

*Firm level motivations and barriers for initiating sustainability transitions in the  
Norwegian energy system*

Tyson Weaver\*<sup>1</sup>\*<sup>2</sup>

\*<sup>1</sup>Sogn and Fjordane University College, \*<sup>2</sup>Norwegian University of Science and  
Technology, Norway

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Abstract

Given the urgency of realizing a transition to more sustainable energy systems, it is crucial to gain more knowledge about the role of incumbents and the dynamics of regimes. Over the past decade many energy system incumbents have found themselves responding to exogenous challenges in their core domestic markets and many have strategically reoriented themselves towards new 'green' opportunities. By investigating diversification strategies of traditional energy companies and their associated suppliers in terms of both products and markets, this paper contributes to an enhanced understanding of agency and dynamics of regimes and the role of spatiality in transitions. Our analytical framework is multi-disciplinary in drawing on insights from transition studies, evolutionary-relational economic geography, and strategic management. Utilizing survey data from 250 strategically sampled firms, our findings suggest that skill relatedness triumphs spatial proximity in diversification strategies, but that this also depends on the nature of the incumbent's product. However, recently two key industry developments have taken place that changes the trajectory of these firms being firmly rooted in sustainability transitions. Whilst the discovery of new fields on the Norwegian Continental Shelf has revived the O&G industry, the implementation of a 'Green certificate scheme' has created new opportunities in the domestic electricity sector. We conclude that our case incumbents continually demonstrate reactive strategies, thus undermining proactive sustainability transitions. Until global market opportunities in new renewable energy technologies can demonstrate sustained market stability and growth as traditional industry we posit that such incumbents will remain on beaten tracks.

## 1. Contextures of Sustainability Transitions

It is well understood that humankind is set upon an unsustainable trajectory. In attempts to understand how we can begin to make a shift towards a more sustainable path, academics have begun devising several emerging theories of sustainability transitions. The transfer of resources from non-sustainable to sustainable sectors, a process that Cooke (2012) has defined as transversality, is crucial to succeeding the grand energy system transition. This restructuring of societal production and consumption patterns will not occur overnight, and thus transitions are understood to be long-term processes spanning multiple decades (Konrad et al., 2008, Farla et al., 2012). As a point of departure we find it prudent to share Jørgensen's belief that sustainability should be considered as a journey, rather than a destination. What is the role of dominant firms in this journey? Do they take a proactive or reactive stance? What are their motivations for pursuing sustainability? What barriers stand in their way? These questions have been posed before, yet there is much work to be done to complete our understanding.

According to Moors et al. (2004) transitions are regarded as large societal transformation processes which are not deterministic or predetermined, and involve the emergence and diffusion of new technologies into user domains with societal embedding. With the pursuit of sustainability at the focal point, understanding how processes unfold that engage transitions is of importance to scholars and other stakeholders alike. Much focus has been placed upon framing sustainability transitions in a larger systems perspective which has shed light on the bigger picture but according to Farla et al. (2012) these insights may have overshot more actor oriented analyses. In light of much work that has been done in the technological innovations systems and strategic management frameworks, we have begun to understand how niche innovations have the capability to disrupt the existing regime and force prevailing actors to respond to such niche innovations. A prevailing *a priori* assumption in the strategic niche management and technological innovation systems literature is that incumbents resist changes within the regime, are focused upon pursuing their *status quo* through the control of resources, and most importantly, take a reactionary stance towards green innovations that guide the regime towards sustainability transitions (Jacobsson and Lauber, 2006). Whilst there is antecedent evidence to support this claim, we believe one in the same as Bob Dylan in that the 'times are a changin'. Whilst new entrants may at times be credited for the creation of niche green innovations that promote the sustainability agenda, we argue that it is the incumbents who embrace these that realize the rollout from niches to full scale market economies with these innovations.

It has been well versed that disruptions to the regime can come from innovations or landscape forces, but what is overlooked is the transformation from inside the regime itself. We argue that the role of transversality at the incumbent level of the regime is constrained by the firms' dynamic capabilities and motivationally impinged upon their future strategic orientations. The article is structured as follows. First we discuss the role of incumbents in regimes, followed by linking extant grounded theories in strategic management to discourse in sustainability transitions. We follow with presenting the research backdrop and questions for empirical investigation. Section 4 outlines our methodological approach, with ensuing results presented in section 5. We

conclude with some theoretical implications for sustainability transitions and propositions for further research.

