Universitat Autònoma de Barcelona

International Renewable Energy Entrepreneurship; A Mixed-Method Approach

Seyed Meysam Zolfaghari Ejlal Manesh

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By

Seyed Meysam Zolfaghari Ejlal Manesh

SUBMITTED TO THE DEPARTMENT OF BUSINESS IN PARTIAL FULLFILMENT OF THE REQUIRMENTS FOR THE DEGREE OF

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Advisors:

Dr. Alex Rialp *Prof. Joaquim Vergés*

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Abstract

The demand for energy is increasing over time because of the rapid expansion of the global economy and population growth. However, conventional energy systems based on fossil fuels are not only an unreliable source of energy for the future but also cause a range of environmental consequences, including acidification, air pollution, global climate change, etc. Energy-based economic development (EBED) (Carley, Lawrence, Brown, Nourafshan, & Benami, 2011) and sustainable development (SD) (Hopwood, Mellor, & O'Brien, 2005) will consequently require a new source of energy based on renewable energies, which are more accessible, environmentally friendly, secure, and efficient.

To address challenges associated with fossil fuels and fostering sustainable development, recent progress in the field of entrepreneurship has shown increased interest in sustainability issues and environmentally friendly technological development. Current practical and theoretical advancements under the name of sustainable entrepreneurship (Schaltegger & Wagner, 2011; Dean & McMullen, 2007), eco-entrepreneurship (Holt, 2011), environmental entrepreneurship (Holt, 2011; York & Venkataraman, 2010; Young & Tilley, 2006), green entrepreneurship (Hockerts & Wüstenhagen, 2010; Nikolaou, Ierapetritis, & Tsagarakis, 2011; Wüstenhagen, Markard, & Truffer, 2003), and social entrepreneurship (Bull, 2008; Holt, 2011; Zahra, Gedajlovic, Neubaum, & Shulman, 2009) have made significant and diverse contributions to this field.

However, due to the paramount importance of this subject, entrepreneurial activity in the energy sector needs further consideration. The notion of energy entrepreneurship (EE), introduced quite recently by Wüstenhagen and Wuebker (2011), involves "the role of entrepreneurial activity in the development and commercialization of breakthrough energy technologies in both start-up and established firms" (Wüstenhagen & Wuebker, 2011, p. 3). Here, an energy entrepreneur is defined as a person who seizes the environmentally relevant challenges of high-carbon fuel sources as opportunities for achieving profitability. This new concept at the intersection of entrepreneurship, social, and environmental research provides a theoretical initiative to determine how opportunities related to sustainability and energy arise through market imperfections (Cohen & Winn, 2007), and the role of entrepreneurship in the resolution of market failure and emerging environmental degradation (Dean & McMullen, 2007). However, this body of knowledge is still growing and further theoretical and practical progress is needed.

By introducing the concept of international energy entrepreneurship (IEE), we provide a further contribution to the EE literature. IEE is an interdisciplinary research subject at the intersection of EE and international entrepreneurship (IE). According to the first formal definition provided by McDougall and Oviatt (2000) IE is: "…a combination of innovative, proactive and risk-seeking behavior that crosses national borders and is intended to create value in organizations" (p. 903). Drawing upon this definition and the EE concept in this doctoral dissertation, we study the role of entrepreneurial activity in the development and commercialization of new energy technologies across borders.

The main objective of this study is to ascertain the state of the development, commercialization, and diffusion of renewable energy technologies in international markets. To examine this question, we based this thesis on data gathered from multiple cases and a survey in the renewable energy industry. The research questions are designed at four levels of analysis: entrepreneurs, firms, industry, and policy. First of all, we are interested in identifying motivators, barriers, and enablers for energy entrepreneurs to enter international markets. At the firm level, we wish to determine what resources and capabilities are required, and how they impede or facilitate the process of internationalization. Finally, we investigate the importance of policy and industrial factors in the further development of this industry.

This study makes several advanced contributions to the IE and EE literature. First, from the theoretical point of view, we provide the IE research stream with empirical data from the renewable energy industry as an emerging industry. The study also contributes to the IE field by examining the sustainability entrepreneurship literature to understand how sustainability principles might explain the internationalization of firms in this specific industry. Moreover, we apply resource-based theory as internationalization is an integrated part of a process by which companies try to access and leverage resources on their path towards commercialization and international growth (Zahra, Matherne, & Carleton, 2003). From the methodological perspective, performing a multi-level analysis is another contribution of this study to IE and the sustainable entrepreneurship literature. Multiple levels of analyses including entrepreneurs, firms, industry, and policy provide an opportunity to adopt a more holistic approach to internationalization in the renewable energy industry. Mixed methods research also allows us to examine the research questions and analyze the results using complementary data sources and from different perspectives. Finally, the results of this study will be of significant use to policymakers, assisting them in defining the starting point for reform and institutional capacity building, and establishing an environment that favors renewable energy development. In addition, managers and eco-/entrepreneurs can take advantage of the results of this study to foster international growth and survive. The next section begins with a review of theoretical developments in the sustainable business, EE, and IE literature.

To Ateeyeh & My Future Daughter!

Acknowledgements

First and foremost, I would like to thank my wife Ateeyeh for her never-ending encouragement and love. I will never be able to express my love and appreciation for her enough. My parents, Zahra and Mahdi, instilled in me a love for education, and their desire for me to be a "Doctor" (or at least my belief in that) played a non-significant role in my decision to pursue and complete this degree. I also would like to express my appreciation to my only brother, Morteza, for taking care of my parents when I was not home for 8 years. And my special thanks to my wife's family, Dr. Abbas Aghamohammadi, Dr. Mahdieh Aghamohammadi-Schmidt, and my lovely mother in-law Shamsi, for their wonderful support and encouragement during all these years.

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-There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things. " Niccolo Machiavelli"

1. *Introduction*

What is *energy entrepreneurship* (EE) and how is it related to *international entrepreneurship* (IE)? In this section, as an introduction, we first shed light on these two concepts and the relationship between them. We then explain renewable energies. Finally, we define the scope of the research.

Increasing oil prices and consumption are now a global challenge and dependence on fossil fuels is increasing. The emergence of new economies, comprising highly populated countries such as China, India, and Brazil, has intensified the demand for dirty sources of energy. Not only does the paucity of these resources escalate instability in the global market, but also the high levels of global greenhouse gas emissions from fossil fuels constitute a threat to our planet. This environmental degradation and market imperfections provide significant entrepreneurial opportunities to achieve profitability through the development of renewable energy (Cohen & Winn, 2007; Dean & McMullen, 2007). This issue represents a new and interesting line of research, defined as *energy entrepreneurship* or EE (Wüstenhagen & Wuebker, 2011). As the role of entrepreneurs in this process has remained relatively unexplored, it is important to consider the role of entrepreneurial activity in the development and commercialization of breakthrough energy technologies in both start-up and established firms (Moore & Wüstenhagen, 2004; Wüstenhagen & Teppo, 2006; Wüstenhagen & Wuebker, 2011).

Moreover, in the globalized world, characterized by environmental challenges that adversely affect the lives of billions of people around the world, we need renewable energy technologies to develop further and thrive in international markets. By taking advantage of the IE literature, we aim to understand how companies and entrepreneurs can successfully develop their entrepreneurial activities across borders to tackle these global environmental challenges. IE is an important research subject at the juncture of international business (IB) and entrepreneurship theory (Keupp & Gassmann, 2009). This field is related to the "discovery, enactment, evaluation and exploitation of opportunities, across national borders, to create future goods and services" (Oviatt & Mcdougall, 2005, p. 540). According to the latest study by Jones, Coviello, and Tang (2011) on the ontology of IE research, one of four streams in this field is concerned with entrepreneurial internationalization and international new ventures (INVs). However, the extant related literature on IE in clean technologies is still narrow, and it needs further development to support EE as a promising field and establish *international energy entrepreneurship* (IEE) as a new research subject.

This research subject is critically important, lying as it does at the intersection of IE and renewable EE. Because of political and environmental problems related to conventional modes of energy, such as fossil fuels and nuclear energies, intergovernmental institutions and national governments in most countries have developed plans to increase their share of renewable energies. For instance, the European Union (EU) 2020 program for renewable energy put forward targets for reducing the EU's greenhouse gas emissions by 20% and increasing its proportion of final energy consumption from renewable sources to 20%, both to be achieved by 2020. Now many European countries have implemented similar supporting schemes to facilitate the development of renewable energies and to meet this goal by 2020.

The aim of such planning and sizeable R&D investment is the successful development of new renewable energy technologies. To achieve the effective development of viable renewable technologies across borders, we must rely on market actors carrying new innovation extensively and quickly into international markets. This can be done either by existing multinational organizations that already have experience in developing new technologies all over the world or by the internationalization of new ventures and small firms (Løvdal & Aspelund, 2011; Wüstenhagen & Wuebker, 2011).

Conventional wisdom suggests taking advantage of experience from large and multinational energy companies, such as Endesa, Exxon Mobil, Shell, Chevron, and BP in the energy sector, but recent studies in the tidal and wave energy industry suggest that new ventures are more effective and successful in developing these types of technologies due to their flexibility and their commitment to the development of new technologies and new solutions (Bjørgum, Moen, & Madsen, 2013; Løvdal & Aspelund, 2011; Løvdal & Moen, 2013). In contrast, incumbent firms are more inclined to preserve the current energy regime (Hockerts & Wüstenhagen, 2010).

1.1. *An overall description of the planned research*

In this study, we focus on barriers and opportunities related to the development of renewable energies in international markets. To address this objective, we apply the IE perspective (Oviatt & McDougall, 2005) to see how various factors at the firm, entrepreneur, industry, and policy levels accelerate or impede the international development of renewable energy companies in Spain.

First, we explore and identify the most challenging barriers and/or incentives perceived by firms in this emerging industry. We therefore need to investigate what factors influence the internationalization of renewable energy companies, and how and why, as well as the role of internationalization in overcoming the difficulties they face in the development of new technologies. These results define our propositions at multiple levels of analysis, i.e., entrepreneur, firm, industry, and policy. At the industry level, we wish to understand what specific characteristics of the renewable energy industry influence the entrepreneurial internationalization of companies (Fernhaber, Mcdougall, & Oviatt, 2007). Firms' resources, capabilities, and business models affecting their internationalization will be explored and examined (Zahra & George, 2002; Zahra et al., 2003), and the effect of eco-entrepreneurs' values and motives on their foreign market entry decision will be studied at the entrepreneur level. Finally, we analyze the particular role of policy on the inward and outward internationalization of renewable energy companies.

