
Assessment of the firm–region coupling in the Arctic: Local content and innovative institutional regulations

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ABSTRACT

This paper elaborates on the firm–region coupling to analyse how Global Production Networks (GPN) anchor in peripheral regions through economic activities and how the encounter between GPN and regions impacts on new regional path development. In order to assess the GPN anchoring within regions, we lean on the framework set out by MacKinnon and on the concept of strategic coupling. Drawing on energy cases in Finnmark in Norway and in eastern Iceland, we outline two possible regional paths of GPN encounters with new territories. On the first path, the industry follows its own logic and builds an enclave within new areas of operation. On the second path, the industry is embedded, transformed, and sends ripple effects within the area of operation. Our analysis demonstrates that exogenous institutional regulations – as economic government-level policies in non-core regions – influence the degree of material outcomes such as value creation, shifting power relations, and the extent of GPN anchoring in regions. Consequently, we argue that adding a more refined concept of geographical scale and the role of national policies to the model of “strategic coupling” may enrich the application of the model. Our findings will influence theories of exogenous path development, and the results will help policy actors maximize the spill-over effects and material output of GPNs entering new regions.

Keywords: *Global production networks, strategic couplings, socio-economic impacts, local content policies*

1. INTRODUCTION

The question of renewing regional industrial structures and consolidating already strong industries is at the core of the debate on regions' competitiveness and the need to enhance knowledge as a response to economic globalization. Issues of new regional path development have also received increased attention in the field of economic geography. Forces of endogenous sources of innovation and learning inside condensed, "thick", and diversified regions are well-developed (Cook 1997; Asheim and Gertler 2005). The literature on regional innovation systems (RIS) and endogenous capacity within regions explores how new ideas and knowledge are transformed and connected to new growth and innovation (Asheim and Isaksen 2002; Asheim et al. 2013; Neffke and Hening 2013). A large body of literature indicates that "thick" regions are well-positioned to absorb enhanced growth and innovation.

There is nevertheless a lack of understanding on how northern regions in the context of key economic geography theories develop within, alongside, or outside questions of economic globalization. Also, theories of evolutionary economic geography to a large degree ignore exogenous sources of and linkages between new regional path development (MacKinnon 2011; Trippel et al. 2015). Non-core regions often face challenges of achieving renewal by means of endogenous resources due to weak development of infrastructure, knowledge, low innovation ability, and small firms (Isaksen and Trippel 2014). The potential role of extra-regional sources of new industrial growth paths, represented by the entry of multinational corporations (MNCs) into new areas, is a growing interest of economic geography (Asheim et al. 2015), but extra-regional knowledge and how it is exploited and transformed into new path development is still poorly understood (Trippel et al. 2015). In this paper, we address this concern by studying circumpolar regions as a site of Global Production Networks (GPN) entering and developing new areas of operation.

The limited possibilities for regional development offered by extractive industries often serve as examples of regional dependency of Global Production Networks and of the lack of knowledge spillovers between local firms and GPNs (Bridge 2008). We suggest two possible regional paths for GPN encounters with new territories. On the first, the industry follows its own logic and builds an enclave within new areas of operation. What modest couplings there are between GPNs and regions take place in areas that extend the regional pathways of development. On the second path, the industry is embedded, transformed, and sends ripple effects in the area of operation. New paths arise and spillovers occur.

We seek to explore this relationship in a High North context. The increased industrial activities in a number of north European regions are significant. In the Barents Sea area close to northern Norway, multinational corporations have recently discovered mining resources and are now developing oil and gas extraction. Accordingly, resources from hydropower plants are utilized to provide electricity to aluminium plants and other energy-intensive industry in Iceland, and MNCs have increased mining in Greenland. Enhanced economic activity in peripheral regions has led to an increasing interest from policymakers, who are eager to obtain benefits and returns in the host economies of natural resource extraction (Tordo et al. 2013; Ovadia et al. 2014). To increase the maximum benefit from extractive industries, regional regulations are adapted to profit the regional economy under pressure from economic globalization. An example are the policies of local content, understood as the extent to which the output of the extractive industry generates further benefits to the economy beyond the direct contribution of its value-adding (op. cit.). Serving as a linkage between GPNs and regional assets, local content can help knowledge flows and learning between production systems and local capacities (Eikeland and Nilsen 2016).

In this paper, we approach two oil and gas developments in Finnmark in northern Norway and one aluminium construction in eastern Iceland through the lens of Global Production Networks. We discuss to what degree concepts of value creation, power, and embeddedness provided in the GPN literature help to illustrate differences or similarities in two different contexts. In particular, how can the entry of GPNs in peripheral geographical regions in northern Europe be stimulated through exogenous policy regulations to secure benefits in the host economies of natural resource extraction?

We start out with a theoretical section on the evolutionary economic geography approach. The recent contribution of GPN within this field is followed by the introduction of the data sources. In section four, we introduce the data and results from three different case studies. Section five analyses the concepts of strategic coupling in order to evaluate the anchoring of GPN in the Arctic. We discuss the limits of “strategic coupling” in a circumpolar context, and suggest adding a more refined geographical concept into the model. The discussion leads us to concluding remarks.

2. GLOBAL PRODUCTION NETWORKS AND NEW PATH DEVELOPMENT

2.1 Evolutionary economic geography and path-dependent development

Economic geographers have started to pay increasing attention to an evolutionary approach (Grabher 2009). This turn broadly implies that experienced competencies developed over time by entities in certain localities regulate present formations as well as future paths (Kogler 2015). Path-dependent regional development focuses both on the negative lock-in effects and the positive ones leading a technology, an industry, and a regional economy along one path rather than another (Narula 2002). Regional industries may thus enter into path extension through mainly incremental product process innovations in existing industries and technological paths. When there is growth in the regional economy, the local and regional firms increase their market positions, provide more jobs, and contribute to development through continuity in a regional economy. In such situations, regional industries may eventually experience stagnation and gradual decline due to a lack of renewal (Hassink 2010). They may face a risk of path exhaustion, when their innovation potential is reduced. Typically, external events or developments are overlooked or recognized too late, and firms become uncompetitive and may decline. Path renewal occurs when local businesses shift into different activities, which may still be related. The content – including the knowledge base – of regional firms shapes to some extent the type of renewal that occurs. Path renewal often takes place, when a regional industry transforms and broadens the industrial structure into new or related areas of expertise (Boschma and Frenken 2011), whereas path creation represents a more radical change in a regional economy. This involves the formation of new firms and new sectors, or the businesses have different products, apply new techniques, or organize anew (Martin and Sunley 2006).

