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Cluster renewal and the heterogeneity of extra-regional linkages: a study of MNC practices in a subsea petroleum cluster

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ABSTRACT

The cluster literature in general and evolutionary economic geography in particular emphasizes the importance of extra-regional linkages for cluster evolution. However, the literature does so without necessarily nuancing the content, i.e., heterogeneity, of such linkages. We argue that treating extra-regional linkages as homogeneous hampers an important aspect of cluster renewal; namely, that it is context specific and dependent upon the diversified practices of the involved multinational companies (MNCs). In so doing, we also argue that relational approaches to economic geography offer an important insight into the evolutionary perspective. We investigate one of Norway's strongest and most dynamic industry clusters, the subsea cluster in Hordaland county, and discuss the usefulness of combining relational and evolutionary understandings in analytical frameworks that address cluster renewal. This study shows that the practice of regional firms that internationalize (labelled *MNC out*) and foreign-owned MNCs coming into the cluster (*MNC in*) contribute in different ways to renewal of the cluster. We find that the practices of *MNC out* contribute to further specialization of the cluster, whereas the practices of *MNC in* contribute to diversification of economic activities. Both types of extra-regional linkages are important for renewal of the cluster, as they together represent a mix between continuation and change of existing activities. Necessarily, such interplays between MNC practices and cluster evolution pan out differently in different contexts, but we argue that the literature should acknowledge that extra-regional linkages are heterogeneous and contribute differently to cluster evolution in general and renewal in particular.

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INTRODUCTION

Evolutionary theory has proven useful in explaining how industry systems develop along given paths based on former contingencies and choices (e.g., Kogler, 2015; Martin, 2010; Martin & Sunley, 2010; Sydow, Windeler, Müller-Seitz, & Lange, 2012; Wimmer & Kössler, 2005). Linked

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to this, the literature on evolution of industry clusters emphasizes the importance of stimulating regional cluster capabilities through the utilization of both intra- and extra-regional linkages (Njøs & Jakobsen, 2016; Trippl, Grillitsch, Isaksen, & Sinozic, 2015) in order to stimulate processes of cluster renewal (Chapman, MacKinnon, & Cumbers, 2004; Hassink, 2005). Through contributing with novelty, extra-regional linkages have been argued to be particularly important (e.g., Bathelt, Malmberg, & Maskell, 2004; Boschma & Iammarino, 2009; Fitjar & Rodríguez-Pose, 2011, 2013; Isaksen, 2009). We understand extra-regional linkages to be those that span a cluster's national context, i.e., practices linking a cluster to the global economy. In the cluster literature, a common way of operationalizing extra-regional linkages is through investigating the practice of multinational companies (MNCs). However, when discussing extra-regional linkages as a source for cluster renewal, the literature has largely treated such linkages as *homogenous*. Thus, extra-regional linkages are considered to contribute to cluster evolution, but nuancing the content of such linkages – and their adjoining practices – is important if we are to advance our understanding of cluster renewal. Such an understanding is currently missing from the cluster literature and evolutionary economic geography.

Hence, we base our approach on an understanding of MNC activity as a practice of networking and transfer of knowledge (Fløysand, Njøs, Nilsen, & Nygaard, 2016; Nilsen, 2016, 2017). Consequently, in developing our approach, we argue that there is a need to incorporate relational understandings (e.g., Fløysand & Jakobsen, 2011; Hassink & Klaerding, 2009) in conceptualizations of cluster renewal. Linking up to the theoretical discussion, we analytically separate between *MNC in* (foreign-owned MNCs coming into the cluster) and *MNC out* (regional firms internationalizing) in order to account for the heterogeneity of extra-regional linkages. Furthermore, this links up to arguments that regional contexts matter for how MNC activity influences processes of regional development more broadly.