### 1.1. Incumbents and the triple P

A key node in sustainability transitions theory is the role of firms. The success of sustainability oriented transition management depends greatly on interactions, performance (Morioka et al., 2006), and intentions of the stakeholders involved. In the case of actors within the energy regime, one of the largest challenges to achieving sustainability transitions is surmounting the path dependence and lock-in conundrum. This entrapment in existing systems may be difficult to dislodge (STRN, 2010), but we must be mindful that transitions unfold over longitudinal time scales and thus it is most interesting to gain more insight into the timing of actor engagements that disrupt, or perhaps intervene upon, existing path dependencies.

It has been commonly argued that niche actors create protected spaces in a technological regime, and incumbents are forced to respond to such new innovations (Hockerts and Wüstenhagen, 2010, Farla et al., 2012). We have thus set forth an empirical analysis of the energy regime in Norway in attempts to uncover several key facets of how sustainability transitions unfold at the regime level. Contrary to Penna and Geels assessment (2012), we posit that a number of incumbent actors proactively engage into the green innovation agenda on their own volition.

### 1.2. On the need for the inclusion of complementing theories

It has been stated there are many theoretical advancement opportunities in sustainability transitions theory through the inclusion and incorporation other existing and established theoretical knowledge bases (Markard et al., 2012). Amongst these vast opportunities, we have chosen to incorporate doctrines rooted in strategic management studies into our theoretical framework.

One of the key theoretical challenges in sustainability transitions is the appropriate construct of its conceptualization when so many factors are at play. Jørgensen (2012) proclaimed one and the same highlighting the need 'to combine an analytical understanding of... path dependent dynamics of dominant societal configurations...with a process oriented understanding of situated actor's possibilities of engaging in transitional processes.' This vulnerability creates opportunities for sustainability transitions to come under stark criticism from distinct academic disciplines. Ranging from policy to society to industry regimes which all take a stake and play a role in transitions, proponents of the multilevel perspective have worked feverishly to address this theoretical demurring (Geels, 2011, Smith et al., 2010). In line with Markard et al. (2012), we believe that sustainability transitions can benefit greatly from the inclusion of existing theories that can ultimately both critique and broaden existing theoretical knowledge of the field.

## 2. Theories on strategic orientations of the firm

Strategic orientation is a concept widely used in the research field of strategic management to reflect future directions of the firm as devised in a strategic corporate plan. It involves the conceptualization of how a firm will position itself moving

forward with the creation of a plan, and the managerial actions to allocate of resources to implement that plan. Strategic orientations may entail a variety of options for the firm including internationalization, diversification, and innovation activities. The underlying rationale for incorporating the following theoretical contributions from management science and their connection to the role that incumbents play in sustainability transitions is the simple question: how do firms explore to create new value?

### 2.1. Market and product mixes

According to industry life cycle theory firms must seek new ways to create value to survive the long haul. A firm eventually finds itself seeking to take existing products or services into new markets or develop new ones for their existing market. This has traditionally been conceived to occur at the maturity or decline stages of the model. Firms therefore either look for new ways of consolidating or increasing their domestic market shares (Gallego et al., 2009) through incremental product and service innovations, or seek market expansion abroad. Managerial perceptions of stimuli, their attitudes towards risk, and an understanding of the firms resource base create the foundation for which strategic orientation decisions of the firm are made. Firm level positioning and their resource base within a given industry will play a major role in their capability to engage into new activities. Scholars have thoroughly investigated the identification and significance of firm resources with attention being paid to tacit knowledge, network capabilities, financial wherewithal, and innovative capabilities.

The focus of our work is then upon diversification in strategic reorientation. Diversification in strategic management has taken a wide form of constructs over its theoretical evolution, but we choose to focus on product and market level diversification based upon Ansoff's seminal work (1957) reflected in Figure 1. It is well established that diversification basically occurs along the two axes of market and technology, and often in 'proximity' to skills/technological relatedness to the 'base position' of a given firm (Neffke and Henning, 2012). Theory suggests that a key element in firms' diversification strategies is to leverage existing resources by slowly shifting product and market penetration matrixes further out along both axes.