A two-stage method is applied to explore and examine the effect of facilitating and impeding factors on the internationalization of renewable energy companies. First, we conduct case study research to explore relevant factors and determine key concepts that generate pertinent hypotheses, and to develop a conceptual model. Then, a quantitative confirmative method is used to analyze the constructs or themes emerging from the survey conducted.

1.2. *Objectives of research and research questions*

The body of knowledge concerning IE and its influence on the development of new technologies is still narrow and needs further development in both theoretical and empirical respects (Jones et al., 2011; Peiris, Akoorie, & Sinha, 2012). In particular, EE and the development of clean energies toward integration in new international markets as yet remain relatively unexplored. Thus, the main objective of this study is to answer the following questions:

> *How and why do renewable energy companies enter international markets? How do IE and sustainable entrepreneurship contribute to the international development of renewable technologies?*

However, we need to narrow down these main research questions. By concentrating on renewable energies, we aim to explore to what extent and how firms operate internationally as an act of entrepreneurship in this industry. Thus, we summarize the research questions as follows:

- *To what extent do companies within the renewable energy industry use internationalization as a strategy?*

- *What are the most important factors that drive and/or hinder the sales of renewable energies in international markets?*

- *How and why do these factors influence renewable energy companies' international sales?*

- *Why do renewable energy companies enter foreign markets?*

- *How do renewable energy companies implement their internationalization strategy?*

- *What factors do differentiate the process of entrepreneurial internationalization in renewable energy companies from other industries that have been studied in the international entrepreneurship field and why?*

1.3. *Expected contribution to existing knowledge on the topic*

This study aims to make several substantive contributions to the IE literature. These contributions are two-fold: theoretical and methodological. From the theoretical point of view, this thesis enhances our understanding of energy entrepreneurs and technology-based firms that apply new knowledge and international development as their main tools in creating new, global, sustainable energy industries. The final results of this study help us to develop the IE field oriented toward sustainable entrepreneurship and to suggest some adjustments to theory regarding the international development of new clean energy products and technologies.

The multi-level analyses conducted at the entrepreneur, industry, firm and policy levels provide another contribution of this study to the literature. The units of analysis are at multiple levels to attain a holistic picture of the internationalization process and also to increase credibility of the research. In addition, from the methodological point of view, by using a combination of quantitative and qualitative methods, we strive to understand the complexity of entrepreneurial internationalization in a young and emerging industry.

The final contribution of this study concerns policymakers and eco-/entrepreneurs in the renewable energy industry. The results of this study can assist policymakers in: (i) defining the starting point for reform, (ii) institutional capacity building, and (iii) preparing an environment that favors the development of renewable energies. These findings will be of crucial importance for eco-/entrepreneurs and managers to thrive and survive in international markets.

1.4. *Method and research activities*

This study is based on a mixed methods approach, employing both qualitative and quantitative methods in three different phases. In the *first phase* of this study, we explored the narrow extant literature on the internationalization of renewable energy companies. In doing so, we searched online databases and journals for all relevant works on the importance of this immature industry and its internationalization in both the IE and sustainable entrepreneurship literature.

In the *second phase* of this study, we implemented multiple case studies based on available cases in Spain. To identify potential firms, we focused on IDAE's[1] (El Instituto para la Diversificación y Ahorro de la Energía) list of firms working in this industry and public lists available in different datasets. This database, in particular, provides a list of registered firms. We also employed other sources of information, such as an Internet search and personal networking, to find suitable cases. We then shortlisted the firms according to IE criteria: These criteria are discussed in several studies and include the age of the firm and the level of international activity. Based on these, it was possible to select suitable and viable cases for the study.

The *third phase* of this study comprised data collection through a survey and the triangulation of data. The survey aimed to examine the findings from the qualitative part

[1] http://www.idae.es

of the study. A questionnaire was sent to target groups as a web-based survey. To avoid responses from outside the target group and to ensure the respondents' commitment, we contacted managers and entrepreneurs in person before sending the web survey to their personal e-mail addresses. Finally, we drew conclusions based on the results and findings from both the case studies and quantitative analyses. The sequence of this research design is illustrated in Figure 1.4.3.1.

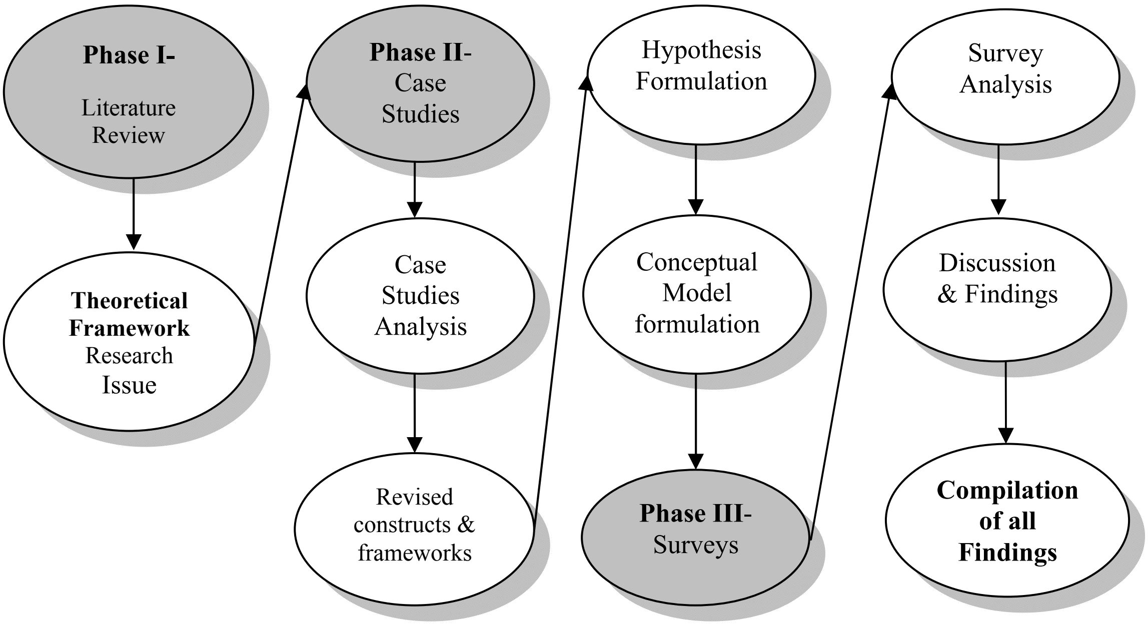

Figure 1.4.3.1 Research design and sequences

-Sustainability, ensuring the future of life on Earth, is an infinite game, the endless expression of generosity on behalf of all.
"Paul Hawken"

2. *Sustainability and entrepreneurship*

One of the most significant current discussions in business is sustainability. The term *sustainable development* emerged after the publication of the Bruntland Commission Report in 1987 at the World Commission on Environment and Development (WCED, 1987). This report defines the concept as follows: "Sustainable development is development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" (WCED, 1987: 43).

Sustainable development has been used widely in economics and development economics in the last thirty years. It is discussed in the related literature from different perspectives. The intergenerational viewpoint advocates that non-renewable resources should be replaced by renewable resources in order to extend their viability for future generations. From the *triple bottom line* perspective, sustainable development promotes social and environmental objectives as well as economic objectives. Here there is no trade-off between the economic growth and environmental degradation and nations can use resources without sacrificing natural resources for future generation.

However, some others challenge sustainable development as a paradoxical notion which is in contrast to current capitalism development models. They believe that in the existing development theories economic growth is uncontrolled, in contrast in order to attain sustainability we need to decelerate the growth intensity (Balakrishnan, Duvall, & Primeaux, 2003; J. Robinson, 2004). On the contrary, we consider sustainable development as new opportunity to achieve economic and social development without environmental degradation. According to the *World Wide Fund* for *Nature* report, the low carbon energy sector has created 400,000 new jobs in Europe since 2002 (WWF, 2009).