To illustrate our point, we present a qualitative study of a cluster operating in the subsea sector oriented towards the oil and gas industry, located in and around the county of Hordaland in western Norway. This cluster serves the aftermarket segment of the subsea production chain, and it has been affected by the current economic downturn in the oil and gas industry. This makes the renewal perspective not only theoretically interesting but also highly relevant. Furthermore, as the firms in the cluster are strongly internationally oriented, this cluster provides an interesting context for studying the impact of extra-regional linkages on cluster renewal. We investigate these aspects through a qualitative analysis of MNC practices. The analysis shows how the practice of *MNC out* contributes to increased specialization of the cluster (extending current activities, but broadening their geographical reach). In contrast, the practice of *MNC in* contributes to the expansion of the cluster's profile through diversifying its activities. When linking this to a theoretical discussion of cluster renewal, the latter practice appears particularly important for upholding contingencies and stimulating regional development and avoiding lock-in. However, also extension of current activities is important for maintaining cluster identity and capabilities. This is achieved by *MNC out*. Thus, the balance between continuation and change appears beneficial for the cluster. Consequently, our analysis illustrates the importance of considering the interplay between the practices of *MNC in* and *MNC out* – what we term the 'heterogeneity of extra-regional linkages' – in theoretical and analytical frameworks addressing cluster renewal.

THEORETICAL BACKGROUND

Renewal of industry clusters

In times of falling commodity prices and economic recession, regional industry structures specialized within one or a few markets face particular challenges (Arthur, 1989). Regional economic restructuring is a recurring theme in studies of industrial development, and recent advancements

in the literature have been accompanied by promising insights from the literature on evolutionary theory. Evolutionary perspectives, which emphasize the complexity, heterogeneity and openness of economic development (Aldrich et al., 2008; Boschma & Martin, 2010; Castellacci, 2006; Schreyögg & Sydow, 2010), have become particularly influential in frameworks that analyse innovation and regional industrial development. Concepts such as path development, increasing returns and lock-in are central. These evolutionary concepts are also linked to the paradigmatic approach of innovation as *systemic*, i.e., that innovation and industrial development result from complex interlinkages between actors in (different types of) innovation systems (Fagerberg, Mowery, & Nelson, 2005; Lundvall & Johnson, 1994). Associated with this is the especially influential concept of *industry clusters*, which was popularized by strategist Michael Porter in the 1990s (Porter 1990, 1998). Industry cluster theory emphasize the importance of linkages between related (economic) activity in regional agglomerations, and clusters are thought to evolve based on unique combinations of region-specific and extra-regional linkages (Bathelt et al., 2004; Frenken & Boschma, 2015; Njøs & Jakobsen, 2016; Wolfe & Gertler, 2004). Relating this concept to nature-based resource industries such as the petroleum industry (e.g., Chapman et al., 2004; Cumbers, Mackinnon, & Chapman, 2003) implies that industry clusters are entities that contribute to, for example, the market orientation of clustered firms and the development of new technology, as well as influence regulatory regimes.

A cluster's background or history can reveal how geographical proximity (Boschma, 2005) between firms facilitates the flow of particular types of knowledge, which in turn can lead to a concentration of local competence and agglomeration effects. Following from this, economies of scale and externalities will emerge that further encourage the firms to follow the same path (Martin & Sunley, 2006). Such self-reinforcing processes have been classified as *path development*, where, as time goes by, former choices influence current and future contingencies and scopes of action (Sydow, Schreyôgg, & Koch, 2009). Thus, the term *path dependency* refers to the process by which a cluster grows in step with its spatial environment, as an agglomeration follows a trajectory of decreasing contingencies leading to development of established practices, routines and institutional frameworks (Fløysand, Jakobsen, & Bjarnar, 2012). In many instances, this is a positive development. It is also crucial if a cluster is to be established; cluster evolution requires that several firms and organizations develop in tune and that their activities are related and interlinked. This, in turn, leads to maturation and a distinct cluster profile and identity (Fløysand et al., 2012; Malmberg & Power, 2006). However, the path dependency along which a cluster evolves can become negative if its specialization becomes too rigid, i.e., that its profile becomes too narrow. This can result in lock-in, i.e., that a cluster is locked into a path dependency. Such situations are hard to get out of if/when readjustment is required (Martin & Sunley, 2006; Menzel & Fornahl, 2010; Sydow et al., 2009). In other words, path dependency can be considered a neutral concept in terms of its implications for a region: it can be both positive (stimulating cluster evolution) and negative (e.g., if a cluster becomes too specialized and an external shock destabilizes the system). Thus, a particular challenge in cluster evolution is to uphold contingencies and to develop capacities that makes a cluster capable of adapting to changing circumstances. This is referred to as *cluster renewal*.

