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Institutional work, regional key actors, and green industrial restructuring

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ABSTRACT

Departing from evolutionary economic geography, the objective of the article is to reveal the dynamics of institutional work by regional key actors with a need to achieve green restructuring in regions dependent on the oil and gas industry. The authors combine quantitative and qualitative methods to investigate how, why, and when regional stakeholders' institutional work contributes, or not, to changing institutional logics that enable green industrial restructuring in the regional innovation systems of two adjacent petroleum-dominated regions in Norway. The main finding is that despite shared positive visions in both regions for green industrial restructuring, the processes of institutional work and related institutional logics respectively legitimize a green shift in Hordaland and delegitimize it in Rogaland. Consequently, there is a need to remain mindful of institutional work's connection to regional and often taken-for-granted institutional logics. In conclusion, the authors argue that the findings challenge the current IW discourse within economic geography, which has tended to explain green regional industrial restructuring as outcomes of intended agency leading to successful outcomes.



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Introduction

In a petroleum industry dependent country such as Norway, there is a need to search for possibilities for a new green path development. Recent work in regional industry development in general and in evolutionary economic geography (EEG) in particular has investigated the roles of agents and agential processes to understand regional restructuring better (Simmie 2012; Steen 2016; Miörner & Trippl 2017). This focus has now shifted to the role of agency in path development processes (Boschma et al. 2017; Grillitsch & Sotariuta 2018), and interplays between firm-level and system-level changes have emerged as topics of interest (Isaksen et al. 2018a). The specific focus is on practices needed to ensure environmental sustainability in

regional restructuring (Sjøtun & Njøs 2019). Inspired by ideas from institutional theory, actors' visions and expectations are argued to be crucial for legitimizing and institutionalizing green industries (e.g. Binz et al. 2016). Although EEG's inclusion of institutional theory is promising, it is struggling to account for the dynamism between agency and institutions and/or how this plays out in regional contexts. Cortinovic et al. (2016, 25) argue that EEG scholars should adopt a more practice-oriented perspective in order to reveal how actors 'engage in collective action to mobilize knowledge, resources and public opinion to create new or adapt existing institutions'.

In this article we respond to the above statement by Cortinovic et al. (2016) by combining insights from EEG and from institutional work (IW), which is

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defined as ‘physical and mental efforts aimed at affecting an institution or set of institutions’ (Lawrence et al. 2011, 55). We depart from EEG because that field asserts that most industrial development trajectories are linked to past choices and that scopes of action and contingencies are conditioned by former practices and choices that were made within spatial, typically *regional*, contexts (Boschma & Frenken 2011). EEG posits that regional industrial development often follows *path-dependent* trajectories in terms of path dependency (Martin & Sunley 2006) that are not easily altered. The EEG literature has also informed discussions of regional industry development strategies. This is exemplified in studies of regional innovation systems (RIS) and related discussion about formal policy strategies for different RIS types (Isaksen & Trippel 2014). In RIS studies there has been an increased focus on policy development and bureaucratic implementation of industry policies, which has tended to include key stakeholders’ agency in regional development. In addition, we use insights from IW (Lawrence et al. 2011) to include an agency focus in the analysis of institutional logics in terms of social prescriptions that direct what is legitimate practice within a given RIS. The focus of this analysis is to reveal the contextual leverage of resources aimed at maintaining, creating, or changing institutional logics in a regional context confronted with a need to achieve green restructuring. Following up this empirically, we investigate how, why, and when regional stakeholders’ IW contribute, or not, to ‘institutional entrepreneurship’ (e.g. ‘activities of actors who have interest in particular institutional arrangements and who leverage resources to create new institutions or to transform existing ones’ (Maguire et al. 2004, 657)) and ‘green industrial restructuring’ in the RISs of two adjacent and rather petroleum-dependent regions. Our research questions are:

- How is IW in regions balancing maintenance, creation, and change of institutional entrepreneurship behaviour?
- How is this IW legitimizing and delegitimizing green industrial restructuring?

We scrutinize these questions through an EEG-IW inspired in-depth study of key stakeholders’ practice of institutional entrepreneurship in the RISs. A key point is that altering strong path dependency necessitates institutional changes, but that this is challenging given that such a trajectory involves a degree of ‘cemented’ institutional logics (Grabher 1993) and related *practice patterns for and/or of behaviour* of institutional entrepreneurship work (Thornton 2004). The analysis

concentrates on the IW of key stakeholders in the RISs, focusing on whether, and if so, how, it contributes to maintenance, creation, and change in *practice patterns for and/or of institutional entrepreneurship behaviour*, after which we consider the possible implications of these dynamics for green industrial restructuring. The study reveals both differences and similarities in the IW of the two adjacent RISs. In Hordaland (formerly a separate county, as shown in Fig. 2, but now part of Vestland County), which is characterized by an organizationally thick, diversified, interactive networking RIS, IW is collective-oriented practice patterns sustaining cross-clustering institutional logics and promising new green industry activities. By contrast, in Rogaland County (for location see Fig. 2), which is characterized by an organizationally thick, petroleum-specialized RIS, IW is individual-oriented practice patterns sustaining a petroleum sector ‘bouncing back’ as oil and gas markets recover. Thus, despite shared positive visions for green industrial restructuring, the processes of IW and related institutional logics in the RISs respectively legitimize (Hordaland) and delegitimize (Rogaland) a green shift. Accordingly, there is a clear need for context-sensitive IW approaches that acknowledge the importance of identifying context-specific evolutionary institutional logics to understand better how RISs best can be guided towards green industrial restructuring.

