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Global Sourcing Strategies and the Dynamics of Cluster Knowledge Sharing: An Evolutionary Perspective

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ABSTRACT

As clusters have increasingly become more globalized, an important question is whether this development changes the knowledge dynamics of clusters. This article addresses how cluster companies' global sourcing strategies affect cluster knowledge dynamics and innovation performance. The article combines insight from the literature on global sourcing and evolutionary theory with empirical findings from a regional cluster that has experienced the intensified globalization of cluster value chains over the last few decades. The case study demonstrates that the path-dependent characteristics of global sourcing strategies may lead to changes in cluster knowledge dynamics. Building on evolutionary theory and a case study from the maritime cluster in Norway, three propositions are presented, highlighting the path-dependent characteristics of global sourcing. A consequence of this path-dependency is that, over time, manufacturing capabilities will be lost when manufacturing is sourced out of the region in which it was previously located. This may create a barrier for the later backshoring of manufacturing.

KEYWORDS: Global Sourcing, Backshoring, Path Dependency

JEL CODES: O31, R110

Since Michael Porter rekindled Marshall's idea of industrial districts in the early 1990s, clusters have attracted a considerable amount of attention in research and politics. Porter claimed that the success of clusters lies in the proximity of companies in the supply chain, demanding customers, and a shared knowledge base (Porter, 1998). Central to this theory is that coordination and knowledge exchange between companies largely happen through

informal interaction between personnel in the cluster, with trust and social capital being of vital importance (Malmberg, Power, 2006). Sharing knowledge among cluster members, as well as learning, have been at the core of much of the cluster literature in the last few decades (Boschma, 2005; Rutten, Boekema, 2007; Staber, 2009), where knowledge transfer stems from the co-location of companies and the relational form of governance, facilitating the exchange of tacit knowledge (Bell *et al.*, 2009). The cluster approach acknowledges that interactive learning and innovation processes are context dependent, as they “*unfold in such ways that geographical space plays an active role*” (Malmberg, Power, 2006, p. 51). An important reason for this is the possibility for frequent face-to-face contact between cluster actors, but also the shared identity, norms and values of cluster members (Romanelli, Khessina, 2005), promoting close cooperation and exchange of knowledge. Hence, close inter-firm cooperation and social structures in the cluster stimulates collective learning and continuous innovation, creating competitive advantages for companies in clusters. The localized form of knowledge is often referred to as ‘sticky’ knowledge, as it is embedded in social interactions in specific geographical locations as clusters (Asheim, Isaksen, 2002). The ‘stickiness’ which is the contextual property of knowledge, is claimed to be the underlying explanation of why industrial cluster firms exhibit high innovativeness, which outperform others. Here, an underlying assumption is that the context-dependent and knowledge-enhancing structures of clusters are more important than knowledge acquired elsewhere (Asheim, Isaksen, 2002). It is even alleged that “*places matter more than ever because of globalization*” (Lorentzen, 2008, p. 539). Consequently, and in line with this view, knowledge structures in clusters are determining economic prosperity in today’s global economy (Malmberg, Power, 2005). The ‘stickiness’ is associated with territorially-delimited institutional traits, which have an impact on the direction and speed of the innovation processes (Malmberg, Power, 2006). In a globalized economy, the geographical anchoring of knowledge and learning is seen as a few remaining localized phenomena as it cannot easily be transferred to other places, but rather can be built up over time (Lawson, Lorenz, 1999).

Despite the vastness of the cluster literature, the conditions and effects of knowledge sharing in business clusters and networks are still under-explored. In particular, the role of clusters in an increasing globalized and digitized world is debated (Belussi, Sedita, 2012; De Marchi *et al.*, 2018; Götz, Jankowska, 2017). A key question is how (or whether) cluster dynamics change when value chains that were previously contained inside a geographically-limited region, with close ties between the actors in the chain, are transformed into globally-distributed supply chains. Despite the “*crescendo of interest in the*

local/global issue” (Belussi, Sedita, 2012, p. 166), there is still a lack of research regarding the effect of globalization on cluster relationships and knowledge (De Martino *et al.*, 2006), and on global connectivity in the context of cluster evolution (Mudambi *et al.*, 2017). In order to gain an understanding of the role of clusters under the duress of globalization, the following research question needs to be addressed: how do the global sourcing decisions of cluster companies affect knowledge dynamics in the cluster in which they are a part? In order to answer this question, we need to take a long-term perspective of cluster development. This is done by introducing evolutionary theory into the discussion, which will be addressed in the following section.

Theoretical Framework

Evolutionary Cluster Theory

Porter (1998) claimed that a cluster’s roots can often be traced to historical circumstances, while in the same paper he argues that the emergence of clusters is often the result of chance events. He explained the death of clusters by technological discontinuities that arise when cluster knowledge becomes outdated, referring also to internal rigidities such as regulatory inflexibility, restraints on competition, and groupthink. Researchers have been concerned with explaining why and how some clusters prosper and others decline, which has led to an “*upsurge of interest*” in evolutionary approaches in the economic geography literature (Coe, 2011, p. 81). Evolutionary economic geography applies core concepts and methodologies from evolutionary economics in order to explain such territorial and institutional differences (Boschma, Frenken, 2006). This approach tends to explain territorial concentration by differences in the history of the firms and industries residing there. Authors within this tradition argue that history that is represented by regional structures, institutions and ideas may act as a ‘filter’ for seizing new opportunities (Lambooy, Boschma, 2001). The recent theory development within this field provides an open-ended view of the evolution of the agglomeration of economic activities, and applies key notions such as path-dependency, technological trajectory, chance and technological lock-in (Boschma, Frenken, 2007; Boschma, Martin, 2010). In particular, this approach is used to explain the capacity of regions to develop new innovations or to adjust to new technology. According to Lambooy and Boschma (2001), the notion of path-dependency in evolutionary economics is related to the collective knowledge, institutional structures and social conventions in regions (Storper, 1997).

