Stimulating Supply Chain Manufacturing Growth: Can Policy Create Supply Chains from a Void?

Michel Leseure (m.leseure@chi.ac.uk)
University Chichester Business School, Bognor Regis, UK

Dave Cooper
University Chichester Business School, Bognor Regis, UK

Dawn Robins
University Chichester Business School, Bognor Regis, UK

Abstract

The UK has introduced in 2014 the Supply Chain Plan, which requires that a sufficient number of parts and services associated with the construction of a wind farm are sourced from the UK. This requirement is the last instalment in a series of policy measures attempting to increase local content, but its effectiveness is questionable in terms of achieving the industrial dynamics associated with the creation of centres of excellence through smart specialisation. Based on the experience acquired in 3 different applied research projects about creating local offshore wind supply chains, we use a behavioural theory of the firm theoretical approach to assess the alignment between policy and stakeholders respective behaviours. We conclude that the Supply Chain Plan is very likely to be a case of escalation of commitment, and as such, a policy of questionable rationality

Keywords: supply chain, policy, offshore wind, escalation of commitment

1 Introduction

The UK Department for Energy and Climate Change introduced in 2014 the so-called 'Supply Chain Plan' (DECC, 2014). Developers of wind farms above a certain power output have to demonstrate that arrangements have been made to ensure that many of the parts and services needed for the construction of wind farms to be installed in UK waters will be sourced from the UK. The supply chain plan is the spinoff of a consultation process which is summarised in the 2013 *Offshore Wind Industrial Strategy: Business and Government Action* report as follows:

> *'As part of our new industrial policy, we want to see UK-based businesses grow to create a centre of engineering excellence that delivers cost reduction for UK projects and exports to overseas market. To achieve the vision set out in this strategy, we need to grow our manufacturing base to be world-leading in more areas of offshore wind supply and to achieve levels of UK content in our offshore wind farms which are similar to those achieved by our North Sea oil and gas industry where more than 70% of capital expenditures is through UK-based suppliers*' (DECC, 2013, p. 2).

The same report estimates that only 30% of offshore wind spending is, on average, sourced from UK suppliers (p. 71). Whereas up to 2014, industrial policy support for the offshore wind sector was

centred around innovation, for example with the *GROW: Offshore Wind programme* (a fund for Manufacturing Supply Chain Programme for Regional Growth) the supply chain plan adopts a different direction as it does not exclude achieving its 70% target through foreign investment. This is exactly what is happening in Hull with the building of a 'green port' by one of the leading turbine manufacturers in Europe, Siemens, and its partners. The news of the first wind turbine blade manufactured there have been commented on widely and positively in the national press, which also quotes ministers for stating that this factory is a proof that "*manufacturing has a glittering future in the UK*" (Vaughan, 2016).

The Supply Chain Plan is clearly a success in terms of regional job creation (1000 jobs in a city with the UK's highest unemployment rates; Vaughan, 2016) but the celebration of Hull's green port is the sort of news item that one would expect to read about an emerging economy rather than a country with a level of technological knowledge such as the UK. The Supply Chain Plan is a policy which is an interesting and unusual case study in the institutional analysis of structural economic change, as it raises many questions.

First, the Supply Chain Plan is essentially a local content requirement and thus a form of protectionism. In the context of Brexit and of a government sporting the traditional unconditional British allegiance to free trade principles, imposing local content requirements on European trade partners is an odd position. An interview of Siemens UK's chief executive (Vaughan, 2016) acknowledges that exports will only be considered when the factory brings its costs down; a statement that echoes the typical lack of performance associated with local content requirements (Belderbos and Sleuweagen, 1997; Kuntze and Moerenhout, 2013).

Second, such cost disadvantages inscribe themselves in a larger debate about the competitiveness of local versus global supply chains. In order for the UK to build wind farms with the lowest lifecycle cost of electricity, relying on a global supply chain benefitting from either competitive or comparative advantage effects (e.g., Christopher *et al.*, 2006) sounds like a robust strategy. There is a growing paradoxical tension, especially at the policy making level, between advocating global versus local supply chains, and the UK Supply Chain Plan is a good example of this tension.

Third, the Supply Chain Plan departs from the vertical policies associated with smart specialisation support policy (Foray, 2014) as it does not try to directly stimulate entrepreneurial excellence (whereas previous initiatives such as Offshore: Grow Wind did).

Finally, the fourth and most challenging issue comes from the fact that UK-based first movers in wind power technology in the 1980s were not deemed worthy of policy support, and the small industry that they formed eventually died off. Thus, the Supply Chain Plan is an attempt to re-create an extinct cluster, but this time, from a void.