Theoretical framework

EEG, RIS studies, and agency

The EEG literature has focused on historical and geographical conditions explaining regional development, in which self-reinforcing processes imply that institutional logics, once established, tend to be reproduced (Martin & Sunley 2006). For example, this process sustains the development of more standardized interaction patterns (i.e. practices) and formal regional institutions and policies that influence how an industry evolves (Jakobsen et al. 2012). Generally, regional industry becomes path-dependent when specific technology solutions, practices that are taken for granted, and institutionalized rules gain a foothold. This may lead an industry to a state of lock-in, a situation characterized by rigidity and eroded adaptability (Hassink 2005) in which certain institutional logics are particularly dominant and, thus, difficult to change. Following the logic of EEG and the path dependency literature, changing industrial development patterns is increasingly difficult as a path progresses towards strong specialization and lock-in (Isaksen et al. 2018a). Explanatory weight has typically been placed on systemic configurations such as industry clusters and RISs (Boschma et al. 2017;

Miörner & Trippel 2017; MacKinnon et al. 2019). We are particularly interested in RISs, which have been defined as ‘interacting knowledge generation and exploitation subsystems linked to global, national and other regional systems’ (Cooke 2004, 3), ‘in which firms and other organizations are systematically engaged in interactive learning through an institutional milieu characterized by embeddedness’ (Cooke et al. 1998, 1581). RISs have primarily been illustrated using three interacting subsystems: a knowledge infrastructure system (i.e. R&D, educational institutions), an industrial system (i.e. clustering firms), and a governance system (i.e. mediators such as technology transfer offices) (Stuck et al. 2015). The knowledge infrastructure, which contributes to specialized training, teaching, information, research, and technical support, has received relatively little attention. By contrast, there has been much debate on industrial subsystems of RISs and how they should be politically governed to support innovation processes. To this end, different typologies have been suggested. Asheim et al. (2011) emphasize the characteristics of RISs organizations, finding them to be either thick or thin. Building on work by Cooke (2004), Stuck et al. (2015) emphasize the network aspect in their categorization of RISs as either interactive networking, localized grass roots, or globalized dirigiste. Building on Asheim et al. (2011), Isaksen & Trippel (2014) divide between organizationally thick and diversified RISs and organizationally thick and specialized RISs.

Nevertheless, both the EEG literature and RIS studies have recently shifted to a stronger focus on the agency dynamics of the economic landscape. The EEG part of this literature emphasizes the importance of related variety for overcoming overreliance on one or a few industries. Related variety points to the importance of a diversified, yet interlinked, industrial structure, in which industries share certain similarities yet remain different from each other, the argument being that,

the higher the number of technologically related sectors in a region, the more variety in related sectors, the more learning opportunities there are for sectors in that region, and the more intersectoral knowledge spillovers are likely to take place, resulting in higher regional growth. (Boschma & Frenken 2011, 188)

Furthermore, RIS literature has shifted focus towards the role of key actors in shaping the evolution of regional industries (Mackinnon et al. 2019). For instance, it has been argued that agents may respond differently to similar regional systemic settings (Zukauskaitė et al. 2017) and that regional evolution may result from both intricate interactions between actors (i.e. bottom-up) and policy intervention (i.e. top-down) (Njøs & Fosse 2018).

Linked to this is the argument that agency can and should be performed by both firm and non-firm actors if it will result in ‘real’ changes in a region’s industrial activities (Binz et al. 2016; Isaksen et al. 2018a; Steen & Hansen 2018; Kyllingstad & Rypestøl 2019). Following societal movement towards greater sustainability, the interest in the role of agency in developing greener economic practices and green restructuring is likewise increasing (Tödting & Trippel 2018). To understand ‘agency in context’, alternatively known as the agency–structure dimension, scholars are increasingly interested in ideas from institutional theory (Dawley 2014; Chlebna & Simmie 2018; Grillitsch & Sotarauta 2018; Miörner et al. 2018; Sotarauta & Suvinen 2018).

However, we argue that the understandings of the interaction between agency and institutions in EEG and RISs are still immature, especially regarding how actors go about structuring, and are structured by, institutional logics (Cortinovis et al. 2016). Thus, we elaborate on ‘agency in context’ by looking more closely at institutional agency theory.

Institutional agency theory

When developing an analytical framework linking EEG and RIS studies to institutional agency theory, which can inform our understanding of regional restructuring and the emergence of green industries, it is necessary to define what we mean by ‘institutions’. A commonly accepted definition is that they are the ‘formal and informal rules that organize social, political and economic relations’ (North 1990, 3). Formal rules include either employees’ written rights and obligations, or the rules of governance formed by a political regime, while informal rules are well-established practices and codes of conduct used in social settings. While institutions have often been treated as ‘static’ by EEG (Coenen & Lopez 2010), our interest lies precisely in explaining how purposeful agents attempt to alter institutions. As such, we are quite interested in the term ‘institutional entrepreneurship’ (Battilana et al. 2009), which refers to the ‘activities of actors who have interest in particular institutional arrangements and who leverage resources to create new institutions or to transform existing ones’ (Maguire et al. 2004, 657). The term is most strongly associated with DiMaggio (1988, 14), who argue that ‘new institutions arise when organized actors with sufficient resources see in them an opportunity to realize interests that they value highly’. These actors – institutional entrepreneurs – ‘create a whole new system of meaning that ties the functioning of disparate sets of institutions together’ (Garud et al. 2002, cited in Garud et al. 2007, 957). This approach can also be linked to

recent discussions about the roles of different agency types in regional industrial evolution (Grillitsch & Sotarauta 2018), which is associated with both innovation systems (well functioning and not well functioning) and entrepreneurial activity by firms utilizing commercial opportunities, where both firm and non-firm actors can act as influential agents in such processes (Binz et al. 2016; Isaksen et al. 2018b; Kyllingstad & Rypestøl 2019).

The institutional entrepreneurship literature has been criticized for conceptualizing institutional change as a consequence of the actions of ‘heroic individuals’ (Fuenfschilling & Truffer 2016). There has also been a focus on agents’ special skills and intended actions (Lawrence et al. 2011). Thus, we find the adjacent perspective of IW more promising. Based on the work of Lawrence et al. (2011, 55), IW can be defined as ‘physical and mental efforts aimed at affecting an institution or set of institutions’. While such efforts can contribute to maintaining, creating, or changing institutions, they can also disrupt them (Lawrence et al. 2011). IW differs from institutional entrepreneurship in that agency also includes ‘taken-for-granted practices’. Although there is nothing inherently spatial about how IW interprets agency, some promising ways in which we might begin to engage with IW through a contextual understanding of agency have been highlighted (Sotarauta & Pulkkinen 2011; Bathelt & Glückler 2012; 2014), such as viewing it as a form of ‘reflexive interaction in specific spatiotemporal contexts’ (Bathelt & Glückler 2014, p. 14). Thus, IW harbours a strong institutional agency view. This differs from both ‘old’ and ‘new’ institutionalism, which have both focused on how existing institutions have affected the agency of actors (DiMaggio & Powell 1983; North 1990) (see also Garud et al. 2007 for a review of institutional theory). Finally, IW also posits that materiality can ‘enact’ institutional agency (e.g. contributing with a signalling effect), which could lead to legitimization of institutional change (Monteiro & Nicolini 2015; Fuenfschilling & Truffer 2016). IW aimed at creating new institutions or changing existing ones can, for example, involve the development and legitimization of new patterns of behaviour in terms of interorganizational collaboration (Lawrence & Suddaby 2006). In other words, actors’ IW in a RIS can contribute to changing institutional logics towards legitimizing green industrial restructuring understood as processes of change ‘that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services’ (UNEP 2011, cited in Grillitsch & Hansen 2019, 2166).