The evolutionary approach within economic geography addresses historical developments at a regional level. However, it is recognized that changes happen incrementally at the microlevel, resulting in fundamental institutional changes over the long term (Martin, 2010). Decisions regarding global sourcing can be considered to be such microlevel changes. In this way, evolutionary theory represents a link between theories addressing decisions at the transaction level, and the macro-level development of whole regions. The transaction cost approach (Williamson, 1975) is one of the theories that explain and predict decisions at the transactional level. A transaction is a relation between actors that is embedded in an institutional context, which shapes these relations (Bathelt, Glückler, 2003). Furthermore, evolutionary theory argues that changes at the transactional level define a development path. This means that past decisions at the transactional level represent both opportunities for present choices, as well as limiting the possible set of decisions in the present. Hence, the evolution is path-dependent. Relations between actors in networks are shaped by previous and present transactions that over time become institutionalized in the network.

Bell *et al.* (2009) focus on this interaction between the institutional level and transactional level when they develop a model for cluster evolution. A key point in this model is that effective transactions require a match between the institutional level (cluster macroculture), and the transactional level (governance). Furthermore, the model links choice of governance to the form of governance that is exchanged between the companies, where they use the well-known typology between tacit and explicit knowledge (Polanyi, 1967). A main takeaway from Bell *et al.*'s (2009) model is that there is room for actors choosing new forms of governance, creating a mismatch between the institutional and transactional level. This will in turn establish a new path-dependent development of the cluster.

According to Martin and Sunley (2006), "*a path-dependent process or system is one whose outcome evolves as a consequence of the process or system's own history*" (P. 399). Studies have demonstrated a range of possible sources of path-dependence in regions, as sunk costs of local assets and infrastructures, regional technological lock-in, region-specific institutions, cultural traditions, and interregional linkages and dependencies (Martin, Sunley, 2006). In the model developed by Bell *et al.* (2009), they specifically point to the transaction's specific mode of governance as being path-dependent, in that they claim that it is easier to move from a relational form to a hierarchical form of governance than in the opposite direction. However, this is not tested using empirical data in the article. In Halse (2017) this model is developed further, introducing globalization, where it is indicated that the

process of global sourcing is path-dependent. By using cluster companies that have the same institutional context, it is suggested that the globalization of cluster value chains has led to a move from a relational form of governance towards other and more formalized forms of governance. These formalized forms of governance are associated with the exchange of explicit knowledge, which does not exhibit the localized traits as the exchange of tacit knowledge. Consequently, this view suggests that the globalization of cluster value chains will lead to the development of an evolutionary path where tacit knowledge plays a less important role, changing the knowledge dynamics of the cluster. The present study will explore this further, first by discussion of the role of clusters in a global world, and then looking deeper into the global sourcing decision itself, before addressing possible consequences for cluster knowledge dynamics through a case study of the maritime cluster in North West Norway.

Clusters in a Global World

In a regional production system, as in an industrial cluster, knowledge associated with the different stages in the production from raw material to end customer is gradually built over time. The dominant view of what services and products are appropriate to produce in-house, and what to source out outside the company, has changed over time. However, as long as most of the production network has been confined within a region, regional knowledge has been developed and has been accessible for companies being part of the network. Cluster theory has emphasized such systems as being particularly innovative, and frequently cited examples has been Silicon Valley (Saxenian, 1994), industrial districts in Italy (Becattini, 1991) and Baden-Württemberg (Cooke, 1997). Since Porter addressed and created attention to the innovativeness of clusters in the 1990s, reduced trade barriers, the availability of communication technology, and faster and less expensive transportation, has made clusters more open in different ways. Cluster based firms increasingly engage in multiple knowledge networks, production networks and value chains on multiple geographical scales (Gereffi *et al.*, 2005; Gupta, Subramanian, 2008).

