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## Reconsidering path creation in economic geography: aspects of agency, temporality and methods

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### Abstract

The emergence of new industrial development paths is an important topic in economic geography. However, current perspectives emphasizing the constraining forces of historical trajectories on innovation and change have shortcomings in accounting for how and where new industries arise. This article argues that more attention needs to be paid to agency, and that agency must be seen as intertemporal in the sense that actors' activities and strategies are framed by combinations of experiences and expectations. As such, the article combines insights from economic geography, transitions studies and the sociology of expectations literature to expand extant theory on path creation. A brief analysis of the emerging Norwegian offshore wind power sector serves to illustrate how experience (the past) and different types of expectations (the future) have tangible effects on agency, and in effect on path creation processes. These insights have methodological implications, essentially favouring qualitative approaches over quantitative ones to understand formative phases in industrial development.

**Keywords:** *Path creation, agency, temporality, offshore wind, expectations*

## **1 Introduction**

Because new industries provide the ground for future economic growth they are of great interest to both researchers and policy makers (Feldman & Lendel, 2010; Forbes & Kirsch, 2011).

Although there is consensus about the importance of new industries, the processes by which new industries emerge are not sufficiently explained by current theories, concepts, research strategies and empirical accounts in economic geography (Martin & Sunley, 2006; Menzel, Henn & Fornahl, 2010). Evolutionary economic geography (EEG) has made important contributions to understanding path dependent evolution, notably by providing a theoretical basis for explaining how new industries emerge through re-combinations of knowledge and other resources from established industries (Frenken & Boschma, 2007). A core idea underpinning EEG theorizing is that of path dependence; that the development trajectories of technologies, firms, industries, places and regions are conditioned (primarily in a constraining sense) by the historical processes that created them (Boschma & Frenken, 2006; Martin & Sunley, 2010). However, a conceptual debate concerning the relevancy of path dependence theory in accounting for change and renewal has emerged in recent years, informing the development of broader 'path-as-process' perspectives encompassing forces of both continuity and change (Martin, 2010). Whilst this has paved the way for a much broader understanding of path creation, here referring to the emergence of new industrial development paths (Martin, 2010; Binz, Truffer & Coenen, 2015), it is fair to say that this debate is still in its infancy (Martin & Sunley, 2010).

Against this background, the article departs from a recognition of three inter-related issues that could further develop our understanding of how new industries emerge in the economic landscape. First, insufficient attention has been paid to agency (Dawley, 2014). EEG empirical research aims to explain new industry formation on the basis of firm level dynamics following variety in firm routines (Boschma & Frenken, 2006). Despite this micro-level theoretical foundation, EEG accounts of new path creation tends to render social agency, motivation and strategy largely invisible. For instance, firm diversification has been identified as a key mechanism of path creation, but the strategies and motives underlying diversification into adjacent sectors are questions that few economic geographers have posed, let alone attempted to

answer. Second, the temporal dimension of analysis in current perspectives disregards the future orientation which is fundamental to human agency (Emirbayer & Mische, 1998), and particularly prevalent in innovation processes (Borup, Brown, Konrad & van Lente, 2006). Path creation relies on (collectives of) entrepreneurs, spin-offs, diversifying firms and other actors that more or less strategically recombine and transfer knowledge and resources from different sectors as they act on new and expected opportunities (Garud & Gehman, 2012). The future, in this context, materializes as expectations and visions that shape and are shaped by strategy and planning, and are consequently acted (or not) upon (Borup *et al.*, 2006). By implication, conceptualizations of agency and temporality should be reconsidered so as to provide more analytical strength in understanding actors, whilst the articulation of expectations should be seen as both resources that actors deploy in pursuit of interests (Berkhout, 2006) as well as forming part of the socio-economic context (Martin & Sunley, 2006) in which path creation processes unfold. Third, and reflecting the lack of attention to agency in research on path creation, coterminous studies of emerging industries are rare (Feldman & Lendel, 2010). Novelty tends to be studied in hindsight, when (important) actors, phenomenon, processes, events, and (naturally) outcomes, may be identified more easily. Clearly, a challenge with emerging industries is that they do not fit with existing industrial classification schemes (e.g. SIC codes), making such data inappropriate for quantitative approaches. This article suggests that qualitative methods are needed to provide new insights into the complexity of ongoing path creation processes.

The aim of this article is thus to explore ways of extending economic geography theorizing on path creation, yet the ideas launched here have implications for understanding industrial development trajectories more broadly. To this avail, the article draws on insights from the literatures on socio-technical transitions and the sociology of expectations (SoE). The former provides analytical tools for understanding technological shifts and the development of new technologies and industries, and has received growing attention from economic geographers (e.g. Simmie, 2012; Truffer & Coenen, 2012). The SoE literature, which focuses on the generative and performative role of expectations and visions in influencing innovation, strategy, resource mobilization and so on and so forth, has so far seen few encounters with economic geography. In this article I suggest that insights from the SoE literature stream can provide novel and valuable understandings of agency in path creation processes. That is, I argue that seeing agency as

simultaneously past and future oriented helps disentangle the micro-level processes underlying innovation and change, which are core to path creation and of relevance to path evolution more generally.

