. They build ships for customers all over the world. The cluster related competence base has proved effective also in a global setting, especially since Norwegian shipyards have been good at offering shorter production time and delivering better on

schedule than their competitors. However, high internal costs and high wage levels make it difficult to maintain production capacity in Norway. Outsourcing has thus reduced production costs substantially. Most of the construction of hulls has now been outsourced to Eastern European transition economies. Many shipyards have based their production of parts by contracting foreign suppliers (Hervik et al 2004: 20). Moreover, Norwegian equipment suppliers have also established branch offices and production units abroad. And some of the subsidiary shipyards have developed to a level that they in the future may be able to produce fully equipped ships, thus providing the markets with end products.

Nevertheless, ship building is, as already mentioned not mass production, but the construction of rather unique and individual products. Moreover, it is still largely craft based production. Specific demands and specifications will be attached to each ship, and the production is very complex, involving a wide range of components, work operations, professions, suppliers and sub–suppliers etc. The production process thus may be unpredictable and demands excellence in managing it. Complicated logistics at the shop–floor level moreover require a pool of highly developed tacit knowledge. Shipbuilding has, a "fluid" character, since the interaction between managers, workers, specialists and suppliers may vary from ship to ship. The cluster is thus to a certain extent consisting of temporary production systems.

It appears from the above that one of the most important factors still clustering the firms on regional level is the character of the knowledge base and in particular the high requirements posed on knowledge flows. The cluster has a distinct "synthetic" knowledge base, and it seems from world wide cluster studies that maintaining this kind of knowledge base is a considerable force preventing the region from being tapped of knowledge through inward or outward internationalisation. It is, simply framed, a kind of sticky knowledge, sticking to a specific geographical area. A recent study of globalisation pressures in four clusters in Denmark largely confirms this picture – while production is outsourced – the knowledge intensive part remains intact in the cluster (Andersen et al 2006: 50). However, we also can depict processes that could have been defined as pipelines in operation, like offshoring, foreign branch offices and links to global knowledge bases, and import of skilled workers from abroad.

The most recent figures show a soaring internationalisation during 2006. A large number of specialised supply vessels, anchor handling vessels, remote operated vehicles, construction vessels and well intervention vessels have been contracted. They are operated from the cluster but in global locations to an almost astonishing new degree. All new special vessels delivered in 2006–2007 were ordered from the 25 Norwegian PSV shipping companies. During 2006, these operators have ordered 84 new special vessels, and only 13 of them will be built abroad, most of them in China (Oterhals and Hervik 2008).

There seems to be a kind of inter–subjective agreement among our informants that this internationalisation process rests heavily on the flow of tacit knowledge in the cluster. These vessels and their operations are so advanced and complex, that the planning process, the construction and work process at the shipyards, and the hands on operations in often global locations requires very complex socio–technical knowledge that so far predominantly resides in qualified workers recruited from the cluster environment and in the cluster. The global

actors in the clusters are seen as important contributors to this internationalisation process. Interaction between flows of tacit and formal knowledge among cluster–based actors and the often substantial formal R&D–capacity within the global companies has produced a number of innovations especially within construction and equipment, and many local firms benefit from being attached to the global actors knowledge and market networks. This bridge is forged through a number of pipeline contexts, ranging from more structured cooperation around innovation projects with global actors as partners to subtle and to some extent not explicated recruitment policies. For example, larger corporations secure the flow of tacit or local knowledge into the development processes through hiring technical and managerial expertise educated at national or international institutions of higher education, but who have been brought up in the local area. Moreover, our informants stress that the role of regional vocational and higher education will be of growing importance, and some of the larger actors invest quite substantially in supporting regional education and centres of expertise.

A divergence narrative of knowledge flow

The mentioned surveys do not, however, in the first place, discriminate between global actors and regional actors, and cannot therefore reveal possible institutional tensions inside the cluster between global and local actors. Moreover, the relations between external pipelines as channels for knowledge flow and local channels, local buzz, is not investigated. Whether strengthened international relations contribute to closer interaction or external relations is becoming more important than local or not, can therefore hardly be derived from the actual survey. Thirdly, they do not reveal whether there is a shifting balance between the flow of tacit and formal knowledge between actors, hence there is the possibility that beneath a surface of strengthened flow of knowledge we may witness increasing formalisation of knowledge flow.