Globalization of clusters was addressed relatively early in the cluster literature (Amin, Thrift, 1992; Malmberg, Power, 2005). This was a consequence of the increased global sourcing from the 1990s, creating global value chains spanning large geographical distances. The globalization of cluster value chains represents in many ways a paradox, since cluster's competitive advantage lies in local things (Porter, 1998). Nevertheless, much of the literature have had a rather romantic view of this development, and even

regarded this as a necessity for avoiding cluster lock-in. The seminal article by Bathelt *et al.* (2004) points to the advantages of establishing ‘pipelines’ to knowledge sources outside the cluster. Through these pipelines between cluster companies and the rest of the world, the companies in the cluster may absorb new and otherwise not available knowledge. This knowledge would presumably spill over to other companies in the cluster through ‘local buzz’. From this perspective, global value chains may stimulate innovation in the cluster, which is of vital importance for its long-term survival. This positive view of cluster globalization has gained considerable support among researchers. According to this literature, the most innovative firms are those who access international sources of knowledge, where they combine the strong local knowledge base in the cluster with high levels of connectivity to other regions in their global networks (Belussi, Sedita, 2012; Mudambi *et al.*, 2017; Simmie, 2003). This literature seems to assume that localized (tacit) knowledge is rather easily combined with global (explicit) knowledge, leading to cluster competitiveness (MacKinnon, Cumbers, 2011; Semlinger, 2008), and creating opportunities for new path development in clusters (Trippel *et al.*, 2018). Consequently, global sourcing may represent an opportunity for creating knowledge links (‘global pipelines’), facilitating innovation and cluster competitiveness. The opposite effect would be that the system’s knowledge base becomes eroded, leading to reduced innovative capacity. In line with the latter view, it has become widely recognized that knowledge and capabilities associated with manufacturing have become depleted over the years since offshore outsourcing gained momentum in the 1990ies (Pisano, Shih, 2012). The argument is that sophisticated engineering and manufacturing capabilities underpinning innovation have been lost together with the global sourcing of manufacturing (Pisano, Shih, 2009). Following this logic, this means that these capabilities need to be restored when bringing manufacturing back home. In line with this view, global sourcing may represent a depletion of localized knowledge, as knowledge associated with the activities is moved out on the cluster.

Global Sourcing Strategies

The terms outsourcing, offshoring and global sourcing are often used interchangeably without clear definitions (Fratocchi *et al.*, 2016). Outsourcing means that a company allows an external and independent vendor to perform the activity, which can be considered as an alternative to keeping the activity internally within the organization (Williamson, 1975). The term offshoring can be defined as “*transferring activities over geographical boundaries but internally within the enterprise*” (Kotabe *et al.*, 2008), and is often called

'captive offshoring' since the activity is owned by the organization (MNC). The term 'offshore outsourcing' means moving the activity to a supplier outside the organization's borders and outside the focal company's home country (Pyndt, Pedersen, 2006). Here we use the term global sourcing, encompassing moving activities outside the home country's borders, either through an external foreign supplier, or to a foreign subsidiary in an MNC.

Sourcing decisions have frequently been analysed using the basic theoretical frameworks provided by transaction cost theory and the resource based view. In principle, transaction cost theory prescribes what activities should be carried out in-house or by an external supplier (the boundary of the firm), while the resource based view focuses on companies' core competence, which should be kept in-house (Prahalad, Hamel, 1990). When global sourcing became prevalent, geography became introduced as a new and relevant variable in the discussion. Consequently, several theoretical approaches emerged, as well as different concepts and definitions (Pyndt, Pedersen, 2006). The global value chain (GVC) literature (Gereffi *et al.*, 2005) addresses this question using transaction cost theory, introducing theory on production networks, technological capability, and firm-level learning into their model. Gereffi *et al.*'s (2005) focus is on governance patterns in global value chains, specifically what mode of governance is appropriate or most effective, depending on the complexity of transactions, the ability to codify transactions, and the capabilities in the supply-base. The GVC approach has, however, been criticized for being linear (MacKinnon, 2012) and failing to account for the social structures within which transactions are embedded. This is in particular relevant in offshoring decisions, involving cultural differences between the home company and the foreign site supplying products or services.

Backshoring is a global sourcing decision that has gained increased interest the last years. Backshoring is broadly speaking the opposite sourcing decision as global sourcing, involving moving activities back to the 'home' country. When it comes to backshoring, the definitions are less clear. This may be because this is a relatively new phenomenon, and therefore one has not agreed on a common definition. Ellram *et al.* (2013) defines 'reshoring' and 'back-shoring' as "moving production back to the country to [the firm's] parent company" (p. 3). Gray *et al.* (2013) expand this by taking into account the ownership dimension at home and abroad, and proposes a typology with four cases: in-house reshoring, outsourced reshoring, reshoring for outsourcing, and reshoring for insourcing. In this study the term backshoring is used, which in principle includes all cases of the return of production, regardless of ownership. Nevertheless, we will address cases where production is moved from abroad into its own organization 'at home', either from foreign suppliers

or independent foreign suppliers. The literature on backshoring is still scarce and has mainly been focusing on the extent and drivers of this phenomena (Kinkel, 2012; Kinkel, Maloca, 2009), decision-making (Tate, Bals, 2014), and consequences (Kinkel, 2014), applying the same basic theoretical frameworks as used to explain and analyse the global sourcing decision. Recently, however, the knowledge perspective has been introduced into the debate on backshoring (Nujen *et al.*, 2018; Nujen, Halse, 2017; Halse *et al.*, 2019). In particular, this literature addresses how the institutional context affects backshoring decisions, and the depletion of organizational knowledge as a result of previous global sourcing decisions.