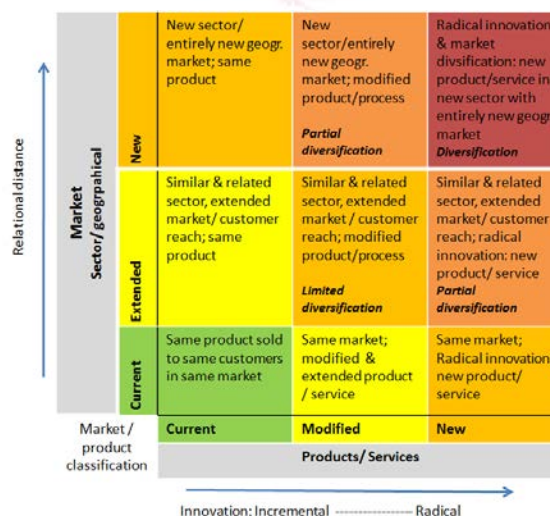


Figure 1 Product and market diversification mix; modified from (Ansoff, 1957)

## 2.2. The corporation as an entrepreneur?

The recent academic definition of entrepreneurship goes far beyond its historical connotation of small startups. Entrepreneurship embodies risk taking, proactivity, innovativeness, and strategic response to a recognized need through coordinated economic activity. Given that corporations are nothing more than a collection of individuals, they possess the same capability to demonstrate these characteristics as a single individual. Therefore the notion of entrepreneurship has been extended beyond its neoclassical meaning to include all collections of individuals that exhibit such behavior, including corporations. These newly defined boundaries have given rise to the growing body of literature on corporate entrepreneurship. It reflects how established corporations can act entrepreneurially by venturing into new business areas to identify and explore the potential of new business opportunities, even at times when no existing market for the product exists (Frederiksen and Davies, 2008). Thus firms that engage in diversification by extending their activities into areas marginally related to their current domains of competence exhibit characteristics of corporate entrepreneurship (Burgelman, 1983).

Corporate environmental strategies began to take shape in accordance with greater demand for corporate social responsibility throughout the 1990s, resulting in a strand of entrepreneurship literature based around these principles. Sustainability transitions and sustainable entrepreneurship share close linkages. According to Hockerts and Wüstenhagen (2010), sustainable entrepreneurship is the 'discovery and exploitation of economic opportunities...that initiate the transformation of a sector towards an environmentally and socially more sustainable state' (p.482). An alliance that the sustainable entrepreneurship research stream shares with sustainability transitions is the notion that new entrants disrupt stability in the regime, forcing incumbent firms to respond to new green niche innovations. Hockerts and Wüstenhagen's conceptual work offered us a significant takeaway: when incumbents positively respond to market introductions from new entrants, incumbents propel transitions. They deem incumbents engaged in these gradual transformations 'greening goliaths,' as strategic reorientation repositions incumbents along new lines towards sustainability paths.

## 2.3. To track on beaten paths or forge new?

The concept of organizational learning through exploration versus exploitation was championed by March (1991) which implied that firms choose between two trajectories to renew knowledge based assets of the firm. Exploitation emphasizes refining the firms knowledge base through incremental steps with high degrees of control, certainty and risk minimization (Prange and Verdier, 2011), whereas exploration entails greater departure from the norm implying more risk of expansionary plans outside of core competencies (March, 1991, Barkema and Drogendijk, 2007) with discovery, experimentation, and innovation at its core (Prange and Verdier, 2011). According to (He and Wong, 2004, Benner and Tushman, 2003, Barkema and Drogendijk, 2007), firms operating in a technological domain seeking exploitation improve on existing components within existing product and market

domains, whereas exploration implies a shift to a different technological trajectory altogether.