The article proceeds in three steps. The next section discusses current perspectives on path creation (in economic geography) and how these can be extended by drawing on ideas from the transition and SoE literatures. Thereafter, these ideas are employed mainly for illustrative purposes on a case study of the emerging offshore wind power (OWP) industry in Norway. Finally, I conclude and reflect on implications for path creation theorizing and research strategies.

## **2 Theorizing path creation**

### **2.1 (Evolutionary) Economic geography and path creation**

Recent theorizing in economic geography has focused on the evolutionary character of economic activities and how they relate to processes of socio-spatial development and change, giving rise to a distinct evolutionary economic geography (EEG) (Boschma & Frenken, 2006; Essletzbichler & Rigby, 2007; Martin, 2010). In emphasizing evolution, EEG takes "*a critical stand towards static analysis*", and aims at explaining "*a current state of affairs from its history: 'the explanation to why something exists intimately rests on how it became what it is'*" (Boschma & Frenken, 2006, p. 280). A key tenet of this work has been that development trajectories are subject to path dependent processes, meaning that any given outcome "*evolves as a consequence of the process' and system's own history*" (Martin & Sunley, 2006, p. 399).

In EEG, explanations of path dependence are rooted in micro-level processes. Drawing on evolutionary economics (e.g. Nelson & Winter, 1982) the key idea is that differences in firms' routines (how they tend to conduct various activities) explains variation in firm performance over time. Routines, which are seen as mechanisms of organizational control and (knowledge) resource coordination (Boschma & Frenken, 2009), are necessary for decision-making processes and change only slowly, implying that they are a source of path dependence. In explaining changes in economic landscapes, EEG thus "*attempts to understand the spatial distribution of routines over time*" (Boschma & Frenken, 2006, p. 278). The focus on routines as a main way of explaining the behavior at the micro level stems from evolutionary economists' critique of

mainstream (neoclassical) economic theory's premium rationale of 'maximizing profits'. In neoclassical economics, actors are taken to be careful in their deliberations and attempted foresights. Evolutionary economists argue that "*real actors, however, simply do not have the vast computational and cognitive power that are imputed to them by optimization-bases theories*" (Nelson & Winter, 2002, p. 29). Actors are therefore not optimizers, but what Simon (1979) labelled 'satisficers', operating with a cognitive logic of bounded rationality (implying that decision-making processes are constrained by limited information and time), which provides theoretical underpinnings for path dependence as arising from the micro-level behavior of firms and other actors.

In evolutionary economics path dependence is conceptualized as having constraining effects on innovation and change (Martin & Sunley, 2006). However, more recent conceptual work has argued that path dependent processes are not limited to continuity, but that they also generate change (Martin, 2010). That is, through ongoing innovation and adaptation, which takes place even in rigid systems, path dependent processes may allow for knowledge development and resource transmission within and across sectors over time. A major contribution that EEG has made in this regard is to provide explanations for firm diversification into (new) activities that are technologically related to their existing activities and knowledge base (Neffke & Henning, 2013). This same logic of 'evolutionary branching' whereby organizational routines diffuse applies to entrepreneurial spin-offs. As such, 'branching processes' are key path creation mechanisms (Martin & Sunley, 2006; Cooke, 2012). However, diversification is not only conditioned by the knowledge dimensions (commonality and proximity) of relatedness, but also by sunk costs and costs associated with adapting to new activities in new contexts. For instance, a production firm is likely to diversify into a new product market for which it has a relevant knowledge base *and* in which its existing manufacturing equipment may be reutilized. Whilst EEG emphasizes the technological dimension of relatedness, also other dimensions of relatedness, such as the organization of supply chains and institutional contexts, may facilitate (or hamper) diversification processes (Steen & Hansen, 2014; Tanner, 2014).

EEG suggests that new industries emerge in windows of locational opportunity (Boschma & Frenken, 2006). That is, the whereabouts of new industrial development parts is relatively open,

provided a set of generic conditions (e.g. infrastructure, human capital) are fulfilled. The actual creation of a new path is however often attributed to ‘historical accidents’, which says little if anything about the origins of path creation. As argued by Martin (2010, p. 20), however, there is robust empirical evidence that *"place-specific factors and conditions (...) are not simply "accidental" or random but are often the product of and reflect the economic, social, cultural, and institutional conditions inherited from the previous industrial and technological histories of a locality."* Such locality specific assets may form the basis for industrial renewal or the development of new industries (Klepper, 2007), but they may also constrain innovation and new path creation because they are not easily adapted and applied to new circumstance. New paths may spring out of periods of crisis and creative destruction, but also from processes of adaptation and incremental change (MacKinnon, 2011). In the latter cases, new paths evolve gradually from established paths through processes such as evolutionary branching (Frenken & Boschma, 2007). However, ‘old paths’ may provide assets and resources relevant to different new paths. The particularities of new paths will thus be context specific (Martin, 2010) and contingent on agency (Sydow, Windeler, Schubert & Möllering, 2012; Dawley, 2014). To understand why particular paths emerge instead of others therefore requires more attention to agency and how actors respond to changes in (but also influence) the contexts in which they operate.

