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Cluster Policy: Renewal through the integration of institutional variety

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JEL codes: B52; O10; O30; R30; R50

Keywords: cluster policy; institutions; path-renewal; path-creation; manufacturing; periphery

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The literature on cluster evolution suggests that heterogeneity of firm capabilities and openness of network structures are essential for the renewal of mature and declining clusters. This paper argues that the regional and institutional context in which clusters are embedded plays an important role for the renewal of clusters. It elaborates how the integration of institutional variety can stimulate the combination of different types of knowledge, learning and modes of innovation, thereby promoting cluster renewal. The conceptual argument is illustrated with a case study of the maritime cluster in Møre and Romsdal, Norway, which is one of the globally leading clusters in this industry. We find that key actors and policy play an important role in integrating institutional variety. Additionally, the case shows that institutional variety and the integration thereof can be a driving force for cluster renewal even in specialized and semi-peripheral locations.

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Introduction

Cluster renewal does not only depend on cluster specific-factors such as firm competencies and networks, or on industry specific-factors such as maturity of technologies and standardisation, but also on the institutional environment within which clusters are embedded. The institutional environment cannot be isolated from regional and national context conditions. Institutions are erected at different geographical scales (Gertler 2010) and the interplay of different types of regional, national and supra-national institutions has a profound effect on lock-in or renewal of clusters (Hassink 2010). A cluster's institutional environment is not without frictions and characterised by a variety of institutions, which are potentially combined and reinterpreted in the pursuit of individual agent's intentions (Strambach 2010). We investigate why and how the integration of institutional variety can promote cluster renewal and how policy can contribute to the integration of institutional variety.

The conceptual framework is developed against the backdrop of the semi-peripheral manufacturing region Møre og Romsdal in western Norway, where a globally leading cluster in the maritime industry has developed. It is one of only few maritime clusters worldwide with strong presence of all actors of the value chain. The cluster features a high speed of incremental innovations drawing on experienced-based knowledge and localized, interactive learning processes embedded in global networks. While most firms are home-bread and family-owned, global players such as Rolls-Royce Marine, V.Ship, VARD (owned by Fincantieri), and Bourbon are present in the region. The maritime cluster has received national recognition by being awarded a Global Centre of Expertise (GCE) status in Innovation Norway's cluster programme as one out of only two successful applications. GCEs support mature clusters with a global position as knowledge hubs. However, despite a strong economic performance, an extremely low unemployment rate and a high GDP per capita, the region is classified as moderate innovator by the EU's Regional Innovation Scoreboard, which means a region with below average innovation performance.

The maritime cluster in Møre og Romsdal is highly interesting from the perspective of cluster evolution as it goes against the grain, being highly successful in a traditional industry, located in the semi-periphery, and scoring low for the traditional innovation indicators. As such, it offers relevant insights for non-metropolitan regions. Furthermore, the specialised industrial structure and semi-peripheral location is advantageous for an institutional analysis. On the one hand, the institutional environment is less complex than in metropolitan regions, which allows us to capture it comprehensively. On the other hand, if institutional variety and the integration thereof play a role for cluster renewal in a specialised, semi-peripheral region, we can expect that this will play a role also in more diversified regions.

We proceed with a literature review and a conceptual framework. The section deals with the role of institutions in cluster evolution, explains our theoretical perspective on cluster renewal, and conceptualises the regional and institutional context, where the concepts of organisational thickness, as well as institutional

variety and connectedness, are discussed. Then we present the case study and institutional analysis before providing the conclusions.

Literature review and conceptual framework

The role of institutions in cluster evolution

Institutions are "the rules of the game" or more formally "the humanly devised constraints that shape human interaction" (North 1990, p. 3). Institutions come in different shapes. Formal institutions comprise all codified rules or constraints such as constitutions, laws, regulations, and contracts. Informal institutions include customs, traditions, values, and business practices, which are not codified. Institutions are widely acknowledged for their role in cluster evolution and especially for their contribution to positive and negative lock-ins, and thereby to cluster growth and decline (Hassink 2005, 2010). Grabher (1993) defines three types of lock-ins, namely functional, cognitive and political. The third type of lock-in refers to institutions that preserve existing industrial structures and self-sustaining coalitions of powerful players protecting vested interests. Maskell and Malmberg (2007, p. 614) maintain that institutions co-evolve with the requirements of the dominating industry in a cluster, thereby creating a favourable environment, path dependence but also inertia.