Global Sourcing and Cluster Evolution

To address the long-term effect of sourcing decisions, Tate *et al.* (2009) study the process associated with global outsourcing of services from an evolutionary perspective. Building on institutional theory, transaction cost and resource-based perspectives, five propositions are presented, which explore the motivation and evolution of offshore outsourcing. Their findings show that when it comes to offshore outsourcing of services, the governance structure changes over time. Initially, the competitive pressure dominates, followed by a cost focus before additional benefits are discovered leading to structural adaptations through changes in governance and geography. In general, this study presents a positive picture of the offshore outsourcing process, where the firms in the study realize that the foreign supplier “*can add value beyond simply lower cost*” (Tate *et al.*, 2009). The conclusion in this study is based on offshore outsourcing of IT, call services and back offices in nine case companies within seven different sectors. Hence, the generalizability of the study is limited, in particular to cases with outsourcing of manufacturing. Furthermore, Tate *et al.* (2009) do not address an important evolutionary aspect of offshore outsourcing that is in the heart of evolutionary theory, namely path-dependency.

The present paper, however, aims at analysing global sourcing decisions by introduction the concept of path-dependency from evolutionary theory. Following the arguments of Bell *et al.* (2009) and Halse (2017), path-dependencies may reside in the governance choices made by firms for a particular transaction. In this, the focus is on structural inertia caused by cost associated with organizational change in routines, adjustment and rules of conduct (Hannan, Freeman, 1984). Moreover, both articles emphasize the form of knowledge as being closely connected to the mode of governance. In this view, the move from the exchange of one form of knowledge to another is a consequence of a change in mode of governance caused by the globalization

of cluster value chains. Knowledge is emphasized as a vital characteristic of the transaction or the institutional context, being something that actually creates the path-dependency.

Summary of Theory and Theoretical Framework

In this theory section, we have presented the theoretical foundation in order to analyse how recent development in evolutionary theory can provide insight into global sourcing decisions, and how these sourcing decisions may affect the long-term knowledge dynamics in clusters. We have seen that the process associated with global sourcing of services has previously been studied from an evolutionary perspective, focusing on how governance structures and expectations change over time (Tate *et al.*, 2009), but without shedding light of cluster knowledge dynamics and specifically the growing literature on cluster evolution (Jakobsen *et al.*, 2012; Malmberg, Maskell, 2010; Martin, 2010). Moreover, within the cluster field of research, several studies have shed light on how global pipelines may contribute positively to the cluster knowledge base (Bathelt *et al.*, 2004; Belussi, Sedita, 2009), however without studying how the establishment (through global sourcing) or removal (through backshoring) of these global pipelines may affect cluster knowledge dynamics.

The theoretical passages laid above represent the foundation for the theoretical framework applied in the study. First, at the cluster level, the knowledge dynamics of the cluster is vital for cluster innovativeness. The innovativeness stems from close relations and intense knowledge exchange between cluster companies. The knowledge that is shared is a combination of tacit and explicit knowledge, where especially the tacit component is context dependent or 'sticky' (Markusen, 1996). Furthermore, at the organizational level, cluster companies make global sourcing decisions. In this study, two main decisions are addressed: global sourcing and backshoring. By combining these two analytical levels, the evolutionary dimension of global sourcing, and how this affects cluster dynamics, can be addressed. In order to investigate this further, we have collected data from companies in an industrial cluster called the maritime cluster in North West Norway, which will be presented in the following.

Methods

Research Design

This study aims at shedding light on how global sourcing decisions affect cluster knowledge dynamics, which calls for an in-depth qualitative analysis of a cluster (Yin, 2009). Case studies offer exploration of the development over time (Welch *et al.*, 2011), which is particularly appropriate in this study. Furthermore, building on existing theories and collected data, a case study is appropriate for developing new theory (Eisenhardt, 1989; Voss *et al.*, 2002), which is the aim of this study. In order to understand how global sourcing decisions affect cluster knowledge dynamics, we need a deep understanding of the cluster context. The research design in this study is a single embedded qualitative case study of the global sourcing decisions of companies in the maritime cluster in Norway, located in the county of Møre and Romsdal in North West Norway. This particular cluster is appropriate for this study, as it has a long history, where relational ties and cooperation between cluster actors has developed over time. Furthermore, in the last decades companies in the clusters have carried out both outsourcing and backshoring, making it possible to study both sourcing strategies in the same context, which is important to give a more comprehensive answer to the research question. As the study is historical in its nature, the research design involved the mapping of changes over time, that was captured through a combination of historical, retrospective, and real time data (Pettigrew, 1990), including primary and secondary data sources.

Data Collection and Analysis

As previous knowledge about the path-dependent characteristics of global sourcing is limited, a qualitative approach was chosen (Denzin, Lincoln, 2005). The data collection was carried out in two steps, collecting a combination of primary and secondary data. First, the cluster context was explored in order to analyse the historical foundation of the cluster culture, which is central to understanding the organically evolved knowledge base. A comprehensive document study was performed, comprising company documents as well as previous historical studies of the cluster, including interviews with personnel with a long history in the cluster. The document study included document analysis of annual reports, strategy plans, internal documents and magazines, newspaper and web articles, journal articles, research reports, and books describing the historical development of the companies. Moreover, previous surveys carried out in the cluster were part of the study. The aim of

this part of research was to describe the historical foundation and development of the cluster, and in particular identify how the relations and knowledge dynamics have developed over time. By interpreting these data in their own historical context, an impression of how actors make sense of the world around them was obtained (Kipping *et al.*, 2014).