Garud and Karnøe (2001) pioneered the path creation debate and argued against the perspective that new industries initially arise by accident. Contrary to 'canonical path dependency', in which path dependence forces set in 'behind the back' of actors (Simmie, 2012), Garud and Karnøe emphasize collective agency and knowledgeable actors who 'mindfully deviate' from extant paths and established routines to initiate processes that shape new social practices and technologies. This strategic agency is simultaneously past and future oriented (Garud & Gehman, 2012). Whilst the strategic maneuvering of actors onto new paths has been incorporated into the more open perspectives on path evolution in economic geography (Martin, 2010; Simmie, 2012), the temporality of strategic agency has not been awarded much attention, at least not explicitly. Appreciating the importance of the future, which materializes in the form of expectations and visions (Borup *et al.*, 2006), in shaping the evolution of the economic landscape may provide novel insights into how new industrial development paths emerge. That having said, this is not to suggest that 'chance' or 'accident' does not play a role in innovation and the evolution of

technologies, firms and industries. As argued by Martin and Sunley (2010, p. 79), "*in most instances path creation will inevitably involve a complex admixture of deliberate agency and accidental and unintended emergence.*" Thus, the effects of intended actions may be different than those envisaged, and chance events may have profound impacts.

To summarize thus far, explaining path creation requires attention to both context and agency. Regarding context, economic geography can benefit from drawing on insights from the socio-technical transitions literature (see also Simmie, 2012; Martin & Coenen, 2014). This literature, which it is beyond the scope of this article to account for in detail, has developed a set of frameworks for analyzing the dynamics of technological and industrial development, particularly in constraining contexts. In the following section I briefly review core ideas in this literature relating to innovation and change before I focus in on the temporality of agency and the role of expectations in innovation and industrial development.

## **2.2 Socio-technical transitions**

The socio-technical transitions literature provides various analytical frameworks for understanding the emergence of new technologies and industries, particularly within large-scale, highly path dependent, and complex systems such as those of the energy industries (Markard *et al.*, 2012; Truffer & Coenen, 2012). A key concept is the 'regime', which encapsulates the complex assemblage of firms and other actors, technologies, infrastructures, regulations, institutions and practices that constitute established sectors and systems. A transition from an established 'socio-technical regime' (e.g. a fossil-fuel based energy system) to a new one (e.g. an energy system based on renewable energy technologies) happens as a result of an interplay of forces that are exogenous and/or endogenous to a (analytically defined) regime. Exogenous forces include changes on the macro-level, such as changing consumer trends or booms or busts in commodity prices, which serve to destabilize regimes and open up for new technological niches to emerge. Niches come into being as a result of agency and do not exist *a priori* as opportunities ready to be seized (Schot & Geels, 2007). Although new technologies may be promising, they compete with both extant technologies and other new technologies and therefore often fail to survive past infancy. In short, the selection environment is strongly shaped by mature technologies and the economic practices, actors, institutions and investments linked to these.

Promising technologies may increase their chance of survival if they attract resources through public subsidies or private strategic investments. This enables the formation of arenas for interactive learning processes and other self-reinforcing mechanisms that are necessary for development and maturation. Transition frameworks are quasi-evolutionary in that creation of variety is not seen as being completely blind. Instead, future selection environments (for technologies) are anticipated and actively shaped by actors (Coenen, Raven & Verbong, 2010). This brings me to the role of expectations in innovation and technology development, and, by implication, to the temporality of agency.

### **2.3 *The temporality of agency and the role of expectations***

Processes of entrepreneurship or diversification entails innovation, which in “*contemporary science and technology is an intensely future-oriented business*” (Borup *et al.* 2006, p. 285). A range of studies have shown how expectations and visions about the future are fundamental to understanding technological development and industrial change (Ruef & Markard, 2010; Bakker *et al.*, 2012). Similar to Garud and Karnøe's (2003) path creation approach, the sociology of expectations literature departs from the basic yet important premise that behavior is simultaneously oriented towards past, present and future circumstances (Emirbayer & Mische, 1998). Agency is thus inter-temporal: ongoing processes of becoming connect the past -which constitutes the basis for ongoing action - with the future in the form of visions or expectations of how action may unfold. This inter-temporal orientation is moreover flexible, and changes with variation in the contexts that actors confront. According to Garud *et al.* (2010, p. 767) actors mobilize parts of their past to support imagined futures, which are thus “*essential mechanisms that stimulate action.*”