However, few studies investigate whether institutions also can contribute to cluster renewal. Martin (2010) suggests that the institutional framework in which firms are embedded consists of multiple institutions allowing for re-combinations and changes to some institutions without disrupting the larger system. This then implies that institutions may continuously evolve without necessarily becoming locked in to a stable state. In a similar vein, Strambach (2010, p. 412) argues that institutions are not only constraining action but also "act as enablers, […] actors can use institutions as toolkits in a myriad of ways to solve innovative problems. They are able to recombine and convert or reinterpret institutions for their new objectives or transfer institutions to different contexts." Variety in the institutional framework allows for "the conversion and redeployment of established institutions for new purposes" (ibid, p. 424), thereby contributing to renewal.

It follows that institutions may not only be responsible for lock-ins but potentially also promote cluster renewal. Institutional variety appears to be an important factor as actors can draw on it to branch into new market or technological niches and to promote institutional change, while making it more difficult for powerful players to forge institutions to fit their interests. In relation to cluster renewal, this implies that it is important to understand the embedding of clusters in the regional institutional framework, which is composed of institutions erected at different spatial scales, and how this relates to cluster renewal. However, so far the literature on cluster evolution has largely neglected the regional context and the multi-scalar relations in which clusters are embedded (Trippl et al. 2015).

Cluster renewal and combinatorial knowledge dynamics

The argument that new knowledge combinations are at the root of innovation, novelty and consequently cluster renewal has received widespread support including lately in the literature on related variety, knowledge bases, and types of innovation. Related variety is based on the idea that very similar knowledge provides limited learning opportunities while highly dissimilar knowledge is difficult to transfer (Nooteboom 2000; Boschma 2005). It is argued that related industries, i.e. industries based on knowledge, which is neither too similar nor too dissimilar, should offer the best learning opportunities to branch into new niches (Frenken, Van Oort, and Verburg 2007).

The knowledge base approach differentiates between three theoretically derived knowledge types (Asheim and Gertler 2005; Moodysson, Coenen, and Asheim 2008). Analytical knowledge is created using scientific methods often in collaboration with research units, is universal, highly abstract, and characterised by a high degree of codification. Synthetic knowledge develops by applying or combining existing knowledge often in collaboration with customers or suppliers, requires interactive learning, is to a higher degree tacit and context specific. Symbolic knowledge is about creating meaning, desire, aesthetic qualities, affect, symbols and images, usually in a creative process involving project teams. This type of intangible knowledge is highly context specific. The recent contributions to the knowledge base literature have emphasised that innovation frequently results from the combination of different knowledge bases across institutional boundaries (Manniche 2012; Strambach and Klement 2012).

Related to the knowledge base approach, Jensen et al. (2007) differentiate between the Science-Technology-Innovation (STI) and the Doing-Using-Interacting (DUI) modes of innovation. The STI mode of innovation draws on R&D based on analytical knowledge (basic research) generating more radical product innovations but also on synthetic knowledge (applied research). The DUI mode of innovation resonates well with the learning and innovation dynamics associated with a synthetic knowledge base where tacit and context specific knowledge plays an important role leading to more incremental innovations. Jensen et al. (2007, p. 685) find that "it is the firm that combines a strong version of the STI-mode with a strong version of the DUI-mode that excels in product innovation".

Building on these theoretical perspectives, cluster renewal will depend predominantly on the extent to which learning takes place and the extent to which learning processes integrate different types of knowledge. In clusters where organisations learn and innovate by integrating different types of knowledge, we expect the highest potential for innovations and cluster renewal, which alters the development trajectory of the cluster or leads to the emergence of new ones. In clusters where organisations learn and innovate within the framework of the dominant knowledge base but without combining different types of knowledge and innovation modes, we expect that clusters are well equipped to extend their development trajectories, i.e. leading to path extension (cf Asheim et al. 2013; Isaksen and Trippl 2014).

