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Global production networks and strategic coupling in value chains entering peripheral regions

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ABSTRACT

In economic geography, scholars have discussed how endogenous regional sources of skills, networks and capital have led to new regional industrial growth. However, extra-regional dimensions and global production networks has mostly been left behind in the literature. In this paper, I develop a conceptual framework through the analysis of how exogenous sources are coupled to regional actors through the lenses of Global Production Networks and Global Value Chains in offshore oil. The author find that strategies in GPN lead firm vary between local integrative strategies and more complex global strategies. I demonstrate that GPN strategies have different impacts on local development processes, whereby strategies in the early phases of the value chain (i.e. drilling and seismic surveys) were path dependent and led to few local linkages due to lack of competence and infrastructure locally. The GPN strategies in late stages of the value chain (operations) were more context sensitive, as GPNs sought new solutions in procurement and oil spill preparedness, which together increased the local linkages. The implications for policy are to develop cautious regional development policies that are sensitive to specific GPN value stages and lead firms within GPNs.

1. Introduction

A prominent feature in today's regional economies is that an increasing share of the capital flow is influenced by foreign direct investments (FDIs) in geographical settings and nations, and by the related practices of multinational corporations (MNCs) (Fløysand et al., 2016). FDI stocks as a percentage of world's gross domestic product increased from c.10% in 1990 to c.35% in 2016 (UNCTAD, 2017). The dramatic change in global inflows of FDIs that has taken place since the 1990s has led to an increase in the integration of global economies into international flows of capital and labour being bundled by MNCs and international firms (Crescenzi et al., 2014). These processes impact both positively and negatively on involved host regions and local economies. Multinational corporations have been seen as a source of high-skilled employment, know-how, and innovation capabilities that has led to optimism about the development of regional economies and their industries through FDI (Fløysand et al., 2016;). At the same time, there has been scepticism towards the counterproductive effects in terms of the renewal of economies, due to the risk of 'branch plant' syndrome, whereby subsidiaries that are not embedded in the host economy develop unproductive local linkages (Phelps and Waley, 2004).

In economic geography, scholars have discussed how endogenous sources of skills, networks, competence, and capital have led to new

regional industrial growth (Boschma and Frenken, 2011; Feldman, 2007; Spigel, 2013). However, these ideal conditions for endogenous new path development are primarily found in metropolitan regions (Isaksen and Trippel, 2016). The results of a number of studies conducted in non-core regions have raised concerns regarding the latter approach by demonstrating how regions outside metropolitan clusters tend to lean on exogenous sources of new regional industrial path development (Dawley, 2014; Hassink et al., 2019; Isaksen and Trippel, 2016; MacKinnon, 2012). In this paper, I seek to contribute to this debate on how exogenous sources are coupled to regional assets through the lenses of global production networks (Coe et al., 2008; Henderson et al., 2002) and global value chains (GVCs) (Gereffi and Korzeniewicz, 1994; Humphrey and Schmitz, 2002).

When a multinational company decides to locate in a greenfield region, it will have a number of major and minor strategic considerations in terms of its development concept, the location of its activities, and the relocation of activities from its headquarters to its branches close to the development site. However, we have very limited understanding of the transformative power of the flows of capital, skills, and knowledge bundled into increasingly complex value chains, which often are controlled by multinational firms (Crescenzi et al., 2014).

The regions of Hammerfest (Finnmark), Tromsø and Harstad (Troms), and Sandnessjøen (Nordland) have been arenas for the location

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of a number of MNCs within the offshore sector in the last eight years (i.e. since 2011). To date, the regions have been inexperienced in the oil sector. However, the future prospects for offshore oil in the Barents Sea are positive and have attracted large global enterprises within the oil global production network. In this context, the extent to which GPNs unfold in new regions has huge impacts regionally, which leads to the following research question: *In what sense do GPNs' decisions about different value chain stages connect to regional actors through context-sensitive solutions or path dependent strategies in peripheral regions?* In this respect, we focus on path dependence at the organizational level and examine whether the set of decisions faced for any given circumstance is limited by the decisions made in the past, even though past circumstances may no longer be relevant.

This paper is organized as follows. In Section 2, the relevant background literature is reviewed and the importance of socio-institutional drivers and value chains is discussed. Section 3 introduces the empirical study approach, and Section 4 introduces the strategies used during the entry of new MNCs. In Section 5 we discuss the empirical findings, and finally present our conclusions in Section 6.

2. Conceptual framework

In this section we present a theoretical framework for discussing value chain stages in MNC operations through the lenses of global value chains (GVCs) and global production networks (GPNs). The theories on industrial and economic organization are central in the field of economic geography. One of the most prominent debates in economic geography has been on the drivers for and emergence of new industrial paths and innovation processes in regions. Many contributions concentrate mainly on empirical evidence and discussions of local actors and regional clusters, their internal networks and competencies (Hassink et al., 2019; Isaksen and Trippel, 2016; MacKinnon, 2012). The emphasis almost exclusively on endogenous factors in the shaping of the development of new industrial paths has led to a neglect of exogenous factors such as MNCs and GPNs as driving forces (Hassink et al., 2019). This in turn has called for a need of a multiscale approach that takes into consideration how new industrial paths arise and develop from a balance between the endogenous and exogenous factors of new industrial path development.