In EEG a current state of affairs is explained by the events and circumstances that led to it – its history (Boschma & Frenken, 2006). An intertemporal conceptualization of agency implies that attempts to explain innovation and change must also capture how actors' activities and strategies are influenced and molded by their expectations of how the future could or should pan out. Martin and Sunley (2010) argue that contrary to accounts that emphasize serendipity in path creation, *ex ante* selection is a significant force in technological (and industrial) development. They (*op cit.*, 82) connect this to micro-level processes when stating that “*new ventures are based*



on 'business conceptions' or the entrepreneur's interpretation of the opportunity and the approach adopted to exploit it (...). Such intuitive conceptions characteristically mix past experience, memory, and current intentions and they have important framing effects on the new firm's motivation and direction (...)." However, they do not elaborate on the role of intentions, which, I would argue, are future oriented by their very nature, in shaping path creation processes. As pointed out by Garnsey, Lorenzoni and Ferriani (2008), intentionality and choice in technological development distinguishes it clearly from biological evolution. Whilst *ex ante* selections may be constrained by routines, bounded rationality and limitations set by search heuristics, decisions to invest into new technologies and solutions are obviously informed by expectations of how futures (of markets, application domains, demands and needs) could or should pan out.

Expectations are important for path creation processes, therefore, because they are generative. That is, they contribute to attracting interest and fostering investments (resource mobilization), guiding and directing activities (steering technological development), providing structures and legitimation, the aligning of industrial actors and innovation networks, and to the build-up of hard and soft infrastructure (Borup *et al.*, 2006). On the micro level, expectations influence the particular activities of engineers, scientists and other actors. Together these forces produce effects, which in extreme cases represent self-fulfilling prophecies (van Lente, 2012). However, hyped expectations that are not fulfilled, for instance promises of new market formation supported by government subsidies, or technologies that do not 'deliver' as promised, may have a long-term detrimental effect on an entire technological field (Ruef & Markard, 2010).

Expectations may be positive or negative, and often involve a mix of commercial, technological and societal aspects (van Lente, 2012). Furthermore, expectations can be both collective and individual (Bakker, 2014), implying that futures are contested rather than coherent. The framing of futures through strategic planning, foresight exercises and so on is done by many types of actors (not least by policy makers), but here I specifically focus on firms. Firms' decisions to invest in arising opportunities are based on experience combined with future expectations (Shane, Locke & Collins, 2003). However, when confronted with new opportunities, lessons learnt from the past may have limited relevance. Borup *et al.* (2006) argue that the generative nature of expectations

is particularly important in initial stages of technological development, which are characterized by ambiguous roles, high levels of uncertainty, missing regulations, and so on. Because path creation is a result of collective rather than individual agency (Garud & Karnøe, 2003) the development of some sense of collective expectation (of technological progress, market potential, regulations etc.) is important. *Economic geographers have pointed out that the development of collective expectations benefits from geographical proximity (which facilitates interaction, learning processes etc.) (Coenen et al., 2010). Such collective or shared expectations offer common understandings of potential risks and opportunities, and increase the possibility that a wider range of stakeholders are attracted to a new path. In this respect, an essential problem is that expectations are at their pinnacle during formative phases, and future realities are likely to differ from envisioned futures. These envisioned futures are contingent on vantage point (Borup et al. 2006), in the sense that the future looks different from a science lab than it does from the perspective of a 'common' consumer, or, I might add, from a large established corporation with vested interests vis-à-vis a small start-up firm struggling to attract resources, develop its products or services and establish itself in the market.*

*However, an issue that has not been advanced in this burgeoning debate is that expectations not only vary with vantage point, but that expectations themselves (often) have inherently spatial dimensions. In the energy sectors, for instance, this is evident in terms of expectations that certain countries and regions will lead the way in the 'green shift' by investing into renewable energy capacity and/or develop industries and technologies to cater to that demand. On the industry level, the 'green shift' will offer different opportunities and challenges for actors in established and emerging sectors, in part contingent on the spatial patterns industries. On the firm level, geographical market orientation is of course a key aspect of corporate strategy. We can for instance assume that there are firm specific expectations and motivations linked to particular market segments understood as "sub-system structures that serve specific user segments and that are characterized by specific product forms and related actors, networks and institutions" (Dewald & Truffer 2011, p. 286). In turn, these expectations should then have tangible impacts on the activities and strategies of firms (and other actors, e.g. R&D institutions, government), and, by extension, have imprints on the particularities, momentum, pace and direction of path creation processes.*

## 2.4 *An intertemporal perspective on path creation*

In drawing together key insights from the preceding theoretical discussion, the point of departure is that innovation is the basis of new industrial development paths. Most innovations are incrementally developed within existing paths, where they lead to ongoing change and processes of renewal or reorientation (Isaksen, 2014), but innovations may also spur the creation of new industrial development trajectories. However, in many circumstances, innovations compete with existing solutions in established industries (Truffer & Coenen, 2012). This is particularly the case in large-scale, complex and relatively rigid sectors such as those constituting energy systems, in which new path creation hinges on processes of niche market formation and collective agency (Simmie, 2012). Whilst a path-as-process perspective acknowledges forces of both continuity and change, a transition perspective adds value by providing conceptual tools for understanding the dynamics between established paths ('regimes') and new ones ('niches') and various macro level factors which alter selection pressures on extant paths and thus influence opportunities (and barriers) that confront actors. Whilst the case at hand (the emerging OWP industry in Norway) does not constitute a classic 'transitions case' (in the sense that OWP in Norway replaces an established energy technology), the more general insights provided by the transitions literatures are valuable for understanding how firms (and other actors) navigate in between established and emerging paths.