In fact, the 2006 survey by Hervik et al concludes that growing foreign presence in terms of ownership, both within shipping companies and the equipment supply sector may indicate that the cluster has become more attractive for foreign investments and has, subsequently, grown stronger financially. Globalisation processes have been considerable in the cluster in recent years. Three larger hub firms are engaged in foreign operations which constitute a substantial part of their activity. According to Hervik et al (2004: 13) they are, however, emerging as more mobile and footloose actors that may routinely consider moving activities to other countries due to favourable institutional settings.

There seems to be a kind of inter–subjective agreement also in this respect among our informants. Regardless of company or institutional connection they articulate a feeling that the knowledge networking has become more formalised and as they say “professionalized”. They express a conception that some of the regional “glue” in knowledge flow has been weakened so that the cluster increasingly consists of what they call parallel networks or sub–clusters with lessened interaction between them and with more weight on disseminating formal knowledge. Growth processes and growth strategies foster formalisation also in terms of negotiating procedures and contractual processes which pose a substantial challenge to local firms. The hub firms are experiencing a growing tension between local adaptation and international standardisation, or between standardisation pressures to be efficient and flexible

specialisation to be innovative. In–house developed innovations are protected to a larger extent than before, and firms of diverse origin have internal policies that limit the direct diffusion of ideas to the cluster milieu. This tension may be difficult to expose and convey as essential issues within the managerial structures of the hierarchies. As mentioned in the previous chapter, however, actors have quite successfully so far been able to establish pipelines that facilitate the flow of knowledge across such barriers.

But there are many possible sources of diverging learning processes connected to emerging pipelines. For example within the PSV market segment one has to follow up closely a few important clients with great in–house resources and expertise. They are able to set terms and are somewhat more reluctant to share knowledge than is the case within the cluster. Hence, the dependence on a few larger clients, either abroad or inside the cluster, may be seen as a kind of pipelines fostering asymmetrical patterns of knowledge sharing. Informants representing important cluster–based firms that also interact tightly with incoming global actors in the cluster say that the firms thus gets access to the global actors' market network and sales network, however on terms set by the hub actor (Rech 2007). Executives also say, however, that interaction with the incoming global actors gives them a better opportunity to monitor recent market trends. A study of knowledge sharing in the maritime cluster by Rech (2007) indicates that a larger part of R&D activity and innovative projects are conducted in–house within MNCs, built on local units possessing high technical expertise. In some cases these projects are widely connected to cooperative patterns with the cluster milieu, however, for certain core technologies, this contact is limited, and development processes are defined on a high corporate level.

In other cases, local firms form "groups" in order to develop new knowledge and technology and monitor market trends. They may develop extensive flow of knowledge within the group, but may be less inclined to diffuse their knowledge to the milieu. If this can be further validated, such groups may develop as a kind of global–local pipelines that may be of great importance to cluster development, but at the same time may be "disturbing" the very operative–system of the cluster – the collective sharing of knowledge – and not the least the flow of and sharing of tacit knowledge.

In these cases, we may anticipate that pipelines emerge as a way of accessing knowledge flow. This access is depending on some sort of two–way process between global actors, or regional hub firms, and the cluster milieu. Hence, we may allude to our pipeline model. Pipelines emerge as *interpretative and transforming contexts* inside MNCs and clusters respectively, and not the least *between* these contexts. Moreover, we may suggest that these interpretative contexts arise especially because it is highly difficult to diffuse tacit knowledge from the one setting to the other. The pipelines depicted above may be 'closing' the membership in knowledge flow, and moreover have a tendency to limit it inside the cluster, as there also are more or less explicit policies or general reluctance due to knowledge leaking that refrain actors from sharing knowledge outside a certain circle.

Another movement or direction depicted in our model concerns more traditional internationalisation processes. Also such processes may depend on the construction of pipelines that are exclusive and with limited knowledge spill–over to the cluster. Some firms choose to develop extensive contact with design expertise in several global locations.

Additionally, some firms invest strongly in such global connections in developing new technology, and the spill–over to the cluster may be limited. One firm reports that the flow of knowledge is quite extensive between its foreign units, and between them and the HQ, but the flow from these pipelines to the cluster is scarce.