The overall objective of this paper is to investigate the conditions under which a local content requirements policy such as the Supply Chain Plan is feasible and valuable. This requires considering the following topical questions for any country willing to develop its manufacturing base: can entire supply chains be created from a void? Are local content requirements an effective way to do so? How can we make sense of the contradictions of policy simultaneously advocating local and global supply chains?

2 Offshore Wind: A Global Overview of Markets and Supply Chains

The wind power industry has grown steadily in continental Europe for the last 20 years, but its recent accelerated growth in 'follower' countries is down to a number of international, European, and national directives with the purpose of reducing carbon emissions and of increasing the share of renewables in national energy mixes. First movers, both in terms of wind energy production and of the fabrication of wind power equipment, were Denmark, Sweden, and the USA. They were the only three countries to generate electricity with commercial wind farms in 1983[1]. Wind farms were built

[1] All statistics in this section are from the International Energy Statistics database, www.eia.gov, and the Global Wind Energy Council, www,gwec.net.

in 1986 in India and the Netherlands. In Germany and the UK, wind electricity generation began in 1988. By 2016 though, the UK hosted the 6th largest wind power capacity in the world with 14.5 GW, composed of 10GW of onshore wind farms and 5GW of offshore wind farms. The largest users are China with 169GW, the USA with 82GW, and Germany with 50 GW. In these countries installed capacity is predominantly onshore.

In recent years, the UK has almost entirely ceased investing in onshore wind. This can be explained by the relatively small landmass which does not provide much opportunity for siting wind farms especially in a context of frequent social opposition to wind farm projects (Bell et al., 2005; Van der Horst and Toke, 2010). The larger coastal areas and associated stronger, steadier winds along with much reduced issues of social acceptance means that the UK is now focusing on offshore wind growth. As a result the UK has stepped out of the shadows and is now the largest offshore wind market with 36% of the global installed capacity, right in the geographical centre of offshore wind growth, as Northern Europe hosts 88% of the market share. The 10 largest commercial wind farms in operation today are in the North Sea, with London Array being currently the largest wind farm in the world with a capacity of 630MW. Plans to build more (and larger) wind farms mean that the UK offshore wind market is estimated to be worth more than £100 billion in the next 20 years.

This growth is not without challenges though, as offshore wind electricity is considerably more expensive than onshore wind (Blanco, 2009). Whereas onshore wind is nearing competitive parity with traditional fossil fuel sources, offshore wind farms can only be operated through subsidies. This subsidisation has been a key feature of the UK energy policy (chronologically through the Renewable Obligation and the Contract for Difference policy instruments). It is likely that the subsidy rate, typically ranging from 50 to 100% of the electricity rate, has motivated the UK government to find ways to demonstrate value for money beyond carbon reduction and increased energy security. Inspired by the examples of a handful of countries where the growth of offshore wind had resulted in the creation of new and vibrant industrial districts, such as Germany and Denmark, the UK, and most European countries, built an expectation that the construction of offshore wind farms would generate economic spillovers resulting in significant local job creation and in the type of structural changes typically associated with smart specialisation. Alas, in the majority of the cases these spillovers did not materialise. For example, the Kent region did not experience significant spillovers, and this, despite being offshore wind first movers in the UK (Leseure *et al*., 2014). This realisation led to the consultation mentioned in the introduction and eventually to the adoption of the Supply Chain Plan.

To better understand the nature of this market, it is useful to consider the product breakdown structure of a wind farm project. A large offshore wind farm, such as London Array or Rampion in Brighton, will typically cost about £2 billion in capital expenditures. 43% of this budget is for the wind turbine manufacturer and 33% for the balance of plant (foundations, cables, and substations), leaving 24% for the developer's installation, commissioning, and project management expenses. Typically, the wind farm is built with an expected 25 years operating life, and annual operations and maintenance expenses will be 3% of the original construction budget. The operations budget includes recurring expenses such as leases, connection fees, operating base, staff, etc, that add up to 50% of the budget. The remaining half of the budget is spent on spare parts.