Cluster renewal is a process stimulated by the adaptability of the clustered firms, and is therefore characterized by simultaneous processes of continuation (extension of practices) and change (novelty). Thus, renewal of a cluster implies upholding contingencies in the industry environment, while also avoiding narrow specialization and overreliance on, for example, one activity, market or commodity (e.g., Chapman et al., 2004). Accordingly, the more specialized a cluster is the harder it is to break out of an existing path dependency (Sydow et al., 2009) and to uphold adaptability and scopes of action. This discussion on cluster renewal and the balancing act between continuation and change is exemplified by Tichy's definition of 'the cluster paradox' (referred to by Menzel & Fornahl, 2010): although strict specialization can increase the cluster's ability

to exploit technological synergies between firms, too much specialization can lead to negative lock-in that reduces the cluster firms' adaptability and the likelihood that they will develop radical innovations. Thus, according to the logic of evolutionary theory, cluster renewal is more likely to occur if a cluster is located in a region with several related industry activities (Aarstad, Kvitastein, & Jakobsen, 2016; Boschma & Frenken, 2012; Frenken, Van Oort, & Verburg, 2007; Neffke, Henning, & Boschma, 2011; Njøs & Jakobsen, 2016), and, thus, needs to adapt its resources to changing external circumstances (cf. Nelson & Winter, 1982; Penrose, 1959; Teece, Pisano, & Shuen, 1997).

As this discussion suggests, clusters may be a source of both positive and negative lock-in. The literature on the evolution of clusters argues that to avoid negative path dependency and lock-in in clustered firms and industries (Coenen, Moodysson, & Martin, 2014; Hassink, 2005), clusters must balance regional specificities (Asheim, Isaksen, Martin, & Trippl, 2016; Frenken et al., 2007; Njøs, Jakobsen, Aslesen, & Fløysand, 2016) and external linkages (Bathelt et al., 2004; Fitjar & Rodríguez-Pose, 2013; Isaksen, 2009). However, the evolutionary literature has been criticized for failing to understand how actors and functions shape the development of an industry system (Bergek, Jacobsson, Carlsson, Lindmark, & Rickne, 2008; Boschma, 2016; Carlsson, Jacobsson, Holmén, & Rickne, 2002; MacKinnon, Cumbers, Pike, Birch, & McMaster, 2009), e.g., a cluster (Holmen & Fosse, 2017). This has raised a discussion on the importance of complementing the evolutionary approach with a *relational* understanding (e.g., Bathelt & Glückler, 2003; Fløysand & Jakobsen, 2011; Hassink & Klaerding, 2009; Hassink, Klaerding, & Marques, 2014).

A relational understanding implies that studies of economic practice must be broadened to include the social situations of actors and their various network relationships at different and overlapping spatial scales. These contributions in the economic geography literature are intended to develop more context- and process-sensitive understandings of economic practices (Bathelt & Glückler, 2003; Storper, 1997; Yeung, 2005). First, it is argued that the practices of MNCs cannot be explained by referring to their internal capabilities or their ability to copy the successes of other firms; it needs to be explained by network performances (Yeung, 2005). Second, networks are not fixed in time and space but constantly changing and multi-spatial. Third, the formal and informal stores of knowledge that are (re)produced in networks are not only influenced by business relationships, market situations, political regulations and the strategies of rivals, but also they have legacies that are informed by discourses, narratives and rules of conduct produced within the social context where the economic practice arises (Fløysand & Jakobsen, 2011). Thus, a relational understanding of economic practice involves focusing on networks of actors, the flow of knowledge and assets within these networks, and the interconnectivity of various networks. Linking this to cluster renewal and evolution, a common way of operationalizing extra-regional linkages is to investigate the relational practice of MNCs.

Extra-regional linkages and renewal of industry clusters

Following up our theoretical arguments, we define MNC practice as a complex that involves what we label the *relational characteristics of economic activity*, i.e. to which extent MNC practices involve shared capital interests, networking and the transfer of knowledge at the firm level. In this view, cluster renewal is the result of encounters between MNCs and a cluster in which exchange of capital as well as the networking and knowledge outputs partly depend on the particular practices it generates within the region (Fløysand et al., 2016). According to cluster theory, proximity promotes externalities that do not exist beyond the regional scale (Gordon & McCann, 2000). This also applies to knowledge externalities; although MNCs are more internationally oriented than regional/national relationships, they do indeed have a geographical embeddedness that influences their practices (Asheim & Isaksen, 2002; Hess, 2004; Maskell & Malmberg, 1999; Schoenberger, 1999).