Related to our proposed model (figure 1 above), what is put under pressure by globalisation processes is the part of the collective learning that emerges from indirect often social networking – essentially general monitoring processes and the diffusion of tacit knowledge. At this stage of our research, we are somewhat refrained from exposing the possible in–depth construction of these closing processes within pipelines, both due to limited "grounded" work with the qualitative material we have or are in the process of collecting, and also due to certain considerations we need to care for in relation to our informants. However, if the diverging tendencies we have sketched above will be further confirmed, the implications may deserve a lot of attention in future research as well as in practical business. We will address such implications in the following conclusive part of the paper.

Conclusions and outlooks

As depicted above, regional flow of tacit knowledge has played an essential role in the soaring internationalisation of cluster–based firms as well as the incorporation of global or other hub firms in this flow of knowledge. We have seen that there is a strong case for convergence perspectives, and that different forms of pipelines facilitate the flow of knowledge both ways between the "milieu" and the "hierarchy", and that some of these pipelines have successfully merged global and local knowledge. This convergence, however, rests to a considerable extent on a specific form of globalisation processes at this very stage, namely the extensive requirement for complex tacit and formal knowledge in order to master the whole process from idea to construction to operating advanced technology in new global settings.

The successful knowledge flow is also eased by the fact that much of the innovative process is built on already established "conceptual innovations", as some of our informants express them. Innovations within the PSV segment have to a considerable extent grown around a basic concept, "the supply vessel", developed already in the 1970s. Likewise, the previous mentioned innovations, like the compact factory trawler, the modern combined ring net and trawler vessels, and the vessels for automatic driven long line fishing, are all basic "conceptual" innovations, or prototypes that have enjoyed enormous international success and have thus been of great importance to regional growth.

Regardless of position, our informants express that such groundbreaking innovations also in the future may be depending extensively on the flow of tacit knowledge within the cluster environment. However well developed global pipelines can hardly replace this cluster–based knowledge flow. It is this flow that in many cases successfully has been merging tacit and formal knowledge, and local and global knowledge. Hence, maintaining the balance between global pipelines and local buzz is a strategic issue.

Subsequently, it may also have consequences in the long term if global pipelines increasingly are formed as more closed forms of knowledge sharing. Such pipelines may have a strategic function in knowledge creation and diffusion both within and between

organisations of different origin, as long as the local buzz of knowledge is maintained and strengthened. The possible development of new conceptual innovations may be linked in a rather basic sense to this buzz. On this background, it is not without reason that many of our informants express some concerns about the future development. Offshoring of production is, for example, not without some possibly drawbacks, as it is pointed out that the local buzz and flow of knowledge may function less well in the long run unless the cluster maintains its production capacity and production environment. The idea that the future cluster development can be maintained through a concentration of the so called knowledge–intensive part of the process to the region is challenged.

Although we have seen that the maritime cluster has prospered from internationalisation processes, and that the cluster–based flow of tacit and formal knowledge has been a vital element in this growth, the balance between global and local actors, between the hierarchy and the milieu, between tacit and formal knowledge, and between different pipeline contexts and local buzz is becoming increasingly delicate to master.

References and background literature

Adler, N.J. (2002), International Dimension of Organizational Behaviour. Fourth Edition, Cincinnati: South-Western

Andersen P. H. and P. R. Christensen (2005), From localized to corporate excellence: How do MNCs extract, combine and disseminate sticky knowledge from regional innovation systems? DRUID working paper, 2005–16

Andersen P. H., A. Bøllingtoft and P. R. Christensen (2006), Erhvervsklynger under pres. Globaliseringens indflydelse på dynamikken i udvalgte danske erhvervsklynger. Institut for ledelse, Handelshøjskolen i Århus

Andriusyte L. and L. Ragnarsson (2006), Knowledge Transfer between International Subsidiaries and Headquarters: Principal-Agent Theory Approach, Master Thesis, Norwegian School of Management

Asheim B. T. and S. J. Herstad (2003), "Regional clusters under international duress: Between local learning and global corporations". B. T. Asheim and Å. Mariussen (eds.), Innovations, Regions and Projects. Nordregio R2003: 3

Asheim B. T. and S. J. Herstad (2003), "Regional innovation systems, varieties of capitalism and non-local relations: Challenges from the globalising economy". B. T. Asheim and Å. Mariussen (eds.), Innovations, Regions and Projects. Nordregio R2003: 3

Asheim B. T. and P. Cooke (1999), "Local learning and interactive innovation networks in a global economy". E. Malecki and P. Oinas (eds.), Making connections: Technological learning and regional economic change. Ashgate, Aldershot.