#### 2.4. Path dependence and lock in

As firms move further through industry life cycle their past histories may constrain what they can do in the future (Teece et al., 1997). These path dependencies give a firm their current stock of capabilities but also constrains future strategic options (Medcof, 2000). Path dependence is a powerful force in energy systems (Lovio et al., 2011) as much of the existing system is characterized by stability, lock-in (Verbong and Geels, 2010) and large sunk costs into the existing infrastructure. Outside of the obvious infrastructural lock-in that embodies energy systems, the related skills and belief systems associated with former legacies complicate transitions towards new systems (Verbong and Geels, 2010) or paths breaking away from the sector all together. This entrapment in existing systems may be difficult to dislodge (STRN, 2010), but it is most interesting to gain more insight into the timing of actor engagements that disrupt, or perhaps intervene upon, existing path dependencies.

The past may not only constrain and shape on-going evolution, but also constitutes the platform for which diversification processes unfold, implicating an enabling view on path dependence (Martin and Sunley, 2006). In line with Dewald and Truffer (2012) we argue that cross-sectorial resource transfer will depend on firms' historic capabilities and will be impinged upon their strategic intentions to pursue new product and market opportunities.

### 3. Motivation for this contribution

We find it timely to research diversification and path creation within the energy system due to the fact many energy systems throughout the world are undergoing transformation along political, technical, and socio-economic lines. Therefore the underlying tenant to this research stream is the need to understand processes that firms in a given regime endure, and more specifically for our work, the effects of being exposed to new stimuli that act as triggering factors which forces firms to search for new paths in either proactive or reactionary stances.

#### 3.1. Research setting

Norway is an energy nation. As a country it is a major global producer and exporter of natural gas and oil (gas: 4<sup>th</sup>, 3<sup>rd</sup>; oil: 15<sup>th</sup>, 7<sup>th</sup> respectively). The extraction of fossil fuels on the Norwegian continental shelf currently generate tax revenues amounting to 23% of GDP, and represent about half of total exports, making the petroleum sector Norway's largest industry (OED, 2013). Figure 2 reflects the Norway's drastic increase and imminent decline of petroleum extraction. Like many other countries globally, available reserves are on the decline as peak oil and peak gas have already occurred in the early 2000's (based upon known reserves).

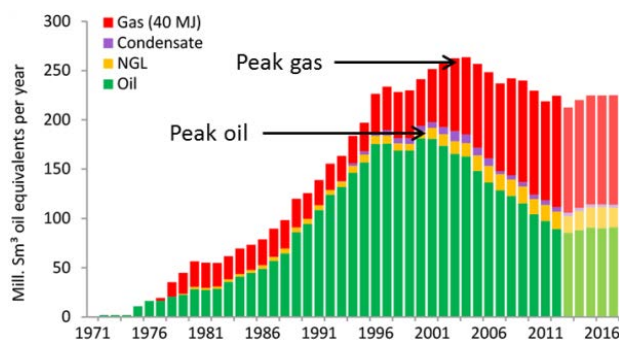


Figure 2 Norwegian peak oil and gas (OED, 2013)

The country has amongst the highest percentage of renewable energy in its electricity supply globally (over 97%), provided namely through hydropower that was primarily built out during the water wave of the 50's-80's. The global rise of environmental and social concerns that plagued the hydropower industry throughout the 1990's and 2000's drastically slowed down new development of this clean energy resource. Of Norway's total domestic hydropower resource base of 217 TWh, 60% has been built out, 25% is protected, leaving 15% available for further development for future generations to meet future energy needs (NVE, 2011).

With the EU renewable energy directive, Norway has also committed to increasing its share of primary renewable energy consumption from the 2005 baseline year of 60,1% to 67,5% in 2020. The strategic plan of implementation has resulted in a joint subsidy support mechanism for renewable energy in the power sector with Sweden, with both countries jointly responsible for adding 26,4 TWh of new clean power to the common grid. Interestingly enough, the estimated production trajectory of renewable energy share of electricity for Norway was cited at 113,6% in 2020, reflecting large renewable energy export plans with the surplus (MPE, 2012).

Given this background context of a nation that has built strong industrial foundations around these two core industries in which limited opportunities existed for both more fossil extraction and hydropower development in the mid to late 2000's, we find it most interesting and timely to empirically investigate if and how sustainability transitions are unfolding. What will the Norwegian energy system transformation look like? Will the oil and gas sector strategically reorient itself from grey to green? Given the favorable existing high penetration of renewables in the power sector, what technologies will be utilized in expanding production?