As Chapman et al. (2004) suggest, if clusters follow a highly specialized development path, stagnation and decline can in the long run occur. This is because strengthening of current specializations does not stimulate cluster renewal, i.e., it does not uphold contingences and scopes of action, making firms in the cluster particularly vulnerable to external shocks. Therefore, processes of cluster renewal are important for avoiding lock-in and possible path exhaustion. In order to avoid such detrimental development, renewal of a cluster should take place through diversification of the activities of the clustered firms. When discussing the role of diversification in cluster renewal, Chapman et al. distinguish between the categories *geographical diversification* and *sectoral diversification*.

Summing up the discussion above, cluster renewal is considered to be stimulated by influx of novelty either from other sectors within a region, or through extra-regional linkages (e.g., Njøs & Jakobsen, 2016). We have placed particular emphasis on extra-regional linkages in contributing with novelty in clusters, emphasizing the importance of understanding MNC practices. However, the cluster literature has yet to incorporate understandings of how the practice of MNCs takes different forms. Hence, extra-regional linkages, represented by the practice of MNCs, have largely been treated as a homogenous category considered to contribute with novelty in evolution of clusters. Nuancing this view, we argue that understanding MNC practices is crucial in frameworks addressing cluster renewal, and that such frameworks should take into account that extra-regional linkages should be considered heterogeneous rather than homogenous.

INVESTIGATION

Methodology

In order to exemplify our theoretical argument, we conducted a qualitative case study of a subsea petroleum cluster in the county of Hordaland in western Norway. Thus, we employed a methodology where the aim is not to provide statistical representativeness or to develop empirical generalizations (George & Bennett, 2005), but to nuance theoretical assumptions through abductive reasoning (Edwards, O'Mahoney, & Vincent, 2014; Sayer, 2000). A central aim of qualitative case studies is to contribute to theory development through *analytical* generalization (George & Bennett, 2005; Gobo, 2004). It has been argued that case studies are especially appealing for developing deep understandings of empirical phenomena (Easton, 2010; Kessler & Bach, 2014) because this methodology has as its particular strength in that it offers high conceptual validity, it contributes to development of new hypotheses, it uncovers causal mechanisms in the context of the studied case, and it addresses causal complexities (George & Bennett, 2005, p. 19). Thus, as argued by George and Bennett (2005):

> The development of theory via case studies should be distinguished from the deductive development of theory. Deductive methods can usefully develop entirely new theories or fill gaps in existing theories; case studies can test deductive theories and suggest new variables that need to be incorporated. […] But theory development via case studies is primarily an inductive process. (p. 111)

Case study, context and data collection

The subsea cluster in Hordaland is specialized in the subsea sector of the oil and gas industry (Njøs et al., 2016), and is considered one of Norway's strongest industry clusters. This is attested to by its status as a global centre of expertise (GCE). In Norway, the policy programme National Innovation Clusters consists of three levels. The first level, ARENA, is a status given to immature clusters intended to develop towards a dynamic cluster. The next level, Norwegian centres of

expertise (NCE), consists of mature, dynamic clusters that represent particularly strong industry environments and which have a strong position in international markets. Lastly, the GCE level, a status given to only three clusters, is considered to represent Norway's strongest industry environments. These clusters represent the most dynamic and internationally oriented clusters in Norway. The subsea cluster in Hordaland was from 2006 part of the NCE programme. In 2015, the cluster was assigned GCE status, underlining that this cluster has particularly strong extra-regional linkages and capabilities for renewal.

The Norwegian subsea sector is distributed throughout the country in specialized regions, and the subsea cluster around the Bergen area in Hordaland emphasizes the aftermarket segment of the subsea sector value chain. The cluster is internationally oriented and it actively promotes internationalization. The firms in this cluster mainly install, maintain and modify subsea equipment. The cluster consists of approximately 120 firms, research and development (R&D) institutions and other supporting agencies. Clustering firms have been heavily affected by the decline in the oil and gas industry and, therefore, they are facing several challenges, such as downsizing, the standardization of products and services, and organizational changes.

We collected data for this study during two fieldwork sessions, in October–November 2011 and September–November 2014. Data collection was conducted for two master projects investigating internationalization of the subsea cluster. Both master projects were part of large research projects investigating cluster development, internationalization and the role of policy for cluster evolution.