2.2 Global Production Network

Reflecting the neglect of external relations in studies of growth and innovation in the 1990s, the Global Production Network (GPN) approach signals renewed attention to extra-regional interests (MacKinnon 2012). A key contribution of GPN research has centred on “globalizing” regional development, approaching the region as a “porous territorial formation whose national boundaries are transcended by a broad range of network connections” (Coe et al. 2004, 469). As peripheral regions characteristically differ from core areas when it comes to development of knowledge bases, one should apply the same explanatory models with caution if they are to help us understand innovation and growth processes in such different regions (Isaksen and Trippl 2014). Core areas draw on a combination of synthetic and analytical knowledge bases while

new industrial paths in less-favoured regions often seem to be influenced by exogenous development impulses such as arrival of innovative firms from outside and other forms of inflow of external knowledge (Leibowitz 2004; Rees 2005; Isaksen and Trippel 2014; Eikeland and Nilsen 2015).

Consequently, the GPN approach investigates the organization and governance of global industries (Henderson et al. 2002). A Global Production Network is defined as a “globally organized nexus of interconnected functions and operations by firms and non-firm institutions through which goods and services are produced and distributed” (Coe 2004, 471). The use of a network allows a more open and fluid conceptualization of production, encompassing all relevant actors and relationships (Henderson et al. 2002). The GPN approach highlights three important elements in its theorization. First, there is value, which refers to economic return, rent generated by the production of commodities for sale, and involves the conversion of labour power into an actual labour process. The second conceptual category is power, defined primarily as the source of power within the “GPNs and the way in which it is exercised is decisive for value enhancement and capture and thus for the prospect for development and prosperity” (op.cit., 450). Three types of power are relevant in this respect. First, corporate power refers to the way in which the lead firm in the GPN has the capacity to influence decisions and resource allocations within the network. Second, we have institutional power exercised by national and local states, international inter-state agencies, the IMF or the World Bank, UN agencies, and international credit rating agencies. According to Henderson et al. (2002), “the capacity to exercise power to influence the investment and other decisions of lead companies and other firms integrated into GPNs is inevitably asymmetric and varies both within and between these five categories.” Third, collective power refers to collective actors, trade unions, and employers’ organizations. This translates to actions of collective agents who seek to influence companies at particular locations in GPNs, their respective governments, and sometimes-international agencies.

The GPN approach stresses institutions at various spatial scales that have power to change the geographical distribution of economic activities and moderate network couplings. At the core of the GPN, the concept of bargaining power (Hess and Yeung 2006) explores the dynamic between global and local actors. As Coe argues, “the relative power of actors within a network depends, in large part, on the extent to which each possesses assets sought by the other party and the extent to which access to such assets can be controlled” (Coe et al. 2008, 276). The GPN approach leans on a relational understanding of power (Allen 2003): mechanisms other than possession of assets determine the bargaining power within a production network. The concept of “interac-

tive effects” (Coe et al. 2004) is more or less similar in that learning and upgrading may be enhanced through connections with and/or participation in a trans-local production network. Institutional structures of varying scales (such as states) affect strategic coupling processes through processes of regulation and governance, and are crucial in enabling interaction and reciprocity between local companies and a GPN (op. cit.).

The third key element in GPN is embeddedness on a societal, network, and territorial level. GPNs can become territorially embedded – anchored in different places – because of the lead firm’s historical ties to particular locations. From such a perspective regional development *is a product of the strategic coupling* between GPNs and such regional assets (MacKinnon 2011, 230). As Yeung (2009) maintains, strategic coupling refers to “the dynamic processes through which actors in cities or regions coordinate and mediate strategic interest between local actors and their counterparts in the global economy”. In this, it is the role of regional institutions to ensure that such strategic coupling occurs by shaping and moulding regional assets to fit the lead firm needs in GPN.

Coe et al. (2004) argue that this depends on the creation, capture, and enhancement of value. Value creation involves the creation of supporting conditions for growth by regional institutions through training, education programmes, promotion of start-ups, and the provision of venture capital through private-sector investors. Enhancement of value refers to knowledge and technological transfer, industrial upgrading, the provision of more advanced infrastructure, and the development of specialized skills (op. cit.). Finally, value capture involves the extent to which key firms are embedded in the regional economy, or how strongly the anchoring to the territory itself is developed.

2.3 Extractive industries in peripheral contexts


To contextualize our study, we shall next present an analysis of relevant studies examining a peripheral context. According to Amin and Thrift (1992), regional development strategies that depend on specialized production systems are bound to fail in geographical areas lacking such assets as knowledge and capital. Steen and Underthun (2011) also advocate this argument in their study of the Snøhvit (Snow White) natural gas field complex. However, Eikeland (2014) discusses regional ripple effects from the Snøhvit complex on the basis of first-hand company data and presents a comprehensive analysis of local and regional effects for industries, the municipality, the population, and local businesses. Nilsen (2016) identifies the dynamics of regional path development in that the industry creates job opportunities and economic ripple effects, both of which are considered essential to a community’s survival. He also analyses specif-

ics in Arctic governance and politics. Loe and Kelman (2016) apply an approach of corporate social responsibility in oil development in the Finnmark region, and also discuss the perceived effects of petroleum developments. Environmental concerns and opposition to oil and gas are largely ascribed to external forces and feature less in the locals' perceptions. Opposing a development perspective on natural resource expansion in the case of mining, Fløysand et al. (2016) demonstrate how the development of the mining industry in Kirkenes in northern Norway leads to path exhaustion, even though the industry employs about 400 people. The study claims that the community of Sør-Varanger faces dependency on a capital-dominated industry with decisions made elsewhere. As the mining industry is analysed from a perspective where the benefits have escaped the region, the paper demonstrates how foreign direct investments mostly become visible through economic capital and do not extend local knowledge and network between local actors and GPN. One central point is that the industry in Norway lacks regulative regimes unlike the petroleum sector, where local content policies guide the sector's emergence. The introduction of foreign direct investments has not contributed towards much innovation or regional development (Fløysand et al. 2016), and in 2016 the minerals sector struggled with environmental challenges and negative economic returns (op. cit.).