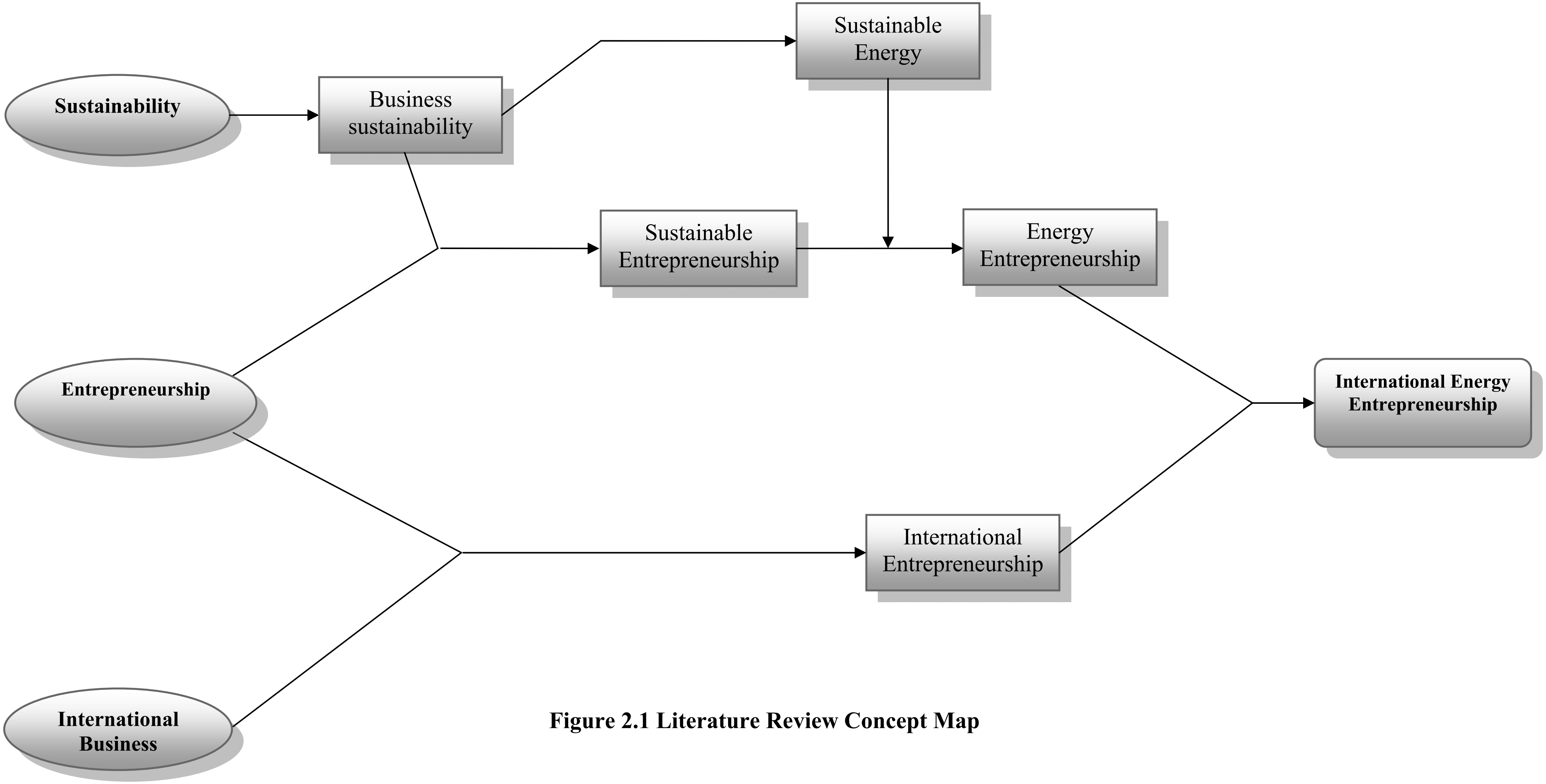

Figure 2.1 Literature Review Concept Map

2.1. *From sustainable development to sustainable business*

Despite all the controversial concerns about sustainability, this concept has been influential in business and managerial studies. Nowadays many major firms have accepted sustainability in their strategic plan and state that they consider *triple bottom line* principles (financial, environmental and social performance), in order to outperform other competitors. Many empirical practices for waste management and resource substitution are developed and rewarded. Sustainable measures are standardized in ISO 14000 series in terms of an environmental management system to assist firms with a framework for better environmental management control. The terms *corporate sustainability* and *corporate social responsibility* are widely used to demonstrate the distinctive characteristics of these firms. But the question is how the notion of sustainable development has emerged and developed from macro-level to organizational-level and business studies?

If we want to understand the evolution of this term from sustainable development in economics to corporate sustainability in business studies, we need to understand who has used this term in business studies and why. As debate continues about the global degradation of the natural environment and the degree to which human activities impact on environmental issues (such as global warming and climate change), blame has been widely placed on business and commercial activities. Although the role of business in the global decline of the natural environment is undeniable, business, by accepting the responsibility for environmental damage, has this potential to alleviate its harmful impacts. More significantly it can lead the world into the next industrial revolution by improving negative environmental impacts (Braungart & McDonough, 2009; Cohen & Winn, 2007; Hawken, Lovins, & Lovins, 1999; Senge, Carstedt, & Porter, 2001).

Growing attention toward environmental issues in the early 90's led to heated debate about the role of business and industry in environmental degradation. In 1992, *Paul Hawken* published his foundational book entitled *The Ecology of Commerce*. In this book, he blames business and industry as the main reason for environmental degradation and he urged world business leaders to accept the responsibility for environmental damages. In this book he explicitly asserts that:

> "*Business is the only mechanism on the planet today powerful enough to produce the changes necessary to reverse global environmental and social degradation*."
>
> Hawken (1992 pp.94-95)

In other words, he defines a new role for business and he suggests that business must lead the way in addressing the environmental crisis (Forbes & Jermier, 2010).

Nevertheless, this perspective of sustainability in business led to dispute. At that time, the conventional wisdom was that considering environmental issues is costly for companies and distracts managers' attention away from their key responsibility which is profit maximization (Friedman, 1970). But this approach to the sustainability issue has been challenged during the last decade. Several analysts and scholars warned firms about environmental impacts and how sustainable development efforts provide competitive advantage in the market (Porter & Linde, 1995; Porter, 1991; Sharma, S & Verdenburg, 1998). For instance, Porter (1991) argues that improving environmental performance, by saving waste material and energy, reduces costs and provides opportunity for better economic or financial performance and stimulates innovation. In the same vein, they argue that being competitive in the market requires a balance between economic and environmental performance. Ambec and Lanoie (2008) show this balance in terms of opportunities for increasing revenues and opportunities for reducing costs (Figure 2.1.1). As it is represented in this figure better financial and environmental performance could be achieved through mechanism involved in each of the channels for increasing revenues and reducing costs.

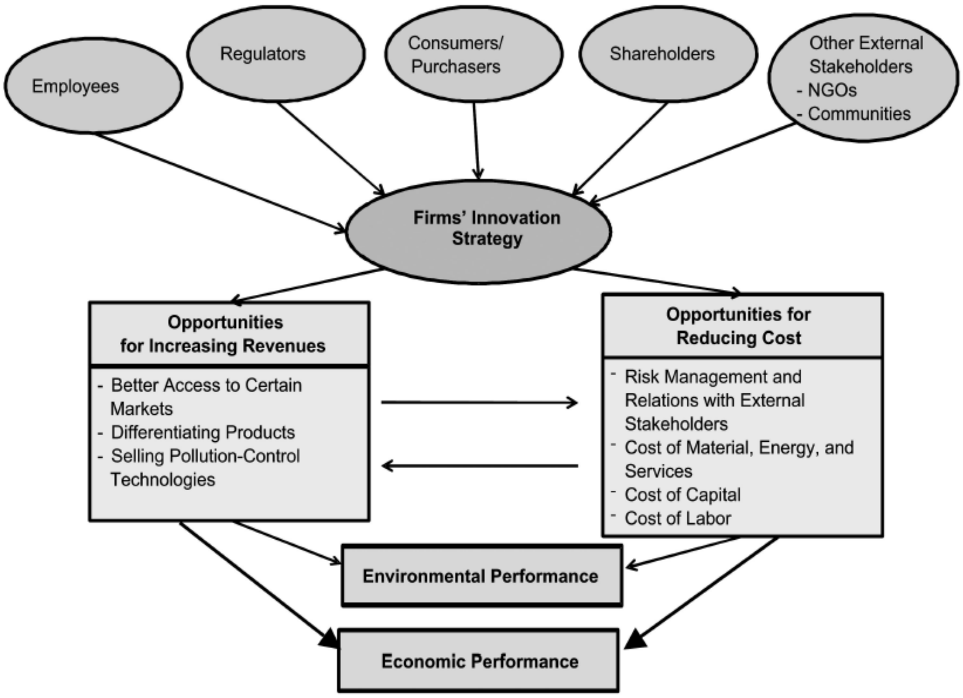

Figure 2.1.1 Balance between the environmental and economic performance, (Ambec & Lanoie , 2008)

Over the time, business attitude toward accepting environmental and social issues has been passed through several stages. According to Young and Tilley (2006) during the first stage from 1960s to 1970s *pollution control* was the main solution for managing environmental issues. From the mid-1980s till 1990s *environmental practices of the firm* became dominated by *efficiency* and *competitive advantage*. Minimizing resources consumption and wastes was defined as "win-win" solution for environment and business challenges (Porter & Linde, 1995; Porter, 1991). For most business firms, the term sustainability and corporate sustainability means *eco-efficiency*. With this perspective something is sustainable only when it is profitable. *Eco-effectiveness* at the end of 20th century was the third domain change in business sustainability. In new perspective role of the business redirected beyond the pollution control and eco-efficiency toward a way of doing business that *restore and enhance the environment*.

Despite all the above mentioned progress in adopting sustainability measures, in practice it is limited to eco-efficiency while social and natural approaches to the sustainability in business has been neglected (Dyllick & Hockerts, 2002). Moreover, recognizing the significance of the sustainability issue in business is not enough and we need to encourage business and more importantly entrepreneurs to take into account the beyond of eco-effectiveness that take them to environmental or ecological entrepreneurship (Young & Tilley, 2006). Recent developments in the field of sustainable business have led to renewed interest in entrepreneurial activities subject to sustainability issues. Thus, recent developments in this field need further involvement of sustainability in business and entrepreneurship studies.

2.2. *Sustainability in entrepreneurship literature*

The corporate-sustainability literature has mainly focused on large and established firms. In these studies, subjects such as reducing the environmental impact, sustainability as source of competitive advantage, and strategies for *going sustainable* have been discussed extensively. In SMEs, greening strategy is studied for the first time by Bianchi and Noci (1998). They argue that proactive environmental strategy only adopted by large corporations and they remark the role of stakeholders in improving SMEs' environmental performance. More recently, Masurel (2007) identified the reasons behind SMEs investment in environmental measures. Results of this study show that SMEs' incentives for investment in environmental issue differ from large firms. Employment-related reasons such as more safety on the work floor are the most important motive for SMEs investment on environmental issues. In contrast, the satisfying legislation and moral duty are in second and third place. This issue is indirectly related to the environment and profit of firms and it connect *people* and *planet* together (Masurel, 2007). These results imply the necessity of a novel approach to realize the attitude of SMEs' managers towards sustainability. In this case, thus, entrepreneurship theory can be an applicable theoretical framework to understand the sustainability behavior of small firms and entrepreneurs.

As York and Venkataraman (2010) define the entrepreneur and environment nexus, they suggest the act of entrepreneurship as "one of discovering and evaluating opportunity as well as creating new opportunities and possibilities"(York & Venkataraman, 2010 p.451). However, sustainable development from an entrepreneurial perspective has not yet been properly investigated. The term *sustainable entrepreneurship* in the literature generally refers to the combination of the two words: sustainability and entrepreneurship. Here entrepreneurial activity focuses more on the personal ideas and skills of the entrepreneurial person (or team) to recognize market success and societal change with environmental or societal innovations.

From the entrepreneurial economics perspective, by taking into account the concept of *creative destruction* by *Schumpeter*, the sustainability pressure from either stake holders or the physical environment can resolve market failures and negative externalities. This approach explains the key role of entrepreneurial activity in achieving sustainable development and describes how sustainable development opportunities arise out of market imperfections (Dean & McMullen, 2007).

Despite the importance of the entrepreneurial perspective in sustainable development, related terminology has been ambiguously defined. This notion has been described in the current literature as ecopreneurship (Bennett, 1991; Schaper, 2002), green entrepreneurship (Berle, 1991), environmental entrepreneurship (Keogh & Polonsky, 1998), and social entrepreneurship (Leadbeater, 1997). It shows that various streams of thought and literature have tried to understand the relationship between entrepreneurship and sustainable development.