A very simplified representation of an offshore wind supply chain is a 3-level linear supply chain composed of the user (typically a utility company), the developer (who will typically operate the facility for the first five years after construction), and the first tier level of suppliers. Key players in the first tier are the turbine, cables, and foundations manufacturers. The turbine manufacturers have their own traditional manufacturing supply chains. Whereas supplying to other first tier suppliers requires a specialist trade (e.g. cables), the turbine manufacturers rely on a much more diverse set of suppliers. This, along with the high percentage of the budget going into the turbine, explains why the turbine supply chain has been the main focus of policy. Ten companies hold 72% of the global market share for turbines: 1 from Denmark, 2 from Germany (1 based on the acquisition of a Danish operator), 2 from the US (including the merger with a Spanish manufacturer), 2 from India, and 3 from China. Although the UK has a number of firms manufacturing small scale as well

as mid-size turbines suitable for onshore installations, the only firms that could have been players in the offshore sector either went out of business in the 1980s or were bought out and moved to Scandinavia. There is currently no firm in the UK with the ability to manufacture offshore turbines. There are UK businesses with experience of foundations manufacturing (for oil and gas platforms), subsea cables production, as well as a few foreign-owned specialist manufacturing centres (e.g. blades).

3 An Industrial Strategy Perspective

Given the context described in the previous section, does the Supply Chain Plan seem to be a sensible and promising industrial policy? It is tempting to try to find an answer to this question by relying on the traditional industry view of strategy, i.e. by using Porter's Diamond (Porter, 1998). Given the high rate of building offshore wind farms in the UK, the demand conditions are certainly very strong. There are sufficient factor endowments in terms of material and knowledge as well as related industries (offshore and oil and gas sectors). However, when it comes to the strategy, structure, & rivalry, which drive in Porter's Diamond, the ability to maintain a competitive advantage through innovation, there is no large player or alliances that can fulfil this role.

A similar conclusion can be reached by using the lenses of smart specialisation. Entrepreneurial discovery is at the heart of the process of smart specialisation, and in the absence of any entrepreneurs invested or willing to invest in this area, nothing will happen.

However, in a comparative study of several countries industry policy support mechanisms, Lewis and Wiser (2007) conclude that "*whether new wind turbine manufacturing entrants are able to succeed will likely depend in part on the utilization of their turbines in their own domestic market, which in turn will be influenced by the annual size and stability of that market. Consequently, policies that support a sizable, stable market for wind power, in conjunction with policies that specifically provide incentives for wind power technology to be manufactured locally, are most likely to result in the establishment of an internationally competitive wind industry*". This conclusion suggests that the Supply Chain Plan is a feasible and worthy initiative but it has to be mitigated by the fact Lewis and Wiser's (2007) conclusion is based on an historical examination of first mover countries only. All these benefited from direct and indirect support from their government to develop a local wind power industry (see Lewis and Wiser for a full account of the different policy instruments used) and worked initially at a national scale before the industry became truly global. The only case study that could be compared to the UK is Japan, a late entrant with no prior experience in the sector (Lewis and Wiser, 2005), that now has 3 large scale turbine manufacturers. Such a case study resonates with academic criticisms of Porter's Diamond, e.g. Davies and Ellis (2002) report cases of the successful creation of business clusters in the absence of an innovation core. To add to these opposing viewpoints, local content requirements are presented as key policy mechanisms in Lewis and Wiser (2007) but their use in the renewable energy industry have also been criticised as ineffective policy instruments (Kuntze and Moerenhout, 2013).

4 Theory

This paper explores these opposing viewpoints from the theoretical perspective of the behavioural theory of the firm (Cyert and March, 1963). Cyert and March challenged the classical theory of the firm's proposition that managers maximise shareholder's wealth. As most managers make decisions in contexts best described with bounded rationality and imperfect information they look for satisficing solutions that are good enough to please shareholders, rather than make optimal decisions. The behavioural theory of the firm has never been previously applied at the policy making level, but policy makers belong to organisations which are exposed to problems of equal, if not higher, complexity than firms. They, too, have to make 'rational' decisions under uncertainty to please a vast array of stakeholders.

The behavioural theory of the firm offers many sub-theories with which to investigate the behaviour of decision makers. Cyert and March (1963) explain that in the face of uncertainty and different decision alternatives, organisations are likely to divide into different coalitions, and the

process of decision making becomes a process of establishing the power or dominance of a coalition. They also replace the idea of optimising with the concept of an organisational search. Different coalitions will adopt different directions of search. March (1991) contrasts explorative searches (innovation and experimentation) vs. exploitation (the use of tested and known business models) and concludes that there is an optimal trade-off between exploration and exploitation. Gavetti and Levinthal (2000) compare cognitive searches that look forward and analyse conditions for change to take place with experiential searches, which look backward before making a decision. They conclude that the ability to change a cognitive representation is important for adaptation. Coalitions have been associated with the role of ideology in decision making, and especially with the existence of irrationality in organisational action (Brunsson, 1982) and for explaining the escalation of commitment to a course of action (Staw, 1981).