Data on how extractive industries have (or have not) generated local and regional effects in Finland is mostly lacking (Haley et al. 2011). However, mining overall appears to be more integrated in the economy than in northern Norway. As an example, the city of Oulu in the Arctic region hosts the third largest stainless steel plant in the world (Outokumpu Chrome), supplied by a Lapland chromite mine (Haley et al. 2011). As Haley et al. state (2011, 43), Finland has a historic mining legacy, and the northern economy is well-integrated into the larger national economy. A great share of the minerals extracted in this region is processed locally, but old mining deposits in Finland face an uncertain future, as old mines yield fewer discoveries. This creates a challenging perspective for mining-dependent communities. Another study from this region explores how narratives on mining and the sector's ability to develop new structures in the regional surroundings are embedded in documents (Suopajärvi 2015). The study applies a discourse analysis to demonstrate three history lines from the social impact analysis of mining in northern Finland. Suopajärvi concludes that "Lappish" people and authorities of small rural municipalities have struggled with economic problems, and mining appeals to communities that for decades have suffered from unemployment and out-migration of young people. New employment opportunities and tax revenues thus become the most valued aspect of a mining project (Suopajärvi 2015).

Examples of extractive industries from Canada, Alaska, and Greenland represent industrial activity in a totally different context compared to Sweden, Norway, and Finland. As mining values, prospects, and recent high exploration development increase year by year, Canada, Alaska, and Greenland have become mining hotspots. However, most of the mining regions in northern America and Greenland lack infrastructure to handle operations, and significant environmental challenges are obstacles for these frontier-mining regions (Haley et al. 2011). The nature of being a frontier region adds to the challenges of creating a positive impact on the regional development in general, with few potential areas to retain added value regarding local employment and local economic development. Examples from Alaska are particularly interesting here: in a prototypical frontier economy, most of the mining products, along with their value, are exported to other geographical locations. The physical infrastructure and climate conditions add to this complex relationship in the encounter between local actors and GPN. Remote, roadless regions and frozen shipping lanes make construction, transportation, and exploration both demanding and expensive (op. cit.).

Several studies on the extractive industries and regional development discuss the social disruption that occurs in the period of industrial activity (O’Faircheallaigh 1991; Gibson and Klink 2005; Brubacher and Associates 2002; North Slave Metis Alliance 2002). Economic benefits tend to leak out of the region, and the advantages of being located in geographical proximity to the production site are perceived as very limited. Technology and labour need to be imported from other regions and royalties may be sent to central governments. Consequently, regional development occurs in mature regions outside the region hosting the production, and firms outside the region grow as a result of new industrial activity in peripheral regions. Such uneven development has led to regulations and policy development in order to increase local benefit for communities. Emerging and new institutional practices have been implemented to balance the power structures, to apply MacKinnon’s terms (2011). This has happened in Canada, for example, where agreements between mining companies, aboriginals, and local communities have been signed to benefit the local communities and regional development (Haley 2011, 57). Examples include the Socio-Economic Agreements of the Northwest Territories and the Yukon Territory. Other examples are Joint Venture Agreements between communities and mining companies that address employment, training, and profit sharing. Impact and Benefit Agreements (IBA) have also become particularly important to companies in Canada with regard to funding, training, employment preferences for local residents, revenue sharing, and environmental concerns.



2.4 Strategic coupling between Global Production Networks and regional assets

In order to assess in depth how GPNs embed within regions from a socio-economic perspective, we have leant on the framework set out by MacKinnon (2011, 240). He has identified ten key dimensions to capture the linkages between GPN and regions, elaborating on certain dimensions as analytical tools on coupling, recoupling, and decoupling processes. These are the mode of entry of lead firms in GPN, status of TNC affiliates in the parent company, regional assets, and degree of coupling. Further, we have analysed if couplings refer to the power relations between GPN and regional assets on the symmetric/asymmetric axis.

DIMENSION	SCENARIOS
Mode of entry	Greenfield–Repeat investment–Merger
Status of TNC affiliates	Autonomous–Dependent
Type of region	Source–Host
Regional assets	Distinctive–Generic
Type of coupling	Organic–Strategic–Structural
Degree of coupling	Full–None
Depth / Layering of recoupling	Deep–Shallow
Power relations	Symmetric–Asymmetric
Regional development outcomes	Development–Dependency
Exposure to decoupling	Low–High

Table 1. Dimensions of coupling between GPNs and regions (MacKinnon 2011, 240)

3. DATA AND METHODS

Our study draws on quantitative and qualitative data from three long-term monitoring research projects in Norway and Iceland. Launched in 2003, the first research project monitored socio-economic effects of the Snøhvit gas field². The database of contracts included 4899 subcontracts, allocated to 2033 suppliers, of which 1633 were Norwegian. In total, 60 of the Norwegian enterprises were interviewed in depth. In addition, data on labour, employment, firm strategies, and housing prices were collected in 2002. The second research project was launched in 2004, a year after contracts were signed on the largest construction project in Icelandic history on the Kárahnjúkar hydropower plant to provide electricity for Alcoa's Inc. aluminium plant, built simultaneously in eastern Iceland. The parliament passed a resolution on monitoring the socio-economic impacts of the project as a whole. Primary data consisted of three large postal surveys among individuals and two surveys among companies, interviews with around 20 individuals in four rounds and with experts, and data on labour force from the contractors and project owners. The third research project was launched in northern Norway in 2010. The background was the approval of the Norwegian Parliament in 2008 to develop the Goliat oil field in the Barents Sea. We analysed 15 main contracts and 200 subcontracts to map regional firms in the supply chain, conducted 36 interviews with oil service firms and seven interviews with the oil company Eni Norge. Around 70% of the interviews were recorded on tape and transcribed; we noted key points during the rest of the interviews. Interviews were carried out with industry representatives, contractors, regional, and central governments in Norway and Iceland in 2003–2015.