The second part of the data collection aimed at collecting, firstly data about the offshore outsourcing process; what consideration were made, and what changes did it lead to. Secondly, the backshoring decision and process was explored. Here, the study has been supported by previous published studies of the clusters, and primary data collected through in-depth semi-structured interviews and observations in meetings in central cluster companies, as well as company documents. The interviews were carried out with managers in three shipbuilding companies, one design company and four equipment suppliers. In the interviews, questions were formed to identify the most important sources of knowledge both internal and external to the cluster, with a particular focus on the processes leading to the development of products and new concepts. Furthermore, information was collected regarding knowledge sharing between cluster companies, and whether there have been changes in knowledge exchange over the last decades of intensified globalization, and the recent trend with backshoring. The transcripts of the interviews were analysed by highlighting and categorizing quotes relevant to the research question, in order to identify patterns and themes in the material (Yin, 2009). The process was carried out in two main steps, where in the first step the themes derived from theory were identified from the transcripts. In the second step, which was a coding process, data was categorized into specific groups that addressed knowledge dynamics in the cluster (historically founded), the global outsourcing decision, the backshoring decision, and experiences with backshoring related to knowledge. The data analysis was a continuous and iterative process, carried out in parallel with data collection and theory development, in accordance with the qualitative and explorative nature of this research.

The Maritime Cluster

The cluster under study has its geographical location at the northwest coast of Norway, with a geographical center in the county of Møre and Romsdal. The cluster is part of the maritime industry in Norway, which has a long history and rich tradition of shipbuilding, fishery services, and costal transport in the region. The historical foundation of the cluster can be traced back to the 19th century, with the development of shipping and fisheries based

on a strong tradition for cooperative entrepreneurship (Bjarnar *et al.*, 2006). Previous studies have explored the historical development of the cluster (Amdam, Bjarnar, 2015), and in particular the importance of close relational ties between the companies in the cluster, involving extensive exchange of tacit knowledge (Asheim, Isaksen, 2002; Halse, Bjarnar, 2014). Historical records describe how the small shipyards worked closely with ship owners to tailor the vessels and equipment to the specific operating needs. Moreover, the completeness of cluster value chains has been emphasized as being essential for the cluster's innovativeness and economic success in times when shipbuilding has been shut down in other high-cost locations. Furthermore, the cluster has been awarded the prestigious status as Global Centre of Expertise by the Norwegian government, which has led to governmental support for promoting innovation, building common meeting places, and carrying out research projects related to technology development and cluster competitiveness.

Historically, the role of skipper owned companies within deep sea fishing have been important for the earlier development of the cluster (Berge, Bjarnar, 2008). In the 1970's, the discovery of oil in the North Sea gave new opportunities for the companies in the cluster, and the activity shifted from the construction of fishing vessels to the delivery of specialized vessels, equipment and services to the offshore sector. Over the following decades, the cluster fostered innovations in design, engineering and the construction of offshore and specialized vessels to the offshore sector, creating a global niche through a focus on product innovation and the management of complex projects. The cluster became specialized towards delivering tailor-made highly unique ships made primarily for the offshore service market, named offshore supply vessels (OSV's). In this period, the number of equipment suppliers has grown representing today the largest group of companies in the cluster. These are companies not only delivering internally to the cluster, but have become global suppliers. The vessels produced in the cluster are built on a high degree of customization for individual customers. Despite of high cost associated with this strategy, the cluster has proved to be successful, due to high degree of innovativeness and being world leading in systems integration.

At the start of this decade, the maritime cluster accounted for the largest share of the region's overall value creation in the private sector compared to the eight other maritime regions in Norway (Menon, 2011). In the period 2004-2014, the companies in the cluster experienced a strong growth where 8000 new jobs were created, and total value added increasing 13% annually, reaching 23 billion NOK in 2014 (Mellbye *et al.*, 2015). In 2014, the cluster was hit hard by the oil-price shock, and experienced a marked reduction in

activity, where almost one third of the jobs in the cluster disappeared the following years. Due to the oil crisis, the demand for new offshore vessels has been close to non-existing, and the last years' profit of the margin of the cluster was reported to be negative for the third consecutive year (Jakobsen *et al.*, 2018). However, since the oil-shock, the cluster has gone through a transformation involving a reorienting from offshore oil and gas market towards other markets as vessels for fisheries, aquaculture (fish farming), short sea shipping (ferries) and cruise. The distribution of the cluster's combined revenues on different markets is shown in Figure 1 (Jakobsen *et al.*, 2019).

There is an expectation of increased revenues in the future, which is expressed by the quote "*the tide is turning*" (Jakobsen *et al.*, 2018, p. 31). However, there are some concerns regarding the productivity of the cluster, which according to the report is decreasing. The report argues that this development may be due to a weakening of cluster linkages, which traditionally has been highly integrated within the cluster. Moreover, because of the oil crisis, cluster companies have had to orient themselves to new customers outside the cluster, where new relations need to be developed.

Today the cluster consists of more than 200 companies, where the majority is equipment suppliers. The companies in the cluster can be categorized into four main groups; shipping companies, shipyards, equipment suppliers and companies delivering design and services. The employment and share of value creation corresponding to these categories are shown in Table 1.