Lewis and Wiser (2007) point out that nearly all countries using wind turbines are attempting to establish a local supply chain, and this, regardless of their level of capability, experience, knowledge, and timing of entry. In other words, all are searching for a way to create a new promising industrial sector and the associated jobs. Based on the behavioural theory of the firm, the following propositions can be made to explain the creation of the Supply Chain Plan and to assess its worthiness.

4.1 Proposition 1

There exists in UK policy maker circles, a dominant coalition which is concerned with the political argument that UK taxpayers are not getting enough for the high subsidies paid to the offshore wind sector, and that the real beneficiaries of these subsidies in monetary terms are foreign manufacturers and utility companies. This dominant coalition therefore considers that the creation of a UK-based manufacturing sector is a fair and justified offsetting mechanism. In this scheme of things, the goal is to create jobs, ideally in areas in need of regeneration. Whether or not actual spillovers will take place is not necessarily a prime consideration, and this coalition may be content with the idea that the knowledge base of the sector in the UK may remain that associated with contract manufacturing, with only limited technology transfer taking place. In other words, this coalition is happy with the idea that this is an exploitation policy that can only generate benefits in the short term and offers limited and uncertain growth potential.

4.2 Proposition 2

UK policy makers have been impressed by the global strength and size of emerging offshore wind clusters and by the accounts of Germany and Denmark (see for example Bergek and Jacobson, 2003). Further inspired by the fact that for different reasons the UK has created a strong and stable domestic demand, policy makers see in offshore wind an ideal sector for vertical policy support, i.e. an off-the-shelf solution to their problem of 'identification and discovery' (Foray, 2014). This resulted in the categorisation of offshore wind as a promising 'smart' investment. As initially attempts to create clusters such as the Centre for Offshore Renewable Energy (COREs) were not all successful and classic R&D support (such as *Offshore: Grow Wind*) did not lead to the emergence of strong local first tier suppliers, the Supply Chain Plan is a case of escalation of commitment. Escalation of commitments rarely, if ever, lead to satisfactory outcomes.

4.3 Proposition 3

UK policy makers are well aware of the numerous past market co-ordination failures in the establishment of a UK-based offshore wind supply chain but believe that this is an industrial sector where a follower may eventually lead the industry by benefitting from the loss of real option value to first mover advantage and instead search for follower advantages (Cottrell and Sick, 2002).

5 Methodology

5.1 Qualitative field research

The authors were involved from 2012 to 2015 in 3 separate applied research projects commissioned respectively by a regional interest group, a local government, and INTERREG Channel to investigate the potential and feasibility for local small businesses and regions to become involved in an offshore wind supply chain. For 3 years, we collected data and performed analysis to develop recommendations about how to 'make the most' out of offshore wind opportunities. This required extensive involvement with all stakeholders at a local, regional, and national level and for this reason our methodology is best described as qualitative field research. Our data sources and method of data collection are described in the next section. Through these projects, we have been active participants of the ongoing search for the development of the offshore wind sector in the UK, and this gives us the ability to characterise behaviours, values, and coalitions that we have observed. Our focus is not so much the independent factors of industrial strategy frameworks (e.g. strong demand conditions) but more the dynamics (or lack thereof) between these factors. Recent work in Technology Innovation Systems (TIS; Bergek *et al.*, 2008) confirm that these dynamics, core to both Porter's Diamond and smart specialisation, are of central importance to achieve effective agglomeration economics effects.

5.2 Projects

The authors were first contracted to populate a database of potential suppliers for the new Rampion windfarm before building started off the coast of Brighton. This was done by mapping local businesses areas of expertise against a detailed breakdown structure provided by the client. This led to a follow-on project for the Kent region. Kent is interesting as a region in the context of this paper for two reasons. The first is that it is there that the first UK offshore wind farms were built (Kentish Flats and Thanet). It is also within reach of other 'first mover' wind farms (Greater Gabbard and Gunfleet sands). It also the home of London Array. The second reason is that local economic spillovers were much lower than expected (cf. Leseure et al., 2014). Therefore, Kent is an ideal 'test bed' to analyse the root causes of lack of local economic spillovers. The project was to extend the supplier mapping exercise for Kent but also to promote the sector and to provide recommendations to the region about how to stimulate local small business engagement with the industry. As part of the Kent supply chain project, several interactive workshops were organised in order to capture the perceptions of local businesses in terms of the opportunities and barriers associated with offshore wind. The last workshop included an exhibition where potential suppliers could see a range of spare parts that could be supplied.