Conceptualising the regional context: Organisations and institutions

In the innovation systems literature, the regional context is frequently captured with the concept of institutional thickness (Amin and Thrift 1995). Metropolitan regions are typically institutional thick with strong universities, R&D institutes, firm headquarters, and a diverse industrial structure. Furthermore, institutional thickness is associated with institutions that support knowledge exchange and learning.

The use of this concept is ambiguous because it conflates institutions (rules and constraints that structure social interaction) and organisations (actors in the system). One way to deal with this confusion is to differentiate between an organisational and an institutional dimension (Trippl, Asheim, and Miorner 2015). An organisational thick region is one where many organisations, with strong capabilities are present. The institutional dimension relates to the "rules of the game", which enable or constrain interactive learning between the organisations located in the region.

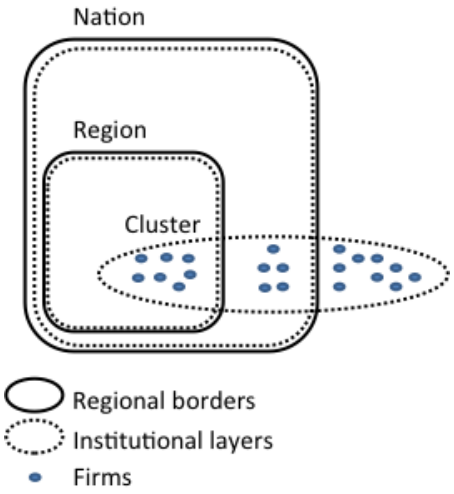
The differentiation between organisational and institutional thickness remains incomplete, however, without further specifications. Organisational thickness has a quantitative dimension, capturing the sheer number and size of organisations, and a qualitative dimension. The qualitative dimension relates to the level of organisational competencies. Few organisations with high competencies may be more important for regional renewal than many with low competencies.

Furthermore, following the arguments brought forward in the previous section, the potential for cluster renewal largely depends on the abilities and opportunities to combine complementary knowledge, which is often held by organisations that operate in different institutional contexts. In order to capture this, we propose to build on the concept of institutional layers (Grillitsch 2015, p. 6):

"An institutional layer is defined as the set of rules and constraints that govern the interactions between individuals and organisations belonging to a distinct social structure. A social structure is understood as a totality, characterised by interdependencies and networks between individuals and organisations, a certain degree of persistency over time, and a set of rules and constraints, the institutional layer, which governs the interactions between the individuals and organisations being part of the social structure."

Translated to the realm of clusters, institutional layers can be illustrated as follows (Figure 1): The dots represent firms, the interrupted lines institutional layers and the uninterrupted lines administrative, territorial boundaries. Figure 1 represents the bare minimum of institutional layers, in which clusters are embedded. This includes an institutional layer linked to the industrial specialisation of the cluster, and institutional layers, which are territorially defined and related to the administrative region and nation state.

Fig. 1 Illustration of institutional layers for a single cluster case



Industries are social structures with a certain degree of persistency, with interdependencies and networks between respective actors, and co-evolving institutions (Nelson 1995; Murmann 2003). This is depicted in the graph by the institutional layer, which crosses the regional and national boundaries. Firms of a given industrial cluster are subject to a respective institutional layer. Such an institutional layer may be global in the sense that global interdependencies exist between firms of the specific industry, as discussed for instance in the literatures on global value chains and global production networks (e.g. Henderson et al. 2002; Gereffi, Humphrey, and Sturgeon 2005).

The cluster firms are also embedded in territorially defined institutional layers. For the sake of developing the conceptual argument, we discuss only regional and national institutional layers. Institutional layers at the national level define the framework conditions for economic activities. In this regard, the varieties of capitalism literature differentiates between liberal and coordinated market economies (Hall and Soskice 2001; Asheim and Coenen 2006). Liberal market economies such as the US or the UK are co-ordinated mainly by market mechanisms, dominated by arm-length interactions based on formalised contracts, a high importance of capital markets and "hire and fire" labour relations, which makes such economies highly adaptable to changes and well equipped for radical innovations. Coordinated market economies such as Germany or the Scandinavian countries build to a larger extent on strategic, non-market coordination where long-term labour contracts and bank financing play an important role. This promotes long-term relationships, interactive learning between users and producers, experienced based knowledge, and incremental innovations as typical in engineering sectors.