### 3.2. Research question

In light of the aforementioned literature review, we propose the following research question:

*What are firm level motivations and barriers for pursuing diversification within the energy regime?*

That transitions unfold over long time scales, we find it prudent to investigate why firms are interested in pursuing the ‘green agenda,’ and equally importantly, what barriers stand in the way of doing so. Understanding that motivations and barriers come from both inside the regime and the external landscape, we developed two frameworks that reflect both internal and external motivations and barriers as depicted in Figures 3 and 4. Furthermore we developed our framework to test whether firms in the energy system are more proactive or reactive, based upon their motivations for engaging into new activities that promote sustainability transitions.

	Proactive	Reactive
Endogenous	-HR strategy (attract / hold talent) -Reuse competence and resources in new area	-Reduce dependence on main activity -Low returns on main activity
Exogenous	-More attractive business opportunities -Positioning for future	-Stagnation in main activity (sector) -Following customers /competition

Figure 3 Motivational framework for pursuing diversification within the energy system

Endogenous	-Lack of internal knowledge resources -Access to competent talent -Lack of financial capacity
Exogenous	-Unclear politics -Uncertain subsidies-tax mechanisms -Access to new resource areas

Figure 4 Barriers framework for pursuing diversification within the energy system

#### 4. Methodological structure

Our research design for answering the aforementioned research questions consisted of an industry wide web based survey throughout the energy sector in Norway. Our strategic sample and respondent list was collected and compiled through industry representative organizations, consisting of 783 firms in total. We grouped our respondents into three primary classifications as reflected in Figure 5: energy producers, product suppliers, and service suppliers. Our belief is that incumbents within these classifications play different roles in the shaping of the industry, and our goal was to capture these regime dynamics.

In line with Cooke’s (2011) notion of transversality, our methodological approach to track diversification has been tailored to fit the sustainability transitions framework as we sought to underpin transfer of resources between non-sustainable sectors (oil and gas) to sustainable ones (renewable energies). Diversification options were thus limited to renewable energies, as opposed to a variety of industries outside the energy sector for which we could not make the clear argument and distinction of resource transfer leading to sustainability transitions.

##### 4.1. Research model

Figure 5 reflects our methodological approach in a research model. We sought to capture a current picture of incumbents’ current situation, i.e. what their business



dynamic is. This involved a number of descriptive elements about their firm and current activities, in addition to managerial perceptions about former and future market developments. This structure sought to underpin product and market level diversification as laid forth in Figure 1.