The third project was Channel-MOR, an INTERREG Channel project. The objectives of Channel-MOR were to provide recommendations to regions in the Channel Arc Manche area in order to facilitate and promote the uptake of MRE opportunities by local businesses. The Channel Arc Manche regions include all coastal Channel regions, from Brittany to Nord-Pas de Calais on the French coast and from Cornwall to Norfolk on the British coast. The MRE technologies that were considered were offshore wind, tidal energy and wave energy. The authors led the Channel-MOR workpackage which was about promoting the sector's opportunities to SMEs and providing recommendations to regions about facilitating and stimulating regional transitions towards the energy sector. Channel MOR was a very large 11 partner project with a total budget of €1 million, and our workpackage involved extensive data collection, interactive workshops, and promotion events. It provided the authors with a genuine immersive experience with the sector and the opportunity to meet with all stakeholders. Data collection included a global survey of industry experts asking them to rank through an Analytical Hierarchy Process (AHP) key strategic factors that could lead a region to become a global player in the industry. The survey results were then used as an input for strategic analysis workshops to produce a mapping of all 8 participating regions onto a grand strategy matrix. Each of these workshops included local stakeholder participations. Finally,

further workshops were organised for each region to produce scenarios of regional transitions to join the offshore renewable sector.

5.3 Data Analysis

A presentation of all the detailed data (e.g. survey results) is not possible given the quantity of data involved. Data from the Kent project can be found in Leseure et al. (2014) and the Channel-MOR findings in Channelmorenergy.eu (2014). This data forms the body of evidence from which we can assess the support for the 3 propositions formulated in the previous section. The method of data analysis is as follows:

1) Extract from each project's final report key observations and conclusions about (i) the context of operations of the offshore wind supply chain, (ii) the perception of the characteristics of this supply chain, and (iii) commonly shared beliefs about market structure and conduct.
2) Map the support that these observations/conclusions provide for each proposition.
3) Tally the overall amount of support for each proposition.

This process can be illustrated with one of the findings from the Kent project. To understand the lack of engagement of local businesses with the sector, an interactive workshop including 50 participants was organised. Participants were asked in groups to produce a cause and effect diagram of the root causes of barriers to engagement. In all groups, perception of high uncertainty about the future of the sector were identified as a reason to 'wait and see' rather than to proactively engage. The workshop was repeated at an international conference with 25 participants from industry in Cherbourg during the Channel-MOR project and produced similar conclusions. The high visibility of the sector in the press, which is based on numerous controversies (social acceptance, impact on cost of electricity, level of subsidies, low capacity factors, unproven technologies, etc.), means that businesses are reluctant to consider the (high) cost/risk of transitioning to this sector.

The next step is to question how this conclusion aligns with the three propositions. If the ongoing search, i.e. the policy makers' push for the sector, was based on the exploitative idea of generating short terms jobs linked to the construction projects, one would expect clear communications being made in this regard. Policy statements would stress the short term orientation of the search and clearly indicate to potential entrants that the long term future of the sector is not an issue, i.e. the aim is 'make money whilst we are building wind farms'. This is not the case as policy documentation (e.g. the *Offshore Wind Industrial Strategy*; HM Government, 2013) very clearly states that offshore wind is an exciting sector to invest in, and in the long run. Thus, we can conclude that our observations of the perception of high uncertainty does not support proposition 1.

Most business participants in our workshop were seduced by offshore wind but unconvinced by the opportunity and this because of their perception of uncertainty and high cost for establishing a competitive presence. One would expect that if proposition 3 were true (search for follower advantage), much of the policy voice would acknowledge this uncertainty as benefitting from follower advantage is by its very nature an uncertain business. A search of the *Offshore Wind Industrial Strategy* report reveals that uncertainty is only mentioned once, when discussing the challenge of raising finance. This gap between portrayed uncertainty (policy) and perceived uncertainty (actors) lead us to the conclusion we find no support for the third proposition. High uncertainty supports proposition 2 though, i.e. the idea that the current search is a case of escalation of commitment. For a rational decision maker, the persistence of the cause (uncertainty) of the setback (no spillovers) should reduce the perception of future outcomes (Staw, 1981). When it does not and investments in a prior course of action intensifies, this is a case of escalation of commitment.

This process of analysis is repeated for the 10 key conclusions from our three projects.