Of particular relevance to this article is the role of actors' expectations as an important generative mechanism in contributing to resource mobilization, experimentation, knowledge generation et cetera linked to new industrial development paths. The discovery and recognition of new 'windows of opportunities' depends in large on previous experience (Shane *et al.*, 2003), which helps actors in selecting among various potential new activities. It also contributes to explaining the diffusion of routines as a result of firm diversification into (emerging) sectors that are technologically related (Frenken & Boschma, 2007). Whilst futures are always uncertain, this does not necessarily imply randomness and chance, but rather greater or lesser degrees of probability of certain scenarios playing out. In turn, expectations (individual/ collective, positive/ negative etc.) influence how firms and other actors navigate a new terrain, what strategies they employ, which activities they initiate, and how they (attempt to) mobilize and develop resources. It follows that firms (and other actors such as policy makers) must be understood as strategic

entities, where strategy basically refers to the goals that actors aim to achieve, the activities they pursue in order to reach those goals, and the intangible and tangible resources they allocate to those ends (Farla, Markard, Raven & Coenen, 2012).

### **3 Exploring agencies and strategies in the Norwegian offshore wind industry**

Empirical studies in economic geography tend to study a specific development process and provide historical explanations for observations. This article suggests that this temporal perspective can be extended by including also the impact of expectations and future orientation on actor strategies and activities. Whilst outcomes naturally cannot be explained *ex ante*, firm activities and strategies based on expectations are at least in part accessible to researchers.

The guiding research questions for the brief and illustrative analysis that follows are *how are Norwegian offshore wind firms' strategies and activities linked to experience, current circumstance and expectations* and *how does expectations impact on path creation processes?*

The empirical basis for the analysis is qualitative, with firm interviews as the principal research strategy component. As argued by Schoenberger (1991, p. 181), the evidence yielded by the corporate interview "*is the testimony of participants in complex, ongoing processes*" and the rationales underlying their activities. Semi-structured in-depth interviews with firm managers and other stakeholders (R&D, support organizations, finance providers etc.) were conducted in 63 different firms or organizations. Interviews were conducted in the period September 2010 to February 2014, with the main bulk in 2010 and 2011. The informants were mainly senior-level managers (CEOs/CFOs), but also included technical personnel and industry experts. In addition to interviews, the qualitative data comprises documents and participatory observation at various seminars and conferences organized by supporting member based organizations and/or research institutes.

#### **3.1 The emerging offshore wind industry and Norwegian involvement**

In the mid-2000s, the deployment of offshore wind power (OWP) turbines in Northern European waters 'took off'. OWP in Europe is expected to grow rapidly onwards and become a major new energy industry, with the UK as the largest market (EWEA, 2014). Like other new renewable energy technologies, however, the OWP sector remains immature in terms of technology and

regulations, and there is considerable uncertainty linked to future financing and policy support. Growth depends on state support in the form of market subsidies, research funding and so on (Wieczorek *et al.*, 2013) until OWP can compete with more mature energy technologies. A key trend is that OWP farms are developed further from shore in deeper waters using larger, specialized turbines in greater quantities. Whilst the pioneers of OWP were actors with experience in onshore wind energy, the 'further, deeper, larger' trend created demand for the involvement and participation of incumbent firms (both producers and specialized product/service suppliers) from the maritime/offshore oil and gas (O&G) industries (Markard & Petersen, 2009; Steen & Hansen, 2014).

Many European countries have strong drivers for OWP in the form of CO<sup>2</sup> emission reductions in the energy sector, energy security issues, and new job creation. By contrast, Norway's national drivers for OWP are relatively weak, primarily due to a high share of renewables (hydropower) in its energy system. Nonetheless, a number (approx. 150-200) of Norwegian firms are (or have been) involved in this emerging industry to larger or lesser extent. The Norwegian OWP sector comprises a few (20-25) specialized OWP firms, energy majors Statoil (O&G) and Statkraft (utility), and a broad set of diversified supplier firms from the offshore O&G, maritime and power/utility sectors. Most of these firms are found in the deployment chain of the OWP industry (e.g. foundation structures, maritime logistics, installation) reflecting the knowledge base in the Norwegian petro-maritime industries. For both diversified and specialized firms, the move into the OWP niche is largely motivated by the opportunity that OPW offers for reutilizing historically developed capabilities and for supplementing core activities (i.e. market opportunities) (Hansen & Steen, 2015).

### ***3.2 Experiences, expectations and offshore wind power***

The case exemplar that follows aims to illustrate how the strategies and activities of firms that are involved in the emerging Norwegian OWP industry reflect both experience and expectations. The analysis reveals how some expectations are individual or firm specific, especially regarding the development of particular technologies, market segments and value chain organization, whilst expectations linked to broader development trends to greater extent are collective.