Asheim B. T., P. Cooke and R. Martin (2006), "The rise of the cluster concept in regional analysis and policy. A critical assessment." B. T. Asheim, P. Cooke and R. Martin (eds.), Clusters and Regional Development. Critical reflections and explorations. Regional Studies Association and Routledge, UK and Canada

Asheim B. T. and A. Isaksen (2002), "Regional innovation systems: The integration of local "sticky" and global "ubiquitos" knowledge". Journal of Technology Transfer, 27:77–86

Audretsch D. B. and E. H. Lehmann (2006), "The role of clusters in knowledge creation and diffusion: an institutional perspective". B. T. Asheim, P. Cooke and R. Martin (eds.), Clusters and Regional Development. Critical reflections and explorations. Regional Studies Association and Routledge, UK and Canada

Bartlett, C. A. and S. Ghoshal (1989), Managing across borders: The transnational solution. Boston, Harvard Business School Press.

Bathelt H., A. Malmberg and P. Maskell (2004), "Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation". Progress in Human Geography 28 (1):31–56 (X)

Bathelt H. (2005), "Cluster Relations in the Media Industry: Exploring the 'Distanced Neighbour' Paradox in Leipzig". Regional Studies Vol. 39, No.1, February

Benneworth P. (2006), Creating economic possibilities in old industrial regions: the role of universities. Centre for Urban and Regional Development Studies, University of Newcastle

Birkinshaw, J. and J. Hood (1998), "Multinational subsidiary evolution: Capability and charter change in foreign–owned subsidiary companies." Academy of Management Review 23(4): 773–795.

Birkinshaw, J.and N. Hood (2004), "Subsidary entrepreneurship, internal and external competitive forces, and subsidiary performance". International Business Reveiw 14(2): 227–248.

Bjarnar O., D. M. Berge and O. Melle (2006), Havfiskeflåten i Møre og Romsdal og Trøndelag bind 2: Fra fri fisker til regulert spesialist. Tapir akademisk forlag, Trondheim

Boschma R. A. (2005), "Proximity and Innovation: A Critical Assessment". Regional Studies Vol. 39, No.1, February

Boschma R. A. and J. G. Lambooy (2002), "Knowledge, market structure, and economic coordination: dynamics of industrial districts", Growth and Change 33: 291

Breschi S. and F. Malerba (2001), "The geography of innovation and economic clustering: Some introductory notes". Industrial and Corporate Change, 10 (4):817–33

Camagni M. P. (1995), "The concept of innovative milieu and its relevance for public policies in European lagging regions", Papers in Regional Science, 74: 317–340

Camagni M. P. and R. Capello (1998), "Innovation and performance of SMEs in Italy: the relevance of spatial aspects". Competition & Change, 3: 69–106

Camagni M. P. (2004), "Uncertainty and innovation networks: towards a new dynamic theory of economic space". Camagni R. (ed.), Innovation Networks: Spatial Perspectives, London Belhaven Press: 121–144

Chiarvesio M, Di Maria E. and Micelli S. (2003), "Innovation and internationalisation of Italian districts: Exploitation of global competencies or transfer of local knowledge?", Paper to the Regional Studies Association International Conference, Pisa, 12th -15th April

Christensen P. R. and K. B. Munksgaard (2001), "Transforamtionspres og inerti i en klynge af små virksomheder. Den rustfri stålindustri i Trekantområdet, Danmark", Nordiske Organisationsstudier, 3 (4): 82–109

Christophersen S. and J. Clark (2007), "Power in Firm Networks", Regional Studies Vol. 41, Number 9: 1223–1237

Claes D. H. and H. Hveem and B. S. Tranøy (2006), Økonomisk globalisering og politisk styring. Universitetsforlaget, Oslo

Cooke P. (1998), "Introduction: origins of the concept". H. Braczyk, P. Cooke and M. Heidenreich (eds.), Regional Innovations Systems, UCL Press, London

Dawley S. (2007), "Making labour market geographies: volatile flagship inwards investments and peripheral regions", Environment and Planning A.