4. VALUE CREATION AND POWER RELATIONS IN GPN IN EASTERN ICELAND AND NORTHERN NORWAY

4.1 Cases in the study

Two of the cases in this paper, the development of the oil field Goliat and the gas field Snøhvit, are drawn from Finnmark and northern Norway. The region of Finnmark, Troms, and Nordland is thinly populated and has traditionally been seen as an economically peripheral and disadvantaged area (Nilsen 2016). Finnmark is the largest and least populous of the northern counties in Norway, containing 74,000 inhabitants spread out across 46,000 km². The long and narrow shape of this northern Norwegian region creates great internal distances and related climatic, economic, and cultural differences (Fitjar 2013). When it comes to economic development, Finnmark in particular is among Norway's poorest regions and has been a regional policy target area. Accordingly, the state has applied a range of mechanisms – as government policies – to attract capital and

skilled labour to the region. Until 2000, the region experienced a substantial decline in population as an effect of a declining demand for labour in the fisheries sector (Fløysand et al. 2016), and young people would leave the area in search of better education and job opportunities. The introduction of the petroleum sector in Finnmark, 35 years after the first Norwegian oil field came on stream, was expected to improve the situation (Arbo and Hersoug 2011). Another contextual factor was that after 40 years of production from the North Sea and the Norwegian Sea, these mature areas of the Norwegian Continental Shelf were perceived as soon to be depleted resource bases.

Reflecting on the economic role of petroleum development for Norway, which has brought a tremendous amount of capital to the Norwegian state, the Ministry of Petroleum and Energy together with the oil companies started to search for new and prospective areas. Consequently, the Barents Sea became the new hot spot for this activity. However, the lack of necessary infrastructure in the region, the low education levels locally, and the geographical distances to clusters in the petroleum sector were seen as hampering a positive societal impact from new petroleum developments.

Our third case is located in eastern Iceland and concerns the construction of the hydroelectric project Kárahnjúkar, and the Alcoa Fjarðaál aluminium plant. The hydroelectric station is located in the eastern part of the highland and consists of large dams, reservoirs, diversion of rivers, water tunnels, and a powerhouse. Alcoa Fjarðaál is located near a small town Reyðarfjörður with 625 inhabitants in 2002, the year before the megaproject started. The statistical region of eastern Iceland had 11,800 inhabitants in 2002, and 13,060 lived in the same area in 1992. The population is divided between a number of small towns and rural areas. Basic industries are traditionally fishing and agriculture but jobs have declined in both industries due to rationalization and quotas. Quotas can be “sold away” from local fishing communities, which then lose access to the fishing resource, leading to job losses. As a result of out-migration, younger people and females have been underrepresented in the region (Jóhannesson et al. 2010). Reykjavík and neighbouring municipalities in the southwest part of the country have been growing rapidly and are the main destination for migrants from other regions. Eastern Iceland is furthest away from Reykjavík, and access to the capital region is costly and time-consuming. The region is characterized by many fjords surrounded with high mountains, which makes road transportation challenging.

Since the early 1980s, plans have been underway to harness the glacial rivers in the region to provide energy for large-scale manufacturing, which would diversify the

economy and reverse the development. Contracts between the Icelandic government, Alcoa, and the main contractors were signed in 2003, and the project was launched. According to surveys and interviews, the majority of inhabitants in eastern Iceland were satisfied with the advent of the megaproject (Jóhannesson et al. 2010) but others, especially in the capital area and abroad (De Muth 2003), heavily criticized it. Aluminium now represents an increasing share of Iceland's exports: by 2010 it had become an equally important export commodity as fish, each with just over 39% of the export value (Jóhannesson, 2011).

As the coupling between GPN and regions can take many dimensions, we need to narrow the scope and define specific coupling areas to answer the research question. Here, we have been inspired by the literature on GPNs' attention to value creation and on the encounter between GPN and regions in the periphery. The following section seeks to present the findings from three case studies through GPN terminology and the MacKinnon model.

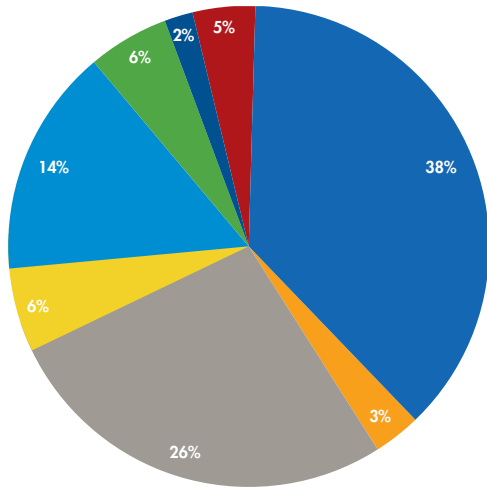
4.2 Local value creation and local labour market: Finnmark and Snøhvit

The development of the Snøhvit field was mainly based on the use of employees willing to commute. A major reason for the need for commuters was the lack of available labour locally and regionally. The mayor of Hammerfest was looking forward to the construction of Snøhvit: "It will be interesting to see the development in the local labour stock during Snøhvit construction. We certainly hope for a lot of involvement of local labour. (Interview, Mayor, Hammerfest 2001) In the end, a total of 22,783 persons from 1,454 firms worked on the Snøhvit plant. Of these, 18,105 lived in Norway at the time, and 4,170 of those had foreign citizenship. As of the end of 2002, registered employment in Hammerfest Municipality increased by 1,300 employees.

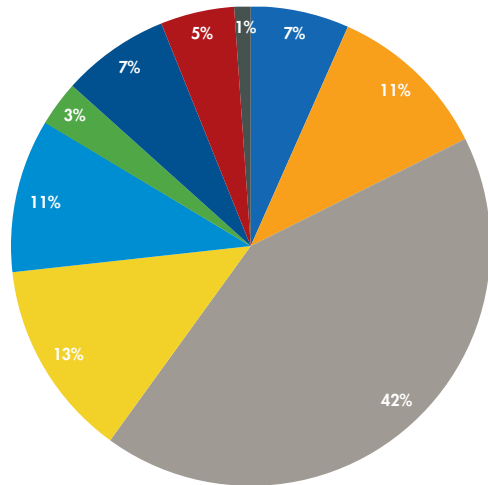
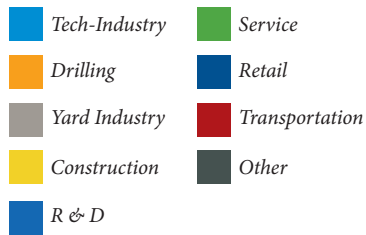
Another measure of how GPN is embedded within the region is the share of subcontracting in the Snøhvit project. This is illustrated in Figure 1.