Figure 1 - Cluster revenues on different market segments

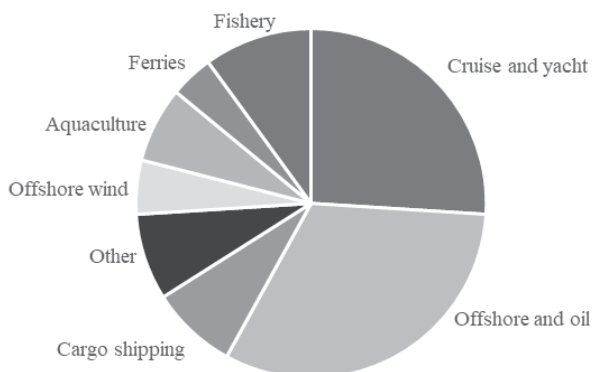


Table 1 - Companies in the maritime cluster

Category	Number of firms	Employment	Share of value creation
Shipping companies	18	3400	42%
Shipyards	14	3300	11%
Equipment manufacturers	170	4500	27%
Design and services	13	3000	11%
Sum	215	14 200	100%

(Jakobsen *et al.*, 2019; GCE Blue Maritime Cluster, 2018)

Shipping companies deliver offshore shipping to the offshore industry, as well as wellboat transport and other services to the aquaculture industry. The shipyards are delivering vessels to shipping companies in the cluster, mainly within the offshore sector, but also vessels to other segments, as cruise. The cruise and ferry segments have increased markedly the last years, while the demand for offshore vessels has fallen (Jakobsen *et al.*, 2019). Equipment suppliers, representing the largest group of companies, are mainly delivering equipment to shipyards in and outside the cluster. The last category are companies delivering design and different services to other cluster companies, and directly to foreign companies. This includes activities as ship design, trade, installation and service. Even though the number of employee is almost at the same level in the different category of companies, the value creation varies significantly, as can be seen from Table 1.

In the following, the findings of this study are presented, related to cluster knowledge dynamics and global sourcing strategies, and where the path-dependent characteristics of global sourcing will explained in greater depth.

Cluster Knowledge Dynamics

Historically, dispersed ownership and short social distances have characterized the culture in this region. Strong cooperative links were developed between shipping, fishery, shipbuilding, and related production and service industries, which constituted a kind of federation within this maritime complex (Andersen, 1997). The cluster business culture facilitates knowledge sharing and innovation, combined with competition (Bjarnar, Gammelsæter, 2003). Innovation in the cluster is characterized by local user-producer interaction, incremental improvements on the shop floor, knowledge spill-over and local supporting organizations (Asheim, Isaksen, 2002).

Even though cluster firms have cooperated with external R&D institutions, both nationally and internationally, the exchange of tacit knowledge in informal settings has been the most important for the transfer of knowledge between actors in the cluster. Historically developed unique competence of firms supported by local institutions has been the most important factor for cluster competitiveness, whereas knowledge at the national and international level has played a subordinate role (Isaksen, 2009). Recent studies of cluster culture under the pressure of globalization show that strong norms for knowledge sharing within the cluster remain prominent (Bjarnar, 2010; Halse, Bjarnar, 2014). The cluster is characterized by strong relational ties between actors, maintained through cooperation in work-related projects as well as in a variety of social settings after working hours (Asheim, Isaksen, 2002), where small social distances between individuals promote the relational form of interaction. Furthermore, people working on the shop floor have the freedom to make improvements and make decisions without asking for permission, and trying something new and different is considered positive. Entrepreneurs hold a high social position in the community, and failure to establish a new business is not regarded negatively. Summing up, the historically founded cluster culture involving norms for cooperation and knowledge sharing has been decisive for the knowledge dynamic in this cluster.

Global Sourcing

The last decades we have witnessed an increased globalization of the cluster, both up-stream and down-stream in the supply chains. First, increased market shares stem mainly from markets outside the North Sea (Oterhals *et al.*, 2008). Second, the supply side of the cluster has also become internationalized. This development has taken place in several ways and at different stages of the supply chains. Equipment suppliers have increasingly outsourced their production to foreign countries. These sourcing decisions have mainly been made based on cost considerations, but also in order to follow regional customers, mainly shipbuilding companies. The number of shipyards is small, but these are nevertheless regarded as focal firms in the cluster. Several of these yards belong to the same shipbuilding group. During the 1990s, global sourcing of the construction of vessels was initiated, when some actors started to outsource the construction of hulls to East European countries, like Poland and Romania. The main production strategy since then has been to perform the construction of hulls as well as simple equipping at shipyards abroad, and then tow the hull to the cluster for the main part of equipping, finalization and testing (Halse, 2014). In the recent decade, some of the shipbuilding

groups have started to move up in the supply chain, by integrating design and other suppliers into their group. The trend has shifted towards a focus on design, engineering and effective execution of shipbuilding projects, while considering shipbuilding as an activity that may be carried out at shipyards all around the world. This development has led to an increasing number of vessels to be constructed at foreign production sites as in Dubai, China, Turkey, South Korea and Brazil.

