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Varela-Vázquez, Pedro; Sánchez-Carreira, María del Carmen
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Singularities in the Promotion of the Galician Wind Energy Peripheral Cluster

Pedro Varela-Vázquez[1], María del Carmen Sánchez-Carreira[2]

Abstract

Wind energy can foster industrial diversification as well as employment. This phenomenon does not occur automatically due to the existence of inertias which hinder its development. So it is required public stimulus which triggers the emergence of a new sector. The aim of this paper is to analyse the difficulties in cluster promotion in peripheral contexts in order to develop a comprehensive wind energy industry and service sectors in the north-west Spanish region of Galicia. The methodology uses a broad cluster approach and the evolutionary perspective of the target approach based on the extended life cycle perspective. The results should allow us to obtain an accurate diagnosis of the weaknesses, strengths and the scope of public policy action.

Keywords: wind energy; cluster; public policies; Galicia

[1,2] Department of Applied Economics. Faculty of Economics and Business. University of Santiago de Compostela. Avda. do Burgo, s/n, 15782. Santiago de Compostela. Phone: [1]34881811695, [2]34881811647.
e-mail: [2]carmela.sanchez@usc.es (corresponding author).

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Introduction

Nowadays, the promotion of renewable energies is, gradually, beyond traditional environmental goals and energy diversification aims. The emergence of an industrial agglomeration could have beneficial effects on the regional economy, such as a sustained increase in the employment and production (Blanco and Rodrigues, 2009; Varela-Vázquez; Sánchez-Carreira and Pereira-López, 2014) or the development of new technological patterns. Nevertheless, fostering a cluster framework represents a complex process in which is necessary the combination of multidisciplinary policies. It is also essential to overcome institutional and technological inertias set up by conventional energies (Del Río & Unruh, 2007).

Wind energy has become one of the most technological mature renewable energies worldwide (GWEC, 2014). In spite of the existence of wind resources in many European regions, wind energy deployment has showed remarkable differences. In this way, there are several successful development models, in particular, the pioneer case of the Danish experience (4162 MW in 2012, including 505 MW offshore), in which arise a comprehensive framework and an international competitive industrial sector (Simmie, 2012). In the case of Spain, there are regions that have similar installed capacity, but with a smaller industrial related sector, such as the case of Galicia (Varela-Vázquez and Sánchez-Carreira, 2014) (3.275 MW in 2012). Galicia is a north-west Spanish region leader in terms of wind energy and hydropower installed capacity. Then, renewable energies would play a role of economic drivers with essential positive socioeconomic effects on the economy. This phenomenon shows different development patterns as well as key drivers. Concerning cluster promotion, it is also necessary to emphasise specific particularities of the institutional and technological contexts, as well as the role of different firms in a global value chain when we examine peripheral clusters. In these kinds of industrial agglomerations, the structural weaknesses need a different policy shape to solve multidisciplinary problems (Tödtling and Trippl, 2005; Markusen 1996).

The main aim of this paper is to analyse the scope of cluster promotion and the singularities of peripheral clusters, mainly in the Galician wind sector. The theoretical approach is based on the systemic perspective of Regional Innovation System (RIS) (Cooke, 2009), as well as in the evolutionary approach, which makes easier the analysis of sectoral transitions and the effects of former policies and conditions in later development.

This paper is structured as follows. First of all the scope of wind energy cluster promotion and its alternative policies are analysed. Afterwards, it is highlighted the features of peripheral clusters and the singularities of the Galician wind energy. Finally, the conclusions summarise the final remarks.