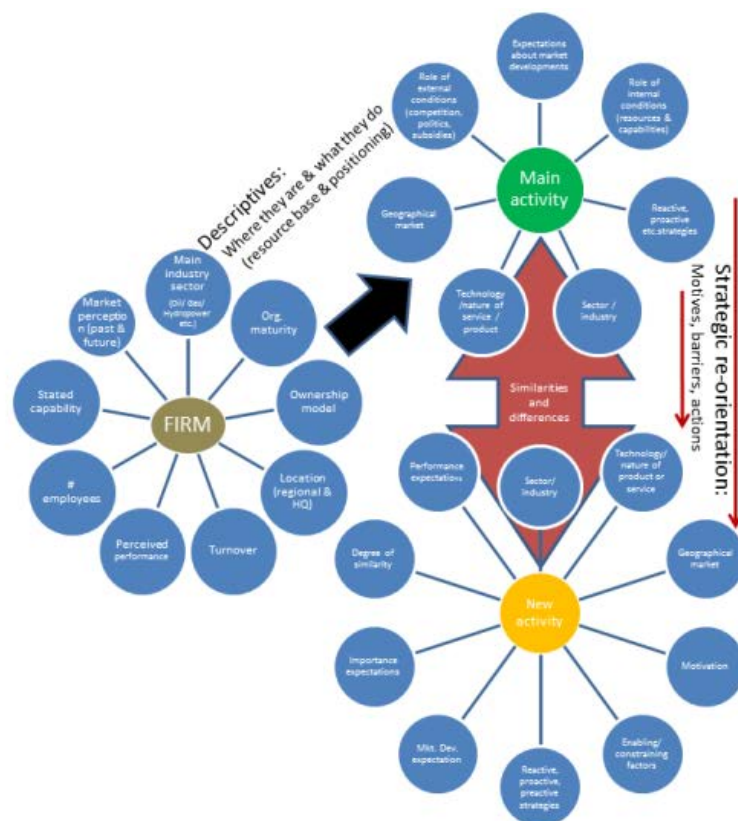


Figure 5: Research model for strategic reorientation in transversality

#### 4.2. Measures and analysis

Key measures utilized a seven point Likerts scale, indicating degrees of assessment with the variables presented. Survey results are presented as descriptive statistics below.

#### 5. Results

The survey produced 220 responses, a response rate of 28%. Individuals with senior leadership roles make up 55% of total respondents. Figure 6 shows the industry composition of each according to the firms' stated primary activity. Figure 7 breaks down the activities of the incumbents in both regimes.

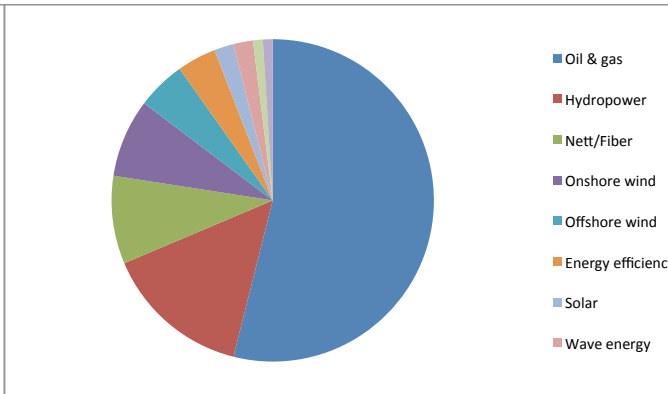
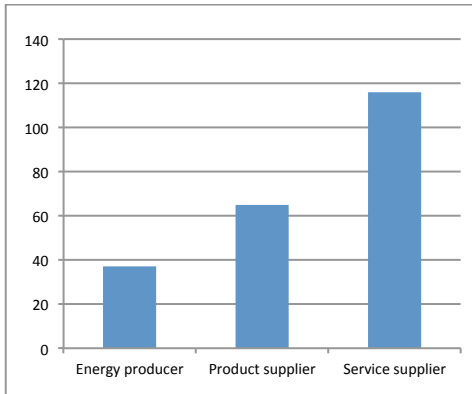


Figure 6 Activities of the respondents

Figure 7 Composition of the respondents' main sectors

Following our framework in Figure 3, motivational results for pursuing transversality within the energy system are presented in Figure 8.