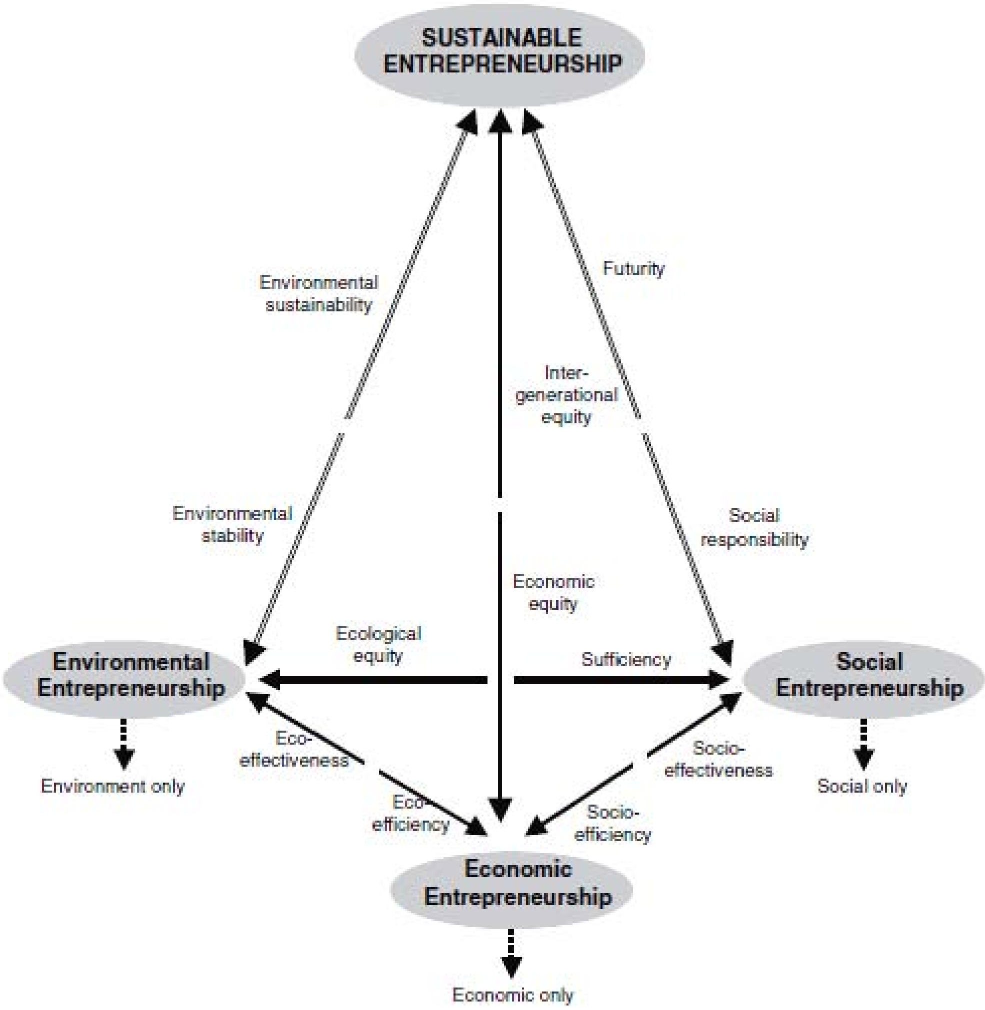

Figure 2.2.1 Sustainable Entrepreneurship Model (Tilley & Young, 2009)

The term *ecopreneurship* was coined by Steven Bennet in his seminal book *Ecopreneuring,* in 1991. In his book he defines *ecopreneuring* as business opportunities from emerging environmental challenges. Then, Berle (1991) suggested the term *green entrepreneur* to describe a person who takes advantage of opportunities from environmental challenges to make money. Environmental entrepreneurship defines entrepreneurialism as an effective mechanism to champion and foster environmental concerns (Keogh & Polonsky, 1998). Moreover, Dean and McMullen (2007) defined environmental entrepreneurship as a subset of the wider concept of sustainable entrepreneurship. They consider it as "the process of discovering, evaluating, and exploiting economic opportunities that are present in environmentally relevant market failures." However, they describe sustainable entrepreneurship as a broader concept: "the process of discovering, evaluating, and exploiting economic opportunities that are present in market failures which detract from sustainability, including those that are environmentally relevant (Dean & McMullen, 2007: P.58)." But social entrepreneurship is defined in a different way as "organizational innovations and initiatives in governmental organizations, NGOs, and not-for-profits, or, alternatively, where the profits generated from business activities are used to benefit specific disadvantaged groups (Leadbeater, 1997; Zahra et al., 2009)".

Table 2.2.2 Related definitions to sustainable development and entrepreneurship

Terminology	Definition
Ecopreneurship	Ecopreneuring as business opportunities from the emerging environmental challenges (Bennet, 1991).
Green entrepreneurship	Green entrepreneur as person who take advantage of opportunities from environmental challenges to make money (Berle,1991)
Environmental entrepreneurship	Environmental entrepreneurship defines entrepreneurialism as effective mechanism to champion and foster environmental concerns (Keogh & Polinsky, 1998). The process of discovering, evaluating, and exploiting economic opportunities that is present in environmentally relevant market failures (Dean & McMullen, 2007).
Sustainable entrepreneurship	The process of discovering, evaluating, and exploiting economic opportunities that is present in market failures which detract from sustainability, including those that are environmentally relevant (Dean & McMullen, 2007).
Social entrepreneurship	Organizational innovations and initiatives in governmental organizations, NGOs, and not-for-profits, or, alternatively, where the profits generated from business activities are used to benefit specific disadvantaged groups (Leadbeater, 1997). Activities and processes to discover, define, and exploit opportunities for the enhancement of social wealth through the creation of new ventures or managing existing organizations (Zahra et al., 2009).

As is shown in Table 2.2.2, *sustainable entrepreneurship* has been developed from different streams of literature from economic, environmental and social aspects. Although their history lines are distinct, the underlying motivations for activities are quite similar and there could be convergence in these rather distinct lines of study.

Schaltegger and Wagner (2011) refined the sustainable entrepreneurship definition by including environmental and social aspects to it. They describe the term more widely as "an innovative, market-oriented and personality driven form of creating economic and societal value by means of break-through environmentally or socially beneficial market or institutional innovations"(Schaltegger & Wagner, 2011; P.226). In this new perspective the firm influence is extended beyond the economic goals such as profit maximization and market success and it deals with initiating societal change and changing market conditions and regulation, which has been discussed in the literature under the term of social entrepreneurship (Cohen, 2006; Dixon & Clifford, 2007; Neill, Hershauer, & Golden, 2009) . In addition, the notion of "beyond the market" application of the entrepreneurial approach, with institutions and market changes intent, is presented under the term of institutional entrepreneurship (Agterbosch, Vermeulen, &

Glasbergen, 2004; Caron & Turcotte, 2009; Coman, 2008; Rothenberg, 2007). In the same vein, York and Venkataraman (2010), with a new entrepreneurial action perspective, explain how environmental entrepreneurs address environmental degradation through solving problems of uncertainty, innovation and resource allocation. It can be achieved in extant institutions or by creating new products, service or institutions.

Nevertheless, in the rest of this study, in line with Hall, Daneke and Lenox (2010), we exclude social entrepreneurship from the related stream of research because it deals with the behavior of a specific group of entrepreneurs and concentrates on social needs rather than sustainable development. In addition, social entrepreneurs are not necessarily engaged with sustainability issues, but entrepreneurs for sustainable development maybe driven by enhancement in social wealth. Likewise, we can also rule out institutional entrepreneurship because of its indirect effect on entrepreneurship and sustainable development relationship.

2.2.1. *Sustainable entrepreneur*

As we defined sustainable entrepreneurship and its research scopes in previous section, we need to remark who is a *sustainable entrepreneur* and what peculiarities differentiate them from the conventional entrepreneurs. Based on these factors at the end of this part we describe various types of eco-entrepreneurs.

Start-ups and entrepreneurial firms differ broadly in adopting ecological measures. Some of them are thoroughly dedicated to the environmental needs, in contrast we have also conventional start-ups giving no attention to ecological issues. Making comparison among different types of start-up shows a very obvious difference in attitude of respective entrepreneurs (Schick, Marxen, & Freimann, 2002). Different studies that examined the influence of attitude and sustainable orientation of entrepreneurs and managers show this different perspectives among them (Dibrell, Craig, & Hansen, 2011a; Kuckertz & Wagner, 2010). Therefore, it is important to investigate the factors that differentiate sustainable entrepreneurs from the other types of entrepreneur.

As mentioned before, Berle (1991) and Bennett (1991) are the first scholars who defined *green* or *eco-entrepreneurship*. Berle (1991) , for the first time, suggested the term *green entrepreneur* to describe a person who takes advantage of opportunities from environmental challenges to make money. The ideal type of "ecopreneur" is defined by Isaak (2002) as a person who "creates green-green businesses in order to radically transform the economic sector in which he or she operates (Isaak, 2002 p.81)." Companies such as *Body Shop* and *Ben & Jerry*'s are close examples to ideal type of ecopreneur who want to not only to make profit, but also to establish their business socially and environmentally responsible.

What factors differentiate the conventional entrepreneurs from the sustainable or green/ eco entrepreneurs is an ongoing question in this field and many scholars have discussed about it. For some scholars the personal characteristics is an essential factor for differentiation. Pastakia (1998) was among the first scholars who discussed about it and he defines conventional (commercial) entrepreneur as "a person who seek to maximize personal gains by identifying green business opportunities and transforming them into viable business ventures (Pastakia, 1998 p.158)." However, sustainable (eco) entrepreneurs are "those who seek to promote eco-friendly ideas, products or technologies either through market routes or through non-market routes (Pastakia, 1998 p.158)." According to Schumpeter (1934) entrepreneur is "agent of the change" and therefore eco-entrepreneur is "a major force in the overall transition toward more sustainable business paradigm (Schaper, 2002 p.27)." if we want to understand how eco-entrepreneurs attempt to broaden their vision upon other actors we need to improve our understanding of the character, motives and incentives of such actors and how they adapt and transform their surroundings.

As it is suggested in the literature, eco-entrepreneurs' incentives and motivations are not mutually exclusive. So for them the desiring to make money, following environmental innovations and green ideas are as important as, their internal commitment to improving the world (Gibbs, 2009; Isaak, 2002). We can conclude that sustainable entrepreneurs have mix motivations of green, ethical, social and economic motives that are inseparable. However, it would be complex to design multi-dimensional criteria to assess the success of the eco-entrepreneurs based on non-financial factors (such as social inclusion) and financial factors, for profit maximization.

Schaltegger (2002) argue that this tension between the personal ideal and socio-economic context cause creative tension. Other scholars (Schick et al., 2002; Walley & Taylor, 2002) put emphasize on the importance of interplay between these two inconsistent types of motivations and their role in conceptualizing and promoting of more sustainable practices. For instance, Pastakia (2002) suggests making congruence between these two rather distinctive motivations as essential condition rising eco-entrepreneurs.

Additional challenges that discern eco-entrepreneurs from conventional entrepreneurs associated with market creation. Since in sustainable business the financial system is immature, the number of investors interested in this field is limited and the lack of awareness about environmental business lead to perceive it as risky investment. These drawbacks make it challenging for eco-entrepreneurs to find financial supports and hinder market establishment. This might be explained that incorporating the ethical issues in the business idea creates uncertainty within the mainstream business community (Linnanen, 2002).