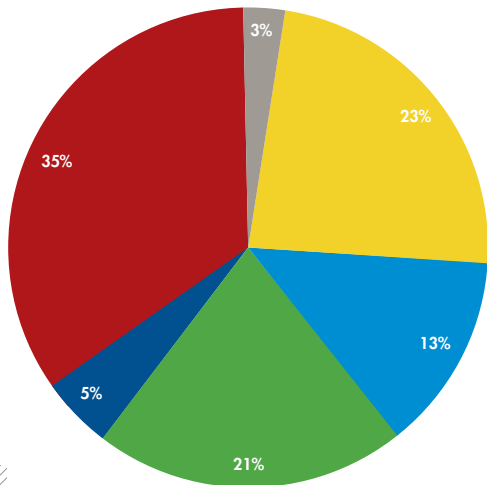
Figure 1.



GLOBAL PRODUCTION NETWORK



NORWEGIAN CONTENT NOK 30,5 MIA



LOCAL CONTENT



The contracts totalled NOK 47.6 billion (USD 8 billion). In Figure 1, the left-hand pie chart shows the foreign share of the deliveries to Snøhvit, broken down into sectors for 2003–2008. The middle pie chart shows the share of deliveries for Norway as a whole, and the right-hand pie chart shows the share of deliveries for northern Norway. Only 60 of the enterprises were based in northern Norway. Analysis of data from Statoil's subcontract database revealed that the total value of goods and services supplied from northern Norway amounted to USD 480 million, which represented 6% of the total deliveries and 9% of the national deliveries (Eikeland 2014).

That only 60 enterprises based in northern Norway acquired contracts for the field development demonstrates that the boom bypassed the majority of the regional companies. The regional firms belonged to three groups in the value chain. Firstly, local businesses with a weak connection to the petroleum industry used their geographical proximity to the development site as a strategy to encounter the Snow White project. Buildings were being erected, and there was a need for power supply, transportation of staff, provisioning, cleaning services, security, waste management, vehicle repairs, etc. "It was enough work for many small companies and the workload just grew. We did the same as we do in other markets, just more of it." (Interview, local electricity firm)

Secondly, the high demand for skilled workers led to several recruitment agencies in the region concentrating on the hiring of labour to the major suppliers. The third group of companies had few contracts on Melkøya, but benefitted from the public development and other expansion brought by the Snow White project. The host municipality initiated comprehensive building activity in the upgrading of schools, the construction of a new cultural centre, and a total upgrade of the roads. For several of the local companies, this became a more important market than the development at Melkøya, which they made a decision not to become too heavily involved in (Eikeland et al. 2010).

4.3 Labour and company connections to the GPN in the megaproject in eastern Iceland

The development in eastern Iceland from 2004 and further was, as in Finnmark, made possible through fly-in and fly-out strategies with a high frequency of commuting. There was a significant mismatch between the main contractors requesting certain labour competences and capacity and in the regions' ability to answer this demand. Mostly multinational corporations were involved as main contractors and subcontractors. The companies established temporary branch offices on site during the construction period, and the connection to headquarters was project-related as the branches had a delimited assignment in building an infrastructure on behalf of the company. The degree to which

foreign workers were needed was more than previously experienced in Iceland. An interview with an employee of the aluminium plant in 2009 sheds light on this:

Concerning the foreigners, then there was of course a huge number of them that we needed here, we needed much support while starting up the plant and they were living together in their own camp... The Polish kept to themselves, it was temporary work and they knew it and were of course starting to look out for a new project to work on... But the Canadians who came here to help out and some of them came with their families and they were very pleased. It was well planned, they were part of the Alcoa staff.

During the planning phase of the project and in its environmental impact assessment, more participation of locals was expected. After the main contractor for Kárahnjúkar had been selected, the make-up of the labour force was addressed by the director of the national power company Landsvirkjun and owner of the plant in its annual meeting in 2003:

It is of course not possible at this moment to state how contractors will hire people but it is likely that they will find an equilibrium in hiring foreign and domestic staff. As an example of this one can mention that the Italian contractor Impregilo, which will build for around 50% of the construction cost of Kárahnjúkar hydropower plant, expects that around 60–70% of its staff will come from abroad. Taking this into account I consider it likely that the share of foreign staff building this huge project will be significantly more than was anticipated (Johannesson et al. 2010, 49).

The data of the socio-economic effects underlines the fact of a branch-plant economy. Few locally owned firms participated in the construction phase of the aluminium plant. The main and subcontractors employed 2344 people, of whom 1616 were Polish (about 70%), 392 Icelandic (about 17%), 3.7% Canadians, 3.2% came from the United States, and 1% were English or Australian (Johannesson et al. 2010). There was a clear division between the site workers and the local community, as most of the workers lived in a temporary work camp adjacent to the town of Reyðarfjörður, where the aluminium plant is located. In 2002, the town had a population of 625 (Statistics Iceland 2014), but during the busiest time of construction in 2007, around 1700 workers lived in the work camp (Kristiansen 2007). In 2016, the town had just under 1200 inhabitants.