#### ***3.1.1 Societal trends and industrial development paths***

At the most general level, most firm managers that were interviewed share expectations regarding societal trends that will lead to a shift from today's carbon based energy system to a low-carbon system. On the one side, these collective expectations are linked to the depletion of O&G stocks ('peak oil'), particularly on the Norwegian Continental Shelf (NCS), which is the primary market for most of the Norwegian firms active in the OWP sector. On the other side, these expectations relate to the development, implementation and upscaling of renewable energy technologies. In that respect, there is a collective expectation that political support for those technologies is crucial for them to be able to replace hydrocarbons. As the CEO (interview, 2012) of a large O&G supply company put it, *"nobody doubts that the dirty industries will become less profitable because of taxes, whereas the clean industries will become more profitable because of technological development. The uncertainty lays in the subsidy policies."* These expectations regarding the development of established paths (O&G) and emerging paths (such as OWP), and the transition from current fossil-based energy systems to more sustainable solutions, have generative effects in that they influence firms to position for future market developments by initiating various forms of activities such as concept studies, piloting and vanguard projects.

Although oil production peaked in Norway around 2000, there are few signs of path destruction (Martin & Sunley, 2006) in the near future, reflecting both the long term horizons of O&G investments as well as an anticipated gradual decline of activities on the NCS spanning multiple decades. Nonetheless, since the turn of the millennium there has been considerable uncertainty about overall activity and investment levels and the future opening of new exploration areas for O&G drilling. Although O&G production may remain high for decades, activity levels in many parts of the O&G value chain are expected to diminish, with varying effects for different segments of the industry. Thus, although the O&G industry path may be extended (Isaksen, 2014), and possibly also become subject to (multiple) phases of renewal, certain technological paths within the industry may erode. Moreover, the O&G market is cyclical, and a 2008-2009 temporary 'bust' in the O&G industry led many firms towards pursuing OWP as a supplementary market (Hansen & Steen, 2015), which at the time was pungent with expectations of substantial opportunities both domestically and internationally (Normann, 2015). Firms' strategies for embarking on a new path thus connect both with actual and perceived selection pressures on their

core sector, as well as opportunities arising in emerging sectors (such as OWP) into which they can diversify based on their accumulated knowledge and other resources.

Many of the interviewed firm managers have worked in the Norwegian O&G industry since its nascent phase in the 1970s. To large extent these managers have a shared expectation that the OWP sector will develop and mature through similar processes as did offshore O&G. In the early phase of the Norwegian O&G industry, capabilities from the Norwegian maritime industries were combined with O&G specific know-how from international oil companies and redeployed in the (then) new sector. As argued by the CEO of a large supply firm (interview, 2011), "*we have the knowledge and competence needed for offshore wind. It reminds me of the old ship yards (...) they struggled, but managed to adapt to the oil industry. In a few years I think the same will happen with offshore wind.*" In analytical terms, managers' experience and understanding of previous rounds of industry emergence frame expectations about the future shaping of the OWP path. This same logic of developing OWP on the basis of Norway's industrial legacy in maritime and offshore industries also underlies Norwegian policy support for this industry (Steen & Hansen, 2014), despite the lack of drivers for developing OWP farms domestically.

In the absence of domestic market opportunities, the majority of both specialized and diversified firms have explored international market opportunities and the 'UK round 3' OWP licensing phase in particular. When the majority of our interviews were conducted (2010 and 2011) firm managers explained that they aimed for OWP projects being developed from 2013-2014 onwards. As expressed by the CEO (interview, 2010) of a specialized OWP firm, "*if Norwegian firms don't see that this is the time to strike (...) there's a window open between now and 2014, when huge things will start happening on the UK continental shelf.*" The CEO (interview, 2011) of another specialized OWP firm stated that "*we aim for UK round 3, and believe that 50 % of all investments in offshore wind during the next 10 years will be in UK.*" Several of the managers that were interviewed argued that future success in OWP both for individual firms and the Norwegian OWP industry as a whole would be largely dependent on the ability to enter the OWP market through this phase. This was linked to concerns that Norway's perceived comparative advantages in offshore activities would wither as more and more OWP farms were (and would be) built in the UK and elsewhere, with corresponding development of industrial capabilities and

maritime experience. As argued by one CEO (interview, 2010), *"it is evident that they (Germany, UK, etc.) are building competencies, and they are already far ahead in terms of gaining practical experience. There is a real danger that Norwegian firms will never acquire the experience needed to get through the needle's eye next time around."* This quote reflects the importance of market formation for the development of new industries (Markard *et al.*, 2012), and, conversely, how lack of market access can lead to negatively framed expectations of industrial development (van Lente, 2012).