Table 1 – Support for the Three Propositions

	Proposition 1: Offset Subsidies - focus on S/T job prospect	Proposition 2: Escalation of Commitment	Proposition 3: Search for follower advantage
High perception of uncertainty		X	
Not acknowledging the challenge of competing with existing and mature agglomeration economies		X	
Lack of co-ordination at an early growth stage		X	
Idealisation		X	
Limited entrepreneurial knowledge, very dispersed		X	
Cognitive tie between production and use	X	X	
Lack of strategic option thinking	X	X	
Local, not global aspirations	X	X	
Overestimation of S/T job prospects and economic benefits	X	X	
Offshore wind, not energy	X	X	
Support for Propositions	5	10	0

6 Findings

Table 1 displays the results of the process described above, and is followed by a discussion of each row. Table 1 shows that we find no support for the idea that the current offshore wind industrial strategy is a consciously articulated case of searching for followers' advantage. We find only moderate support for the idea that it is about generating short term gains (job creation). We do find strong support for proposition 2, i.e. that UK offshore wind industrial policy is a case of escalation of commitment.

6.1 Not acknowledging the challenge of competing with existing clusters, Lack of Co-Ordination at an Early Growth Stage

Many of our interviewees and participants were fully aware of the level of competitiveness of first-movers (e.g. Germany and Denmark) and also of the long, often tedious, technology development processes that competitors from these countries have gone through. Very much in line with the title, participants were sceptical that the UK could, from a void, overtake the outcome of 30 years of R&D and TIS dynamics (Bergek and Jacobson, 2013; Jacobson and Lauber, 2006). In contrast, the policy stance is uncompromising: there is no reason why the oil and gas benchmark of 70% cannot be matched. This is an important issue as it means that policy ignores the anchor tenant's hypothesis, i.e. the fact that a local large R&D firm (in our case, first mover turbine manufacturer) stimulates the creation of a cluster and of spillovers (Agrawal and Cockburn, 2003). It is at an early stage that the anchor tenant recruits entrepreneurial partners and structures knowledge flow and activities. In the specific case of turbines, there is no anchor tenant in the UK and although structuring activities exist, they are being implemented at a very late stage of the TIS dynamics. Many of the small businesses that we interviewed and that participated in workshops also stressed the very high transaction costs and entry barriers associated with the sector today, which they compared to a 'gentleman's club'. It is very likely that these transaction costs were lower in the early growth stage.

6.2 Idealisation

Through the Channel MOR project, we observed a slight bias in the recruitment of our participants. All of them were very positive about the principle of renewable energy, in fact too positive. This can be described by idealisation, the process of over-valuing and augmenting a value or idea to the extent that it cannot possibly be challenged (Brown and Starkey, 2000). After the survey, we asked each region to perform the traditional stages of a SWOT analysis and we mapped the strategic positions of each region onto a grand strategy matrix. 7 out of 8 regions self-rated themselves as possessing top strengths and as being faced with outstanding opportunities, when common sense suggested that this could not be the case. After moderation of the strategic mapping, it turned out

that only 1 region out of 8 was indeed in this area of the grand strategy matrix. One participant called for an end to the 'gold rush' mentality that surrounds offshore wind and for more a realistic assessment of the challenges and likely outcomes. It is difficult to provide more support to the proposition of escalation of commitment than this!

6.3 Limited Entrepreneurial Knowledge

A key challenge to achieve the spontaneous dynamics of smart specialisation is the dispersion and fragmentation of entrepreneurial knowledge, and when this challenge is too extreme, policy support will be required (for example by creating learning networks; Foray, 2014). There are a number of bodies (*UK Renewables Catapult*) and initiatives (*Offshore: Grow Wind*) that exemplify this type of support and these are successful. It is in fact very likely that all entrepreneurs with a genuine experience and interest in offshore wind are in contact or are being supported by these. In some areas of the supply chain (e.g. cables) where several UK players exist, there may be the required critical mass to create a cluster. However, when it comes to turbines, and therefore the bulk of the value chain, there are simply not enough potential entrants.

6.4 Cognitive Tie Between Production and Use, and Local, not Global aspirations

The behavioural theory of the firm tells us that both cognitive (forward looking) and experiential (backward looking) thought processes, and the balance between the two, will shape the direction of searches (Gavetti and Levinthal, 2000). Our research showed a strong cognitive tie between the erection of a wind farm and the development of a supply chain, and this for all participants (regional officers, businesses, etc.). It is true that this was the case of all first-mover turbine manufacturers and it is also true that in their early phases of growth they benefited from local content requirements (Lewis and Wiser, 2007). As these manufacturers grew this use-production tie disappeared. For example, the industry leader, Vestas, now exports 99% of its production (Lewis and Wiser, 2007). However, it is the account of the early growth stage that has been strongly imprinted in policy makers. In our survey of experts, construction and operations opportunities (i.e. those associated with projects) were rated as more valuable than investments in R&D. When asked to rate the key strengths of a global player in the renewable energy sector, weather, expertise, and policy support were rated equally. This means that policy makers have created an odd tale of wind farms that spontaneously bring factories on shore. The fact that the demand created by one wind farm project is not a sustainable demand base for these factories is rarely discussed and gladly avoided. In the Channel-MOR project, we witnessed the creation of this cognitive tie at work in the marketing of offshore wind farms in northern France, which are almost always associated with the promise of a factory in a local port.