Multinational corporations are important and significant economic actors that have increased their role within the global economy since the 1970s. Already at the beginning of the 1970s, scholars theorized on MNCs by investigating the emergence of multinational enterprises (Wilkins, 1970). A few years later, Dunning (1977) developed the ownership, location, and internationalization (OLI) framework on the basis of MNC activity. The framework stresses the importance of three different sets of advantages in explaining a firm's decision to engage in foreign activities: ownership, internationalization and location. This theoretical strand was followed by contributions from international strategy literature that highlighted a debate on MNCs and the tension between, on the one hand, global integration whereby a company seeks global markets, and, on the other hand, consideration of local responsibility, whereby a company's activities are expected to benefit the community (Bartlett and Ghosal, 1989; Yip, 1992). However, these perspectives lack the most recent developments of interconnected transformations that have occurred in the organization of international economic organizations (Ernst and Kim, 2002). Increased liberalization and deregulation of international trade, as well as the rapid development of ICT-sector have fundamentally changed the organization of economic activity. Alongside a number of factors that increased requirements in global economic competition, new forms of organizing and coordinating global competition have arisen. Sturgeon (2002) introduces a new model of economic coordination in his work on modular production networks. His contribution is that lead firms focus on 'core' competence areas that are perceived as essential for the formation of competitive advantages, especially product innovation, marketing and

other activities related to brand development. However, non-core functions, particularly manufacturing, are shifted out-of-house to global turnkey suppliers in order to reduce costs (Sturgeon, 2002). As a consequence, lead firms no longer have to carry the financial, administrative and technical burdens or the risk of fixed capital for production, which thus allows them to focus on product innovation. Sturgeon (2002) suggests that external economies allow for the development of trust and the industry-wide and locality-wide sharing of production capacity. Also, he underlines that his model allows for greater learning and technology transfer, and an 'ability to reconfigure the functional elements of production according to rapidly changing output requirements and the rise of new markets' (Sturgeon, 2002: 453). He argues that the modular production network yields better economic performance in the context of globalization than more spatially and socially embedded network models (Sturgeon, 2002: 451).

Gereffi and Korzeniewicz (1994) and Humphrey and Schmitz (2002) draw on the concept of the global value chain (GVC) to bring the geographical dimension into the debate on outsourcing and a new industrial organization of manufacturing. A global value chain is constituted by four dimensions, of which identifying the main activities in a value chain is the first and the geographical consideration of the chain is the second. The third dimension is a governance structure that explains how the chain is controlled, while the fourth dimension is an institutional context in which the industry is embedded (Gereffi and Korzeniewicz, 1994). Specifically, when activities are coordinated across geographical locations, the term GVC serves to highlight the people and activities involved in the production of a good or service and its global level supply, distribution, and post-sales activities. The GVC concept emphasizes that, in many cases, clustering producers do not sell in open markets. The chains connecting the local producers with distant retailers are subject to governance by powerful lead firms. Particular attention has been given both to the role of powerful lead firms that 'undertake the functional integration and co-ordination of internationally dispersed activities' (Gereffi and Korzeniewicz, 1994) and to governance structures, which Gereffi defines as 'authority and power relationships that determine how financial, material, and human resources are allocated and flow within a chain' (Gereffi and Korzeniewicz, 1994: 97). Global lead firms also play an important role in determining the upgrading opportunities of local producers (Humphrey and Schmitz, 2002). This places emphasis on relationships between suppliers and buyers within a chain, irrespective of where they are located, and a corresponding shift of emphasis away from linkages within the locality. Such chains are often characterized by quasi-hierarchies (Humphrey and Schmitz, 2002), which implies that the global buyers set both product parameters in order to determine product design and process parameters in order to reduce the risks associated with non-compliance with standards. Quasi-hierarchical governance promotes fast upgrading for local producers in the sphere of production, but these firms find it difficult to move into higher value activities.

A similar approach to GVC is the global production networks approach, which also focuses on global connections and pays particular attention to how networks are bundled together in different places (Ernst and Kim, 2002; Henderson et al., 2002). Research on GPN in extractive industries have been ongoing for some years. Especially has mining been a popular sector for GPN studies based on the sector's organizational structures. McQuilken and Hilson (2018) has studied small-scale mineral production networks, while Santos and Milanez (2015) investigates the relationship between economic and social agents. The governing of supply chains (Parker et al., 2018) has been investigated and the nature of a commodity and how its markets affects activist strategies and outcomes (Bloomfield, 2017) has been analysed. The GPN approach underlines how regional development is not only an effect of local and regional processes, but also of how networks of global connections interact in regions. The numbers of global production networks (GPNs) have increased as major organizational innovations in global operations (Ernst and Kim, 2002; Henderson et al., 2002;

Yeung and Coe, 2015). GPN explores the organization of global industries and how it is governed. In this respect, a GPN refers to 'the globally organized nexus of interconnected functions and operations by firms and non-firm institutions through which goods and services are produced and distributed' (Coe et al., 2008: 471).