The cluster in question can roughly be categorized according to its value chain. The oil company Statoil is focal for several of the cluster firms, and this operating company has been hugely influential in how the cluster has developed within the petroleum market. Typically, the systems suppliers (e.g., Aker Solutions, FMC Technologies) deal directly with Statoil, whereas the third level of the supply chain in the cluster, the sub-suppliers, represent the bulk of the clustered firms in terms of numbers. In other words, the subsea cluster is characterized by an influential oil company (Statoil) setting the framework conditions for the other actors, where a few systems suppliers have had an important role in linking the sub-suppliers to Statoil. The systems suppliers represent important actors in the Norwegian petroleum sector, and they are also important global players within the industry. Overall, though, a large bulk of the clustered firms consist of sub-suppliers to the systems suppliers. We sought to reflect these cluster characteristics when analysing the cluster. When conducting our data collection, we interviewed informants of firms in the cluster, but we also conducted four interviews with two key informants (the cluster facilitator of the NCE/GCE Subsea initiative, and a representative from the board of the cluster initiative which has been involved in development of the cluster project since its inception). The second round of interviews (2014) were based on insight gained in the first round (2011). In addition to the primary data collection, we were also informed on other studies of the cluster through our participation in the two research projects. Coupled with media reports and general insight into the cluster and the region, we have gained deep insight into how cluster firms operate and who are the central actors in the development of the cluster. The key informants served as important discussion partners where our understandings of how the cluster functions was confirmed, while also helping to nuance our assumptions and findings.

The interview guides for both fieldwork sessions involved questions on topics such as knowledge flows, internationalization processes (motives for *MNC out/in*, challenges arising when internationalizing), transfer of knowledge through extra-regional linkages, processes of cluster renewal (whether cluster firms are moving towards specialization or diversification), MNC practices, innovation activities, and regional embeddedness (e.g., regional cooperation, support infrastructure for innovation, cluster identity and modes of operation).

As explained above, we argue for the importance of distinguishing between *MNC in* and *MNC out*. In our empirical investigation, *MNC out* refers to firms from the region internationalizing.

Conversely, *MNC in* refers to foreign firms that have activity in Norway and operate within the cluster.

The 2011 fieldwork session comprised six interviews (two with key informants, one *MNC out*, three *MNC in*); the 2014 session comprised 10 interviews (two with key informants, four *MNC in* and four *MNC out*). The same key informants were interviewed in 2011 and 2014. The 2011 session involved one interview with the operating company, one with a systems supplier and two interviews with systems suppliers. In 2014, the two interviews with key informants were coupled with eight interviews with sub-suppliers. In both fieldwork sessions, cluster firms were selected that were (1) located in the cluster and (2) either had established an office branch, an agent relationship or a subsidiary abroad, or had been incorporated into a foreign corporation through acquisition or joint venture. Based on information we acquired from the internet, regional newspapers and our key informants, we selected the key multinational actors in the cluster. In addition to the information we obtained from the 16 interviews, we used secondary data sources (firms' home pages, regional newspapers, reports and previous research) as the background for our analysis. All the interviews were audiorecorded and transcribed.

MNC practice and networking

Our study revealed that *MNC out* are primarily represented internationally through established subsidiaries, local agents or other facilities. Not surprisingly, the regions where most *MNC out* operate are Houston, Rio de Janeiro, Aberdeen (UK), the Arabian Peninsula, Angola and Perth (Western Australia). According to our informants, the subsea cluster in Hordaland represents an industry environment that holds advanced knowledge on petroleum and subsea technology, making it interesting for foreign firms to link up to this cluster. When it comes to internationalization, the informants emphasize the importance of knowledge of the host market. One informant explained: 'Take Brazil as an example, which is a gigantic subsea market. You cannot cover that from here [Norway]. You have to go to Brazil to do that' (*MNC out* representative, 2011). Thus, it appears that the motivation for an *MNC out* to internationalize is to establish a local presence to lower barriers to the introduction of new products and services. Oil and gas market opportunities are the main drivers for firm internationalization from the cluster (see also Aarstad, Pettersen, & Jakobsen, 2015): 'We are delivering a lot to the US, to Houston, and we are delivering a lot to Aberdeen, UK. We also have supplies to several other locations, such as West Africa, etc., and we are expanding our international channels' (*MNC out* representative, 2014). According to our informants, delivery of products and services appears to be the main motivation for *MNC out*. However, in order to succeed with such activities, knowledge of foreign markets and practices are crucial. Our informants reflect on the challenges relating to this, and argue that it is important to approach foreign markets through focusing on a narrow set of activities, i.e., through specialization of its activities. In addition, access to new knowledge, market impulses, technology trends etc. is also portrayed as important for *MNC out*.