The scope of wind energy cluster promotion

Market-led forces as well as public policies are able to promote the emergence of different kinds of industrial agglomerations with crucial effects on regional economies, such as higher employment and growth rates and the attraction of foreign capital (Markusen, 1996). One of the main typologies of agglomeration is the cluster, defined by Porter (1998, p. 215) as "a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities". However, there are alternatives for this geographical perspective, which highlight different kinds of aspects and dynamics, for instance, supply chains, critical mass, firm networks, technological linkages and so on (Nooteboom and Woolthuis, 2005). In any case, a cluster refers to a set of agents (private or public) with the same purpose and strong linkages among them derived from cognitive, organizational, geographical, social or institutional reasons (Boschma, 2005). In spite of different kinds of clusters and industrial agglomerations (Markusen, 1996; Cooke et al., 2007), the positive effects on the economy as well as external economies of scale for the participants were emphasised since Alfred Marshall (1920). Thus, there are important incentives in order to join a cluster, such as a specialised labour market, particular suppliers or a high degree of knowledge flows and cooperation.

Nowadays, the understanding of the main drivers of cluster emergence is one key research question. Hence, cluster promotion represents an important tool for governments and sectoral associations. The concept of cluster promotion refers to a group of measures and initiatives, both from public and private sectors, that supports the emergence of an industrial agglomeration, regarding an idea of maturity in terms of innovativeness, competitiveness and cooperation among agents (Fromhold-Eisebith and Eisebith, 2005). According to these authors, these initiatives could be top-down or bottom-up. The former refers to policy schemes usually designed, implemented and financed by central decisions from public sector. Sometimes, there is a secondary aim based on regional development. Bottom-up initiatives generally involve private actions fostering cluster interactions and innovative linkages. Likewise, cluster promotion policies could also be implicit or explicit (Ib.). The main difference between these both kinds of measures refers to the degree of official or institutional consciousness in the moment in which main policy goals and guidelines were designed.

An important step is to identify pre-existent conditions, such as industrial structures or institutional setup (the underlying path-dependence), as well as the present agents and capacities before implementing any kind of sectoral promotion (Fromhold-Eisebith and Eisebith, 2005; Avnimelech and Teubal, 2007; 2008). Thus, identifying initial agents is essential, among other elements, because they could play a role as "clusterpreneurs", that is, central figures which foster the framework and constitute fundamental nodes. This initial step could trigger a more efficient use of public funds to promote existing capacities in territories and market-led pre-selection of activities with more capabilities. It includes a crucial initial diagnosis to identify regional advantages (Avnimelech and Teubal, 2008). The preliminary diagnosis is also essential in order to decide what kind of main policy scheme (top-down or bottom-up) should be implemented by public-led forces or private-led ones. This fact depends on the number, composition and size of the clusterpreneurs existent in the exploration stage of a cluster. A considerable number of actors and interactions would have established since the early steps because of individual reasons or not public centralised decisions, i.e. related to another pre-existent sector or to a multinational conglomerate. Therefore, it is appropriate to enhance these existing interactions, but within the private domain. Nevertheless, in the case of a lack of critical mass or the existence of negative dynamics (e.g. an excessive dependence on raw materials or incomplete productive cycles), the role of public sector is crucial to break development paths. A particular case of this is a peripheral cluster (see the next section) when there is also a problem of institutional and technological thinness. However, in some successful cases of wind energy development, such as the Danish one, there is a combination of top-down and bottom-up policies in different stages. The former are more likely in early steps due to the need of building foundations (Gregersen and Jonhson, 2008).

Regarding wind energy, common essential endowments for a cluster emergence in a territory are the existence of a large home market, plenty of primary resource, and a significant level of industrial and technological infrastructure (Pintor et al., 2006; Del Río, 2007; Lund, 2009). Moreover, foreign markets are also important to export in later stages (Lund, 2009). In fact, there is a strong connection between successful policies implemented in home markets and subsequent success in global markets (Lewis and Wiser, 2007). It should be emphasised the articulation of different policies in order to enhance the initial elements existent in a proto-cluster. In fact, there is no need of a direct relation between wind flows and cluster deployment. According to wind resource maps of the European Wind Energy Agency (EWEA), the geographical dispersion of this renewable energy is not always related to the industry location. Even in a country as Spain, this phenomenon occurs in the opposite cases of Navarra, with a relative low level of installed capacity, but an important industrial wind energy sector (Pintor et al., 2006); and Galicia, where a higher level of installed capacity does not involve a competitive industrial sector (Varela-Vázquez and Sánchez-Carreira, 2014). Hence, concerning new activities and sectors, public-led forces are decisive to foster and facilitate the transition in early stages of development in which exists high levels of uncertainty (Rodrik, 2004). In addition, renewable energies have entered in a market with established conventional energy sources. These non-renewable energies have a clear dominant position in several fields, such as technological or social areas, as well as a defined policy path over time. Therefore, barriers and inertia can hinder alternative energies (Del Río and Unruh, 2007).