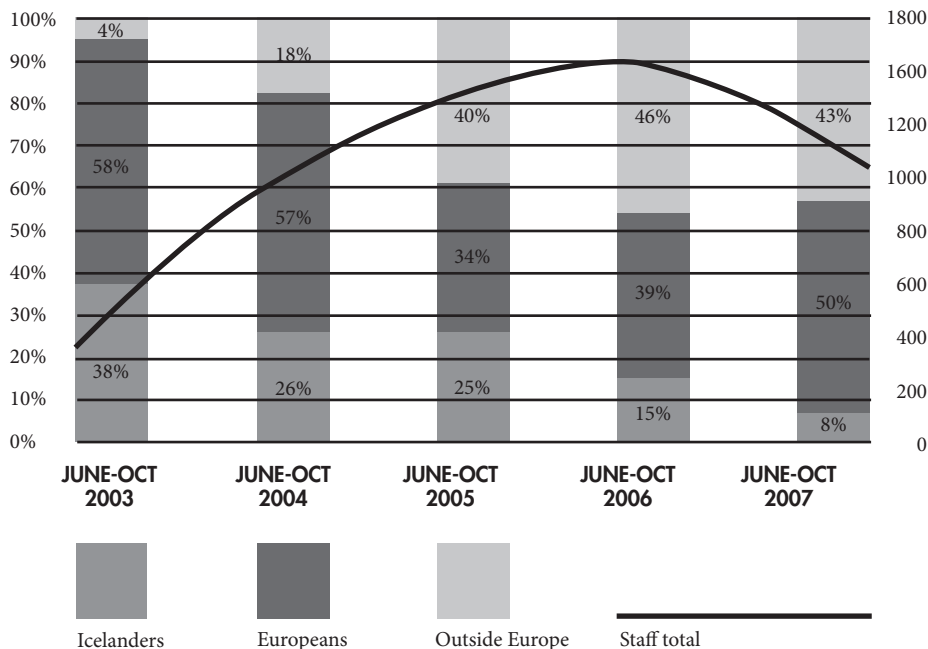


Figure 2

The geographical scope of impact was relatively narrow; the development in the region was not embedded in the society as a whole. As the number of foreign workers played a very important role in the development, the megaproject increased the number of foreign citizens in central eastern Iceland so that they represented about one-third of the population during the busiest time. During the initial phases of the Kárahnjúkar project, European employees were the most numerous, especially the Portuguese and the Italians, because of the main contractors' networks. Later, they were outnumbered by Chinese workers, who were engaged in building dams and drilling tunnels. Such an influx of foreign workers was not anticipated nor was the society prepared for their arrival (Johannesson et al. 2010).

According to a survey among the companies in eastern Iceland in 2008, about 20% of them either sold goods or services to the megaproject or were subcontractors. Participating companies were most prominent in the central impact area (within two hours' driving distance from the main project sites), where they accounted for more than one-third of all companies. Ten per cent of the companies in the more distant northern and southern impact areas had connections with the megaproject. Alcoa set requirements for a re-

sponse time for service provisions, and companies delivering these services needed to be located close to the Alcoa Fjarðaál aluminium plant (Petursdottir 2005).

In some cases smaller companies joined efforts to be better prepared to take on tasks for the aluminium plant as subcontractors. An employee of the aluminium plant described this in an interview in February 2009:

...There are also smaller firms in the area that have joined forces to establish a large company... instead of being one and one in each corner and competing for the small pieces, they have merged into one company to establish a one-stop shop... This concerns different services; mechanics' services, import, management of equipment, management of supplies...

About one-third of the companies were involved in providing accommodation and food services, and many companies offered various support services. Examples of participation in certain work packages of the megaproject as a whole were only found among construction companies

4.4 Value creation and capture: Goliat

The development of the *Goliat* oil field was planned, manufactured, and coordinated in Eastern Asia, Germany and the UK, so few local firms were integrated into the production chain in building the platform installation (Nilsen 2016). Still, local firms won contracts to build the facilities of the operational office of the oil company in Hammerfest, and firms were integrated in the value chain of *Goliat* in relation to serving a supply base, a helicopter base, and delivering equipment and services to the local fleet of oil spill contingency (Nilsen et al. 2013). A recent study demonstrates that 460 local people worked on development of the *Goliat* on site in the region of Finnmark, supplying services and goods to mostly drilling operations, construction, service, and installation of offshore equipment (Nilsen and Karlstad 2016).

As the manager of the supply base in Hammerfest, [I can say that] Goliat is the best thing that could happen to the town. It brings in a lot of new competence and connects the town of Hammerfest even tighter to become a one-stop shop for the petroleum activity in the Barents region. And in relation, Eni Norway do a lot of societal improvement work as well (Interview, Manager, Polarbase)

Compared to the two other industrial projects presented in this paper, Eni Norge took a more active role in building regional support systems, capacity in firms, and enhanced competences in the region. Most of these initiatives were initiated in 2009 and are still ongoing as they are embedded in policy documents of the Ministry of Energy and Petroleum in Norway (2010–2011). As importantly for local and regional employment, Eni Norge has decided to establish a regional district office in Hammerfest for their operations in the Barents Sea, involving 150 employees. Also, the requirement that main contractors be present means that Goliat itself as an isolated offshore oil field creates jobs for about 150–200 employees. Other examples of company initiatives are that they claim the presence of main contractors in the period of operations (35 years) nearby the area of production. As a result of the relatively strict requirements laid out in the Plan for Development and Operation (PDO) by the government and the parliament, the company has supported infrastructure by building ports and developing local emergency equipment outside the centre of Hammerfest, in the municipalities of Hasvik and Loppa. Following MacKinnon's (2011) model of strategic coupling, then, "Greenfield investments" seems an apt description here. Beyond hard infrastructure, the company has invested in modern soft infrastructure and has facilitated a distance learning project – "Digital Classrooms" – in Harvik.

In 2009, both Eni Norway and Statoil renewed their regional strategies as a response to expectations and government policies to create ripple effects of oil and gas development in the High North. The companies have invested in human capital in supporting and building competences in science in local high schools. An important step is a cooperative agreement between Hammerfest High School and Statoil: the company sets the site of operation, including the Liquefied Natural Gas (LNG) facility, available for students to observe and investigate. In addition, the company offers from time to time such resources as teaching and other staff from the LNG facility. They have also supported technologically and financially the construction of a semi-model of the LNG facility at the high school to promote understanding of the production process.