MNC in are characterized by large MNCs setting up national/regional subsidiaries *within* the cluster. The parent companies of *MNC in* are large, Western MNCs with diversified activities on a global scale. According to our informants, the main motivation for *MNC in* to locate in the Hordaland subsea cluster is to gain access to relevant competence, technology and products, but they also want to take a market share and gain access to (new) customers. Furthermore, informants representing *MNC in* portray the cluster as a leading and attractive location for networking in the global subsea oil and gas market:

> There are a lot of companies in Norway [in the subsea cluster] developing exciting technology and that have come a long way in doing so. That's probably well recognized by the big actors; that a lot of exciting things have popped up here. (*MNC in* representative, 2014)

In addition, *MNC in* representatives also report having an extensive set of linkages to the global oil and gas hubs reported by *MNC out*. Thus, as with *MNC out*, the same geographical hubs are presented as key centres for the global oil and gas industry. However, despite this strong international interweaving, our informants point out the importance of a 'local buzz' to explain the competitive strength of the cluster (and its strength as a dynamic industry environment). This was reflected in comments by two *MNC in* representatives:

> So the owner company came in here, and they convinced the board that they actually wanted to keep the firm as it was […] I think it helped that we could show that the reason we were here was to be near this environment [the subsea cluster in Hordaland]. (*MNC in* representative, 2014)

> An international player, like [the large owner company], they decide to invest here in Bergen. And why do they do that? Because there is competence and knowledge in [the acquired firm], but there is also a lot of competence in our surroundings, in the cluster, right? (*MNC in* representative, 2011)

Our informants emphasized *MNC in* and *MNC out* firms as hubs-in-spokes (Markusen, 1996), linking actors and networks in the cluster with extra-regional sources of knowledge, information and market opportunities. However, access to other clustered actors through regional networks was stressed as highly important, and *MNC in* include suppliers or business partners within the cluster in sales and/or development projects (Jakobsen & Fløysand, 2011). Hence, the encouragement and facilitation of networking are important aspects of MNC practice in the cluster. This also illustrates MNC practice as networking and transfer of knowledge, indicating that what was argued in the introduction, i.e., that such relations should be investigated in-depth, is important when explaining how MNCs contribute to cluster renewal.

MNC practice and knowledge flows

Another topic of interest here is how MNC practices relate to knowledge flows. Interestingly, our data revealed that *MNC in* and *MNC out* have different effects on flows of knowledge and learning. The necessary knowledge about a foreign market and what is required to operate there are mainly distributed by *MNC out*. Because such knowledge is acquired through experience, our informants emphasized the importance of their personal and professional networks in their *MNC out* practice, again reflecting the importance of local buzz: 'Market knowledge is important. […] When you are developing a company, you have to have people who have been in that business, people who have market channels, who have that network at the ready' (*MNC out* representative, 2014). This exemplifies the role of (positive) path dependency in terms of firm internationalization in the cluster. According to the informants, choosing to specialize towards some geographical markets appears important, indicating that maintaining and developing market relations (and knowledge) takes time. This may also serve as an explanation of why the cluster firms choose to, in general, internationalize towards the same geographical areas; they learn from each other and share important information on past experiences in foreign markets.

When it comes to *MNC in*, it was noted that when firms in the cluster have been acquired by foreign firms, they have become part of large MNCs. Such changes necessarily lead to organizational challenges, but the informants emphasized that *MNC in* brings with it a host of opportunities, not the least due to organizational size and geographical reach. It should be noted that the *MNC in* we interviewed represent companies that are large global players with several different business activities. However, according to the informants, the new constellations are often open to new ideas, knowledge and technology, which leads to marketing, distribution and business networking opportunities: 'We can use their products, they can use ours, we get new sales persons, we get international offices […]' (*MNC in* representative, 2014). Furthermore, in our case it appears that *MNC in* have relatively diversified marketing and technology portfolios, and

that they provide access to complementary competences and technologies that may contribute to upgrading. According to the informants, *MNC in* integrates clustering firms into a global system in which actors can share with and learn from each other, thus strengthening innovative capabilities. Finally, the practice of *MNC in* should be seen as providing access to new resources and often to financial support and support for R&D activities, indicating that *MNC in* plays an important role in development of the cluster.