The Danish wind experience in sectoral promotion provides a successful lesson, which consists of building a comprehensive framework. There are several agents working in the same direction by means of a social consensus in the main guidelines (Christensen, 2010). Otherwise, structural weaknesses could arise and the environmental, social and economic development perspectives will not be achieved and sustained over time.

Institutional singularities of peripheral clusters

Cluster promotion in some areas and sectors shows particular details, which affect the way of implementing public policies or their effects on the economy. The concept of peripheral cluster does not only refer to a geographical issue, but also to a broader notion, which encompasses more features (Gorenstein and Moltoni, 2011). For instance, a low level of innovative performance, with low R&D investment and a productive specialisation based on natural resources, without forward or backward linkages, constitute characteristics of peripheral clusters. Moreover, the low level of firm capacities and critical mass, the lack of infrastructure and services, and macroeconomic volatility are other kind of features. A representative macroeconomic volatility is the continuous change of normative setup (Ib.). This situation causes financial instability and lack of legal security.

Peripheral clusters are beyond the idea of "central cluster", which is based on decentralised and equal-level relationships among agents. Traditionally, it does not consider a network with high centrality or asymmetric dependence as a cluster (Nooteboom and Woolthuis, 2005). This constitutes a bias, because it only reflects an "idealistic" situation in some countries and industrial agglomerations, such as the industrial or marshallian districts. However, it does not take into account other realities with dominant agents and a high level of centrality, such as a cluster dominated by multinational companies in a few productive branches, multinational subsidiaries with limited regional linkages or public sector hubs (Markusen, 1996). These peripheral clusters arise both in developed and developing countries, and their emergence depends on the pre-existent conditions in those territories, which generate different kind of configurations in continuous evolution over time. Regarding its spread, it is essential a deep analysis of its origins, main characteristics and the specific policies and tools in order to enhance this kind of framework. In addition, the set of policies implemented should be different and, mainly adapted to each situation, in comparison to general strategies in central clusters or traditional industrial agglomerations.

Concerning wind energy, there are several examples of comprehensive cluster structures and peripheral proto-clusters in the European as well as in the Spanish contexts. For instance, since roughly three decades, in the north of the Jutland peninsula (Denmark), it has been settled one of the most important and successful wind energy clusters in Europe. Some of the most global companies in the wind market, such as Vestas, Bonus-Siemens or LM, set their factories and headquarters in this area. Likewise, in the Spanish region of Navarra (with 890 MW of installed capacity in 2012), an integrated industrial and services framework related to renewable energies was developed with substantial success in terms of critical mass, technological activities or industrial and services variety. Nevertheless, there are other regions with similar or even higher amount of wind energy installed capacity, but they were not able to promote productive branches associated with the development of this renewable energy. Galicia constitutes a clear case of the lack of capacity to develop an industrial and service sector.

The Galician wind sector: current situation and recent evolution

The power to grant authorisations for wind farms and the regulation competency of the electricity power installations, transport and distribution correspond to the regional governments in Spain. The central government keeps the competencies related to the coordination and planning of energy policies and the basic legislation of agreements and administrative authorisations. Thus, it retains the legislative power over remuneration models (Bacigalupo, 2010). The regional government is in charge of the regulation competency of the electricity power installations, transport and distribution set in Galicia (a Spanish north-west region). In this sense, the regional government is also responsible for spatial planning of wind energy, organisation and solution of controversial issues about wind energy and the authorisation of new installations. Besides, regional governments could also implement local content requirement policies through industrial plans.