6.5 Lack of Strategic Option Thinking, Overestimation of Short Term Job Prospects and Economic Benefits

This finding came from the Channel-MOR phase of the project when we asked the different regions to formulate scenarios for their transition towards the renewable energy sector. They confirmed the cognitive tie between production and use as many regions only presented scenarios of planned wind farm construction, making the implicit assumption that a local supply chain would naturally follow. This phase also revealed a lack of strategic opting thinking. Before the scenario planning stage, each region was provided with their moderated strategic positions, and most regions had moderate strengths (typically in the maritime and offshore sectors) and faced more threats than opportunities. Strategic options reasoning (Trigeorgis and Reuer, 2017) would recommend considering learning (e.g. partnering) options or waiting options, or in the case of regions with neither strengths nor opportunities, abandonment options. Clearly articulating these options would be the starting point of seeking follower advantage (Cottrell and Sick, 2002). The majority of regions formulated standard growth strategies in their scenarios, and this, despite (i) the fact that their strategic mapping suggested that they should not and (ii) the fact that these regions could

Table 2 – Industry Comparison

	Investment (£b) Capital Expenditure	Employees	Purchasing, Operations, and Maintenance budget p.a. (£m)
Large offshore wind farms (600MW)	1.91	90	76.40
Two UK automotive assembly plants	2.1	3800	1047.2

benefit from the lessons learned from more experienced regions in the project team. These (illusory) growth strategies are the outcome of the enduring policy promotion messages stressing the expected growth of the sector and the number of jobs that will be created. In a workshop in France, we compared the purchasing expenditures and permanent jobs created in the construction and operation phases of a wind farm with an automotive assembly factory, as shown in Table 2.
Upon seeing the table, a representative of a French developer came to us at the end of the presentation and told us that we should urgently remove this table from our presentation as it was inconsistent with national policy statements.

6.6 Offshore Wind, not Energy

The vast majority of our participants were interested in offshore wind and more generally, offshore renewable energy. They generally had little knowledge and interest in the overall energy sector. This is counter to the strong knowledge exchange dynamics that one would expect to see in smart specialisation. In fact, the only region in the Channel MOR project that was in a position to adopt growth strategies (and had already done so) was the East of England (Norfolk and Suffolk). It not only benefited from their oil and gas experience but also from their very proactive all-energy interest group, EEEGR (East of England Energy Group) that perfectly matches the description of a smart specialisation learning network. This region is a successful case study of first tier market entry in the installation, servicing, and maintenance areas.

7 Conclusion & Implications for Policy

Our conclusion is that the Supply Chain Plan is a case of escalation to commitment that fails to recognise geo-political supply chain and industry dynamics which are at the heart of research on smart specialisation and technology innovation systems. The argument of Lewis and Wiser (2007) is based on the business history of first-movers and we find no evidence that it can be extended to seeking follower advantage in this sector. We question whether initiatives like the Supply Chain Plan are really desirable when they risk displacing investment and motivation in more balanced (exploration/exploitation) policies. Instead vertical policy support favouring R&D and structuring entrepreneurial discoveries in 'new spaces' connected to the offshore wind sector as identified in the Channel-MOR project (tidal, wave, energy storage, condition monitoring, subsea connectors, and smart transmission) would seem to be much more promising avenues with long term growth potential.

These findings have wider implications as the UK develops its Industrial Strategy underpinned by regional and national Science and Innovation Audits, founded on principles of smart specialisation. Many of these emphasise the importance of developing regional supply chains, although it is not always clear what the existing basis for this is. Our work also re-emphasises the importance of first mover advantage and establishing regional demand. In some areas of the Industrial Strategy it might be argued that first mover advantage has already been taken, e.g. with battery technologies.

References

Agrawal, A. and Cockburn, I. (2003). The anchor tenant hypothesis: exploring the role of large, local, R&D intensive firms in regional innovation systems, *International of Industrial Organization*, 21(9), 1227-1253.