De Martino, R., D. McHardy Reid and S. C. Zygliodopoulos (2006), "Balancing localization and globalization: exploring the impact of internationalization on a regional cluster". Entrepreneurship & Regional Development, 18, January:1–24

Dunning, J. H. (2000), Global Capitalism at Bay. London, Routledge

Edquist, C. (2000), "System of Innovation Approaches – Their Emergence and Characteristics". Edquist C. and Mckelvey M. (eds.), Systems of Innovation: Growth, Competitiveness and Employment, Celtenham

Eldring, L. (2003), Konkurransen og det seriøse arbeidslivet. Innledning på Fellseforbundets landsmøte 13.10.03. http://fellesforbundet.no/upload/LANDSMOTET2003Fafony.pdf

Enright, M. J. (2000), "Regional Clusters and Multinational Enterprises. Independence, dependence, or interdependence?" International Studies of Management & Organization, Summer 2000 30 (2):114–138

Florida R. (2002), "The learning region", Gertler M. and D. Wolfe (Eds.), Innovation and Social Learning: Institutional Adaptation in the Era of Technological Change, Palgrave McMillan, New York

Forsgren M., U. Holm and P. Thilenius (1996), "Network Infusion in the Multinational Corporation", Bjõrkman og Forsgren (eds.) The Nature of the International Firm, Handelshøjskolens Forlag, København: 475–495

Gereffi G. (2003), "The Governance of Global Value Chains", Review of International Political Economy, November, 4

Gertler M. S. (2003), "The undefinable tacitness of being there: Tacit knowledge and the economic geography of context". Economic Geography, 71:1–26

Gertler M. S. (2004), Manufacturing Culture: The Institutional Geography of Industrial Practice. Oxford: Oxford University Press

Gertler M. S. and D. A. Wolfe (2006), "Spaces of knowledge flows: clusters in a global context". B. T. Asheim, P. Cooke and R. Martin (eds.), Clusters and Regional Development. Critical reflections and explorations. Regional Studies Association and Routledge, UK and Canada

Gordon I. R. and P. McCann (2007), "Industrial Clusters: Complexes, Agglomerations and/or Social Networks?", Urban Studies, Vol. 37, No. 3: 513–532

Grandinetti R. and Tabacco R. (2003), "Formation and evolution of industrial districts: a knowledge-based perspective for industrial district research". Paper to the Regional Studies Association International Conference, Pisa, 12th -15th April

Granovetter M. (1985), “Economic action and social structure: the problem of embeddedness”. American Journal of Sociology, 91: 481–510

Gupta, A. K. and V. Govindarajan (2000), "Knowledge flows within multinational corporations." Strategic Management Journal 21(4): 473–496.

Held D. (ed.) (2004), A globalizing world? Culture, economics, politics. Routledge, London and New York

Hervik A. (2000), Utviklingen av maritime næringer i Møre og Romsdal – status 2000. Møreforsking Molde, Rapport 0004.

Hervik A., Nesset E. og Opdal Ø. (1998), Utviklingen av maritime næringer i Møre og Romsdal, Rapport 9805, Møreforsking Molde

Hervik A. og E. W. Jakobsen (2001), Det regionale maritime Norge, Handelshøyskolen BI, Forskningsrapport nr. 8

Hervik A., Nesset E. og Opdal Ø. (2003), Utviklingen av maritime næringer i Møre og Romsdal, Rapport, Møreforsking Molde

Hervik A., S. Aslesen and O. Oterhals (2004), Maritime næringer i Norge. Omstilling til en turbulent global framtid. Fafo–rapport 479

Ibert, O. (2007), Towards a Geography of Knowledge Creation: The Ambivalence between ”Knowledge as an object” and “Knowing in Practice”. Regional Studies Vol. 41, Number 1.