The national institutional framework influences regional context conditions. Drawing on a typology of regional innovation systems introduced by Cooke (2004), Asheim and Coenen (2006, p. 169) argue that liberal market economies are conducive for entrepreneurial innovation systems, which get "dynamism from local venture capital, entrepreneurs, market demand and incubators". Coordinated market economies, in contrast, promote institutional regional innovation systems, which are characterised "by the positive effects of systemic

relationships between the production structure and the knowledge infrastructure embedded in networking governance structures regionally and supporting regulatory and institutional framework on the national level." (ibid, p. 169) These institutional differences at the national and regional scale will consequently affect the probability for the emergence and competitiveness of certain types of clusters.

Extending the perspective from the cluster to the region, institutional variety is defined by the number of institutional layers present in the region and to what extent they differ from each other. Firms, universities and public authorities are subject to different institutional layers. Industries develop specific institutional layers and thus the presence of different industries in a region creates institutional variety. Individuals can be associated with specific institutional layers relating to e.g. nationality, profession, or upbringing.

Having defined the concepts of organisational thickness and institutional variety, we turn back to the concept of institutional thickness. Often institutional thickness is associated with high levels of trust and informal social networks. However, networks and trust do not comply with the definition of institutions, i.e. they are not the rules and constraints structuring social interaction but rather the result of it (Gertler 2004). As institutional thickness is essentially about the degree of localised learning between different social structures such as firms and universities or organisations associated with different industries, we suggest that institutional thickness can be approached by the concept of connectedness between institutional layers (Grillitsch 2015).

Connectedness, in a strict sense, is created by individuals who are subject to different institutional layers. For instance, a university professor, who at the same time holds the position of a partner in a firm, is subject to the institutional layers relevant for academia and business. In a case study on individuals building innovation networks, Suvinen (2014, p. 150) finds that "the striking feature was that the university representatives held different simultaneous external positions" to politics, intermediary organisations, public financial instruments and firms. Such individuals are aware of the rules of the game in the respective environments, have an incentive to contribute in their different roles, thus creating opportunities for learning between different social structures.

In a wider sense, institutional connectedness can be created by crosscutting institutional layers like an inclusive education system or by temporary organisations such as collaborations, projects, steering committees, advisory boards or consultative bodies for regional decision makers. For instance, Champenois (2012) discusses how an open call for proposals prompted a wide range of actors to collaborate, align their interests, and establish boundary-spanning organisations. Institutional connectedness is thus interrelated with the establishment of common values, a regional identity, and an interpretative framework that facilitates communication and collaboration.

In conclusion, regions can be defined by the degree of organisational thickness, institutional variety and institutional connectedness. Organisational thickness captures the number and level of competencies of organisations. Institutional variety relates to the number of institutional layers present in the region and to

what extent they differ from each other. Institutional connectedness captures to what extent the different institutional layers overlap, either directly through individuals or organisations being subject to several institutional layers or indirectly through crosscutting institutional layers. The integration of institutional variety describes a process of increasing the connectedness between institutional layers.

Empirical illustration

The case study builds on a comprehensive document analysis and semi-structured interviews. The document analysis includes cluster, regional and national policy documents and studies as well as regional, national and industry statistics. In total, 17 interviews were conducted in October 2014 with representatives from different stakeholder groups including firms, higher education institutes, research organisations, public administration and regional government, cluster organisations, as well as innovation and research support programmes. The interviews were all conducted with a representative of the top management of these organisations. An interview guide was used covering the background and experience of the interviewees, information on the organisations they represent, the strengths, weaknesses, opportunities, threats, and major changes in the cluster, the industry and the regional innovation system, as well as regional innovation policy.