That main suppliers be present during modification and maintenance contracts in the operational phase is another local content initiative (Eikeland and Nilsen 2016). Oil companies require main contractors to be present in proximity to the area of operation in the operational phase. This implies hiring local people, investing in local offices, and building up capacity and infrastructure to serve the client on their needs in the future. In the most employment-intensive main contracts in the operational phase, the client requires that 70% of the overall engineering and administrative capacity be conducted

in Finnmark. According to interview data, firms report that the requirement of presence in the region is the most significant factor of localization, followed by access to new assignments. The number of firms and new jobs in Hammerfest has increased thanks to the Goliat operation, involving global firms such as TESS, ABB, Aibel, Bilfinger Industries, Haliburton, Schenker, and Kuhne-Nagel. Employment within the petroleum sector increased from the year 2000 when no one worked in the sector to over 700 employees in 2015 (Statistics Norway 2015). From a situation where the couplings between regional assets and GPNs can be referred to as minimal and dependent on MNCs, the policies of local content have increased the depth and width of couplings from “none” to “full” between Finnmark and the GPN.

5. DISCUSSION

As we have documented so far, two of the three industrial projects in this study – Snøhvit in Finnmark and Alcoa in eastern Iceland – had very limited local linkages through the process of field development, or construction phase, and partly in phases of operation. The third industrial project treated in this paper, the Goliat oil development in Finnmark, demonstrated comprehensive linkages to the host region compared with the two others. We shall next analyse these processes through the theoretical concepts presented in section two of this paper.

5.1 The role of innovative institutional regulations

MacKinnon (2011, 240) developed a framework for analysing couplings between GPNs and the host region, highlighting the existing power relations. The asymmetrical power relation between GPN and regional assets points to a considerable degree of path dependence, and existing patterns of behaviour of GPN firms have been copied into new areas. In the first section of this paper, we suggested two possible regional paths where GPN encounters new territories. In the first case, the industry follows its own logic and builds an enclave within new areas of operation. Both the example of Snøhvit in Finnmark and Alcoa in eastern Iceland appear to follow the enclave formation through the entering of new economic activity within existing activity, and mismatching regional industrial structures. As MacKinnon (2011) would say, the layering of the existing couplings was rather shallow. The firms’ practices were not embedded within the regions, and the regulative assets that had the potential to alter the formations did not influence the power relations within the GPNs. Even though some couplings occurred between regional firms and GPNs, these were typically low-tech connections and involved a relatively low degree of new economic activities for firms

in the regions. While the value creation for the firms involved was significant, the companies did little new as a result of their connection with the plant activity. Rather, they extended their competencies in such familiar areas as construction, transportation, catering, and alike. In accordance with the theoretical framework of Naruala (2002), the processes demonstrated here seem to have stimulated path extension for firms involved on a regional level.

In a global competition, regional firms in Snøhvit and the Alcoa plant were to a limited degree able to penetrate the more technically sophisticated parts of the industry due to the long-established relations between lead firms within the Global Production Network. After 2009, changed institutional regulations on the policies to integrate suppliers of main systems within the phase of operations have created new areas of cooperation and learning for local firms. During the early phases of the Snøhvit complex, local companies encountered rather inflexible GNP regulations, whereas policies of local content required GPN lead firms to establish branch offices at a location nearby the plants and to integrate local labour into their contracts if possible. The situation changed, when the contractual structure was adjusted and broken down in smaller units in order to serve regional firms after it was established they could not mobilize capacity and volume as requested (Eikeland and Nilsen 2016). This has resulted in two main processes: First, local labour is integrated into GPNs lead firms and is recruited in new positions and new sectors. This has increased employment, learning, and the anchoring of the GPN in the region. Second, interview data indicates that firms cooperate intensively within the agglomeration of 45 oil service firms in Hammerfest, and that the geographical proximity to a large degree facilitates the cooperation between firms located there. In addition, firms have gained new market shares. We thus identified patterns of *new regional path creation*; prior to 2002, the region had no connection to the petroleum industry. To phrase it in MacKinnon (2011) terms, the entry of Global Production Networks accompanied by place-based exogenous policies have made the coupling between GPN and regional assets more strategic, as the coupling is linked to competence development and upgrading of firms in a global economy (Eikeland and Nilsen 2016). Because of these policies, data indicates that firms are concentrated within new areas of operations, they renew their markets, and upgrade their competencies. As the population increases and new firms open, the prospects for the region appear good. This is underlined by the fact that the local municipality receives property tax from Statoil totalling EUR 25 million annually during the operational phase from 2007 until 2050, for a total of 43 years.

As we have seen, the exogenous policy regulations differ between our three cases. Consequently, as the Goliat development and Eni Norway met strict government regulations, the oil company had to develop sophisticated initiatives in cooperation with regional Finnmark bodies – such as supplier organizations – that connected GPN to regional assets. The GPN of Barents Sea oil became subject to a shift in the political and industrial philosophy of local content during 2009–2010. This resulted in enhanced attention to the notion of increased advantage of firms in geographical proximity to plants. The initial aim of the shifting policy was to make it possible to develop an industrial environment nearby the location of supply bases, helicopter bases, and the maintenance contractors. The state reasoned that a policy of local content would help to secure business activity in a region close to the Russian border; the geographical distance from the Barents Sea to existing clusters of the Norwegian oil economy is 2000 kilometres. The emergence of a new petroleum agglomeration in Finnmark was envisaged to have economic, logistical, and security dimensions which would improve the overall future sustainability approach of Barents Sea oil development. Much of the unexploited petroleum resources is expected to be located in the Barents Sea area of the Norwegian Continental Shelf, so it was regarded as a national concern to invest in the emergence of a new petroleum province in the High North. Such concerns did not apply in the first phase of the Snøhvit plant, which was considered to be an individual investment when it was planned in the late 1990s. The promotion of a local-grown supplier industry was deemed illogical, as the boom was supposed to be followed by an economic decline. Similar logics applied to the Alcoa plant in eastern Iceland, but the construction was also too large and complex for most regional or even national companies. In addition, the economic benefits for regional actors in aluminium production are quite modest especially during the operation phase compared to oil and gas. There was thus little political reasoning on the regional effects of building up a local and regional industry able to serve a specific industry over a short time span.