The commercial development of wind energy in Galicia dates back to the mid-90s, when large conglomerates, such as Endesa, were interested in taking advantage of the plenty of wind resources. Nevertheless, this development was previous to the first Galician Wind Energy Sectoral Plan (PESG), which was approved in 1997. In spite of that normative delay, wind energy developed in Galicia significantly from 2000 until 2008, turning into the Spanish region with more installed capacity. Figure 1 shows two different trends between 2000 and 2012 in Galicia. The first one goes from 2000 until 2008, characterised by a continuous growth of installed capacity, higher than 50% in some years. Normative instability increased in 2008, because the regional bidding procedure was appealed and there were several regulatory decrees in the sector.

The economic crisis and the gradual reduction of premiums to renewable energies of the special regimen also triggered a strong decrease in the installation of new capacity, characterising a new phase of slow growth. Nowadays, Spain does not allow register new installations in the special regimen, then wind farms owners do not have right to perceive a premium by the electrical production generated.

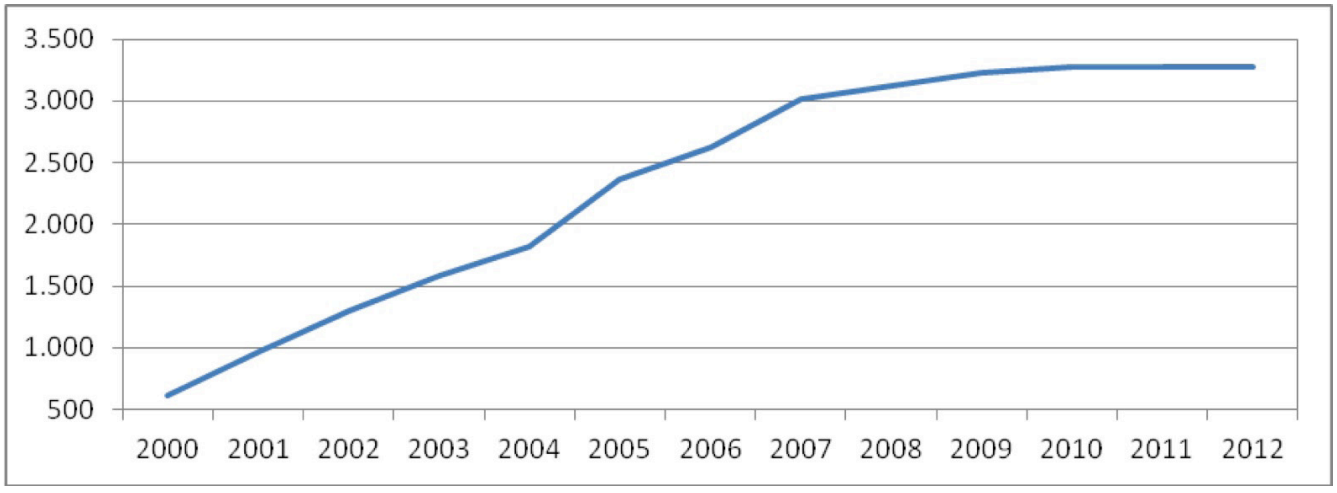

Figure 1. Evolution of the accumulative wind installed capacity in Galicia (MW, 2000-2012).
Data from INEGA (2012)

Table 1 shows the main regional legislations and regional bidding procedures in Galicia. The first decree (1995) introduces the concept of industrial plans and the local content requirements. The main aim was to enhance an industrial sector related to wind energy, but the lack of administrative control hampers this goal (Montero et al., 2010). The next regulation (2001) developed the singular wind farms. This kind of installations enables local stakeholders (such as municipalities, landowners and so on) to participate in wind farms. However, the success was really limited in terms of stakeholders and power capacity.

The aforementioned instability arose after several radical changes in regional legislation. In fact, Table 1 shows that there were two different legislations and two bidding procedures between 2007 and 2010. The former decree (2007) highlights the public interest in wind energy through public sector participation in the wind development. There was also bidding procedure linked to this decree, but it was appealed in 2008.