### 3.1.2 *Technology development and application domains*

The products and services that both diversifying and specialized firms approach the OWP sector with are largely based on well-established knowledge and experience (Steen & Hansen, 2014). On the one hand, firms' experience thus constrains their strategic choices, most evidently in terms of pursuing activities in OWP that are similar to their previous experience, for instance in the O&G industry. On the other hand, the very same historically developed assets and routines provide the platform for which to pursue new opportunities, which resonates well with EEG ideas of branching innovation (Neffke & Henning, 2013). However, the specific strategic choices that firms make cannot be explained by accumulated assets and routines alone, implying that explaining a current state of affairs from history (Boschma & Frenken, 2006) is insufficient.

One issue that came across strongly in the interviews was that expectations are linked to the development of specific technologies, supply chains and market segments with particular spatial, temporal, technical, physical and economic characteristics. For instance, the CFO (interview, 2011) of a diversifying firm supplying foundation structures explained that *"it's really very simple for us. Our markets are those projects that demand jacket foundations. The market is totally dominated by monopiles. Those projects that require jackets are in deeper waters using larger turbines. So we need to find those projects."* Diversifying firms thus (intend to) extend the utilization of their existing assets by moving into an emerging niche sector which they expect will develop along a trajectory where they anticipate demand for particular products or services such as jacket foundation structures. Reflecting individual expectations, these expectations linked to specific technological development paths naturally vary considerably between firms.



The CEO (interview, 2010) of an offshore installation company, which made a considerable investment into new vessels specifically designed for OWP, explained their choice of technological specifications on the vessels being the result of how the firm expects that the OWP industry will develop: "*We believe in bottom-fixed foundations developing first. Floaters will come later. The vessels we are building are for bottom-fixed foundations (...) The sites decided on already, in the countries mentioned, are all requiring bottom-fixed solutions.*" These targeted market segments 'fit' what firms (intend to) have to offer, and provides a business context and a set of demands that the firm believes it can manage and meet. These expectations thus have tangible and generative effects (Borup *et al.* 2006) on ongoing path creation processes by drawing firm-level resources towards certain strategic investments and activities and not to others.

On a 'technological timeframe' firms thus assess their relative position vis-à-vis anticipated future market demand, an assessment which also involves considering how competition will develop both in the proximate and the more distant future. The manager (interview, 2012) in charge of OWP activities in a large maritime supplier firm specializing in delivering instrumentation systems on ships stated that "*we can do something of the same in the wind industry, and then offshore wind is the most similar (...) According to research reports, this kind of instrumentation will not be implemented before 2020-2025. We're trying to enter this market now whilst it's still developing. We won't be first, but neither will we be last.*" Expectations also relate to the development and organization of supply chains in OWP. The CEO (interview, 2010) of a specialized OWP installation firm claimed that "*there are niches in which they will source services instead of developing in-house, and that is a position I think we'll see ourselves in soon, as sub-suppliers to a larger group of 'total suppliers', being specialized.*" Thus, an important part of the strategic work of entering OWP involves developing partnerships with other firms, and also in this regard experience informs strategies for future activities. The manager (interview, 2012) of a technology supplier firm explained that "*we plan to enter together with offshore wind farm developers (...) It's the same thing we did in maritime, we allied with the ship owners.*" In more general terms, the two last quotes reflect how innovation is linked to strategic adaptation of business models, given certain expectations of market demand and value chain development (Garnsey *et al.*, 2008).

These considerations also impact on locational decision-making, for instance where firms should locate their manufacturing activities. The manager (interview, 2011) of a specialized OWP supplier firm explained that *“fabrication of our product will take place where the market is. In the UK this will be a demand from the customer. It will be totally unacceptable [for them] to subsidize a new industry and have all products and services imported. It's what's called a publicly known secret.”* As such, the spatialities of expectations concern not only anticipated market demand and dynamics, but also institutional aspects.

On a final note, expectations that are not met can result in actors 'losing faith' and disconnecting from an emerging path (Ruef & Markard, 2010), thereby withdrawing resources and weakening the momentum of reinforcing mechanisms necessary for new paths to develop (Martin, 2010). Many Norwegian firms entered OWP in the period 2005 to 2010 with expectations that a domestic market would form. At the same time, exploration into OWP was based on actual as well as expectations of continued decline in the offshore O&G industry. However, when a new technology neutral financial support scheme for renewable energy was introduced in 2012 it became clear that the anticipated domestic market would not materialize (Normann, 2015). At the same time, the O&G industry was revitalized as a result of increasing global oil prices and several large resource discoveries on the NCS, with the result that many diversified actors reduced their involvement in OWP, whilst some abandoned the new sector altogether.

#### **4 Concluding discussion and reflections**

This article departed from a recognition of three inter-related issues that can advance our understanding of how new industries emerge in the economic landscape: more attention needs to be paid to agency, development processes can be better understood if studied in real-time and agency needs to be seen as simultaneously past and future oriented. In aiming to contribute to economic geography theorizing on path creation, I advanced the view that one potential way forward is to draw on insights from the literatures on socio-technical transitions and the sociology of expectations. Whilst the former provides analytical tools for understanding the relationship between established and emerging industries/technologies, the latter helps us see how agency in coterminous processes of path creation is simultaneously shaped by expectations of the future. The ideas launched in this article were particularly connected to the debate on how new

industrial development paths emerge, but should have relevance for path evolution processes more generally. Further empirical and conceptual work will however be needed to affirm this proposition.