The maritime cluster in Møre og Romsdal

Møre og Romsdal is a semi-peripheral region located in Vestlandet in Western Norway. 262 thousand inhabitants are spread over 15 thousand square kilometres, three municipalities and a landscape scattered by fjords and mountains. There are, however, frequent flight connections to Oslo and to international hubs such as Copenhagen, Amsterdam and London. Despite being located in the semi-periphery, Møre og Romsdal is economically well off with an unemployment rate of below 3 per cent in 2014 and a GDP per capita, which reaches the national average.

This strong economic performance is puzzling given relative low scores on typical innovation indicators. The average R&D expenditures per inhabitant were with 3,500 NOK significantly below the national average of 8,700 NOK in 2009. The leading regions, Sør-Trøndelag and Oslo, with Norway's two largest universities, even spent more than 20,000 NOK per capita. Furthermore, only 10 per cent of the researchers in Møre og Romsdal have a doctoral degree as compared to Tromsø where the share is above 40 per cent, and to Hordaland, Sør-Trøndelag and Oslo with shares of above 30 per cent (all main university towns). On the positive side, the R&D expenditures in Møre og Romsdal have significantly increased over the last two decades, especially driven by the private sector (Møre og Romsdal fylkeskommune, 2012; Bremnes, H., 2013; Forskningsrådet, 2014).

Møre og Romsdal is a highly specialised region in the maritime, marine, oil and gas, and furniture industries and accounts for 10 per cent of Norway's exports (as compared to 5 per cent of the population). Of the four mentioned industries, the maritime industry is the largest in size, exhibits the highest degree of vertical

and horizontal integration and benefits from a thick labour market (Bremnes, 2013). According to a cluster analysis conducted by Møreforsking (2014), the maritime cluster features strong regional, national and international input-output relationships. 40 per cent of the world's most advanced offshore fleet is controlled by the region's ship owners constituting the second largest offshore fleet in the world after the USA. The maritime cluster in Møre og Romsdal is one of the few globally, where all actors of the value chain are strongly presented.

Three university colleges in Ålesund, Molde and Volda conduct applied research in close collaboration with the industry. Ålesund University College has competences in maritime technology and operations, engineering and natural sciences. Also, it has developed simulators for advanced maritime operations, thereby attracting global players (e.g. Rolls-Royce). Furthermore, relevant for the maritime industry are the specialisation of Molde University College in logistics, in which it has university status, as well as several applied research institutes such as Møreforsking and SINTEF. Møreforsking is a regional applied research institute with offices in all three municipalities and SINTEF is the largest independent Scandinavian research organisation connected to the Norwegian University of Science and Technology.

Several cluster organisations support the industry. In Norway, there are three cluster support programmes, "Arena" for clusters at the regional level, "Norwegian Centres of Expertise" for mature clusters with a leading national position and a strong export orientation, and "Global Centres of Expertise" (GCE) for mature clusters with a global position as knowledge hubs. In Møre og Romsdal the Blue Maritime cluster has received the status of a GCE as only one out of two such centres nationally. In addition, three Arena clusters have been established covering marine (Legasea), furniture (Norwegian Rooms), and more broadly firms in the fields of logistics, material technology and production technology (Ikuben). The Ålesund Knowledge Park supports business development, innovation and community development and has a coordination role for the cluster organisations and other regional initiatives.

The maritime industry is an old industry, largely depending on mature technologies, and draws predominantly on a synthetic knowledge base. Innovations result predominantly from the combination of existing knowledge, often in close collaboration with customers and/or suppliers. Interactive learning in producer-user relationships and tacit knowledge of engineers are central in the innovation processes. With few exceptions, firms generate incremental product innovations and process innovations that increase efficiency. This also explains the relative low importance of traditional innovation indicators as firms invest little in research and most in development and application development, the latter not being captured in innovation surveys.

In summary, Møre og Romsdal is a semi-peripheral region, specialised in a few industries, most importantly the maritime industry. The maritime industry is mature and draws largely on synthetic knowledge. In this sector, the region is organizationally thick as the whole value chain, leading global players and applied research institutes with relevant specialisations are present. Despite

being an old industry and scoring low on traditional innovation indicators, the region has been highly successful economically, driven largely by the strength of the maritime sector.