The trend of offshoring of the manufacturing of hulls and complete vessels can be explained from different angles. First, markets in East Europe opened up after the dissolution of the Soviet Union, creating new opportunities for economical transactions. Second, the price of labour in these countries was low, compared to the high level in Norway, making offshoring of work-intensive activities economically interesting. However, we also have to take into consideration the general trend of outsourcing that was swiping the western countries in this period. After the fall of mass manufacturing in the 1970, dominated by vertically integrated large companies, companies became concerned about core business, which implied sourcing out activities that were considered “less valuable”. However, when the opportunity for building vessels outside of the cluster came up, shipyards in the cluster were reluctant to take on this strategy. The idea of moving manufacturing outside the region represented a marked break with the past, where the construction of vessels had been carried out internally in the cluster. Nevertheless, gradually the shipyards sourced out the manufacturing of hulls to East European Countries. The first shipyard in 1996, and the last shipyard embarked this strategy in the beginning of the 2000s. The attitude towards global sourcing developed in this period, from scepticism to a general acceptance that this was a necessary strategy to be competitive in the market. An important observation is that cluster companies have offshored manufacturing of hull at different points in time. The first shipbuilding company embarked outsourcing in 1996, while the last waited until the beginning of 2000.

The outsourcing of the hull production implied that the production philosophy was changed (Halse, 2014). The traditional way of building vessel was module based, where the outfitting took place before the modules was assembled to the complete vessel. The offshore outsourcing of hulls implied that the outfitting of the vessels had to wait until after the production and transportation of the hull to the regional yard. This was less practical as it was necessary to cut holes in the hull in order fit in the equipment. Furthermore, it eliminated the possibility that different shipyards cooperated in the building process, by building different sections of vessels, which was common when cluster companies were taking on larger projects that they

could not handle by themselves. In the first years of offshore outsourcing of hull manufacturing in the cluster, there were several quality issues regarding the steel work. The quality issues are now mainly related to the outfitting part of the work that is carried out at the foreign subsidiary. However, the respondents are still worried by the lack of steel competence in the cluster. This knowledge has eroded since the generation that have had this knowledge are about to leave, and the knowledge has not been transferred to younger generations. Previous studies have revealed that due to offshoring, relations connected to knowledge sharing have changed. More structured innovation processes, increased formalization, protection of knowledge, and a growing internal organizational focus is reported (Halse, Bjarnar, 2014).

Backshoring

One of the shipyards in the cluster started in 2012/2013 to prepare for backshoring of the most critical module of the hull where the engine is located. This was done by using new technology as welding robots (Nujen, Halse, 2017). This case represents reshoring for insourcing, in that they took control over the activity by moving it from an external supplier into their own organization, back to the regional shipyard. According to one of these companies, an important reason for backshoring a part of the manufacturing of the hull, was to maintain the competence in the company, as they were aware that vital manufacturing competence was lost when they offshored and outsourced this activity. Moreover, it was important to regain control over the manufacturing process, especially over the most complex part of the process. According to a respondent, the company had great success with their backshoring strategy. Not only from an effectiveness and economical point of view, but more important has backshoring initiated innovation processes related to the design of the hull itself, which has been unchanged for many decades. Due to the relatively short time-span between offshore outsourcing of hull production and the backshoring of parts of it, the company still had organizational capabilities to implement the strategy, which turned out to be critical when they introduced new technology with automatization in manufacturing. Furthermore, an equipment supplier that also had brought back manufacturing, claimed that local manufacturing facilitated product development and the making of prototypes.

Most companies in the cluster, however, have chosen to continue the strategy they started in the 1990ies, and have moved more work to hull yards in East Europe. Organizational barriers to backshore hull production have been reported to be knowledge and access to workers with the right

competence. Moreover, the lack of appropriate production facilities is also pointed to as a barrier to sourcing back. Ownership of foreign hull yards has also been considered as a barrier to bringing back manufacturing.

Global Sourcing From a Cluster Evolutionary Perspective

The maritime cluster has evolved organically over several centuries, where the relational bounds between companies involving intense sharing of tacit knowledge, has been vital for cluster innovativeness. Moreover, historical studies of the cluster demonstrate that the cluster has had a unique ability to find new technological solutions when the market has changed. This illustrates how cluster knowledge has dynamically adapted to new situations. This knowledge dynamics represents an evolutionary path of the cluster (Malmberg, Maskell, 2010). The transition from building fishing vessels with sophisticated equipment to offshore supply vessels in the 70ies and 80ies illustrates how the knowledge dynamics associated with this evolutionary path has evolved in order to comply with changed market needs. Within this evolutionary path, decisions at organizational and interorganizational levels have been made in accordance with, and have further developed, the regional culture, knowledge basis, and knowledge dynamics that characterize this evolutionary path. From a transaction cost perspective, the transactions at the interorganizational level have been cost effective (Bell *et al.*, 2009), but more important, these decisions have improved the foundation for future cluster innovativeness. New market opportunities further pushed forward cooperation, in order to be able to deliver larger and more sophisticated vessels (Smogeli, 1983). The development paved the way for growth in regional equipment production, and the development of new and more sophisticated and advanced technology, still based on the close user-produced linkages in the cluster.