Consequently, regional positive change is a result of the *strategic coupling* between GPNs and regional assets (Coe et al., 2004). Strategic coupling means the processes whereby actors in regions coordinate and facilitate strategic interests between regional agencies and their counterparts in the global economy. The role of regional agency is to ensure that such strategic coupling occurs by influencing regional assets to fit the necessities of lead firms in GPNs. Coe et al. (2004) argue that this rests upon the creation, capture and enrichment of value. Value creation involves the formation of supporting conditions for development by regional institutions, and examples are training, education programmes and promotions of firm start-ups. Enhancement of value refers to upgrading of industrial skills, technological transfer, delivery of better infrastructure, and enhancement of specialized skills (Coe et al., 2004). Lastly, value capture involves how key firms anchoring in a particular territory are developed. Still, significant territorial dynamics at the regional level need to be present to facilitate strategic coupling. Examples are regional institutions and assets such as competence, capacity and infrastructure. However, even if the region contains all of these qualities, it might not couple to a GPN in a strategic manner, due to the fact that regional actors also need network dynamics at the global scale, which implies competitive logics of seeking cost efficiency, market access and risk minimization (Coe et al., 2008).

MacKinnon (2012: 240) suggests an analytical framework for research on coupling processes between GPNs and host regions. He identifies eight key dimensions: the mode of entry of lead firms in GPNs; the status of MNCs' affiliations within the parent company; regional assets; whether couplings are organic, strategic, or structural; the degree of coupling; historical layering of the couplings; whether power relations are symmetrical or asymmetrical; and the region's exposure to disinvestment and decoupling. Although focusing on these couplings between host regions and GPNs as networks, MacKinnon's analytical framework can be used to analyse how networks of firms are integrated into a host region.

Inspired by MacKinnon's model (MacKinnon, 2012), we propose an analytical framework for research on the encounter between regions and MNCs in the periphery. By relying on a GPN approach and defining GPN as a driving force in non-core regions, and initiate processes that push the development in one or other direction. We build on the previous work by Nilsen (2017), who suggests there are three MNC value chain decisions in emerging regions: *produce and leave*, *stepwise adaptation*, and *integrate*. A value chain contains 'related and dependent activities that are needed to bring a product or service from conception, through the different phases of production, and delivery to final consumers and after-sales activities' (Crescenzi et al., 2014: 9). The three scenarios and their output are broadly elaborated in Table 1. The model represents the scope of the strategies that companies can undertake in regions. Whereas the left-hand side of the model (*produce and leave*) in Table 1 represents the traditional way of thinking about resource extraction in peripheral regions, it represents few local strategic couplings between GPNs and the host region. It relies on the association between regional investment by large corporations and stagnation, although the limitations of this argument have become increasingly apparent, as regions have developed because of MNCs (Fløysand et al., 2016). Still, if the extent of integration is kept to a very modest level, the output can be characterized as an enclave economy that exists isolated from the society or economy in the region. The right-hand side of the model (*integrate*) represents a more connected perspective between GPNs and the host region. Local linkages are established, and local job creation, added value, competence development, and growth all result from MNCs' integrative strategies. Subsidiary MNCs have autonomy and enable manoeuvres that might lead to long-term effects. Investment in

research and education has the same point of departure. Strategies linking regional actors and MNCs are at the centre where the output for regions is tightly connected to strategic coupling.

3. Methods

The regions in this study are characterized by comparatively large distances between firms and possible research partners, the latter including two universities and their associated small research institutes and some other research institutions located within a geographical area of 113,000 square miles. A significant part of the infrastructure is located in and around the two main university cities. The long and narrow landform of Northern Norway creates long internal distances and related climatic, economic and cultural differences.¹ With regard to economic development, especially the counties of Troms and Finnmark are among Norway's weakest and have been a target for regional policy. Accordingly, a range of policy mechanisms have been implemented to attract capital and skilled labour to the region.

The empirical data in this paper rest on three different research projects carried out between 2006 and 2016. They were conducted in the periods 2003–2008, 2009–2016, and 2014–2016 and mapped MNC strategies in the counties of Finnmark, Troms and Nordland, and their related socio-economic regional ripple effects of the gas field Snøhvit and the oilfield Goliat, both of which are in the Barents Sea.² The combination of quantitative and qualitative data provided an overview of the distribution of firm supplies within the GPN and in-depth knowledge from lead firms and regional actors in two oil and gas projects. The quantitative data was derived from information in the subcontracting databases of the Norwegian oil companies Equinor and Eni Norge, (since merged with Point Resources to form Vår Energi) which consisted of the distribution of contracts in MNCs' work-breakdown structure (WBS). The firms were identified by their VAT number, which we linked to a register of firm addresses. Consequently, we were able to provide information on the value of the contracts and their geographical and sectoral distribution. These data were used to assess to what extent regional actors and firms connected to and were able to tap into GPNs and GVCs.