Institutional analysis

The institutional analysis aims partly at understanding the role of institutional variety and the integration thereof for cluster renewal and partly at what policy lessons can be drawn. We proceed by identifying and characterising those institutional layers that have an effect on the renewal of the maritime cluster in Møre og Romsdal. Then, we will investigate to what extent the institutional layers are integrated, and finally the role of policy in the integration of the institutional layers.

One institutional layer is associated with the "locals" who can be defined as all those who grew up in the region or have been accepted as locals by living in the region. This layer is largely confined to the regional territory although it can extend globally due to labour migration. Locals receive a high level of trust, informal knowledge sharing is common, and the levels of opportunism are low. Combined with flat hierarchies and an appreciation for experience-based knowledge, these normative characteristics allow for a high speed of incremental innovation based on interactive learning between users and producers, supporting path extension.

Furthermore, the locals perceive themselves as particularly entrepreneurial and risk taking compared to other regions in Norway. This has been explained by the fishing tradition and remote location, which meant that locals historically had to secure a living by venturing out into the rough seas. The difficult access to resources was an important incentive to innovate and modernize the fishing fleet (Karlsen 2005). The entrepreneurial spirit and risk taking attitude increases the likelihood that firms invest and innovate in new market or technological niches, and thereby promote cluster renewal.

This local institutional layer is embedded in the institutional framework erected by the nation state. All individuals and firms operating or registered in Norway are subject to this institutional layer, which is therefore confined by the administrative boundaries. Referring to the literature on varieties of capitalism (Hall and Soskice 2001; Asheim and Coenen 2006), Norway can be characterised as a coordinated market economy, implying a comparable long-time horizon in investment decisions and labour relations, strengths in industries that compete on experience-based knowledge and interactive learning processes, and a high degree of strategic coordination involving different stakeholder groups. Therefore, the local and national institutional layers are well aligned and complementary.

An important distinction can be made between family-owned local firms and international groups with ownership in local firms. Family-owned local firms are strongly embedded in both the local and national institutional layers. Such firms typically are characterised by flat hierarchies and informal modes of communication internally and with partners in the region allowing for interactive learning processes. These learning processes lead to the

accumulation of experience-based knowledge and a high speed of incremental innovations, supporting path extension.

In contrast, the routines of foreign groups are affected by the institutional framework that exists where their headquarters are located. Some of the international groups that have acquired firms in Møre og Romsdal originate from liberal market economies. Liberal market economies are characterised by short time horizons, which applies especially for the publically listed groups active in Møre og Romsdal. Hierarchies within these organisations are steeper and the communication and networks are more formal, often relying on tight contracts.

For instance, one of the international groups, Rolls-Royce has its headquarters in the United Kingdom, a typical liberal market economy. Rolls-Royce has strong R&D departments and maintains competence centres in collaboration with leading universities globally. Hence, Rolls-Royce has strong in-house competencies in both synthetic and analytical knowledge and combines DUI and STI modes of innovation. However, due to its origin, arm-length and contract-based relationships with suppliers and clients are the norm. Furthermore, Rolls-Royce is a public company and subject to pressures on the capital market to achieve strong financial returns in the short run.

Therefore, on the one hand, international groups, like Rolls-Royce, can be sources for combining different types of knowledge and modes of innovation and thereby for path renewal. On the other hand, international groups are potentially subject to colliding institutional layers as compared to local firms, creating barriers for localized learning processes. These barriers are deeply rooted in the national and regional institutional contexts, causing distinct differences as regards how firms learn and innovate (Lorenz and Lundvall 2006; Asheim 2012).

In Scandinavian countries, including Norway, learning work organisations, characterised by high degrees of autonomy, task complexity, learning and problem solving, are well embedded in national institutions promoting broad competence-based education, long-term labour relations, and a high prestige of not only highly trained professionals but also skilled workers. In other countries, like the UK, Ireland, and Spain, Taylorist and primitive production organisations dominate, which are characterised by an emphasis on standardised routine work, and constraints on the individuals' work rate from hierarchies, peers and norms. (Lorenz and Lundvall 2006) .