2.2.1.1. *Different types of eco-entrepreneurs*

Post and Altman (1994) for the first time categorized the sustainable entrepreneur's incentives in three groups: compliance-based, market-driven, and value driven. According to Walley and Taylor (2002), based upon the interaction between the individual motivation and external factors, four different types of eco-entrepreneurs are discernible (see Figure 2.2.1.1). They proposed the terms *ethical maverick*, *ad hoc environpreneur*, *visionary champion* and *innovative opportunist* to describe various incentives and orientation of eco-entrepreneurs (Taylor & Walley, 2004; Walley & Taylor, 2002). As it is illustrated in the Figure 2.2.1.1 we can realize that this quadrant is structured upon two axes: individual orientation / motivation and structural influence.

Each axes designed as a spectrum form hard to soft structural influence and from an economic to a sustainability motivation.

- *Innovative opportunists* are financially oriented entrepreneurs and they mostly influenced by hard structural factors like regulation.
- The *visionary champion* is motivated by sustainability and they want to transform the world by hard structural changes. This type is close to Isaak's *ecoentrepreneur* description.
- *Ethical maverick* is sustainability oriented and they are influenced by soft structural factors such as friends, networks, and past experiences instead of changing the world.
- The *ad hoc enviropreneur* is a type of accidental entrepreneur. They are characterized by financially motivation and soft structural influence such as family, friends, and personal networks.

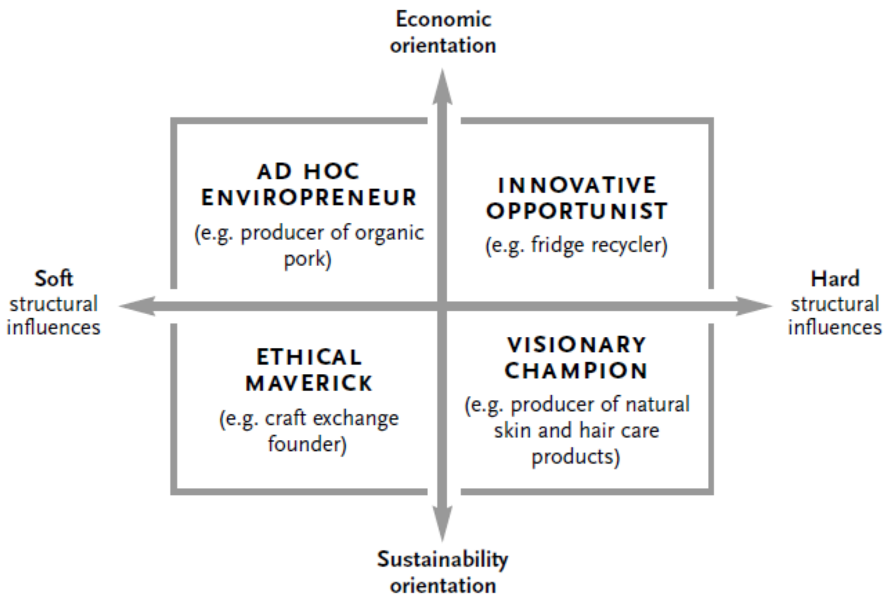

Figure 2.2.1.1 Typology of green entrepreneurs (Walley & Taylor, 2002)

Other researchers define the taxonomy of eco (green) entrepreneurs. Schaltegger (2002) similarly recommend two dimensions to structure his framework based on the priority that entrepreneurs give to environmental goals from low priority to high priority. Other axe is the market effect of the company and its business and he shows it in a range from *alternative scen*e to *eco-niche* and *mass market* (Figure 2.2.1.2). If we just consider the companies with environmental goals in the core of their business, we would locate three types of eco-entrepreneurs as following:

- *Alternative actors*, they are not market oriented and their business is counter-cultural and it is more like a lifestyle.
- *Bioneers*, the term bioneer refers to combination of 'bio' and 'pioneer' and express the main role of research and development and searching for high preferences customers for innovative products. They create the attractive market niche with their customer-focused green products.
- *Ecopreneur*, they want to gain large market share (mass market) to increase their turnover.

Recently Schaltegger and Wagner (2011) developed this framework by including social and institutional entrepreneurship. In this new framework they incorporate entrepreneurial approach toward social goals and changing market context.

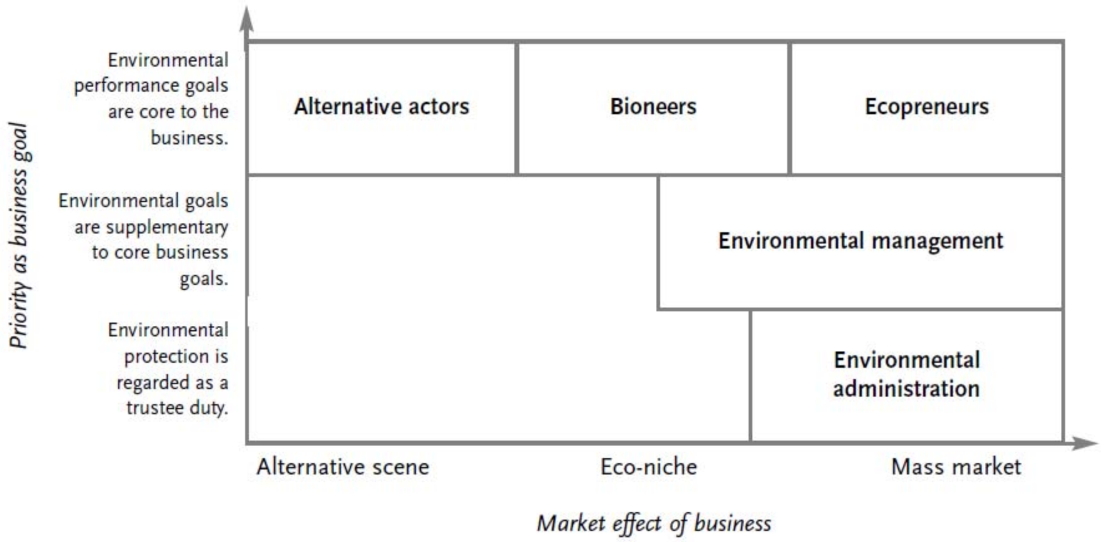

Figure 2.2.1.2 Business continuum (Perspectives of sustainable entrepreneurship and sustainability development) based on Schaltegger (2002)

Linnanen (2002) also developed a model based on the drivers and motivation of eco-entrepreneurs. In his taxonomy he considered two main desires of eco-entrepreneurs; desire to change the world and desire to make money. According to this typology he defines four types of eco- entrepreneurs:

- *Self-employer*, majority of small-scale entrepreneurs are in this category. They are satisfied with current level of income and they have low desire to change the word.
- *Non-profit business*, they have extreme commitment to change the current business and customer behavior but they have low desire to grow and financial result.
- *Opportunist*, they are driven completely by economic motivation and their environmental goal is just for profit maximization.
- *Successful idealist*, they are successful entrepreneurs who make balance between making money and changing the world. Their willingness for better world leads to desire to achieve financial profit.

As presented above, we can identify some overlaps between different typology of sustainable entrepreneurs in all the models. For instance, the *self-employer* of Linnanen is similar to Walley and Taylor's *ethical maverick* and Schalategger's *alternative actors*, the *successful idealist* is similar to *visionary champion* and *successful idealist*, the *opportunist* is as similar as the *ad hoc entrepreneur*.

- **Conclusion and discussion**

At the first glance eco-entrepreneurs are similar to other normal entrepreneurs. However, there are some qualities of eco-entrepreneurs that differentiate them from conventional or commercial entrepreneurs. The first and the most important factor is the value-based leadership of eco-entrepreneurs. As we discussed above, the desire of eco-entrepreneurs for changing the world or their orientation toward sustainability, environment and society plus financial and economic motives give them some special characteristics.

By considering the current studies about the eco-entrepreneurs, some questions are still unanswered. Main critique is that all types of entrepreneurs are identified based on extensive speculation while empirical evidences are limited. A part from a few case studies such as Pastakia (1998) and Schaltegger (2002), most of the available studies are based on subjective evidence. Therefore, we need to take a wider view to empirical studies and assess the extent to which and how practices are different from normal entrepreneurs and firms. Moreover, most of these typologies are not dynamic and they do not consider the change may happen in process of business development. Schaltegger and Wagner (2011) addressed dynamism in business development and suggest their dynamic typology of eco-entrepreneurs. But it is just an improvement in their previous model and needs further empirical development.

Environmental (or external) factors need also further attention in future studies. Factors such as institutional, structural, social and economic factors play critical role in encouraging sustainable entrepreneur in new business investment (Gibbs, 2009; Nikolaou et al., 2011). In order to understand the motives of sustainable entrepreneurs we need to know about the structural factors that influence their motives. For instance, York and Venkataraman (2010), apart from ethical and economical motives, outline two incentives for environmental action. They suggest *government regulation and control* and *stakeholder action* as the two traditional incentives to address environmental degradation. Interaction between the external and internal factors influence entrepreneurial activity of sustainable entrepreneurs, i.e. how the sustainable entrepreneur's idea affects others and how soft or hard structural factors influence them.

The other important issue is that in most relevant literature similar to conventional entrepreneur's literature, they show sustainable entrepreneur as *entrepreneurial hero* (Gibbs, 2009) but we need to know why, when and where these people can take the opportunities to be entrepreneur while the others cannot. Nevertheless, we should not neglect the influence of external factors such as socioeconomic factors, supporting infrastructure at local and national levels on sustainable opportunities identification and exploitation.

One of these external factors is industry. In all of these studies they have neglected the importance of the industry context on entrepreneurial opportunities. For instance, in some infant industries related to sustainability such as renewable energies (wave energy, tidal energy or solar energy, and etc.) more opportunities could be available for eco-entrepreneurs than in mature industries such as apparel manufacturing or mills industries, which passed the emerging and growth phases of industry growth.

2.2.2. *Eco-entrepreneurial firm*

As it is discussed above, the most important issue that differentiates sustainable entrepreneurs from conventional entrepreneur is entrepreneur per se. But as Taylor and Walley (2004) described, the nature of greening the initiatives is an iterative interaction between structure and action. Action is related to internal variables which are discussed before when we were describing the value system and motivations of sustainable entrepreneurs. However, as it is suggested in S-I-M-A/C-P-C framework we need to examine influences before moving to motives. These influences arise from external environment and it range from ‘hard’ structural influences (such as market, green consumer, regulators and environmental pressure groups) to ‘soft’ structural influences (such as personal networks, past experience, family and friends and education)(Taylor & Walley, 2004). External or structural factors are defined in influences with organizational characteristics (Figure 2.2.2.1). This section focuses on the organizational factors as one of the critical structural factors to identify the motives of sustainable entrepreneurs and its artifact as an eco-entrepreneurial firm.