MNC practice and cluster renewal

A cluster's geographical diversification is the result of investments in new, geographically distant markets. In the case study conducted, such activities are the results of *MNC out* practices. Our data indicate that *MNC out* triggered increased specialization in the subsea cluster, given that the motive for internationalizing in many instances was to reach out to new, geographically distant markets with existing products and services. In particular, *MNC out* reported that a distinct and specialized profile is crucial for them to stand out as an influential subsea actor abroad, thereby strengthening their competitive position. As long as they maintain an international focus, they do not see any immediate incentives for sectoral diversification, because specialization is the key factor that legitimates their position abroad, they argue. This was reflected by a key informant (2014): 'Many of the cluster firms are very focused on subsea activity and might not have had to look towards other markets.' Thus, we would argue that the geographical diversification of *MNC out* appears to promote further specialization of the cluster through influx of knowledge and networks within the cluster's existing profile. This was exemplified by an informant:

> If we were to branch out to other industries, we would lose focus. […] We work with ultrasound meters. There's a lot of ultrasound in medicine. So, if we were to branch out to that industry too, we would become something totally different. That wouldn't work. I don't think so. We would be lost in both areas. (*MNC out* representative, 2014)

On the other hand, the *MNC in* informants talked about scope-wise diversification. As noted, *MNC in* informants explain how firms gain access to knowledge, competence and technology from a wide spectrum of economic activities, indicating that these actors appear to encourage *sectoral diversification* through linkages to other industries: 'It's nuclear technology, it's wind-power; there's turbines and locomotive engines and aircraft engines […]'; 'not to mention geotechnics […] housebuilding or urban planning' (*MNC in* representative, 2014). Several informants also mentioned links to the Norwegian armed forces, the spaceflight industry, and the monitoring and mapping of seabed minerals. Thus, from the perspective of the subsea cluster in Hordaland, it can be argued that *MNC in* appears to support expanding the scope of the cluster through encouraging diversification of economic activities. This is illustrated by a representative (2014) from a *MNC in*:

> Internally [in the new company], we can discuss very openly regarding our technology. And this is of course a company that spans a lot of technology, meaning that we can exploit our technology from other areas where [the owner company] has been involved, like medicine or nuclear technology. […] That has been very good.

DISCUSSION

The difference in practices between *MNC in* and *MNC out* in the subsea cluster in Hordaland illustrates how extra-regional cluster linkages should be considered heterogeneous, and, moreover, that the different practices influence cluster renewal differently. In the investigated case, *MNC out*

emphasize the importance of maintaining a distinct profile as specialized to remain competitive abroad. Linking this to the regional cluster level, the role of *MNC out* appears to strengthen path dependencies and current trajectories, as *MNC out* operations support the adaptation of routines and strategies to an existing specialized market. Furthermore, as *MNC out* in our setting were oriented towards global oil and gas hubs, this appeared further to strengthen cluster specialization. An implication of this could be that the chances for radical innovation in the regional cluster are reduced, implying that *MNC out* practice encourages minor changes in clustered firms' orientations. Thus, the knowledge pools in the foreign hubs where *MNC out* is directed may be too similar to the clustered firms' existing knowledge pools, leading to learning that (at a higher level) only results in incremental innovation and the continuation of existing practices (Boschma & Iammarino, 2009). Nevertheless, international operations through *MNC out* generate new market possibilities abroad that limit a company's vulnerability vis-à-vis the home region, while at the same time they contribute new knowledge to the home region. Thus, by engaging in *MNC out*, firms can keep growing and thereby maintain regional growth and employment, as long as the market is experiencing growth and commodity prices remain relatively predictable (Arthur, 1989). The evolution of the cluster is necessarily related to these practices and firm-level development paths, implying that as long as clustered firms are on a positive development path, these practices can be considered beneficial. Also, such processes are important in extending current core activities and to support cluster identity and profile.