The new regional government developed another legal framework in 2009 which leaved the idea of public participation in wind farms. Albeit, one of the most crucial factors which makes easier the shutdown was the total change of stakeholders between the two official allocations of power capacity, i.e., some wind farm developers had received in 2008 significant amount of installed capacity and the next year they hardly received new capacity.

Regional Regulation	Main characteristics	Validity
Decree 205/1995	Most important legislation in terms of power capacity installed Industrial plans and local content requirements	1995-2001
Decree 302/2001	Singular wind farms	2001-2007
Decree 242/2007	Public sector participation in wind farms Environmental protection of special areas	2007-2009
Official allocation of capacity	Allocation of 2325 MW Bidding procedure appealed	2008
Law 8/2009	No chance of public sector participation in wind farms New taxes per wind turbine Environmental Compensation Fund	2009-at present
Official allocation of capacity	New stakeholders Bidding procedure of 2325 MW No progression	2010-at present

Table 1. Main characteristics of regional regulations and bidding procedures in Galicia.
Note: Many megawatts installed after 2001 were in the shelter of the Decree 205/1995.
Data from own elaboration

The role played by public administrations in order to regulate Galician wind sector and foster its development was focused only on increasing the installed capacity, setting aside industrial or environmental aims, such as the protection of special green areas (Montero et al., 2010). Likewise, the lack of administrative control of the fulfilment of the industrial plans and environmental controls reduced substantially the positive impact of the wind development on the socioeconomic framework (Ib.).

One of the techniques that examines the level of development and mainly the competitiveness of a sector in the international context is the Diamond of National Advantage (Porter, 1998). This diagram, which examines the sectoral competitiveness, constitutes a systemic view of the advantages and disadvantages of the components of one sector. There are four reciprocally factors interrelated, which strengthen or weaken the industrial competitiveness. The first one refers to the factor conditions, such as the existence of large natural endowments used by the sector, the existence of qualified workforce, technological and transport infrastructures, among others. Furthermore, the demand conditions, mainly the composition, preferences and its proportion, play an important role to characterise the context where agents interact. Another key factor is the existence of auxiliary industries and internationally competitive related sectors. Hence, the presence of international suppliers leads to boost an efficient and fast supply of inputs. Moreover, the existence of close relationships with international competitive suppliers benefits the adoption of standards, innovative dynamics and the transmission of knowledge. Finally, the fourth factor of the Diamond is the firm strategy, structure and rivalry.

Following this methodology, we elaborate a diamond for the Galician wind sector (Figure 2), which shows the strengths and weaknesses. In addition, it emphasises development patterns, the lack of key elements to enhance the technological catch-up and possible fields for public policy intervention in order to boost the emergence of a wind cluster.

Concerning the set of agents in the wind sector, the main weaknesses are highlighted. Firstly, there is not established any manufacturer of wind turbines; therefore, there is a strong dependence on foreign designs and patents. This situation places the industry in a technological weak position. Likewise, the presence of multinationals is limited to the manufacturing of components of lower added value and logistic activities, which reduces the positive effects on the region. In this sense, this phenomenon causes a reduced innovative performance and innovation patterns dependent on suppliers (Varela-Vázquez and Sánchez-Carreira, 2014). A possible solution would consist of developing a technological centre with public participation to overcome this technological barrier and allow the access to the market. A public technological centre could solve this problem through coordinating actions with private firms. Its role is crucial because the industrial subsector does not have its own business association. The EGA (Galician Wind Energy Association) is focused only on wind farm operation activities.