Bell, D., Gray, T., and Haggett, C. (2005). The social gap in wind farm sitting decisions; explanations and policy

responses', *Environmental Politics*, 14(4), 460-477.
Berderbos, R.A. and Sleuwaegen, L. (1997). Local content requirements and vertical market structure, *European Journal of Political Economy*, 13, 101-119.
Bergek, A.,Jacobsson, S., Carlsson, B., Lindmark, S. and Rickne, A. (2008). Analysing the functional dynamics of technological innovation systems: a scheme of analysis. *Research Policy*, 37, 407-429.
Bergek, A. and Jacobson, S. (2003). The emergence of a growth industry: a comparative analysis of the German, Dutch and Swedish wind turbine industries. In J. Metclafe, and U. Cantner (eds), *Change, Transformation and Development*, Heidelberg: Physica Verlag, 197-227.
Blanco, M.I. (2009). The economics of wind energy, *Renewable and Sustainable Energy Reviews*, 13, 1372-1392.
Brown, A.D. and Starkey, K. 2000. Organizational identity and learning: a psychodynamic perspective, *Academy of Management Review*, 25, 102-21.
Brunsson, N. (1982). The irrationality of action and action rationality: decision, ideologies and organizational actions, *Journal of Management Studies*, 19(1), 29-44.
Channelmorenergy.eu. (2014) *Channel Mor Project: The Channel's MRE sector: Opportunity Analysis*, from: http://channelmorenergy.eu/wp-content/uploads/2015/04/channel_mre_opportunity_analysis.pdf
Christopher, M., Peck, H., and Towill, D. (2006). A taxonomy for selecting global supply chain strategies, *International Journal of Logistics Management*, 17(2), 277-287.
Cottrell, T. and Sick, G.(2002). Real Options and Follower Strategies: The loss of real option value to first-mover advantage, *The Engineering Economist*, 47(3), 232-263,
Cyert, R. M., & March, J. G. (1963). *A behavioral theory of the firm*. Englewood Cliffs, NJ.
Davies, H. and Ellis, P.D. (2000), "Porter's 'Competitive Advantage of Nations': Time for a final judgment?, *Journal of Management Studies*, 37(8), 1189-1213.
DECC (2014), *Supply Chain Plan Final Guidance*, from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/340033/Supply_chain_plan_guidance.pdf
DECC (2013), *Supply Chain Consultation*, from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/260732/supply_chain_consultation.pdf
Foray, D. (2014). From smart specialisation to smart specialisation policy, *European Journal of Innovation Management*, 17(4), 492-507.
Gavetti, G. and Levinthal, D. (2000). Looking forward and looking backward: cognitive and experiential search, *Administrative Science Quarterly*, 45, 113-137.
HM Government. (2013). Offshore Wind Industrial Strategy: Business and Government Action, from: https://ore.catapult.org.uk/wp-content/uploads/2016/05/Offshore-Wind-Industrial-Strategy-Business-and-Government-Action.pdf
Kuntze, J-C., and Moerenhout, T. (2013). *Local Content Requirements and the Renewable Energy Industry - A Good Match?*, International Centre for Trade and Sustainable Development, Geneva, from: http://www.greengrowthknowledge.org/sites/default/files/downloads/resource/local-content-requirements-renewable-energy-industry-ICTSD.pdf
Leseure, M., Cooper, D., and Robins, D. (2014). Supply chain, sustainability, and industrial policy - the case of the UK offshore wind energy supply chain, *Proceedings of the First International EUROMA Sustainable Operations and Supply Chain Forum*, March 24-25, Groningen
Lewis, J.I. and Wiser, R.H. (2007). Fostering a renewable energy technology industry: an international comparison of wind industry policy support nechanisms, *Energy Policy*, 35, 1844-1857.
Lewis, J. and Wiser, R. (2005). *A Review of International Experience with Policies to Promote Wind Power Industry Development*, Center for Resource Solutions, March, from: https://resource-solutions.org/wp-content/uploads/2015/08/IntPolicy-Wind_Manufacturing1.pdf
March, J. (1991). Exploration and exploitation in organisational learning. *Organization Science*, 2(1), 71-87.
Porter, M. (1998). Clusters and the New Economics of Competition, *Harvard Business Review*, 76, 77-90.
Staw, B.M. (1981). The escalation of commitment to a course of action, *Academy of Management Review*, 6(4), 577-587.
Trigeorgis, L. and Reuer, J.J. (2017). Real options theory in strategic management, *Strategic Management Journal*, 38, 42-63.
van der Horst, D., and Toke, D. (2010. Exploring the landscape of wind farm developments; local area characteristics and planning process outcomes in rural England, *Land Use Policy*, 27, 21-221.
Vaughan, A. (2016). Hull's Siemens factory produces first batch of wind turbine blades, *The Guardian*, December 1st, from: https://www.theguardian.com/business/2016/dec/01/hull-siemens-factory-wind-turbine-blades