However, in an EEG perspective, IW involves supporting and sustaining the legitimacy of existing

institutional logics. Although it is difficult to find any widespread, explicit application of an IW approach within EEG, Capasso et al. (2019, 391) argue as follows: ‘Whereas EEG has tended to focus on knowledge and firms, the current debate has placed particular attention on political and institutional contexts [...] hinting towards processes such as market formation and the role of institutional agency and policy-making’. From this perspective, agency as an intersubjective, institutionalized reflexive practice has been explored in the EEG literature. For instance, Grillitsch & Sotarauta (2020) identify three main forms of change agency that can shape the regional restructuring process: *innovative entrepreneurship*; *institutional entrepreneurship*, *place-based leadership*. *Innovative entrepreneurship* is mainly performed by firms and other economic actors and with the Schumpeterian entrepreneur discovering and exploiting new possibilities. *Institutional entrepreneurship* is about seeing the opportunity to change institutions and institutional set-ups and taking the risk to make the change. Such agency can, for example, deliberately change the ‘rules of the game’ by introducing new political regulations that have a huge impact on the practices of industry actors. *Place-based leadership* is regionally embedded and captures action aimed at transforming and changing regional development paths through mobilizing regional competence and resources. Moreover, the literature points to a connection between the industrial composition of regions, and opportunities for green diversification and restructuring (Grillitsch & Hansen 2019; Njøs et al. 2020). In line with Jakobsen et al. (2021, 8), we expect that ‘Specialized industrial regions tend to have R&D institutions and support systems that are closely aligned with the dominant industry, making them vulnerable to negative lock-in and strong contestation from incumbent activities’. As Grillitsch & Hansen (2019) note about these regions, the most realistic restructuring strategy is to focus on the greening of existing industries and green diversification (i.e. use existing competences to diversify into new, green or greener industries).

Bækkelund (2021) introduces a discussion of *change agency* and *reproductive agency* (i.e. how agents and their actions can contribute to change but also to maintaining existing structures). She argues that both forms of agency are important for industrial development processes, but in our context we argue that when investigating *green* regional industrial restructuring, the ‘content’ of the two categories can be considered of additional importance. By this we mean that, as *change agency* opens for influencing existing institutional logics, in our setting it involves influencing logics in a green direction, while *reproductive agency* similarly

can either involve reproduction of existing (e.g. brown) institutional logics or it could be about maintaining emerging and/or ongoing green orientations. Although a conceptual pair, each of the terms *change agency* and *reproductive agency* carries both negative and positive connotations when considering green regional industrial restructuring.

Put simply, when combined, IW and EEG view institutions as being maintained, created, or changed by skilled actors (Sotarauta 2015) who are nevertheless structurally and regionally embedded (Garud et al. 2007). These institutions will then enable (or constrain) further agency of both the actors who created them and others. Thus, the notion of institutional logics is a helpful theoretical abstraction. Broadly defined, institutional logics are *practice patterns of behaviour* and *practice patterns for behaviour* or social prescriptions that direct what is legitimated practice and delegitimized practice within a given context (e.g. Thornton 2004; Almandoz 2012). Following EEG and RIS thinking, such logics, although continuously in process through IW, are nevertheless contingent. For example, returning to the theory of related variety, regions with a high degree of related variety may create a wider scope of contingencies under which several institutional logics can be observed, whereas in specialized regions, dominating institutional logics can be fewer but nonetheless strong or stronger. This means that IW also can reflect institutional logics in terms of *practice patterns for and/or of institutional entrepreneurship behaviour* that delay or obstruct institutional change (e.g. legitimate or delegitimized green restructuring). As such, IW represents the agency through which various institutional logics are promoted, contested, and negotiated (e.g. between different actors in a region).

To summarize, regions may have a strong traditional industrial presence (e.g. the petroleum sector), implying that it is challenging to develop institutional entrepreneurship behaviour legitimizing or delegitimizing green industrial restructuring. In regions there will be actors with different forms of agency. IW that includes both *change agency* and *reproductive agency* (Bækkelund 2021) in different ways can sustain institutional logics legitimizing or (de)legitimizing different types of green restructuring. This necessarily opens for a need for context-specific approaches sensitizing the need and/or desire for either *change agency* or *reproductive agency*, or a combination of these. Taking this to the empirical level, we now turn to our case studies of how IW has develop in a region characterized by an organizationally thick, diversified, interactive networking RIS, an in a region characterized by an organizationally thick, petroleum-specialized RIS.

Materials and methods

Data collection

To determine how IW in different RISs contributes or not to changing institutional logics that legitimize green restructuring, we screened documents, ran quantitative regional industry structure models, and conducted semi-structured interviews. The resulting model, based on secondary data including employment registry data (i.e. employee numbers), NACE codes, and regional contexts, shows that the investigated regions differ regarding the diversity of their industries (i.e. they scored differently regarding related variety). Related variety means that employment within a particular region, in our case both Rogaland and Hordaland, is distributed across different but similar and complementary industries. We modelled related variety by using data from Dun and Bradstreet and the 2002 NACE code classification system (Statistics Norway n.d.,a). For each region, we first applied Shannon's entropy measure of diversity of employment in different industries using five-digit NACE codes. Next, we subtracted from the equation Shannon's entropy measure, using two-digit NACE codes (Frenken et al. 2007). For both entropy measures, we used the natural logarithm.