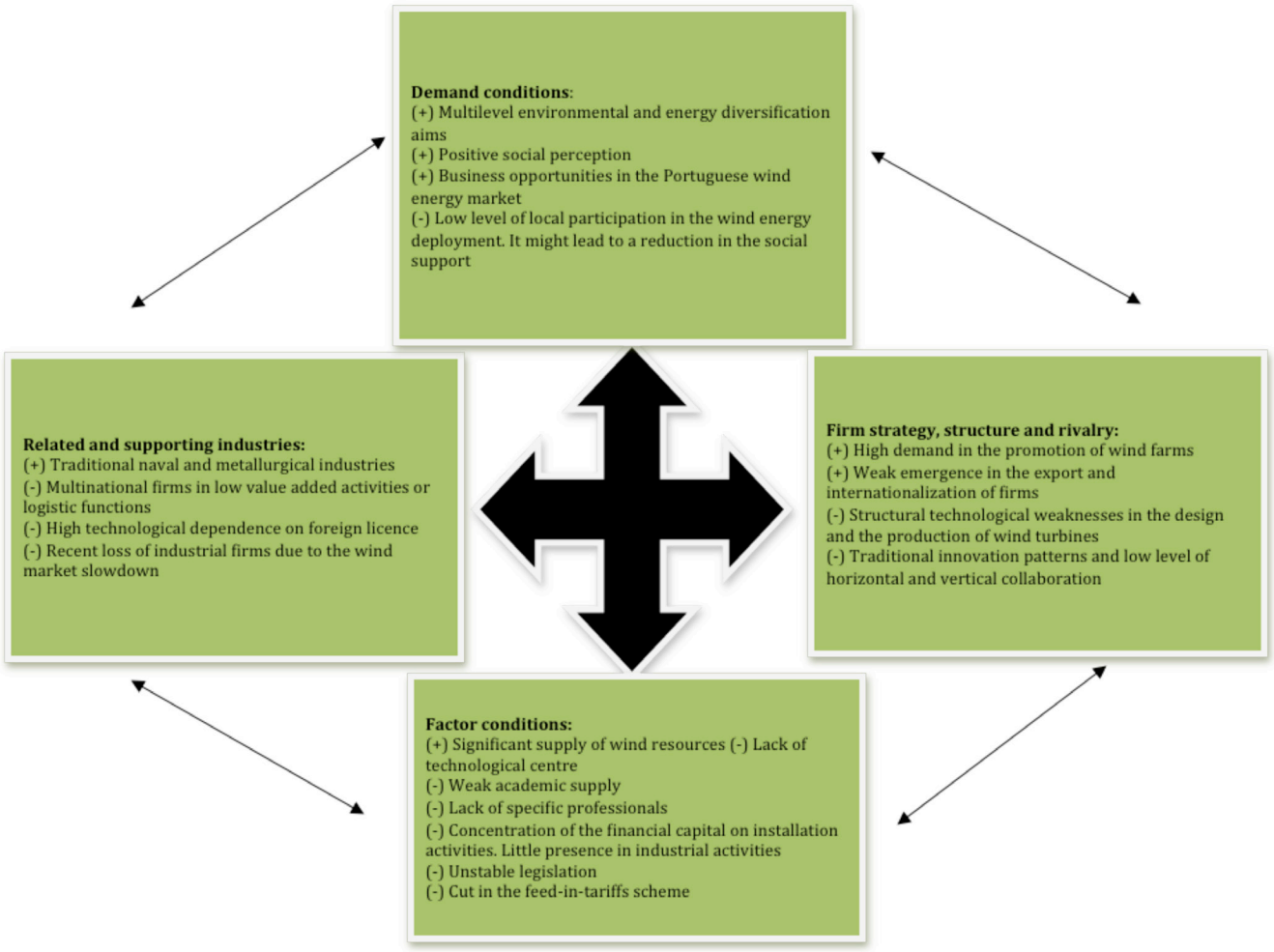

Figure 2. The Diamond of National Advantage for the Galician wind energy sector.
Data from own elaboration

In addition, there is a progressive loss of industrial firms due to the wind slowdown and the effects of the economic crisis on the wind farms funding since 2008. This situation constitutes a loss of industrial capacity and potential supply bottlenecks given a future increase in the wind installed capacity in Galicia.