The qualitative method with semi-structured interviews provided in-depth knowledge of the procurement practices within the GPNs' lead firms, their investment policy, and location strategies, including the contextual knowledge of their operation. Based on the contract database and identification of regional firms with a position within the GPNs and the GVCs, we conducted 45 semi-structured interviews with representatives of four lead firms in GPNs. These data were collected in the periods 2006–2010 (Equinor) and 2013–2015 (Eni Norge, BP, and Total). In addition, we interviewed 16 representatives from oil service MNCs, including Aibel, Linde, Technip, Subsea7, Aker Subsea, Aker Solutions, Siemens, Lankhorst, and DOF among others, in the period 2012–2016. The interview guides were organized for three different groups of interviews. The first group of interviews concentrated on motivations, barriers, and drivers in MNCs' regional strategies. The second group of interviews focused on how those strategies linked MNCs and the host region, by considering the regional ripple effects and impacts on the local firms and communities. The third group of interviews looked at both of the issues covered in the first two groups of interviews four to five years later, in order to map significant changes within the MNCs. Approximately 80% of the recorded interviews were

¹ Fitjar, 2013

² The research programmes were (1) 'Følgforskning av regionale ringvirkninger av Snøhvit 2003–2008', financed jointly by the municipality of Hammerfest in Finnmark County and Equinor, and (2) 'Følgforskning av regionale ringvirkninger av Goliat og Eni Norge's virksomhet i Nord-Norge', financed by Eni Norge. Both programmes were conducted by researchers at the Northern Research Institute (Norut).

Table 1
Value chain decisions in MNCs in Greenfield regions.

Strategy	Produce and leave	Stepwise adaption	Integrate
Scenarios	No/few in-depth couplings MNCs' affiliates dependent on HQ No strategic manoeuvres in regional affiliates of MNCs Traditional transactions and competitive price-based tendering Structural barriers building local content No open information policy	Few in-depth couplings Some autonomy in MNCs' affiliates No or partly strategic manoeuvres in certain areas Traditional transactions and competitive price-based tendering, but with exemptions Some information provided to the region	Several strategic couplings Large autonomy in MNCs' affiliates Strategic manoeuvres in MNCs' regional affiliates Customized procurement strategy such as breakdown of contracts, requirement of presence Investment in research and education Support for cultural activities Full-sized operational staff located nearby
Output	Lack of strategic coupling – path dependent strategies	Partial-strategies	Strategic coupling – context-sensitive strategies

typed and transcribed, while for the remaining interviews we noted down the most important information during and immediately after the interview. In addition, document studies of public policy notes and White Papers regarding the empirical context were an important supplement to the interviews. The data from the interviews were sorted, interpreted, and analysed with respect to the research question stated in the Introduction to this paper (Section 1). A combination of the two methods was chosen in order to secure a robust methodological approach to addressing the research question. The aim of the approach was to combine the rich description from qualitative methods rather than generalizability, but also to gain an overview of the distribution results from the quantitative analysis.

Firm	Location	Theme	Year
Eni Norge	Hammerfest, Stavanger	Decisions in different value chain Local content strategies	2012, 2015
Equinor	Hammerfest, Stavanger	Decisions in different value chain Local content	2006; 2013, 2015
BP	Sandessjøen	Decisions in different value chain Local content	2014
Aibel	Hammerfest, Harstad	Local jobs of contract Employment	2007, 2014
Linde Technip	Hammerfest Oslo	Decision on sub-contract Ripple effects, Competence development	2006 2014
Subsea 7	Tromsø	Sub-contracting Local content	2015
Aker Subsea	Hammerfest	Sub-contracting SPS Local content	2014
Lankhorst	Hammerfest	Sub-contracting Marine contract	
Siemens	Oslo	Electrification	2015
DOF	Arendal	Local content Sub-contracting	2014

4. Value chain stages in offshore oil

In this section, we introduce the empirical data on GPN strategies in different phases of the value chain in the offshore oil sector and the geographical, economic and political contexts of the decisions relating to those phases. We start by examining the early phase of seismic survey and drilling, and then move on to the mature phase by investigating the concept decision, development solution and oil spill contingency in the GPNs. Finally, we investigate the late phase of operations and production.

In the 2000s, the Barents Sea area was defined as a Greenfield area for the oil companies, since it was both unidentified for the companies and relatively large. In addition, the area lacked necessary infrastructure in terms of transportation pipelines and offshore installations. These infrastructural conditions raised the threshold for new investments, as the costs for the 'first-mover' were relatively high in terms of

addressing new infrastructure, to which 'latercomers' could tie-in and connect, as their resources were already developed.

4.1. Early phase – seismic surveys and drilling (context-sensitive decision)

In a Greenfield region such as the Barents Sea, the costs for companies related to seismic surveys and drilling is extremely high due both to long distances from logistics centres and high transportation costs for involved seismic vessels and drilling rigs. The distance from the Barents Sea to the nearest service port for advanced functions is c.1500 km. According to Equinor, the average costs of an exploration well amounted to USD 25 million (interview data, 2013). This represented high risks and costs for companies exploring oil and gas in these areas. Hence, in 2015, when activities were planned for new seismic surveys in the south-eastern areas of the Barents Sea, 33 oil companies collaborated on a joint initiative on the collection of seismic data, named the Barents Sea Exploration Collaboration (BASEC). The aim of the initiative was two-fold. The first aim was to ensure better quality of seismic data by pooling experience and knowledge (interview data, 2015). The second aim was to carry out fewer and more targeted operations with fewer costs relating to seismic surveys, and at the same time, to reduce the negative impact of seismic surveys on fishing interests in the marine area, a topic that flourished in the public debate in 2015 in Norway. The initiative did not come from the oil companies themselves but was directed by the state and the Ministry of Petroleum and Energy. The ministry mobilized companies to assess whether they could safeguard operations in a more cost-effective way and at the same time protect the fishing interests in the resource-rich area of the Barents Sea. A working group facilitated by the interest organization, the Norwegian Oil and Gas Association (Norsk olje og gass), was initiated to create an organizational model that could safeguard the fishing interests. The output of BASEC has been fruitful for the involved companies, as they have managed to have constructive collaboration in previously non-collaborative arenas, and BASEC has led to increased focus on collaboration per se between the companies in the Barents Sea region. Two representatives, one from an Italian company and one from an Austrian company said:

Being at the edge of what is possible outside the coast of Finnmark when it comes to safety and economic sustainability, it is good to have collaborative partners which jointly can arrange workable solutions.