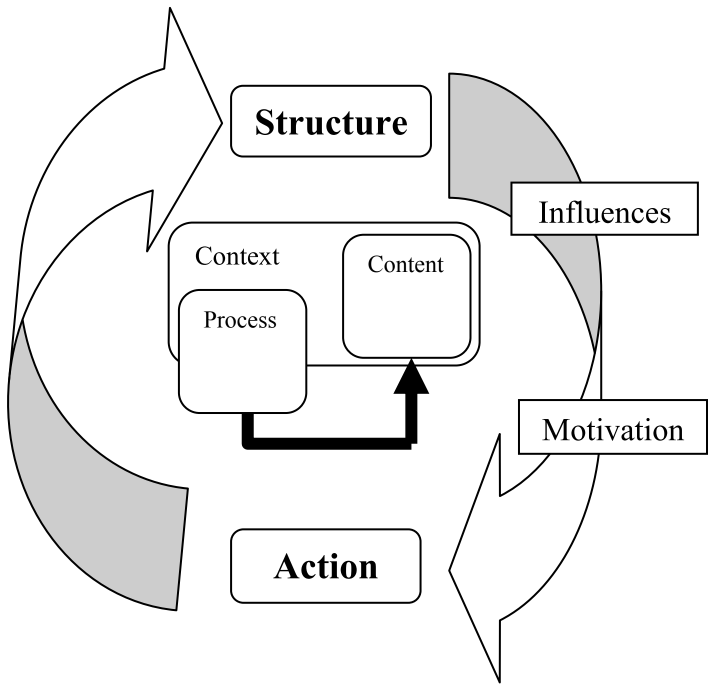

Figure 2.2.2.1 Iterative nature of Greening (Taylor & Walley, 2004)

Related literature about the eco-entrepreneurial firm is developing in recent years. Similar to entrepreneurs we can categorize different types of sustainable firms. Only one study exists about different types of start-ups. In this study based on ten cases studies Schick et al. (2002) classifies them in: eco-dedicated, eco-open and eco-reluctant. *Eco-dedicated* implement environmentally friendly business practices constantly. *Eco-open* “partially adopts environmentally friendly business practices” and *eco-reluctant* implement environmentally friendly business practices forced by policies and regulation. This classification is similar to Schaltegger's (2002) framework based on priority of environmental issues as business goal. In this framework he proposes *alternative actors*, *Bioneers* and *Ecopreneurs* which are closely similar to Schick’s definition. However, the Schaltegger's framework is more comprehensive in terms of market effect as *alternative scene*, *eco-niche* and *mass market*.

One of the key hypotheses about eco-entrepreneurial firms relate to size and age. Results of studies are contradictory in terms of importance of age in accepting the green strategy (Dibrell, Craig, & Hansen, 2011b). As discussed before, the first body of knowledge regarding the environmental strategy and green strategy has developed about the incumbent and large firms. Studies like Porter and Linde (1995), Porter (1991), Senge et al. (2001), Sharma and Verdenburg (1998) and Ambec and Lanoie (2008) have discussed about the positive influence of green and environmental strategy on incumbent firms performance and competitiveness.

It has also discussed in the literature that since it is easier to *infect* new business founders to adopt the sustainability idea (Schick et al., 2002), being early in the organizational life cycle make it more probable to accept positive greening strategy leading to a competitive advantage (Dibrell et al., 2011b; Gibbs, 2009). It implies that it is easier for start-ups and new businesses to adopt environmental policies than to restructure corporate cultures in established firms. In this perspective an extensive sustainability orientation in new founded businesses could "accelerate the process of sustainable restructuring of industry and commerce" (Schick et al., 2002 p.60).

However, Hockerts and Wüstenhagen (2010) speculate that both established and new found firms play significant role in an industry's sustainability transformation. They argue that depending on different stage of an industry transformation we should consider the role of new entrants (emerging Davids) and incumbents (greening Goliaths). As it is illustrated in Figure 2.2.2.2 both types of firms interact in a co-evolutionary manner to promote sustainable transformation of an industry.

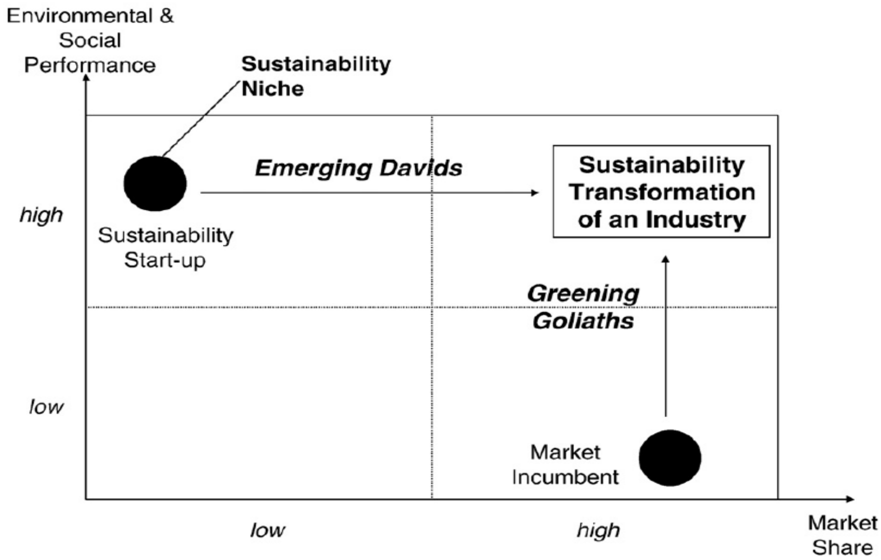

Figure 2.2.2.2 Co-evolution of sustainability start-ups and market incumbents towards the sustainability transformation of an industry (Hockerts & Wüstenhagen, 2010)

But adopting the sustainable business practices by new entrants is not easy and some barriers and challenges exist in this process. As evaluated from case studies and advisers these barriers in start-up process include (1) lack of information (2) the level of knowledge that business advisers have about ecological issue is not enough (3) low level of entrepreneur's awareness about the possible market opportunities for green product and business (4) public founding shortage in promoting sustainable businesses (Schick et al., 2002).

As it is recommended in the literature, eco-entrepreneurial firms follow economic and environmental objectives simultaneously. Therefore, it is important to understand how they maintain economic viability while they want to promote environmental issues. As it is discussed by Dixon and Clifford (2007) balancing between two goals has been achieved through the business model.

2.2.3. *Sustainable business model*

Business models explain how a company makes money and meets the expectations of its stakeholders. For sustainability purposes, we need a new kind of business model that deals with economic and sustainability objectives simultaneously. If we incorporate the issue of sustainability in the business model, it can create superior customer value for individuals and society and it contribute to sustainable development of the company and society. Such added values create competitive advantages for the firms. However, now the question is that how can we design a business model for sustainability?

According to Lüdeke-freund (2009, p.66) "a business model for sustainability is the blueprint of a company's business logic which internalizes the business case for sustainability." By considering the conventional business model that include four basic pillars (product/value proposition, customer interface, infrastructure management and financial aspects) he recommends *sustainable business model* with emphasize on sustainability in the four basic pillars and develop it with fifth pillar as non-market aspects. The fifth aspect stand for "configuration of resources and activities that relates the business model's value proposition to technical, legal, normative and political issues which (currently) are not subjected to market mechanisms and market relationships", but the importance of sustainability in firm's business model and application of business model for sustainability in real business is understudy and needs further investigation.

Nowadays, however, more attention has given to (quasi-) sustainable business models in energy sector. Since energy is important for social and economic development and crucial for individuals and communities, access to clean and reliable source of energy is essential to realize sustainable development. This issue is particularly important in global context where in developing countries the energy is relatively expensive and access to energy sources is limited (Kolk & van de Buuse, 2012). Therefore, many private and public owned projects based on innovative business models are facilitating energy access. Social business model of *Grameen Shakhti* for delivering renewable energies to off-grid and rural areas in Bangladesh (Amin & Langendoen, 2012) and new pro-poor partnership business models for empowering Indian rural communities through provisioning of energy access are the best examples of business models innovations tailored for developing world (Chaurey, Krithika, Palit, Rakesh, & Sovacool, 2012; Kolk & van de Buuse, 2012).

But renewable energies are not only appropriate for niche markets like rural areas in developing countries. Companies in advanced countries are investigating about new and innovative business models to develop renewable energies in the mass market. But selecting business model is a momentous decision for new ventures to gain competitive advantage in the market. Two important factors are discussed in the literature for choosing business model in renewable energy industry; strategic management of internal resources and external factors. The importance of technological advancement and competitive price are discussed as internal factors for entrepreneurial action. But this is not enough, because there are also the external factors that facilitate the development of these types of technologies. These factors are discussed in the literature as social, political and institutional factors. One study in Switzerland about 380 investors' preferences in renewable energy sector about indicator of assessing which business models might succeed in global competition reveals that among three generic business models, service-driven business model is much more preferred by investors than business models that suggest lowest price or best technology (Loock, 2012). In another study about business models in renewable energies, two types of business models are discussed as: utility-side business model and customer-side business model. Utility-side business models are based on few numbers of large projects and have developed for commercial purposes. In contrast, customer-side business model is based on large number of small projects and it is still in early stage of development. Although studies show the advantages of utility-side business model such as potential higher revenue and lower risk, the customer-side business model needs further attention for more sustainable future (Richter, 2012). Nevertheless, choice of business model in more institutionalized sector like renewable energy is less based on firm decision making and more about external forces from national innovation systems and political structure, local socio-technological conditions, and cognitive abilities of the entrepreneur and corresponding stakeholders (Provance, Donnelly, & Carayannis, 2011).

2.3. *Energy entrepreneurship*

Increasing oil price and consumption are now a global challenge. Dependency on high-carbon fuels is rising and environmental concerns about negative consequences of fossil fuels such as greenhouse effect is endangering our planet. According to *ecological modernization* theory, eco-innovation and its diffusion in main stream industries have been defined as the most potential solution to achieve environmental improvement (Jänicke, 2008; Toke, 2011). Energy is one of the main stream industries because fossil fuels challenges have favored eco-innovation and technological changes for energy sector transformation. Alternatively, renewable energies have facilitated access to clean and reliable sources of energy to achieve sustainable development. These energies affect the level of income and productivity and it can improve level of health, education, quality of life and human development by providing sustainable energy in developing countries which are deprived of other types of energies (Kolk & van de Buuse, 2012).