The brief analysis of the emerging Norwegian OWP industry supports a path-as-process perspective in the sense that forces of continuity and change were seen to be at work simultaneously. In this sense, the dynamics of the Norwegian OWP industry appear to imply a process of what can be referred to as "*path-dependent path creation*" (Martin & Sunley, 2010, p. 82) in the sense that both diversifying and de novo firms that are active in this industry largely base their activities on experience from established offshore and maritime sectors. The analysis also illustrated how different actors' actions and strategies relate to and are shaped simultaneously by individual and collective expectations linked to both established and emerging industrial development paths. These expectations relate to different issues or dimensions, such as the development of technologies, supply chains and policies, and are framed according to both timescales (short- and long-term) and spatialities (e.g. in the form of particular (geographical) market formation or industry development processes). In short, expectations *relate not only to how and when industries and technologies will or could evolve, but importantly also to why and where*. The important point here is that these expectations result in actual investments and resource allocation towards more or less specific goals. This is evident both in firms' innovation and product/service development strategies, as well as in the building of strategic linkages and partnerships for positioning for anticipated future opportunities.

Extending on the *sociology of expectations literature*, a *takeaway from the analysis is that expectations have spatial dimension to them. Because of the very tangible effects expectations have on firm strategies and decision making they deserve closer attention in economic geography*. This insight may be particularly relevant for understanding path creation in the context of capital-intensive, highly regulated, and relatively slowly changing industrial sectors. In energy sectors, for instance, int (e.g. new power plants) are often made for several decades, whilst government targets to reduce CO<sup>2</sup> emissions are set with specific long- and short-term deadlines. As such, another strand of literature worth pursuing here, especially regarding micro-level dynamics, is the literature on corporate foresight (Rohrbeck & Gemünden, 2011). Whilst it

was beyond the scope of this article to include the strategies, activities and expectations of other actors than firms (such as state bodies, R&D institutes or industry associations), these are obviously also part of the broader co-creation and 'future-making' processes that underly the emergence of new industrial development paths.

A few methodological reflections follow. Based on my reading of the EEG literature, the semi-structured interview guides that were used for this research project were meant to illuminate how firms' actions and strategies were conditioned by experience and historically developed capabilities (i.e. how 'history matters'). However, it only took a few interviews to realize that firms' involvement OWP was largely based on expectations of future growth. Our questions often triggered answers in the form of narratives whereby informants themselves connected past, present and future. This is significant, because current explanations of path creation or industry emergence in economic geography are mainly based on rear-view-mirror approaches. When seen in hindsight, important actors, phenomenon and processes may be identified more easily. But while retrospective narratives may be coherent and 'sensible', they may also be over-rationalized and simplified, and important details about fragmentary events, failures, detours and mishaps may be suppressed, purposely omitted or simply forgotten. Accounts of the past tend to focus on causal factors that led to a certain sequence of events (i.e. providing the empirical basis for claims of path dependence), although many other alternative chains of events were likely along the way. This is in no way meant to discredit the value of historical analysis, but it is to suggest that placing oneself (as a researcher) in 'real-time' (Araujo & Harrison, 2002) could help to avoid ex-post bias in explanation or retrospective meaning being imposed on events from knowledge of outcomes (Garnsey *et al.*, 2008), and enable more in-depth understanding of both successful and failed attempts at path creation (or path renewal/reorientation for that matter).

Researchers should therefore broaden the methodological and analytical scope to pay attention not only to origins and historical pathways, but also to how agency is informed by anticipated futures. In other words, this implies that analysis of innovation and industrial change should be based on a combination of retrospective, contemporary and (what may be referred to as) prospective data. Empirical insights of this nature, which require qualitative approaches such as interviews or participatory observation, can provide the basis for new theory development

(Eisenhardt & Graebner, 2007). Also other methods capturing expectations, plans and ambitions, such as foresight exercises or focus group workshops, should to larger extent be taken up by economic geographers. As argued by Schoenberger (1991, p. 181), the value of qualitative approaches "*may be highest in periods of great economic and social change that pose new challenges to the analytical categories and theoretical principles underlying much quantitative research.*"

'Futures' are invoked in all sorts of planning and strategic work, be it by civil society organizations, local authorities, large incumbents or entrepreneurs launching a new company. To some extent, strategies are only partially available to researchers, not least because there are limits to what informants will share. There is also a practical methodological challenge in cotemporaneous studies of industry emergence because the window of opportunity may be short or unavailable in the given time frame (Forbes & Kirsch, 2011). Researchers may simple not have the time to source funding, design research approaches and enter the field within the time frame. Historical perspectives are important, but researchers should attempt to place themselves in 'real time' even when considering data produced in the past so as to avoid constructing 'inevitable paths'.

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