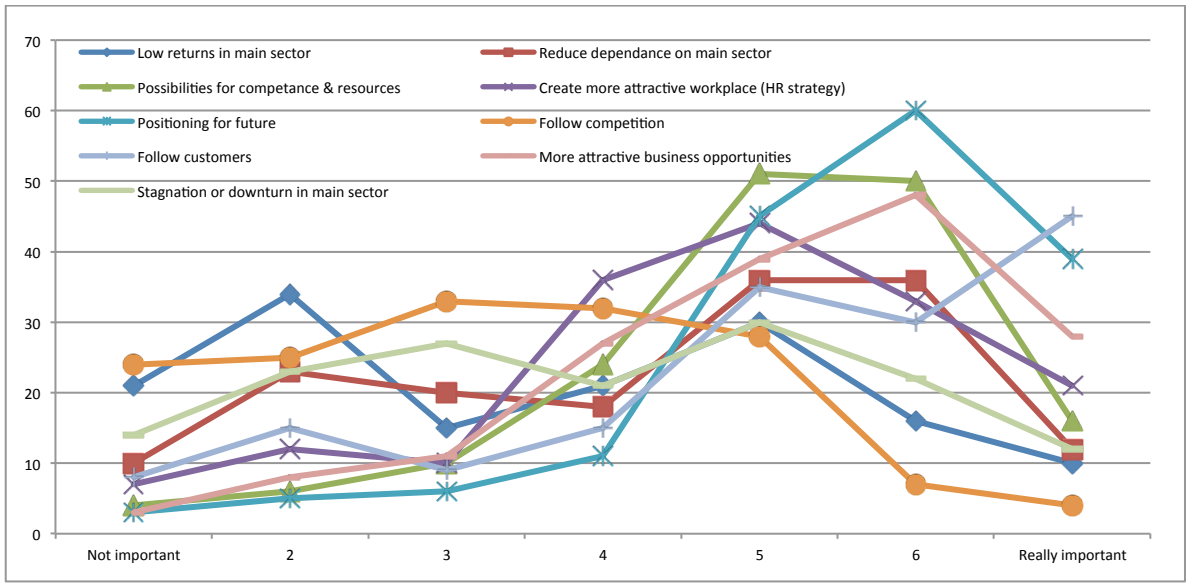


Figure 8 Motivations for pursuing sustainability transitions

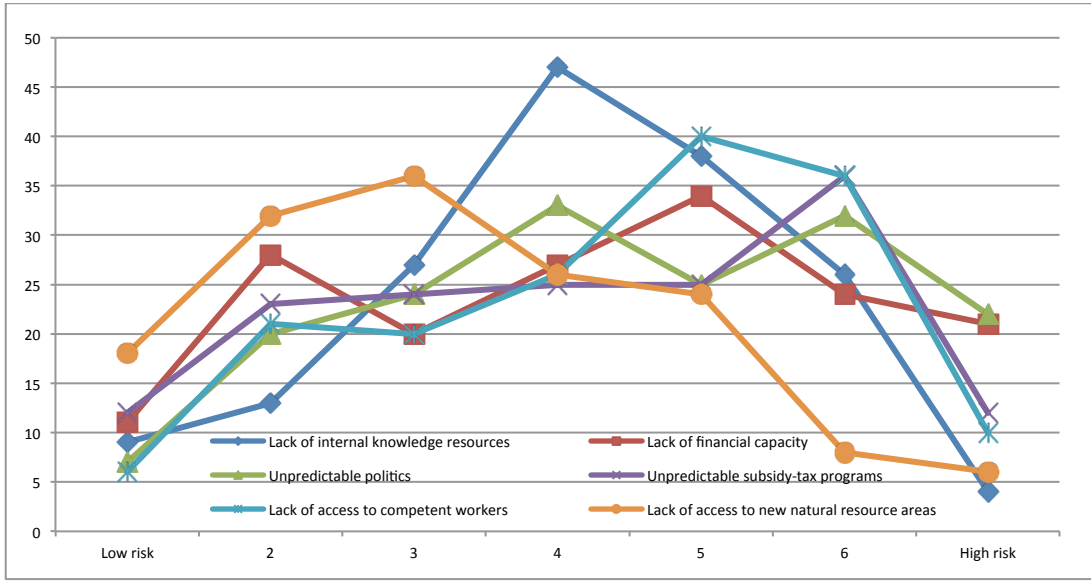


Figure 9 Barriers to pursuing sustainability transitions

## 6. Theoretical implications for Sustainability Transitions

Industry plays a critical role in sustainability transitions as the link between technology and society (Morioka et al., 2006). In addressing the compound problems of lock-in and path dependence within (energy) regimes, it is well understood that ‘uncertainties about future market and regulations hinder the commitment of firms to the development (or implementation) of sustainable technologies...because of market uncertainties and fear of cannibalising their existing products’ (Geels et al., 2008). This antecedent conclusion offers us several takeaways when analysing incumbents within their prospective regimes. First, a strong market demand for new green innovations must exist for incumbents to pursue them. Second, the policy and regulation of their existing business line and the technological maturity of the new innovation being pursued must align in a way that allows firms to envisage a promising economic future in the new green innovation while simultaneously suppressing the outlook for their existing (unsustainable) business activity. Thus regulation plays a key role in advancing transitions by creating frameworks that offer a roadmap towards sustainability, and thus a way to begin the transition out of path dependency and lock-in of existing systems. Given that all firms pursuing multiple paths face internal competition for resources, the allocation of such resources between new and old activities characterizes the managerial challenge of pursuing sustainability transitions.

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