Thereafter, we conducted a qualitative study with a combined exploratory and descriptive research design. We started with an exploratory design to ensure sufficient information about the *how*, *who*, and *when* regarding regional industrial restructuring. In-depth knowledge, held by the authors of this article, about these topics in the target regions was a significant advantage. Previous research experience with the regions was used to make a list of c.40 regional key stakeholders in the RISs, among whom we managed to interview 24. In the interview phase of the study, snowball sampling was used to add new stakeholders to the list of interviewees as the study proceeded. Among those interviewed were key system actors within cluster facilitation, R&D organizations, regional authorities, financial organizations, non-governmental organizations, and leading firms in the two regions. To allow the interviewees to share their views, experiences, and reflections, we used a semi-structured interview guide. The nature of the questions was topic-based and open-ended. As such, they could be tailored to deliver targeted questions to different interviewees, depending on their position and organizational membership. After the interviews had been transcribed, they were thoroughly analysed to identify expressed practices of key system actors and how those were linked to IW that aimed to maintain or create industrial activities in

the regions. Accordingly, in the analysis phase, we switched to a research design focusing on interpretations of the interviews to discover regional similarities and differences in how regional stakeholders' practices contributed, or not, to changing institutional logics legitimizing green industrial restructuring. To complete the exercise, we conducted an analysis concentrating on identifying claims and storylines about dominating events and processes behind industrial restructuring and interpreted how these related to IW and observed institutional logics.

We applied the principle of saturation to generate data. We applied saturation during the interview phase, whereby we stopped interviewing additional stakeholders after the same themes recurred and no new insights were forthcoming with additional data sources (Bowen 2008). Saturation was also applied in the manual coding of the interview data, to ensure that quotes were sufficiently generic to cover multiple stakeholders (i.e. there was a consensus across views expressed). We also revisited recent studies of greening efforts within three main sectors. More specifically, we draw from Fløysand & Jakobsen (2017) in our analysis of the greening of the seafood sector, from Njøs et al. (2020) in our analysis of greening within the petroleum sector, and from Sjøtun & Njøs (2019) when investigating the maritime sector. In total, we draw on 35 in-depth face-to-face interviews, each lasting 30–90 minutes. Nevertheless, there is always a risk of missing important empirical dimensions. Although we believe the quantitative data partly controlled for this risk, a more systematic dialogue with our interviewees, to check for recognition of the qualitative analysis, might have increased the validity of our study. That said, in following up on the aim to elucidate how actors 'engage in collective action to mobilize knowledge, resources, and public opinion in order to create new or adapt existing institutions' (Cortinovis et al. 2016, 25), the analysis is framed as a comparison of IW practices and institutional logics in Hordaland and Rogaland. In the next section, we present our findings and analysis of how these practices and institutional logics are linked to recursive feedback loops between regional industry structures and dominating institutional logics that are relevant for understanding the legitimization and enabling of green restructuring in the two target regions.

Results

Regions and RIS structure

Our case analysis is of two regional economic systems that during time have respectively evolved into an

organizationally thick and diversified RIS (Hordaland) and an organizationally thick and specialized (Rogaland) RIS. The two regions hosting the RISs are both core regions for resource-based industries, important national economic activities, and national wealth creation; this is particularly due to their proximities to several important natural resources in the North Sea, including oil and gas. Although their RIS structure differs, it is evident that Hordaland and Rogaland share many similarities. In 2019, Hordaland and Rogaland had populations of 524,495 and 475,654, respectively (Statistics Norway n.d.,b). Several large multinational corporations (MNCs) operate in the two regions and the regions have developed global positions in the traditional Norwegian industries, namely non-renewable energy, maritime, marine, and renewable energy (Fagerberg et al. 2009). While non-renewable energy, maritime, marine, and renewable energy industries operate in both regions, they have varying impact patterns, as indicated in Table 1. These and other differences can be partly explained by the industrial evolutions of the regional capitals.

In the RIS in Hordaland, Bergen serves as the regional capital. At the end of the 13th century, Bergen was Norway's largest city and its capital city. Bergen was also a trading post in the Hanseatic League, and until 1789 the city enjoyed exclusive rights to mediate trade between Northern Norway and abroad. That paved the way for international trade and related industries such as shipbuilding and shipping assurance. Developments of various fishery-related industries have also been relatively significant since that time. The Hordaland region's recent industrial history involves metallurgical industries based on the development of hydropower plants in the fjord landscape in the early 20th century. During the 20th century, the fjord landscape also attracted international tourism to the region. As a consequence, the region now hosts the busiest cruise port in Norway, with an excess of 300 annual cruise ship dockings. Nevertheless, the most notable industrial restructuring in modern times has been linked to oil and gas resources in the North Sea. Although the region did not take advantage of the opportunity to dominate oil and gas activities in Norway, the petroleum industry has been highly influential in its industry structure (see Table 1). Furthermore, Hordaland serves as an international centre for aquaculture, shipping, and subsea technology, and is a national centre for higher education, media, tourism, and finance.

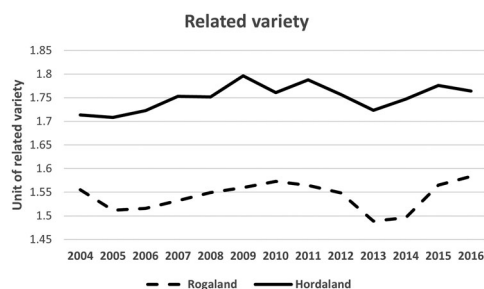
The history of the knowledge subsystem of the RIS in Hordaland dates back to 1825, when the University Museum of Bergen was founded. In 1900, the national

Table 1. Human years, turnover, and export value for non-renewable energy, maritime, marine, and renewable industry activities during 2016 in the studied regions (Source: Samfunnsøkonomisk analyse 2017)

		Non-renewable energy	Maritime	Marine	Renewable energy
Hordaland	Person years (% of regional total)	12	6	4	1
	Turnover (billion NOK)	19,345	45,245	33,630	13,039
	Export value (billion NOK)	52,297	1462	22,625	1031
Rogaland	Person years (% of regional total)	24	4	1	1
	Turnover (billion NOK)	299,398	18,301	14,789	10,743
	Export value (billion NOK)	193,010	264	6226	527

Norwegian Institute of Marine Research and the Directorate of Fishery were founded and located in Bergen. The Norwegian School of Economics (the leading business school in Norway) was established in Bergen in 1936. Currently, the region hosts the University of Bergen, the Norwegian School of Economics, and the Western Norway University of Applied Sciences. The county administration (i.e. Vestland County in 2020 following the merger of Hordaland and the neighbouring county of Sogn og Fjordane) oversees the implementation of regional industrial development policies, which in recent decades have followed a cluster strategy. In sum, the RIS in Hordaland is characterized by several related strong industries, several R&D organizations, and several professional industry facilitators, which are particularly focused on cluster initiatives. Accordingly, the RIS is an ‘organizationally thick and diversified’ (Isaksen & Trippl 2014) industry and support system, as reflected by a relatively high degree of related variety (Fig. 1).