We realized that we need to have such smart solutions in the near future as well, if we are going to operate in these waters.

4.2. Mature phase – concept decision and development solutions (path dependent decisions)

The Barents Sea is a geographically large area compared with the North Sea and covers an area ranging from the deep Norwegian Sea to the west, with depths up to 2500 m, to the coast of Novaja Semlja and

the border of Russia in the east. Long distances are a significant challenge for the oil and gas companies in terms of logistics, operations, and preparedness. A specific challenge concerns the search and rescue (SAR) helicopters, which have an operating limit of 340 km from shore (interview, representative of the Joint Rescue Coordination Centres (JRCC)). The outermost territories on the Norwegian continental shelf, where we investigated petroleum activities, are 450 km from shore. According to the companies, the operating limits are challenged at this distance, as even in adverse weather conditions, such as fog at an offshore installation, helicopters will still have to be able to return to land within a limit of 340 km. If MNCs plan to fly their helicopters beyond the safe operating limits, it must be possible to refuel the helicopters along the way. However, to date, no installations at sea have been able to contribute a solution to this problem.

In contrast to oil discoveries in the North Sea and Norwegian Sea, the discoveries in the Barents Sea are widely dispersed. It has therefore been extremely costly to extract and transform them into commercial products:

What is profitable in the Norwegian Sea is not possible in the Barents Sea. (interview, oil company representative)

The problem is exemplified by the Marulk field in the Norwegian Sea, which is a small gas field operated by Eni Norge. Despite its size, it was possible to develop Marulk because it could easily be connected to existing infrastructure; the production ship *Norne*, which was already established infrastructure in the form of a floating production and storage centre for oilfields in the Norwegian Sea. The costs of developing the resources were low due to the tie-in possibilities, and consequently they were sustainable in economic terms due to low infrastructural costs. One interviewee stated:

We lack a 'Norne ship' in the Barents Sea, a 'field centre' to which other resources can easily be connected. (interview, Swedish company representative)

4.3. Between drilling and operation – oil spill contingency

The production of petroleum resources in the Arctic poses challenges for companies with respect to oil spill contingencies. In connection with the development of the Goliat field, oil spill preparedness is taken care of through various barriers. Barrier 1 is defined as an area in immediate geographic proximity around the platform. Both Barrier 1 and Barrier 2 are out on the open sea and are safeguarded by the sea-going fleet. Barrier 3 is defined as the geographical area close to shore, whereas Barrier 4 is the geographical area at the shore, close to the coastal zone. While global lead firms such as Aptomar, NOFI, Norlense and AllMaritim dominate the first barriers, local fishers in 30 fishing boats have been formally involved in Barriers 3 and 4. These boats operate with acquired oil protection equipment that is especially suited for coastal waters. Rebuilding was required in order for the boats to be included in these operations, and this involved mounting additional towing equipment to meet the need for towing capacity. In connection with barrier 4, two depots have been established in the communities of Hasvik and Måsøy to store extensive oil spill resources for operations in the coastal zone. The group consists of 40 people who are trained in collecting free-flowing oil in the coastal zone. In addition, new technology solutions based on scanners and infrared communications have been established at the Goliat installation to detect and map any emissions.

4.4. Late phase – operations and the importance of socio-institutional factors

Due to the long geographical distances to oil and gas clusters in Western Norway and the costs of commuting, the oil companies have emphasized the need for recruitment of personnel and suppliers from

the host region. BP, Equinor, and Eni Norge signaled that they wanted to build local capacity in terms of human capital, so that they could reduce the amount of commuting done by employees from elsewhere, especially in the operations phase of petroleum projects (Eikeland and Nilsen, 2016). If the companies are to ensure the legitimacy of their activities in the Barents Sea, they will have to establish jobs and value creation beyond offshore employment. Hence, one of the main challenges for companies operating in the High North has been to gain access to highly qualified labour with relevant experience in a region without any experience in oil and gas. A representative of Subsea7, a global service company in Tromsø, stated:

It has to be said that there is no quick fix. It is still a major challenge for the entire oil industrial complex to find expertise and experience in Northern Norway. This fact cannot be overlooked. Many people might think that this would not be the case in Tromsø, which is a larger city, but that is incorrect. Importing workers with experience from the south is still very difficult. (Manager, Subsea7, 2015)

The GPNs in offshore oil have different strategies for dealing with the localization of their activities, presence, and procurement systems in Northern Norway. One of the lead firms in the north, Equinor, has production in three fields (Norne, Snøhvit, and Aasta Hansteen) and one project to be realized in 2022 (Johan Castberg). The history of petroleum activities at Harstad, an administrative centre in the county of Troms, dates from the 1980s, after exploratory drilling began north of 62°N in 1980. The establishment of Equinor was important for the region, since brought in highly skilled people. The presence of Equinor alone has almost ensured the continuity of activity in oil and gas in the Northern Norway, despite periods of decreased activity. The company is still the main driver for the number of petroleum jobs in the region, and according to statistics for 2015, c.400 people from 20 different nationalities were employed in Equinor locally in the Troms region. In the region of Finnmark, a number of 460 people are employed by Equinor.