Johnson B., E. Lorentz and B.–Å. Lundvall (2002), “Why all this fuss about codified and tacit knowledge”? Industrial and Corporate Change, April: 245–56

Kostova, T and K. Roth (2002), “Adoption of an organizational practice by subsidiaries of multinational corporations: institutional and relational effects”, Academy of Management Journal, Vol. 45, No. 1: 215–233

Kristensen P. H. and J. Zeitlin (2005), Local Players in Global Games: The Strategic Constitution of a Multinational Corporation. Oxford University Press, Oxford

Lam A. (2000), “Tacit Knowledge, Organizational Learning and Societal Institutions: An Integrated Framework”. Organization Studies, 21/3

Lervik, J. E., B. W. Hennestad, R. P. Amdam, R. Lunnan & S. Nilsen (2005), ”Implementing human resource development best practices: Replication or re-creation?”, Human resource Development International, Vol. 8, No 3: 345-360

Lervik, J. E. (2008), “Knowledge Management and Knowledge Transfer in Multinational Enterprises: Cultural and Institutional Perspectives”, forthcoming in P. B. Smith, M. F. Peterson & D. C. Thomas (eds.) (2008), Handbook of cross-cultural management research., Thousand Oaks, CA: Sage

Lorenzen, M. and V. Manke (2002), Global strategy and acquisition of local knowledge: How MNCs enter regional knowledge clusters. DRUID working Papers 2002–8, Copenhagen Business School, København

Malmberg A., O. Solvell and I. Zander (1996), “Spatial clustering, local accumulation of knowledge and firm competitiveness”, Geografiska Annaler, Series B 2.

Malmberg A. and P. Maskell (2005), Localized Learning Revisited. DRUID working paper, 2005–19, www.druid.dk

Malmberg, A. and P. Maskell (2006), "Localised learning revisited." Grotwh and Change 37(1): 1-18.

Malmberg, A. and D. Power (2005), "(How) do (firms in) clusters create knowledge?" Industry and Innovation 12(4): 409–431.

Maskell P. (2001), "Towards a Knowledge–based Theory of the Geographical Cluster", Industrial and Corporate Change, 10, 4

Muller E. (2001), "Knowledge, Innovation Processes and Regions". K. Koschatzky, M. Kuliche and A. Zenker (eds.), Innovation Networks. Concepts and Challenges in the European Perspective, Heidelberg and New York

Moulaert F. and F. Seika (2004), "Territorial Innovation Models. A Critical Survey". Regional Studies Vol. 37 (3):289–303

Nooteboom B. (1999), "Innovation, learning and industrial organisation". Cambridge Journal of Economics, 23, 2:127–150

Otherhals O. and A. Hervik (2008), Caserapport OSV Møre – Internasjonalisering og klyngeutvikling. (Forthcoming, Møreforsking Molde).

Porter, M. (1990), The competitive advantage of nations, Free Press.

Porter M. (1998), "Clusters and the new economics of competition", Harvard Business Review, 76 (6)

Polanyi M. (1966), The Tacit Dimension, London

Powell, W. W. and DiMaggio, P. J. (1991), The New Institutionalism in Organizational Analyses, Chicago

Prahalad, C. K. and Y. Doz (1987), The multinational mission: Balancing local demands and global vision. New York, Free Press**.**

Rech, S. (2006), The impact of Internationalization on Knowledge Transfer in Vertical Business Relationships in the Norwegian Maritime Industry. Study of the maritime cluster of Møre and Romsdal in Norway, Master Thesis, Norwegian School of Management

Rogers E. M. (1995), Diffusion of Innovations, New York

Smith, K. (2002), What is the 'Knowledge Economy'? Knowledge Intensity and Distributed Knowledge Bases. Discussion paper Series, Institute for New Technologies, The United Nations University

Steiner M. (2006), "Do clusters 'think'?: an institutional perspective on knowledge creation and diffusion in clusters". B. T. Asheim, P. Cooke and R. Martin (eds.), Clusters and Regional Development. Critical reflections and explorations. Regional Studies Association and Routledge, UK and Canada

Wang Q. and W. Ouyang (2006), The Role of Subsidiary Knowledge Stock and organizational Mechanisms in Reverse Knowledge Transfer Process – An analysis of the Subsidiaries of Norwegian MNCs in China, Master Thesis, Norwegian School of Management

Wolfe D. A. and M. S. Gertler (2003), "Clusters from the Inside and Out: Local Dynamics and Global Linkages". Urban Studies, Vol. 41, No. 5/6, May: 1071–1093

Ødegård, A. M. (2005), Arbeidstakere som går tjenestevei. Tjenesteyting og utstasjonerte arbeidstakere i et utvidet EØS. Fafo–notat 2005:1, Fafo, Oslo