By contrast, the RIS in Rogaland is characterized by an ‘organizationally thick and specialized’ regional industry and support system, reflected by a relatively low degree of related variety (Fig. 1). As in Hordaland, the regional industry structure includes non-renewable energy, maritime, marine, and renewable energy industry. However, non-renewable energy is by far the most significant industry (Table 1). This specialization within non-renewables began in 1969, when oil was first discovered in the North Sea. Prior to that, the most important industries in the regional capital, Stavanger, were related to shipping, shipbuilding, and food processing.

**Fig. 1.** Related variety in Rogaland and Hordaland (2004–2016)

The latter included c.50 canning factories in 1950, an industry that was abandoned when Rogaland was chosen to be the onshore region for Norway’s petroleum activities. The emergence of that new industry was initially driven by international oil and gas companies and their foreign direct investments in the region. However, this changed when the Norwegian state-controlled oil and gas company Equinor (formerly Statoil) was established in 1972. The national government decided to locate the headquarters of Equinor in Stavanger. This was a game-changing move for industry development in Rogaland. The region shifted from being a relatively poor rural area to a dynamic international petroleum hub. From 1972 to 2019, the population grew by 75%, compared with increases of 39% and 38% in Hordaland and Norway, respectively (Statistics Norway n.d.,b). Moreover, the establishment of Equinor was followed by national agencies, including the Norwegian Petroleum Directorate (in 1972) and the Petroleum Safety Authority Norway (in 2004). The region’s R&D organizations also underwent changes, initially by developing to serve the petroleum industry, and later by the accreditation of the University of Stavanger as Norway’s fifth university (in 2004). Thus, compared with Hordaland, Rogaland has been a late bloomer insofar as it hosts several R&D organizations and intermediaries of rather recent origins, all related to the petroleum sector. According to Samfunnsøkonomisk analyse (2017), petroleum extraction and associated suppliers and service providers constitute 50% of the value creation in the region. Necessarily, the industrial characteristics of the two RISs also influence currently observable efforts for green restructuring in the regions, such as efforts to develop more environmentally friendly solutions within, for example, the petroleum, aquaculture, and maritime sectors (Jakobsen et al. 2021).

Institutional work and institutional logics

Bearing in mind the evolution of the RISs in Hordaland and Rogaland, there have been dissimilarities in how, when, and why IW has contributed to the maintenance, change, and creation of institutions and related

institutional logics. Different regionally embedded forms of institutional agency have come to the surface when key stakeholders have engaged in cluster development targeting the national cluster programmes (run by Innovasjon Norge (Innovation Norway), Siva, and Forskningsrådet (Research Council of Norway)), one of the central pillars of Norwegian innovation policy. The ARENA programme is aimed at emerging, immature, and potential clusters, and is intended to explore and to structure industry clusters in an early phase of development. The NCE (National Centres of Excellence) programme, initiated in 2006, is designed for mature clusters with a strong international position. In 2014, another cluster level was initiated for NCEs to become Global Centres of Expertise (GCEs), such as industrial clusters with potential for gaining a global position (Njøs et al. 2017).

The cluster projects and their respective industry clusters are important for understanding recent observable organizational outcomes from IW in the two regions. In the RIS in Hordaland, the IW of the regional stakeholders has formed and been formed by *practice patterns of behaviour* and *practice patterns for behaviour* encouraging clustering. Accreditation as an NCE in the Norwegian Innovation Cluster programme has been highly sought after. Several regional key stakeholders have engaged in cluster development targeting the national cluster programme. As a result, IW in the Hordaland RIS has supported institutions and institutional logics materialising in industrial differentiation. As shown in Fig. 2, six regional cluster projects have been classified as Centres of Expertise (NCE and GCE) in the region. The type of agency related to this development involves a high degree of *change agency* in the initial phase, and in the preceding and current phases of development *reproductive agency* is characterized as extension of this institutionalized logic.

In addition to organizational changes in the RIS (i.e. the establishment of cluster organizations), change agency and reproductive agency have created changes in the social prescriptions that determine what legitimate IW practice in the RIS is. First, changes in terms of ‘intersubjective meaning’ related to IW are evident in an ongoing internalization of a cluster terminology in the everyday language of key regional system stakeholders. For example, in addition to industries and cluster facilitator organizations, several of Hordaland’s university leaders have become central in promoting both cluster theory and cluster practice:

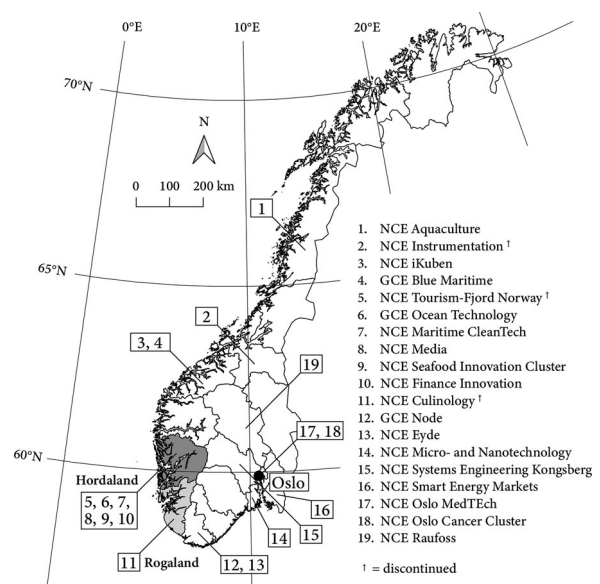


Fig. 2. Geographical distribution of GCEs and NCEs in the Norwegian Innovation Cluster programme