Moreover, environmental degradation and market imperfections associated with energy provide significant entrepreneurial opportunities for entrepreneurs to achieve profitability. It implies that entrepreneurs can seize opportunities to create their own business and also address environmental problem to achieve profitability through development of renewable energy (Cohen & Winn, 2007; Dean & McMullen, 2007). This issue represents a new internationally indispensable line of research which is *Energy Entrepreneurship* (Wüstenhagen & Wuebker, 2010). It is defined as *entrepreneurial activity in the development and commercialization of breakthrough energy technologies in both start-up and established firms* (Wüstenhagen & Wuebker, 2010; Moore & Wüstenhagen, 2004; O'Rourke & Parker, 2006; Wüstenhagen & Teppo, 2006).

Established firms are engine of technological change toward sustainable products. These enterprises because of their superior market dominance, financial resources and process innovation capabilities are endowed with higher market power and possibility to undertake the higher risks for new innovations. Yet, they need to progress toward entrepreneurial policies in order to be pioneer. According to Ketola (2007) study about four sisters oil companies (i.e. BP, ChevronTexaco, ExxonMobil and Shell), results of this study show because the Sisters companies cannot change their vision from *technocentric* values to *ecocentric* values they are reluctant to adopt entrepreneurial environmental goals. They confer that incumbents are reactive to the market pressure and they are also restricted by their existing assets. It means that it is possible that the existing product of the company compete with new sustainability-driven product, such as the renewable types of energies (Wüstenhagen & Wuebker, 2011a). But start-ups have challenged the incumbents and they function as an important catalyst in the transition to sustainability entrepreneurship (Parrish & Foxon, 2006). They are more likely to adopt sustainable entrepreneurship and because of their smaller size and flexibility they are pioneer in first stage to launch sustainability innovation to the market (Schaltegger, 2002). However, they are usually followed quickly by incumbents and their growth is restricted when they want to enter to the mass market. For instance, in energy sector, the incumbent electric utilities companies (such as Fenosa, Gas Natural, Iberderola in Spain) began to experiment with green electricity like wind turbines and solar panels. Therefore, as it is suggested by Hockerts and Wüstenhagen (2010) both incumbent and start-ups interact in co-evolutionary manner for sustainability transformation of industry.

- **Conclusion and discussion**

For developing sustainability practices, we need to consider the characteristics of firms. As it is shown above the age and size of the firms are important factors in adopting sustainable strategy. Although it seems that incumbents are reactive to new trends in the market and restricted by their existing assets (Ketola, 2007), Hockerts and Wüstenhagen (2010) assert that established firms (Greening Goliath) as well as new entrants (Emergent Davids) play significant role in sustainable transforming of an industry. Thus, in this study we need to consider both start-ups and incumbents' roles in sustainability transformation of renewable energy industry and co-evolution. In addition, we should focus on differences between them in adopting sustainable entrepreneurship in renewable energy industry. Despite of crucial role of start-ups and small enterprises in innovative activities this subject is relatively under-represented and there is a knowledge gap to understand how and why entrepreneurial firm are developed in international markets.

Moreover, sustainable business models are suggested as a tool to meet both economic and environmental objectives of the firms. In this study we can explore how firms' economic and environmental goals are converged in their sustainable business model. It is also important to know how and based on which criteria firms choose their business model and what are the most effective sustainable business models in renewable energy industry expansion.

2.3.1. *Renewable energies commercialization*

Commercialization is the final step in the process of moving a technology from lab to the market. If we consider the innovation process in three phases: research, demonstration and commercialization, research phase includes feasibility study and assessment. The demonstration phase consists of planning and introduction of prototype and the last phase is commercial activities to attain full-scale production, self-sufficiency, business maturity (Rogers, 2010).

In the literature, *diffusion theory* discuss about the adoption of new technologies and development of systematic models of commercialization (Rogers, 2010). Diffusion of technology is modeled as life time s-shape curve that shows the adoption rate of new technologies in four phases of learning, growth, saturation and decline (Figure 2.3.1.1) (Balachandra et al., 2010).

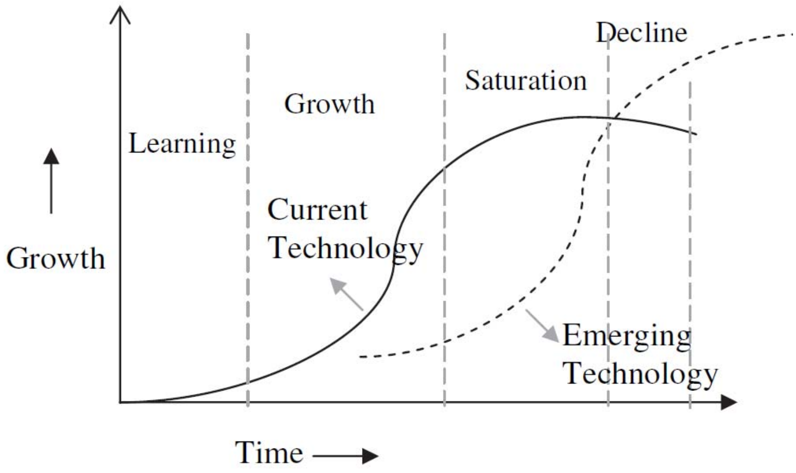

Figure 2.3.1.1 Diffusion model of technology (Balachandra et al., 2010)

If we apply the diffusion model of Rogers (2010) about new energy technologies, we can develop this model in four phases: introduction, early growth, take-off and maturity. Since renewable energies are in early phase of development we mainly discuss about these technologies in the first and second phases (Figure 2.3.1.2). But, we should take into account that all renewable technologies are not in the same level of development and relatively more mature technologies such as wind turbine and photo voltaic (PV) technologies can be positioned roughly around take-off phase.

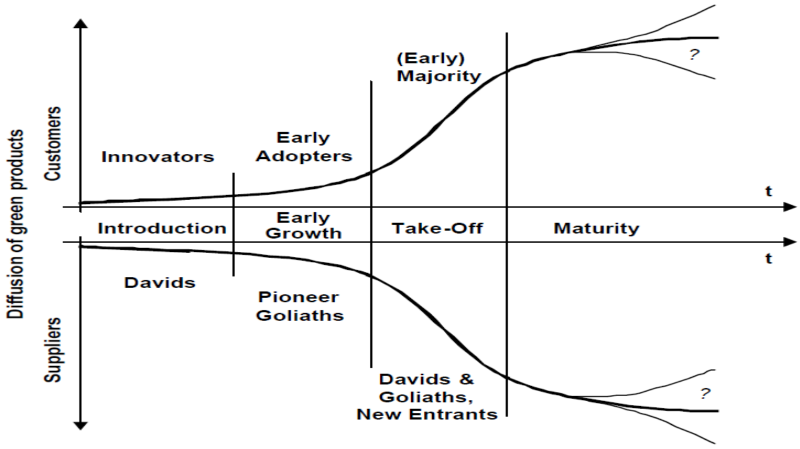

Figure 2.3.1.2 Diffusion of green products over time among customers and suppliers (Wüstenhagen et al., 2003)

In renewable energy industry, established and new entrants' companies which seek opportunities for profitability and competitive advantage in the market need to commercialize new technologies. However, the development of these technologies is a slow, painful and highly uncertain process and many firms face challenges concerning insemination of these technologies (Negro, Alkemade, & Hekkert, 2012).

Depending on the type of energy technology and contextual setting, several studies have argued about systemic problems in diffusion of these technologies. In a review of 50 case studies that analyze the development of renewable energies in mostly European countries, Negro, Alkemade and Hekkert (2012) identified five common types of barriers including institutional problems (hard ex. policy support and soft ex. social acceptance and compliance), market structures, capabilities and capacities problems, infrastructure problems (knowledge and physical), and interaction challenges (too strong or too weak).

Although formal and informal institutional factors are out of firms or entrepreneurs control, they are key environmental factors in the development of the renewable technologies (Negro et al., 2012). Innovation system theory (Jacobsson & Johnson, 2000) define institutional context as defining and structuring element in which the innovation process embedded. Institutional mechanism can hinder or facilitate the innovation and we can classify them to hard (formal) institutions and soft (informal) institutions. Hard institutional factors are formal institutions such as laws, policies, rules and arrangements, etc. (in the next section we discuss more about hard institutional factors and policy). As it is observed by Negro et al. (2012) they classify the related difficulties related to the hard institutional factors in: (1) 'stop and go' policies (long-term regulations and continuity constraint), (2) short-term problem solving and 'attention shift' of policy makers, (3) inconsistency and misalignment between policy levels, different sectors and institutions, (4) and shortage of institutional support during the before market introduction (*valley of death phase*[2]).

[2] The valley of death is the phase in the technology life cycle just before market introduction. In this phase high uncertainties about market success are coupled with high investment costs for building production capacity.

But soft institutions are informal and often implicit 'rule of the game' like norms and values in society that can be studied in terms of legitimacy, culture, trust, risk averseness, etc. In a study by the Jacobsson and Bergek (2004) they discuss about this issue in terms of social legitimacy for renewable energy development. In this study they make example of the Chernobyl disaster as the main legitimacy in Germany for the development of the renewable energies. The importance of the culture as an informal institutional factor in the development of the sustainable entrepreneurship has discussed in the literature (O' Neill et al. , 2009). Another rare empirical study put emphasize on the integral role of the social norms in entrepreneurial action and the level of new firm creation in environmental entrepreneurship (Meek, Pacheco, & York, 2010). In wind energy industry, for example, co-evolution between industries, social movements and institutions lead to the raise of this industry in USA (Sine, Haveman, & Tolbert, 2005; Sine & Lee, 2009).

A part from the aforementioned soft institutional factors, social acceptance and compliance with relevant institutions are key factors that hinder the process of new technologies commercialization. Wüstenhagen, Wolsink, and Bürer (2007) justify social acceptance by distinguishing three dimensions: socio-political acceptance, community acceptance, and market acceptance (Figure 2.3.1.3). According to them the most general level of acceptance is socio-political acceptance because it is related to technological, policies, public and stakeholders' acceptance. Community acceptance defined in the literature as specific acceptance of facility setting decisions by residents and local authorities. It is related to the NIMBY (not in my backyard) syndrome when there is resistant to renewable energy installation from local stakeholders (van der Horst, 2007; Wolsink, 2007). Market acceptance, as process of new innovation adoption, can also be part of social acceptance. This process is more complex regarding renewable technologies because it is limited to available infrastructures. This dimension is under-research and it needs further development for instance in customer segmentation, customer as investor and intra-firm acceptance (Wüstenhagen et al., 2007).