It has been argued that the shareholder-driven, Anglo-Saxon model is highly complementary to the stakeholder-driven, Scandinavian model (Lorenz and Lundvall 2006) and that learning work organisations may be able to combine DUI and STI modes of innovation and consequently have potential for radical innovations (Asheim 2012). Hence, the presence of international groups operating under different institutional layers that promote different forms of learning, knowledge bases, and innovation types presents an opportunity for learning and cluster renewal as long as the institutional barrier can be overcome.

In order to bridge this barrier, the connectedness of the local institutional layer with the institutional layer associated with specific international groups can be crucial. In Møre og Romsdal, connectedness is established in a strict sense, i.e.

locals are still strongly involved in the management of the subsidiaries of international groups, which is essential for several reasons. Besides being well connected and respected, these local managers know how locals think and what behaviour is expected in business and social relationships. This consequently facilitates knowledge exchange and learning between the international groups and the family-owned, local firms. Moreover, the headquarters might not understand the benefits of localized learning processes and the resulting gains in productivity and innovativeness because these benefits are hard to measure. Therefore, Møre og Romsdal, it has been argued in the interviews, needs "ambassadors" within the international groups that can raise awareness and act as "institutional navigators" (Sotarauta 2015).

This form of connectedness, however, is fragile. When the local managers leave the international groups or retire, it will be a challenge to find equally capable locals who have a voice in the headquarters of the international groups. Thus, to identify and train locals to fill positions in the international groups was mentioned to be of key importance for the cluster in Møre og Romsdal. In addition, there is a risk that international groups impose their routines of arm-length, contract-based interactions on the local firms and consequently disrupt the localized learning processes, creating strong dependencies and reduce the clusters capacity for renewal.

Institutional variety can also arise from the presence of different industries. In Møre og Romsdal, the marine and furniture industry play an important role, which are supported by respective cluster organisations. Competitiveness in the marine industry is mainly based on analytical knowledge (e.g. to develop new flavour, ingredients, Omega 3 fats, etc.) while the furniture industry's success in a high cost region depends to a large extent on symbolic knowledge, and specifically the capacity to develop strong brands and attractive design. The firms active in these industries are well embedded in the local institutional layer, such as the maritime industry, which facilitates localized learning between them.

Furthermore, different type of actors such as the regional government, firms, university colleges and research institutes are subject to different institutional layers, which are largely erected at the national scale. While this potentially leads to fragmentation, the actors in Møre og Romsdal are well embedded in the shared local institutional layer. Interactions between firms and university colleges and research institutes follow the same pattern as the interactions between firms, i.e. informal communication, high level of trust, and participation in interactive learning processes leading to experienced-based knowledge. Firms and university colleges as well as applied research institutes have developed a high degree of cognitive proximity drawing to a large extent on synthetic knowledge and conducting application development and to some extent applied research and development. These collaborative activities are often hands-on, quick, on demand, and contribute directly to the learning processes of the firms. Furthermore, the collaboration between university colleges and firms includes the financing of professorships. These localised learning efforts contribute to upgrading existing activities, increasing efficiency, and extending the existing development paths.

Regional and cluster policy can play an important role in integrating institutional variety, for instance promoting a shared vision, providing common infrastructure, orchestrating coordination mechanisms, or fostering embedding in higher geographical scales. Respective regional policy interventions resonate well with the longstanding Norwegian research and policy interest in regional restructuring and renewal (Karlsen and Dale 2014).

In Møre og Romsdal, the vision for regional development is well aligned between different stakeholder groups. In policy documents and interviews, the vision is consistent; namely to be a globally leading player as regards the sustainable use of resources in the ocean. The vision relates to niches (e.g. renewable energy, subsea operations, nutrition flavours) and the development of platform technologies (e.g. biotechnology, material technology, design, logistic, automatization technology). There is agreement that university colleges and research organisations shall strengthen research and education in line with the vision. Business representatives, for their part, consider that such a focus is highly suitable to support innovation activities. Hence, the vision is expression of institutional integration and guidance for the behaviour of local agents.