Old universities like the UiB [University of Bergen] has a very strong focus on clustering. (Head of R&D)¹

When it comes to education, research and innovation, the knowledge clusters that we work with are perhaps paramount in terms of interaction. Media City [NCE Media] is a glittering example of how we try to interact with local, regional, and international players. (Head of R&D)

The IW of regional industry actors, R&D, and intermediaries have together created a ‘cluster Klondike’. This began with the establishment of NCE Subsea in 2006 (currently GCE Ocean Technology), followed by NCE Tourism–Fjord Norway (2009–2019), NCE Maritime CleanTech (2014–), NCE Media (2014–), NCE Seafood Innovation Cluster (2015–) and NCE Finance Innovation (2017–). NCE Seafood Innovation Cluster, NCE Maritime CleanTech, and GCE Ocean Technology represent the historically strong marine and maritime regional industries in the region. Likewise, NCE Tourism–Fjord Norway reflected the region’s historical fjord tourism industry and NCE Finance Innovation represents its traditionally strong finance sector. This IW in the Hordaland RIS reinforces the existing industry structure because clustering triggers the extension of industry paths, which in most cases were already in place and available for further development when industries obtained cluster status in the national programme. As such, the IW is what we earlier have considered as *reproductive agency*. Nevertheless, this IW also appears to have triggered more profound changes

¹The full identity of the study participants has been kept anonymous in this article.

in terms of new industry paths and institutional logics. Along with introducing new organizations (i.e. cluster facilitators) and a new terminology, the IW has been followed by new interorganizational collaborations resulting in unintentional institutional logic changes in terms of new *practice patterns for and/or of institutional entrepreneurship behaviour* (i.e. an ‘opening up’ for *change agency*). Recently, and somewhat unexpectedly in a clustering context, the multiple networking processes has been intra-RIS dominated by networking across clusters. There have been several initiatives, most of them involving two clusters and some of them three clusters:

in relation to digitization [...], which resulted in the AquaCloud project [...], we [the cluster organization] never would had got the flying start without the expertise from finance tech [NCE Finance Innovation] and media tech [NCE Media], which have worked a lot with digitization. (Intermediary)

When we had our partner strategy meeting, the first thing we did was invite all the cluster leaders in the region to join us. How can we co-operate? (Intermediary)

It’s a pretty big shift that has occurred ... it’s about, we are much more concerned about collaborating now than we were previously. I mean, much more ... I would say this is close to an essential acknowledgement, for us at least. (Industry leader)

By contrast, the IW dynamics differ markedly in Rogaland, where RIS stakeholders’ IW has primarily focused on forming processes of smart specialization. Nevertheless, inspired by the ‘cluster Klondike’ in the adjacent region to the north, Rogaland has established several ARENA projects (pre-qualification NCE projects), all of which have emerged relatively recently: Norwegian Smart Care Cluster (2014), Norwegian Tunnel Safety Cluster (2016), Nordic Edge Smart City Innovation Cluster (2018), Norwegian Energy Solutions (2018), Norwegian Offshore Wind Cluster (2018), and Stiim Aqua Cluster (2018). Some of these ARENA initiatives, if not green, are certainly strategies for smart specialization. The Smart Care Cluster’s primary goal is to develop high-quality, efficient health care services, whereas the Nordic Edge Smart City Innovation Cluster’s scope is broader, including city infrastructure and services such as traffic, community transport, waste disposal, energy efficiency and city monitoring. Both of the aforementioned clusters represent IW with potential for the emergence of new industries in the information and communication technology (ICT) sector, as they both aim to capitalize on the regional ICT capabilities of the oil and gas industry. This is also partly the case for the Norwegian Offshore Wind Cluster initiative, for which a driving mechanism is electrification of offshore oil- and gas production.

Although not always intentionally, the majority of the smart cluster initiatives have implied IW supporting continuation in activities related to the petroleum industry and continued strong dependency on the oil and gas industry (see Table 1 and Figure 1). Another significant difference in how IW accounts for how maintenance of institutional logics in the Rogaland RIS, is linked to the dominance of institutional logics regarding individual strategic leadership in the RIS (i.e. that *reproductive agency* consists of ‘more of the same’). Unlike the collective leadership approach observed in Hordaland, IW in Rogaland is legitimizing institutional logics or *practice patterns of and/or for heroic individuals*’ (Fuenfschilling & Truffer 2016). There are various explanations for the legitimizing. The most striking reason is that individual strategic leadership is essential in the narrative of how Rogaland’s industry managed to advance from an organizationally thin to an organizationally thick and specialized regional innovation system in the aftermath of North Sea oil and gas discoveries. The individual leader linked to this path creation is the former Mayor of Stavanger, Arne Rettedal, who among other things, was known for his efforts to convince the Norwegian state authorities (Equinor, the Norwegian Petroleum Directorate, and the Petroleum Safety Authority Norway) and foreign MNCs (Phillips, Exxon, Shell, British Petroleum, Elf, Schlumberger, and Haliburton) to choose Rogaland as their Norwegian petroleum activity headquarters (Kindingstad 1998). Nonetheless, this experience is currently causing *practice patterns of and/or for individual strategic leadership*:

No one has taken the role of regional leadership. They are busy making obstacles for others. (Industry leader)

Compared with the situation ten to fifteen years ago, regional leadership is now at the lowest level. It’s all about the people holding the positions, the collaborations between them, and how institutions function. (Industry leader)

Another institutional logic condition characterizing the IW of the RIS in Rogaland is related to *reproductive agency* experiences in terms of the maintenance effects of a strong petroleum sector in the region. In contrast to Hordaland, the interviewees’ reflections on IW did not focus on new forms of collaboration, learning, and related green restructuring processes, but on how petroleum industry dominance and strong path dependency prevent IW from the creation of new paths:

It will take time to develop new industries. The ecosystem is used to oil and gas. In other fields, we don’t have much knowledge and expertise. Does it take a generation to develop? (Intermediary)

As illustrated in the quote above, in a petroleum-dependent economy such as Norway's, and especially in these petroleum-dependent regions of the country, the green shift is high on the social agenda, but does this ensure green industries?

Green restructuring or more of the same?