Contrary to *MNC out*, *MNC in* promotes diversification and variety in the cluster, where *MNC in* appear to create several new learning opportunities. Our informants perceived *MNC in* as 'extremely diversified' and to be dealing with 'related businesses'. With respect to theory, this implies that *MNC in* can create new (industry-spanning) knowledge that influences and possibly stimulates development of new paths. In the long-term, this may benefit the cluster, as it involves diversifying markets and technologies, and it may also lead to better possibilities for radical innovation (Aarstad et al., 2016; Boschma & Iammarino, 2009). In addition, diversification implies a more robust position in the event of market stagnation or a drop in (commodity) prices.

The case study presented here exemplifies how *MNC in* and *MNC out* in different ways and to a differing extent influence cluster renewal. Whereas both regional dynamics and extra-regional linkages of course are important for cluster renewal (Njøs & Jakobsen, 2016), we have intended to exemplify how extra-regional linkages should be considered heterogeneous. Through including central aspects of theory from relational economic geography, we believe that cluster studies and evolutionary theory should take into account how diversified MNC practices influence processes of cluster renewal. We have attempted to illustrate how emphasizing the relational characteristics of economic activity (Fløysand et al., 2016; Nilsen, 2017), operationalized as the practice of MNCs, adds nuance to the typical view of extra-regional cluster linkages. Arguments for such a dualistic approach that considers the heterogeneity of extra-regional linkages and MNC practices has also been highlighted in, for instance, the literature on global value chains (e.g., Gereffi, Humphrey, & Sturgeon, 2005) and global production networks (e.g., Coe, Dicken, & Hess, 2008; Coe, Hess, Yeung, Dicken, & Henderson, 2004; Henderson, Dicken, Hess, Coe, & Yeung, 2002). Research in these areas emphasizes the importance of diversified input–output relationships and the spatial specificity of such practices and outcomes. However, cluster pipelines (i.e., extra-regional linkages) have largely been approached through a linear understanding. In addition, the relational content of such relationships is treated as homo- rather than heterogeneous. Thus, for analytical purposes, it is important that evolutionary frameworks nuance their understanding of economic practices. Moreover, this calls for context-specific approaches where the characteristics and uniqueness of different clusters are incorporated into theoretical and analytical frameworks (cf., e.g., Tödtling & Trippl, 2005). In addition, advancing this argument would require investigation of how interplays between differentiated MNC practices and cluster renewal takes place also in other industry clusters. We have indicated that balancing between continuation (i.e., extension of current practices)

and change (influx of novelty and diversified practices) is important for cluster renewal, and that *MNC in* and *MNC out* contribute differently in this processes.

CONCLUSIONS

This study illustrates how interplays between *MNC in*, *MNC out* and regional cluster dynamics influence cluster renewal. We have pointed out the importance of including a relational approach to current evolutionary reasoning, arguing for a perspective that views MNC activity as a practice involving networking and knowledge sharing. In our empirical example, *MNC in*, which refers to extra-regional firms coming into the cluster, was shown to contribute to sectoral diversification, i.e., expanding the cluster's profile. In contrast, *MNC out*, which refers to clustering firms of local origin internationalizing, was shown to contribute to increased specialization. However, the intention here is not to argue that *MNC in* contributes to a high degree of cluster renewal, whereas *MNC out* leads to a low degree of cluster renewal per se. In light of theoretical discussion, we have argued that the practices of *MNC in* and *MNC out* are important in the evolution of the cluster, as they balance each other and contribute to a continuation of the cluster profile (*MNC out*) and influx of novelty (*MNC in*).

Necessarily, outcomes of interplays between MNC practices and cluster evolution are the result of regional particularities and context specificities, implying that these interplays pan out differently in different cases. Nevertheless, this study contributes to the nuancing of theoretical assumptions on the role of extra-regional linkages in cluster renewal. The literature on cluster evolution and evolutionary economic geography should account for the heterogeneity of MNC practices when investigating cluster renewal. This requires investigation of the interplays between extra-regional linkages and context specificities such as regional particularities, the industrial affiliations of clusters and firm-level strategies when studying conditions for cluster evolution and renewal. Thus, the evolutionary literature on cluster evolution should also account for the relational content of internal and external cluster linkages, as these linkages in reality appear more complex than current evolutionary frameworks take into consideration.

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