Another lead firm, Eni Norge established its activity in Hammerfest, with a fully-fledged operating organization and drilling operations conducted from the town. The company had 160 employees, and generated 340 regional employees in the supplier industry during the construction phase of the project (Nilsen, 2017). When it comes to the phase of operations, employment effects for regional industry are generated by increased consumption, we find a total of 1200 pr year, including production and consumption effects (Nilsen and Karlstad, in press). Eni Norge was keen to promote growth in the regional supplier industry to build local content in the contracts and thus be less dependent on 'long-travelled' goods and services, especially in the production phase of Goliat. Contract strategies and procurement practices were revised to facilitate local value creation and the development of a local supplier market. A number of these measures are embodied in, for example, the Norwegian Government's requirements stipulated in the 'Plan for utbygging og drift' (PUD) (Plan for development and operation) from 2009, which points out that they resulted from lobbying by politicians ahead of Parliament's handling of the Goliat project. Another important factor that explains Eni Norge's strategy is that prior to Goliat the company did not have a history as an operator of oilfields or gas fields, which means that it had few geographical or supplier ties.

In contrast to Eni Norge, the lead firm of BP has chosen a different strategy for its operation of Skarv in terms of organization in the field. Whereas Eni Norge hired local and regional employees and had full operational organization in Hammerfest, BP has decided to establish an operational organization base in Sandnessjøen. With regard to employment, Eni Norge's model for establishing operational organization consisted of output from 110 to 120 employees, whereas BP's model for Sandnessjøen has c.11–14 employees. BP has also adapted its contract regime to accommodate the size and expertise of enterprises located in Northern Norway.

5. Global value chains and global production networks

The dominating model of economic organization in the oil and gas industry relates modular production networks (Sturgeon, 2002). The lead firm concentrates on the competence areas that are perceived as essential for the formation of competitive advantages for the company, while non-core functions such as manufacturing are shifted out to global turn-key suppliers in order to reduce economic costs and risks. This organizational model exists throughout the oil and gas industry from the early stages in the value chain from drilling to operations. In the context of this paper, the lead firms are of two types: oil companies as the major buyer of assets from suppliers, and the main service suppliers and major contractors that develop main areas on behalf of oil companies in a given project. Typically, suppliers take responsibility as turnkey suppliers by providing a fixed concept with total responsibility for supplying a full package to the client (Nilsen, 2008). However, as Sturgeon (2002) states, the outsourcing of such core competencies and work creates risks, whereby lead firms can lose global competitiveness. As key suppliers gain in financial strength, technical and operational competence, and geographic reach, they gain increased possibilities to develop new steps of their own in competition on services and products. However, this form of economic organization of global turnkey suppliers that specialize on specific solutions also connects to a global net of subcontractors that are necessary for taking on the comprehensive assignments. This creates networks of firms that cut across regions and countries, and in which competencies and trust are exchanged. In turn, this creates obstacles for firms and regions that is not integrated in GPNs and GVCs and thus makes it harder to plug into existing GVCs and GPNs. Referring to the theoretical model suggested in Section 2, modular production networks can lead to increased structural barriers in building local capacity through competitive price based tendering within GPNs.

5.1. The lack of regional strategic coupling in early value chain stages

Humphrey and Schmitz (2002) stress that producers do not sell in open markets and that GVCs that connect local producers with distant retailers are subject to governance by powerful lead firms. In the case of seismic surveys and drilling, the lead firms in oil and gas are Western Geco, Saipem, Schlumberger and Haliburton, which are specialized engineering, design and procurement companies that operate in GVCs and GPNs. Yeung and Coe (2015) and Henderson et al. (2002) underline that in order for regions to tap into GPNs and create positive change in regions, regional firms need to take part in strategic coupling between lead firms in GPNs and regional assets. In our case, context-sensitive models of seismic data collection are arranged and collectively transported to peripheral regions. BASEC cooperation models reduce cost for GPNs because fewer ships are necessary and at the same time, GPN increase the platform for further cooperation in drilling. Drilling is a highly cost-intensive activity and is demanding in terms of infrastructure. The GPN of oil and gas outside Finnmark introduced a new model of collaboration within the network, but the strategic coupling to the regional industry lacked momentum and even though high investments were carried outside the region, the regional firms were not involved in the activity. Investigating the territorial capabilities in the regional context, we find that the region became a passive recipient in the case of seismic. If strategic coupling between regional assets and GPNs should take place, the factors of creation, capture and enrichment of value should be fulfilled. In this case of drilling and seismic surveys, the region of Northern Norway managed to a very limited extent to tap into GPNs and create value for itself. Actors in the region lacked the competence, capacity, and the infrastructure to capture the significant value from drilling activity. For seismic surveys and drilling, the physical distance from, for example, production plants, does not play any significant role. The specialized industry and sector of seismic surveys and drilling is mainly located in south-western Norway and

internationally, and the infrastructure, in terms of ships and rigs, is transported to the northern areas during periods of activity. Consequently, it remains highly undecided as to whether, in a longer-term perspective, MNCs will locate value chain activities and functions in drilling and seismic surveys in geographical proximity to their production plants. Relating to the model suggested in Section 2 of this paper, I here demonstrate, like Defever (2010) states, that prior investments guide future action in companies, closely related to the concept of path dependency for regional actors outside GPN