When taking a closer look at the greening effects of IW, we observed new and promising collaborations between the salmon farming industry and the oil and gas industry in both regions. The salmon farming industry is experiencing enormous challenges from regional environmental impacts. This has been met by top-down regulatory changes, culminating in a policy-induced greening programme introducing tools such as green production licences (2014) and development licences (2016). Industry stakeholders have responded to these new regulations in two ways, by adjusting existing technologies and by developing new technology solutions. These solutions appear to be crucial stepping stones along the industry's greening path and their ability to meet new regulations. The latter strategies have been most notable in Hordaland, where an intensive crossover programme from the oil and gas industry to the salmon industry was set up during oil price fluctuations in the years 2014–2017. Our interviewees described the importance of novel interorganizational collaboration as follows:

But then it went as it did with the oil price and the price of oil and salmon became inversely proportional. The price of salmon rose and they [salmon industry] realized that if they should solve the lice problems and take out their production potential then they would need more technologically advanced solutions than they had. So therefore this created a desire for investments and they had investment capabilities since the industry was doing well. So that was a good fit while the oil market decreased and there were fewer assignments within oil and gas [...] We were stimulated by the market here, so that many, now around forty to fifty of our traditional oil and gas firms, now in addition supply the ocean farming industry. They are the ones that in reality have made a lot of the technology behind the development concessions which look like a crossover between traditional ocean farming and an oil installation. So, there, they have found a market. (Intermediary)

The cluster programme can contribute to more collaboration. And that is done in the cluster programme. We also contribute to that. We contribute in the way that it is an 'enabling' type of thing. Crossover. It is our great green contribution within this [...]. (Intermediary)

The strongest example of greening is in the NCE Maritime CleanTech cluster in the RIS in Hordaland.

Since its establishment in 2011, NCE Maritime CleanTech has become world leading in maritime battery technology (MBT). Although MBT implementation has occurred mainly within two short sea shipping markets in Western Norway (i.e. car ferries and offshore supply vessels), it has also found its way into new markets. For example, Corvus Energy recently won a contract to install the world's largest battery packs on four Norwegian cruise ships that sail Norway's Western Fjords (E24 2021). Also, new and unorthodox maritime actors are becoming increasingly important to the MBT value chain. Power and utility companies now play major roles in maritime industry electrification and will play important roles in building the infrastructure needed for a battery revolution (e.g. fast-speed charging stations, land power infrastructures, and general power grid upgrades). Finally, battery development in the maritime industry has had an effect on other industries, for example with regard to electrification of fish pens and fishing boats in the marine industry. Altogether, the observed greening appears to have been based partly on IW and changes in institutional logics (i.e. novel interorganizational collaboration).

Nevertheless, despite the positive visions for the clusters' green industrial restructuring processes and despite the positive expectations expressed about those processes, key system stakeholders in the RIS in Hordaland expressed contradictions about how the 'cluster Klondike' and related novel interorganizational collaborations between industries correspond to green restructuring:

I think all clusters throughout the cluster programme look for opportunities for green solutions. (Intermediary)

For me, the main reason for being here, is that it is the largest renewable company in Western Norway. I associated it with something very solid, safe, and reliable. Personally, I am convinced that the biggest challenge is 'global warming'. I do not think that I will solve the world problem but feeling that I work in place that contributes to the solutions is absolutely essential to where I want to work. Then I look at it as a small part of my task to try to get that transformation to go as fast as possible, meaning the transformation from fossil to renewable. [...] how can we both obtain the renewable energy as efficiently, cost-effectively, and customer-friendly as possible, so that we can, as far as possible, outperform fossil in most possible sectors, as quickly as possible [...] my challenge is 'How do you find the clusters that demand "doing" together and not just [...] I really need [...] It is very positive with networks, but the risk is that you just talk. (Industry leader)

The environment is obviously important, and all individuals and organizations have an ethical responsibility to contribute always within their capabilities. However, it

is important that conditions and stimulation are there to [protect] the environment, and that it will become business sound, as no company has a formal responsibility for the environment beyond its own work, activities, and capabilities. One has responsibility to stay within the regulations and laws that are there but a company does not have a formal responsibility beyond that. Having said that, I think it is important and smart for every business to have a corporate social responsibility. Other institutions have this as a main role and formal responsibility. So, this must be stimulated by the authorities in every possible way, with both a stick and a carrot. (Intermediary)

The challenge of doing and not just talking in green restructuring matters is even more notable in the RIS in Rogaland than in the RiS in Hordaland. Although there exists a massive awareness of a need to reduce the oil and gas dependency in Rogaland, current RIS dynamics and IW are allowing for continuation of institutional logics in terms of maintaining established *practice patterns for and/or of institutional entrepreneurship behaviour*. For 50 years, the region's lucrative oil and gas industry has developed and advanced with strong support from regional leaders. This regional support for specialization is further enhanced by high oil industry wages, which tend to drain highly educated workers from other industries. For example, Equinor continues to be crucial in most renewal strategies, including those with *smart cluster* potential. When oil prices recover, the regional industry tends to become more competitive due to the relatively low levels of costs achieved during the recession. Consequently, a crisis is often followed by periods with high profit margins. This recurring cycle was emphasized as a key regional lock-in mechanism by the stakeholders of the Rogaland RIS. Most interviewees were very aware of the risk of a 'lock-in' situation for their petroleum-driven RIS. They emphasized three important conditions that they believed would hamper willingness to invest in oil and gas, and hence contribute to an accelerated urgency for regional restructuring, including increased societal environmental awareness, accompanied by the duration of recessions in the oil and gas industry, and relatively modest increases in oil prices following the recession:

Restructuring in the petroleum industry has been very successful. The process of reducing costs started early, and we are now more competitive than the oil shale industry in the USA. However, restructuring to something else than oil and gas has been rather disappointing. (Industry leader)

The worst thing that can happen now is a booming oil price. Then, the industry will re-employ people and reverse emerging restructuring processes. The industry is extremely profitable at the current cost level, and with

booming oil prices it will be very difficult to create new industrial initiatives. (Intermediary)

It is extremely important to create new regional industries. It is very difficult now, we need billions! (Industry leader)

Discussion

In Norway, we need to explore every available avenue for a new green path development in regions that are dependent on the petroleum industry. In following up this need, we have investigated how, why, and when regional stakeholders' institutional work contributes, or not, to changing institutional logics in terms of *practice patterns for and/or of institutional entrepreneurship behaviour* that enable green industrial restructuring in the RISs of two adjacent petroleum-dependent regions in Western Norway. Relying on a theoretical approach that combines elements from EEG (e.g. Martin & Sunley 2006), RIS (e.g. Cooke et al. 1998), and IW (e.g. Lawrence et al. 2011), we have argued that a broader, practice-oriented, but EEG-informed IW approach is of most relevance for scrutinizing how regional stakeholders' IW contributes, or not, to changing institutional logics legitimizing green shifts in RIS. In following up the double-edged dimension of institutional logics, we have studied IW and its maintenance, change, and creation of related institutional logics legitimizing and/or delegitimizing green restructuring.