The decision to move manufacturing out of the cluster, *i.e.* global sourcing, is an organizational decision that in an evolutionary perspective may be claimed to represent a break from this evolutionary path. Regional links between cluster companies with the exchange of tacit knowledge, becomes replaced by interorganizational links to companies at foreign locations, where coordination of activities takes place (Halse, Bjarnar, 2014). The coordination of global supply chains requires mainly the sharing of information and explicit knowledge. We claim that this development towards more globalized supply chains, represents the development of a new evolutionary path

(Boschma, 2007) with a different knowledge base and knowledge dynamics than the historically and organically evolved path. This is in particular demonstrated by the concerns expressed by the respondents of the lack of manufacturing knowledge, but also the indications that interorganizational linkages in the cluster have been weakened.

Over the last decades, global sourcing has become the norm, as this strategy has gained legitimacy among cluster managers. However, in the recent years, backshoring has received increased attention, as a part of a wider trend that has spread in Western countries (Dachs *et al.*, 2019). Still, there are only few companies in the maritime cluster that have chosen to move back large part of their previously outsourced manufacturing. The companies that have moved manufacturing back, have pointed to the importance and challenges associated with the eroded knowledge base due to offshoring, and the need to rebuild this knowledge. The shipbuilding group in the cluster that has been pursuing a backshoring strategy, has due to the relatively short time-span between offshore outsourcing of hull production and the backshoring of parts of it, still had organizational capabilities to implement the strategy. This was necessary when they introduced new technology with automatization in manufacturing (Nujen *et al.*, 2018). Moreover, the decision to bring back manufacturing made it possible to further develop parts of the vessels that had remained unchanged during the years manufacturing was carried out outside of the cluster.

Consequently, the findings support the view that global sourcing of manufacturing is in fact path-dependent, as global sourcing alters cluster knowledge dynamics in ways that is difficult to reverse through the opposite process, that is backshoring. The other companies in the cluster have not yet regarded this as a feasible strategy, with the competence and facilities they possess today. They chose an evolutionary path that has been increasingly difficult to reverse as the years have passed. To our knowledge, this is a characteristic of path-dependency that has not received particular attention in the literature.

Table 2 presents selected quotes from primary and secondary data collected, which illustrates interdependencies between the stage of development of a cluster and the sourcing strategies. Based on the theoretical study and the data collected from the in-depth study of the two case companies, the following propositions are presented:

Proposition 1: Global sourcing of manufacturing is a path-dependent process.

Proposition 2: The path-dependent property of global sourcing is reinforced over time.

Proposition 3: Over time, regional manufacturing networks that have sourced out manufacturing out of the region in which it were previously located, will lose manufacturing capabilities, creating a barrier to source back manufacturing to the home region.

Table 2 - Quotes illustrating interdependencies between the stage of development of a cluster and the sourcing strategies

Historically conditioned cluster knowledge dynamics	Global sourcing decision (After 1990)	Backshoring decision (After 2000)	Path-dependent characteristics of global sourcing
<p>"[S]mall firms, regional clustering and diversification of tasks proved crucial for the survival of the fleet and the maritime complex." (Andersen 1997)</p> <p>"We have our way of doing it, and in a way we have built up knowledge in the area here with an agglomerate is wonderfully effective." (Manager, ship design company)</p>	<p>"They (the foreign shipyard) think in a different way than we do. Right or wrong." (Manager, ship design company)</p> <p>"I am afraid that we are about to undermine a bit of our knowledge accumulation and our experience base, as we source more and more out." (Manager, shipbuilding company)</p>	<p>"Perhaps the most important argument for pursuing a backshoring strategy, is to build the knowledge of how to produce, and to be able to retain this knowledge." (Manager, shipbuilding company (Halse et al., 2019)</p>	<p>"It is much more demanding to take back knowledge-intensive activities compared to outsourcing." (Manager, shipbuilding company)</p> <p>"It is about what knowledge that remains in the organization, which must exist in order to produce, and that we may not still have." (Manager, shipbuilding company; Nujen, Halse, 2018)</p>

Conclusion

A theoretical study has been carried out in order to analyse how evolutionary theory may provide insight into how global sourcing- and backshoring decisions affect cluster knowledge dynamics. Previous studies have indicated that offshore outsourcing is a path-dependent process, but studies on this aspect of global sourcing as well as backshoring are scarce. Based on a case cluster, the study has demonstrated the evolutionary properties of offshore outsourcing of manufacturing. In particular, it is found that knowledge

represents an important barrier to backshoring manufacturing, as manufacturing competence may be difficult to rebuild.

This research contributes to theory by examining the potential of applying evolutionary theory to theory on global sourcing, which has been dominated by transaction cost economics, the resource based view, and the global value chain literature. Furthermore, the study adds to the growing literature on cluster evolution, shedding light on how strategic decision at organizational level may affect the long-term development of cluster knowledge dynamics and innovativeness. Based on literature and findings from the maritime cluster in North West Norway, three propositions are made. Regarding managerial implications, this study provides insight in how global sourcing decisions that at the outset seem to be economically beneficial, may have long-term consequences for companies as well as regions, which may limit the opportunity space for later decisions of reversing previous sourcing decisions.

Due to the study's in-depth exploratory nature, only one cluster was studied, which represents a limited analytical generalizability of the study. Further studies should be carried out in different industries and contexts in order to explore the path-dependent nature of offshore outsourcing decisions. Furthermore, other possible path-dependent consequences of sourcing decisions should be explored.

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