The GPN perspective underlines how regional development is not an effect of only local and regional processes, but also of how networks of global connections interact in regions (Henderson et al., 2002). This can be seen in relation to the fact that in 2015 the Norwegian Petroleum Directorate criticized oil companies' restrictive actions with respect to collaborating on the need for new infrastructure in the Barents Sea (Barents Sea Conference, 2015). The criticism was based on the fact that the companies lacked a long-term perspective on the development of the Barents Sea and that the licenses exclusively focused on quarterly results and current oil prices. The Norwegian Petroleum Directorate has called for collaborative and joint area solutions for coordination of discoveries when planning a development concept to reduce costs and carry the major investments that the development of petroleum installations entails. The developments of the emerging fields of Altha, Gotha, and Johan Castberg are potential assets. The regional actors argued for a joint oil terminal in the Finnmark region. However, our interview data revealed that the three different projects were moving forward as isolated projects, without a joint coordination solution. Lead actors in GPN are however reluctant to collaborate with each other in order to future investments in long-term strategies to build an infrastructure in the region. The validity of this argument is increased by Equinor's decision to award a preliminary contract to Sembcorp Marine in Singapore in November 2017, to build a production installation for Johan Castberg (E24, 2017). By following the same path as previously when treating each project as isolated and as an individual investment in MNCs, decisions made within companies can reduce the opportunities for new investments in the Finnmark region in the future, due to lack of infrastructure.

As demonstrated above, GPNs from their 'dark sides' highlight conflicting GPNs' interests and regional logics. While a GPN typically is concerned about cost-efficiency, regions tend to have industrial upgrading in mind. Regions are interested to take part in industrial upgrading and competence development, but GPNs sometimes locate lower value-added manufacturing activity to the region. In a situation where only foreign firms dominate the GPNs and they all together established within the region, this can create structural dependency based on foreign firms and challenge the region's ability to control the coupling processes. This is especially the case when few domestic firms provide the competence needed to strengthen and maintain the strategic coupling. Relating to the theoretical model suggested in Section 2 of this paper, we observe that GPNs that are in a mature phase and choose already established and existing networks and actors in their economic activities for reasons of cost efficiency and risk minimization. By contrast, regional networks are in an early phase and their lack of capacity, competence and infrastructure are obstacles to them tapping into the GPNs in the early value chain stages of oil and gas. This lead to path-dependent stages of development for regional firms not being able to integrate into the GPNs.

5.2. Joint interests of GPNs and regional actors

Strategic coupling between regional assets and GPNs can be achieved when regional actors and GPNs have joint interests (Yeung and Coe, 2015). As a result of vulnerability in the case study region and the risk potential for damage to fish and fauna habitats, both local actors and GPN actors (Eni Norge) jointly developed new solutions for oil spill preparedness, whereby the involvement of fishers and boats in

the region would lead to new models for organizing the value chain. This led to new ways of integrating value chains by crosscutting sectors in collaboration. The utilization of local knowledge bases in new ways by increasing know-how about wind and wave conditions has increased the industry ability to handle a potential oil spill and keep the oil from reaching the shore. This model has led to new depots equipped with the necessary infrastructure along the coast of Northern Norway, followed by ripple effects in the local industry (Nilsen and Karlstad, in publishing process). The context of vulnerable environments and the risk of oil spills are the main drivers behind lead firms' decisions to integrate regional assets into the value chain. Context sensitive approaches was integrated in the GPN by the lead firms and regional assets was integrated into complementary GPN through the process of strategic coupling (Yeung and Coe, 2015:5). Referring to the model developed in Section 2, we see that relational and scalar interactions between sub-national, national and supranational actions took place and created avenues for context-specific strategies.

From a GVC perspective, global lead firms play an important role in determining the upgrading opportunities of local producers (Gereffi and Korzeniewicz, 1994; Humphrey and Schmitz, 2002). However, the perspective can also shed light on how local producers can break out of the 'lock-in' that results from working for a small number of global buyers (Humphrey and Schmitz, 2002). In the context of regional supplier industry and upgrading, the oil companies communicated that they had been committed to facilitating growth in the regional supplier industry to build local content in the contracts, and thus be less dependent on long-term supplies of goods and services (Nilsen, 2017). The most pronounced expression of this came from lead firms (Equinor and Eni Norge), which showed their commitment by their actions in the development of the operation phases of Snøhvit and Goliat. Contract strategies and procurement practices have been revised to facilitate local value creation and the development of a local supplier market. The procurement strategies are particularly relevant in the operational phase because the subdivision of existing small contracts means that regional players can compete for new assignments (Nilsen, 2017). One of the main challenges for the companies in Northern Norway has been to gain access to well-qualified labour with the right experience. The MNCs have different strategies for locating activity, presence, and procurement systems in Northern Norway. As a result of long distances to key suppliers in Western Norway and for reasons of political goodwill, the oil companies emphasized the recruitment of labour and suppliers from Northern Norway. BP, Equinor and Eni Norge announced that they wanted to build capacity in terms of human capital in Northern Norway, so that in the long term they could reduce the amount of commuting done by the workforce, especially in the operational phase.