Our study confirms that IW is an intersubjective phenomenon operating within context-specific RISs and, as such, contributes differently to green industrial restructuring. In Hordaland, hosting an organizationally thick, diversified (Isaksen & Trippel 2014), and interactive networking RIS (Stuck et al. 2015), recent IW has changed institutional logics or *practice patterns for and/or of institutional entrepreneurship behaviour* in the direction of collective leadership legitimizing green restructuring. Recently, the practice patterns in the Hordaland RIS has been changed through institutional agency of regional actors resulting in a 'cluster Klondike'. Currently, five of Norway's fifteen NCEs and one of three GCEs are in Hordaland. Furthermore, the IW of key stakeholders in the RIS in Hordaland have played an important role in legitimizing emerging green industries. Furthermore, the IW of key regional actors has contributed to institutional change by internalizing cluster discourse in the everyday language in the RIS. In addition to involving clustering processes this has opened for a new institutional logic in terms of practice patterns for green restructuring in the RIS. Several new IW practice patterns can be observed, included the creation of new intersubjective meaning

guiding rules of interaction within the RIS in Hordaland. Thus, the case provides insights into how, why, and when IW accounts for contextual practice patterns of and/or for behaviour that enable green industrial restructuring.

By contrast, in the similarly sized adjacent region of Rogaland, recent IW dynamics appear to be structured by relatively stable institutional logics in an organizationally thick, specialized (Isaksen & Trippel 2014), and rather dirigiste RIS (Stuck et al. 2015). IW in this RIS follows a primarily petroleum-dependent pattern characterized by strong individual leadership delegitimizing green restructuring. Although the IW in Rogaland is aiming for differentiating the region's industry pattern, there are strong signs that well-embedded institutional logics in the oil and gas industry are bouncing back. Thus, the IW and related institutional logics in the RIS seems to delegitimize a green shift, thereby reducing greening to a mainly discursive process.

While the above observations draw attention to how IW and institutional logics in the two cases RISs have led to different outcomes in relation to green restructuring, it is important to keep in mind that the two regions differ in terms of industrial evolution. As is clear from the Hordaland case, particularly the maritime and salmon farming industry are much more prevalent there than in Rogaland. As these sectors have been particularly interested in greening processes in recent years (Sjøtun & Njøs 2019), it is important to be mindful of the fact that IW in regions represents the process through which various institutional logics are promoted. As such, our study confirms the importance of a 'organizationally thick and diversified RIS' (cf. Isaksen & Trippel 2014) as a potential advantage, though not a sufficient precondition, with regard to green industrial restructuring.

Our investigation revealed that different institutional logics, developed over a long time, in Hordaland and Rogaland influence current greening strategies in the two regions very differently. In Hordaland, institutional logics focusing on clustering and cluster-to-cluster collaboration has opened for *change agency* towards green restructuring, whereas in Rogaland *reproductive agency* linked to historical development trajectories formed and influenced by strong individuals is influencing today's current institutional logic in the region, namely a focus on regional leadership or the lack of it. Thus, both regions experience *change agency* and *reproductive agency*, but the regional content of these agencies is different because it delegitimizes green industrial restructuring in Rogaland and legitimizes it in Hordaland. In Hordaland, *change agency* for green restructuring builds on *reproductive agency*

underpinning clustering and related variety, whereas in Rogaland, *change agency* is primarily directed towards renewal of existing industries and *reproductive agency* is most prominent in terms of an existing 'individualized' focus on industrial development.

Conclusions

The study has revealed that we must remain mindful of IW's connection to the regional embeddedness of institutional logics. Accordingly, combining IW and EEG is a promising way forward, as it allows for a practice-oriented analysis of how, when, and why the IW of key actors in a RIS maintains institutional logics (i.e. the structure-in-context dimension in terms of practice patterns for behaviour), while simultaneously remaining analytically mindful of *how*, *why*, and *when* IW implies changes and the creation of institutional logics (i.e. the agency-in-context dimension in terms of practice patterns of behaviour). Thus, how IW contributes to institutional logics in a RIS depends on the contextual interplay between agency and structure described in both the EEG literature (e.g. Boschma et al. 2017) and the IW literature (e.g. Thornton 2004; Lawrence et al. 2011). A striking observation is that IW is intentionally targeting a green shift, but somewhat unintentionally it carries institutional logics that means it ends up sustaining continuation of the oil and gas industry. Thus, although in cases of IW seeking change and legitimization of green industries, IW may at the same time provide for institutional logics that delegitimize such shifts.

In conclusion, our study carries theoretical implications with regard to improving knowledge of how the interplay of different IW and institutional logics have played out in different geographical, yet rather petroleum-dependent RISs, and how this can contribute to green industrial restructuring in regions. Specifically, this emphasizes the understanding of green restructuring in regions as driven by the IW of regional actors, both as processes of change but also of continuation (Bækkelund 2021). This challenges the current debate within IW studies, which has tended to explain regional industrial restructuring as outcomes of more intended agency leading to successful outcomes (e.g. Grillitsch & Sotarauta 2020). Therefore, future IW studies should focus not only on enabling factors and successful agency but also on processes of structuration leading to continuation rather than change. An additional implication of our study is that *change agency* and *reproductive agency* for green industrial restructuring can have different 'contents' in different regions. In other words, a dominance of *reproductive agency* can be important to

sustain emerging and/or ongoing greening efforts, whereas *reproductive agency* can also be a barrier to greening if it is too strongly linked towards historically developed institutional logics supporting an already specialized or overspecialized RIS without the necessary contingencies for reorienting existing institutional logics.

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