The region supported financially the establishment of the Norsk Maritimt Kompetansesenter. It is part of the Ålesund University College Campus and provides the physical co-location and collaboration space for different types of actors, including Rolls-Royce, other firms such as Mitie Norge AS, Zacco Norway, Segel, or Elia consulting, and organisations such as Ålesund Knowledge Park, Møreforsking, the offshore simulator centre, and SINTEF. Ålesund Knowledge Park has a coordination role for different cluster organisations with the goal of sharing knowledge and learning between the industries and cluster organisations. Furthermore, business representatives, also from the international groups, are engaged and often the driving force behind the cluster initiatives. This integration of institutional variety, consequently, creates opportunities to combining different types of knowledge and thereby for cluster renewal.

While the integration of institutional variety contributes to exploiting the regional potentials, regional actors are well aware that renewal also requires tapping knowledge sources outside the region. Interestingly, even the large firms and subsidiaries of international groups have suggested that the cluster organisations can play an important role in this regard. At the same time, we found evidence that individual firms (both small and large) undertake measures to link to complementary knowledge sources, often universities with specialisations that differ quite significantly from the local knowledge base. Furthermore, from our discussions with the university colleges, we found that strengthening networks to universities with strong basic research competencies is a priority. A good example is the application for and granting of a “Centre for Research driven Innovation” grant initiated by Ålesund University College in collaboration with NTNU Trondheim. Centres for Research driven Innovation fosters basic strategic or targeted research and has a more transformative focus, i.e. path-breaking discoveries that potentially lead to cluster renewal or even the creation of new clusters.

Accessing and appropriating external knowledge sources, which allow for the combination of different types of knowledge, therefore plays an important role for cluster renewal. However, it is interesting to observe that all instances of accessing such knowledge mentioned in the interviews have an important institutional dimension. In the case of firms, the contact or acquaintance with external knowledge sources was made in activities related to the engagement of the firms' managers in national industry associations. In the case of the university college's collaboration for the Center for Research driven Innovation grant, the initiator has previously worked at the technical university, which is part of the collaboration, and has a track record in basic research. Hence, a role for policy would be to foster institutional arrangements that provide for meeting places or overlaps between individuals and organisations associated with different social structures and institutional layers.

Conclusion

The starting point for the paper is that renewal depends on learning processes in clusters. Learning that combines different types of knowledge and modes of innovation increases the likelihood for more radical innovations that may lead to cluster renewal. In contrast, localized learning only within the dominant areas will rather lead to the extension of existing development paths.

The opportunities for combinatorial knowledge dynamics, learning and innovation depend besides firm-internal factors, industry-specific factors and networks also on the regional and institutional context. In order to describe the regional context, this paper further develops the concepts of organisational thickness, institutional variety and institutional connectedness. Different types of knowledge and innovation are frequently held by organisations that are subject to different institutional layers. In this paper, we argue that the integration of institutional variety influences the extent to which learning across institutional layers, and thus combinatorial knowledge dynamics, are possible.

Our case study shows that some degree of institutional variety may exist even in specialised semi-peripheral regions such as Møre og Romsdal. Also, the integration of institutional variety can play a role for cluster renewal by facilitating the combination of different types of knowledge and modes of innovation, which are held by organisations subject to different institutional layers. Key individuals are essential in connecting institutional layers. This refers for instance to locals who have a managing position in international groups, to university professors who accept a position in local university colleges, to business leaders who set-up and drive cluster organisations, or to individuals who engage in boundary-spanning organisations like industry associations.

Moreover, the integration of institutional variety is promoted by policy initiatives focussing for instance on the development of a shared vision, the provision of shared infrastructure, the orchestrating of governance, the facilitation of networks and the integration with institutional layers erected at higher geographical scales. Policy, therefore, can play an active role in promoting the integration of institutional variety. From our analysis, we conclude that the integration of institutional variety better equips cluster organisations to exploit

opportunities for combining different types of knowledge and modes of innovation, and consequently promote cluster renewal. Furthermore, institutional integration facilitates the coordination of interests and collective action in order to support specialisation in selected niches.

While the case study provides valuable insights on how the integration of institutional variety may promote cluster renewal, it remains to be investigated to what extent the findings apply for different types of regions. In particular, there may be some trade-off between institutional variety and integration, influenced by regional characteristics like the quality of governance or the networks of regional actors. These open questions deserve attention both theoretically and empirically.

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