5.2 The role of policies and geographic scale in strategic coupling

In the second section of this paper, we set out the model on strategic coupling developed by MacKinnon (2011). As the analysis has illustrated so far, the model has been helpful in analysing the differences in GPN value creation, power relations, and the degree of anchoring in circumpolar regions. Consequently, the model adds new insights into the way that lead firms in GPN adapt to regions in a strategic matter. We argue that the role of exogenous policy regulations and their shaping and re-shaping is crucial to adjusting the power balance within a GPN, which reflects the relationship between symmetric and asymmetric relations between regions and GPN lead firms. This refers to the geo-

graphic scale and the dynamic versus non-dynamic regions as differences between core regions and Old Industrial Regions (OIR), as the latter lead to path dependency and lock-in processes, while the former create the process of co-evolution between GPN and regional assets. We argue that this dichotomy lacks the refinement of a multi-level geographic dimension and power relationships within the nexus between OIR and dynamic regions and especially when natural resources are scarce. As the GPN travels further north and enters areas of the Arctic, there are no defined rules of regulation of business activity in strategically important regions of Arctic waters. While some Arctic states, including Norway and Russia, claim full sovereignty over the sea and the continental shelf in this area, these claims are disputed by other states. The potential of petroleum development in Arctic areas and the changing climate have made the High North a top priority in several Arctic states. A knowledge-based and well-functioning business sector in the northern regions is of significant interest and is a strategic asset in ensuring a state's presence in the area. This is especially the case in the southeastern part of the Barents Sea, and in areas around Jan Mayen and Svalbard. By refining such an argument of geographic scale connected to GPN strategic behaviour, regions which have strategic national interests and resources, and border other countries, are more likely to be supported by state policies in promoting regional industrial development than are regions that do not share a border with other nations. Consequently, national policies are likely to influence the emergence of power relations within GPNs, as these networks enter new peripheral and border regions. We therefore argue for adding a refined geographical dimension to the model, where the entering of a GPN into new regions is influenced by whether the entry takes place in sparsely populated areas of strategic national interest compared to core regions within a nation surrounded by corresponding interests. GPNs will probably need to invest more resources and assets in a location of strategic national interests – where a nation state claims sovereignty in a border region – compared to a region with clear borders. It is reasonable to expect more sophisticated policy regulations, a larger degree of in-depth couplings, and higher autonomy in the branch offices in the former context compared to the latter.

6. CONCLUDING REMARKS

In this paper, we have explored the nexus between regions and Global Production Networks in the circumpolar North. We started out by introducing the research question of how the entering of GPNs in peripheral geographical regions in northern Europe can be stimulated through exogenous policy regulations to secure benefits in the host economies of natural resource extraction. We have demonstrated that theories

of economic geography and especially the evolutionary approach are oriented towards endogenous sources of learning, innovation, and growth. Within the field of new regional path development, the exogenous sources of learning within non-core regions have been poorly developed. In addition, the literature on exogenous capacities for learning and innovation have been inadequately linked to new regional path development (Trippel et al. 2015). Thus, the contribution of this paper is twofold: First, we have shown that focusing on exogenous sources such as a global production network can strengthen the understanding of the nexus between host regions and GPN, and how it is connected to new path development. Second, knowledge from peripheral regions helps to shape theories of path development through an analysis of the role of such exogenous and innovative policy regulations as local content and the connection to and implications for coupling between GPN and regions.

In the Icelandic example and during the first phase of Snøhvit, the Global Production Network largely followed its own logic and built an enclave within new areas of operation. The degree of coupling to regional firms was low and the status of MNC affiliates was dependent rather than autonomous. It was difficult for local inexperienced firms to penetrate technological and capital-intensive global economic production networks and thus influence megaprojects. The development projects in the extractive industry were characterized by a “mismatch” between development size and the population structure of the respective countries. Learning new working methods and involvement in technology networks were prevented by external systems of commuting, and this may have hampered a long-term learning basis and innovation possibilities locally. This is affiliated with regional path extension with the risk of regional lock-in into traditional path development. The regional development outcomes following such paths could be characterized as dependent rather than as development.

Regional path creation is often policy-initiated and demands proactive policy actions (Asheim et al. 2013). Changing regulations and institutional approaches to govern GPNs in northern Norway in 2008–2009 highlight differences between the three cases studied here. The exogenous state policies of local content have contributed to shifting power relations within the GPN, and the MNC efforts of taking on a broader social role and responsibility have created arenas of learning for local firms. This has evolved into a new industry and has led to a population rise, new jobs, and in particular increased job opportunities for young people in the most affected municipalities (Eikeland et al. 2009; Nilsen et al. 2013). As such, the entering of the oil and gas industry in Finnmark stimulates new regional *path creation* in the region. As this paper has documented,

external regulations on GPN behaviour facilitate regional development, and the policy implications of these findings should be useful to a number of public entities.

We have shown how different links between GPN and new theories of regional path development evolve, and more precisely, how different policy regulations stimulate new regional paths in the periphery and add to the model of strategic coupling. Consequently, the geographical context that GPNs encounter in regions is important. In the case of populated regions of strategic national interests with rich resources and less developed infrastructure, this will influence the outcome of the strategic coupling. National interests encourage more in-depth couplings. This new dimension applied in different geographical contexts has the potential to add value to the understanding of the strategic coupling of GPN and regional assets.

NOTES

1. The monitoring of the Snøhvit gas field project was conducted by Norut Alta in 2003–2008, financed by the Norwegian state-owned oil company Statoil, the municipality of Hammerfest, and Finnmark County. In Iceland, monitoring of the Kárahnjúkar hydropower plant and Alcoa Fjarðaál aluminium plant was carried out in 2004–2010 by members of the University of Akureyri Research Centre, according to a parliamentary resolution in 2003, and financed by the Icelandic state. The research area in eastern Iceland was larger than the statistical region of east Iceland used by Statistics Iceland.
2. The development included a subsea production system on the offshore field, construction of the biggest factory in Europe to date for the processing and export of liquefied natural gas (LNG), and connecting the subsea installations and the factory close to the small Norwegian city of Hammerfest by a 143-kilometre pipeline. In the most intensive phase, the construction period required the presence of 3100 workers at the construction site at the same time. The total investments were USD 6 billion.
3. The development included offshore oil offloading and transportation of oil to markets by ships. The total investments when the field was approved by the Parliament was USD 4 billion.
4. The megaproject consisted of the Kárahnjúkar hydropower plant, which is owned and operated by the national power company Landsvirkjun and started operations in November 2007, and the Alcoa-Fjarðaál aluminium plant, owned by Alcoa Inc. and reaching full capacity in April 2008.

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