Other weakness related to the wind sector consists of the lack of university degrees or professional training focused on wind energy. The presence of wind energy in academic programs is only concentrated on specific subjects in master curriculums at the Galician universities. Likewise, there is a deficit of employees with particular professional profiles (Ib.).

Another weakness refers to the limited implication of the financial sector in its development. The role of the Galician financial system in the wind sector is reduced, mainly due to the support of wind farm companies, with a poor role in the remaining subsectors.

With regard to the institutional area, the perspective is also worrying, because of the strong normative instability. It is due to the common changes of direction in the regulation of the wind sector and, even, the current shutdown bidding procedure (Regueiro, 2011). Equally, the failure to meet the commitments with public administration by wind farm owners constitute a worrying factor due to its effects on the sector development and, in particular, in the Galician wind industry (Montero et al., 2010). These commitments force to undertake a total investment in the sector (including a minimum percentage undertaken by Galician firms), the establishment of an installed capacity and industrial investment plans, such as the settlement of new factories. Furthermore, the social acceptance of this renewable resource is under threat due to different problems, such as the land economic assessment and the limited participation of local agents (Regueiro, 2011). The social acceptance constitutes a determinant factor in some successful development models, as in Denmark (Gregersen and Jonhson, 2008).

Thus, in order to carry out the sectoral competitive diagnose, it should be adopted a systemic view, with several drivers causing positive or negative feedbacks. Nowadays, the constituent elements of the cluster show some bottlenecks that are delaying the emergence of a potential wind cluster in the region.

It is also decisive to examine the role played by multinational firms within a global value chain, because it is complicated to develop a comprehensive structure without foreign stakeholder in the industrial as well as in the technological fields. This phenomenon becomes even more essential when Foreign Direct Investment is more important in quantitative termsin wind energy rather than foreign trade (Kirkegaard, Hanemann, and Wescher, 2009). This is due to the combination of high transportation costs and raw materials and relative low share of labour costs (Kirkegaard, Hanemann, and Wescher, 2009; Elola, Parrilli, and Rabellotti, 2013), among other factors. Then, wind energy follows a regional hub structure according to the proximity-concentration hypothesis (Markusen and Venables, 2000). However, there are some components provided globally by few suppliers, such as the case of bearings and some electrical equipment (EWEA, 2009; Kirkegaard, Hanemann, and Wescher, 2009; Lema et al., 2011).

A possible solution for the current situation of the Galician wind sector could be the combination of supply-side and demand-side policies. Concerning the former ones, it would be necessary to increase FDI attraction, mainly heavy in-house wind turbine components, the emergence of auxiliary domestic industry and the diversification in technological-proximity firms. This combination could make easier overcome possible supply bottlenecks, especially during the first development steps. With regard to demand-side policies, it may be essential to enhance the domestic market by means of legislative stability and long-term prospects in terms of installed capacity development.

Final remarks

Public promotion of renewables energies faces institutional as well as technological inertias and barriers, which might hamper a sustained development and consolidation. Wind energy stands out as one of the most mature renewable energies and the development of this energy source can trigger beneficial effects on the economy, beyond the traditional environmental and energy diversification goals. In this sense, there are several remarkable examples of successful wind energy development models around Europe in which there are a significant emergence of international competitive industrial agglomerations. However, in some cases, structural weaknesses constitute additional barriers to these developments. This is the case of the Galician wind peripheral cluster. In these cases, it should be necessary to implement a combination of supply-side and demand-side policies in a multidisciplinary basis.

Concerning the Galician wind sector, the existence of high levels of legislative volatility, some features of enclave industry and the recent industrial offshoring represent important challenges for cluster promotion. Then, policy agenda has to be designed taking into account these singularitie,s which are typical features of regions with low level of industrial critical mass and innovation performance. This situation demands measures which enhance the regional absorption capacity by means of boosting labour skills, industrial standards, technological transfer, among others. In addition, it is essential to combine the close interaction between multinational firms and domestic auxiliary firms due to particularities of the wind global value chain. Hence, the challenge is to upgrade the Galician wind energy sector overcoming internal barriers and integrating the sector into the international dynamics.

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