Whereas Eni Norge hired local and regional employees and had a fully-fledged operational organization in Hammerfest, and had thus made *integrated* value chain decisions, as shown in Table 1 (Section 2), strategic coupling between regional actors and GPN occurred (Coe et al., 2008). The regional supply industry has since upgraded its competence and supply of goods and services to GPNs (Nilsen and Karlstad, in press). However, in the region of Sandessjøen the level of GPN connectivity to regional actors is weaker: GPN locate 'satellites' in the region. BP has decided to establish a 'sub-operating organization' in Sandessjøen, with 7–8 employees, which is closer to the category of *stepwise adaptation*. Det norske oljeselskap (now part of Aker BP) was established in Harstad with 12 employees (exploration), while Lundin (exploration and geo-competence) announced in 2013 that it had decided to establish an office in Harstad, but was uncertain about the number of employees. In summary, Equinor is heavily present in part of Harstad and Hammerfest as its two centres of activity. It has been in the region from the start of the petroleum activities in Northern Norway and has long-term plans for activity in the region through the Snøhvit project, which will produce until 2055, and Johan Castberg, which is in the planning stage. In addition, Norne and Aasta Hansteen comprise

projects that ensure activity will continue in Nordland and Troms, based on Equinor's initiatives.

6. Concluding remarks

In this paper we have demonstrated the ability of GPNs and GVCs by highlighting how new patterns of international trade, production, and employment shape the prospects for regional development and competitiveness. A core issue is that lead firms in these networks claim that they want fewer but larger and more capable suppliers that can operate in different locations around the world. This could provide hope for small regional suppliers, but it remains a challenge to organize and maintain sustainable value chains regionally.

The theoretical contribution of this paper within the field of economic geography connects to the question of how global networks of GVC and GPN are plugged into peripheral regions. More specifically, how GPNs integrate context-sensitive or path-dependent solutions in value chain stages in their operations. By its focus on how GVC and GPN produce regional employment, and increase regional supply industry possibilities, this paper contributes to increased balance in the literature on endogenous versus exogenous sources of new industrial and regional paths in economic geography. The empirical contribution is that MNC preferences and strategies are highly differentiated in terms of global value chain stages and entry modes that result in complex effects for the host economies.

We have demonstrated that in a mature phase GPNs select established and existing networks for reasons of cost and risk minimization. By contrast, regional networks are in an early phase and their lack of capacity, competence and infrastructure are obstacles to tapping into the GPNs in seismic surveys and drilling. Our findings demonstrate that lead firms in GPNs, especially Equinor and Eni Norge, decided on a strategy of integrating the local firms and networks in a peripheral region into the global value chain and production networks, and of relocating highly competent staff locally. The decisions were made in a way that safeguarded the regional context with respect to political demands and expectations of the growth of resource-based industries. In addition, context-sensitive approaches leads to new paths in the regions and creates ripple effects in terms of supplies, competence development, and employment. While this is demonstrated in two of the companies, other companies in more populated regions, such as BP and Total, have chosen to locate with a more traditional and path dependent, modest approach regarding both value chain activities and local employment. This means that 'soft' regional characteristics may influence MNCs' value chain strategies in regions where more attention is paid to context-sensitive and political signals in peripheral regions, compared with more populated regions.

Furthermore, we have demonstrated that decisions in GPNs have been driven by long distances, low infrastructure, and high costs, compared with the Barents Sea's environmentally vulnerable status. New collaborative models for organizing their value chain activities have been initiated and implemented. The way companies have collaborated and formed a partnership on oil protection measures through BASEC, with binding cooperation on seismic surveys and exploration, has been driven by 'hard' contextual factors. The oil spill preparedness has been organized in new ways by integrating local fishers and boats. With regard to infrastructure in the Barents Sea, the question of costs is crucial in GPN decisions. Solutions have been discussed in relation to the joint initiatives on 'common area solutions', whereby companies operating in the same area could establish a field centre to cut their individual costs for the development and coordination of resources. This has the possibility to create a lasting infrastructure, with large investment costs in the early stage. However, companies have chosen a path-dependent strategy due to a decisive cost level, since none of the companies alone can bear the economic investments of new infrastructure to connect the Barents Sea to other petroleum areas in Norway by pipelines.

Finally, we find that GPN strategies have had different impacts on local development processes, whereby strategies in the early phases of the value chain (i.e. drilling and seismic surveys) were path dependent and led to few local linkages due to lack of competence and infrastructure locally. The GPN strategies in late stages of the value chain (operations) were more context sensitive, as GPNs sought new solutions in procurement and oil spill preparedness, which together increased the local linkages.

The implications for policy are to develop cautious regional development policies that are sensitive to specific GPN value stages and lead firms within GPNs. This can be done by developing policies that can attract GPN firms in later value chain stages, and at the same time help domestic firms to develop competencies within the areas of future prosperous development for regions.

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