Figure 2.3.1.3 The triangle of social acceptance of renewable energy innovation (Wüstenhagen et al., 2007)

Various solutions are recommended to tackle such barriers for accelerating the diffusion of new technologies. Wüstenhagen et al. (2003) based upon successful experience in Switzerland suggest eco-labeling (*Naturemade*) as a tool to facilitate the transition from the niche market to the mass market. In Germany, as the other successful example, two main factors have affected renewable energies development. Firstly, effective public policy like feed-in policy system has created new capacities (about 13000 MW between 1990 and 2002) and it has reduced costs about 30% and 60% for wind and solar energies respectively. Feed-in-tariff is also venture capitalists' best friend because it is known as the most effective renewable energy policy (Bürer & Wüstenhagen, 2009). Secondly, from the demand side, green power marketing has shown great potential in renewable energies market development by reducing costs and increasing the capacity (Wüstenhagen & Bilharz, 2006).

If we take the market dynamic approach, "technology-push" and "demand-pull" are two drivers for new technologies diffusion. Technology-push refers to new technology that can convince the market it is needed. Demand-pull is when the market convinces the innovator that an innovative product is required and it can satisfy the needs of market. For renewable energy technologies, in order to understand the commercialization environment and to choose suitable strategies Walsh (2012) suggests the four distinctive environments and the related commercialization strategies. As it is shown in the Figure 2.3.1.4, he demonstrates the commercialization environments of renewable technologies as: innovation wasteland, innovation push, innovation pull and innovation Nirvana. He also reported the related strategies of commercialization, innovation type, commercial risk and commercialization choice in Table 2.3.1.1

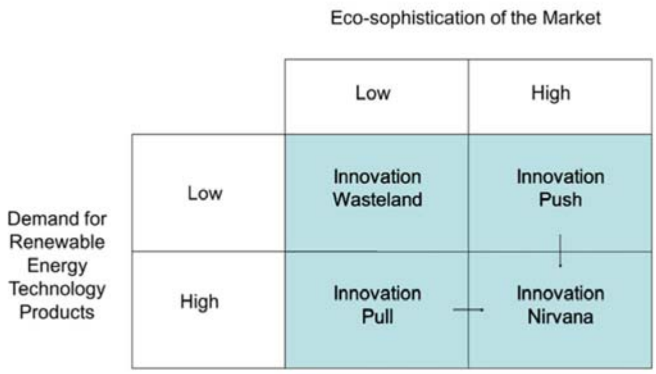

Figure 2.3.1.4 Renewable energies commercialization environments (Walsh, 2012)

The *innovation wasteland* is an environment in an energy market place where there is no incentive for innovators, nor any market demand. The suggested strategies for this environment are government incentives, external R&D contracts and utility funding. In the contrary, we have *innovation nirvana* environment where the demand and eco-sophistication level is high. Here both product and market risk are too low and is a *nirvana* environment for continuous innovation. Venture capital, equity financing and acquisition are the suitable strategies in this environment. *Innovation pull* environment characterized by high demand of renewable energy without related institutional or societal support. Here demand growth and related product availability absorb the innovation into the market and increase the sophistication of the market by upgrading the customer's knowledge of renewable energy products. This process eventually ends up by transition to the innovation nirvana commercialization environment. Joint venture and strategic alliance are strategies recommended in this environment. *Innovation push* in contrast exemplified by high level of sophistication and understanding of renewable energy technologies, but its demand is limited because of accessibility to the lower-cost traditional form of energy. The associated risk is higher for renewable technology provider due to customer's need is not well established but this level of eco-sophistication of customers push the providers into lower-cost and higher performance technologies that raise customer renewable energy demand and final transition to the nirvana commercialization environment. Two suggested strategies in this environment are outsourcing and licensing.

Table 2.3.1.1 Commercialization environment and related strategies for renewable energy Technologies (Walsh, 2012)

RET commercialization environment	Innovation type	Commercial risk[a]	Commercialization choice	Commercialization strategies
Innovation Wasteland	Disruptive	High	Dependent (Collaboration)	Government Incentives External R&D contracts Utility funding
Innovation Push	Discontinuous	Moderate		Outsourcing Licensing
Innovation Pull				Joint Venture Strategic Alliance
Innovation Nirvana	Sequential	Low	Independent	Venture capital Equity financing Acquisition

- **Conclusion and discussion**

New technology emergence, improvement and diffusion can be studied from different perspectives. In neo-classical economic perspective technological choices are explained subject to relative prices. From the perspective of the individual firm, innovation and diffusion process is described as entrepreneurial act. The most comprehensive perspective is innovation system. Not only it encompasses both individual firm and entrepreneurial act but also it includes a large number of variables in country, regional and technological systems levels (Jacobsson & Johnson, 2000).

Innovation system perspective can be a broader approach to study the process of new technology commercialization. With this approach we can study the influence of the technology, entrepreneur, firm and context on the process of diffusion. As it is recently discussed in the literature not only technology, entrepreneurs and firms are crucial factors in the process of technology diffusion, external factors such as institutions, policies and industry context are absolutely imperative in this process. In other words, the innovation and diffusion process is both an individual and collective act and its determinants are not only found within individual firm but also the innovation system in which firms is embedded (Jacobsson & Johnson, 2000; Staffan Jacobsson & Bergek, 2004).

Product commercialization is a complex process with different determinants at different steps of technological diffusion. In renewable energy technologies, because of lack of studies, our knowledge about this process is limited. Thus, in this study, first, we want to address this gap by exploring the renewable energy diffusion and commercialization and to identify systemic problems in diffusion and commercialization of these technologies. We need also to explore the influence of institutional factors in Spain to understand how these factors hinder or facilitate the commercialization process. Then we explore the possible solution to tackle the constraints and limitations that slow down the commercialization process in this industry. We can take advantage of Walsh's

(2012) framework to discover what are the relevant commercialization environment in renewable energy and how the recommended strategies may accelerate insemination and commercialization process.

2.3.2. *Policy*

Renewable energy industry is a policy-driven (or policy sensitive) industry. As we discussed about the formal institutions and renewable energy development, policy works like hard institutional factor and plays key role in development of the renewable energies. New energy policy schemes in different countries has supported renewable energies and created new market opportunities for eco-entrepreneurs.

The effect of policy in development of this industry have been always been a major challenge and it is addressed in several studies (Bürer & Wüstenhagen, 2009; Laurentis & Cooke, 2008; Lewis & Wiser, 2007; Lund, 2007; Reddy, Balachandra, & Nathan, 2009; Wüstenhagen & Bilharz, 2006; Wüstenhagen et al., 2003; Wüstenhagen & Menichetti, 2012). Results of these studies put emphasize on the importance of effective and favorable policy in fostering of renewable energies. In a study by Løvdal and Neumann (2011) on marine energy, for instance, they show the necessity of supportive political scheme in development of these technologies. In wind industry, a comparative study between 12 countries about policy support mechanism, suggests a combination of direct (ex. finance and tax incentives) and indirect support mechanism (mandatory renewable energy target, MRET) for establishing an industry which is internationally competitive (Lewis & Wiser, 2007) .

Governments across the world in order to reach to their ambitious goals for development of renewable energy and tackle environmental degradation have pursued several policies to achieve these goals. Germany is one of the pioneer countries in designing and implementing advanced renewable energy public policies. For instance, well known feed-in tariff law (StrEG) and it successor (EEG) has been important drivers for shaping Germany's renewable energy market and increasing renewable electricity generation (Wüstenhagen & Bilharz, 2006). In European Union, for example, the 2020 program forced member countries to increase their energy production from renewable energy sources to 20% by the end of 2020.

Recent study by Wüstenhagen and Menichetti (2012) shows that policies that effectively reduce the risk of investment, such as feed-in tariff, are more likely to increase in the private investment of renewable energies. In a simple model (Figure 2.3.2.1) Wüstenhagen and Menichetti (2012) illustrate the impact of the policy in development of this industry and following investment in this sector. As it is shown in this model, investors decide based on opportunities the risk-adjusted return provide them and supportive energy policy make risk-return equation more favorable for renewable energies.

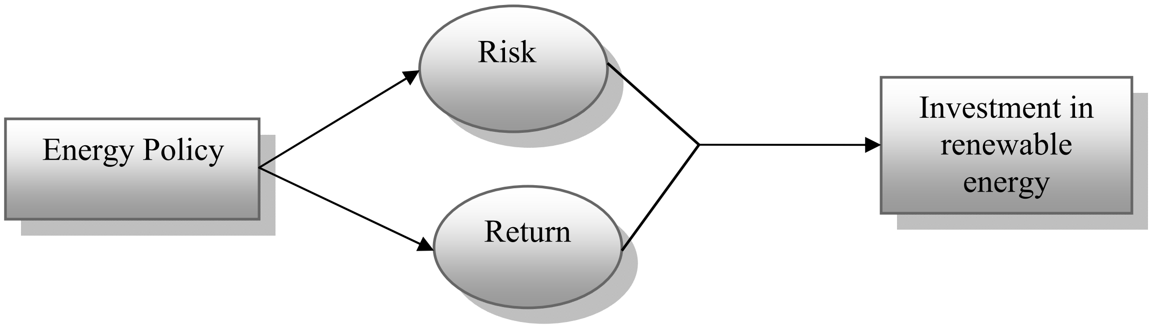

Figure 2.3.2.1 Simple model of renewable energy policy and investment (Wüstenhagen & Menichetti, 2012)

However, the cost effectiveness of public policies for bringing more efficient renewable energies has been under question. Although feed-in tariff has been the most expensive policy choice, it has proved to be the most effective policy both for investors and end-users in many countries (Bürer & Wüstenhagen, 2009).

Deliberate and effective policies could also foster renewable energies across the borders. For example, in wind energy industry a sizable and stable home market is essential for international competitiveness of the companies. This condition provides a long-term planning horizon for both local manufacturer and foreign firms for secure future investment. Therefore, supportive policies result in establishment of internationally competitive industry (Lewis & Wiser, 2007). Recent experience from Chinese renewable energy companies, prove this notion that a powerful and stable domestic market reinforce Chinese wind turbine and solar PV exporters to be successful in the U.S market (Liu & Goldstein, 2013).

However, we need to keep in mind that, a favorable policy can also push for outward internationalization of renewable companies. For example, in China export-driven growth policy during 2000s and special focus on strategic industries (such as renewable energies) in the late 1990s made China as major player in renewable energy international markets (Liu & Goldstein, 2013). On the other hand, supportive policies create an encouraging context to attract other international company’s investments. Løvdal and Neumann (2011) study shows that the main reason for the internationalization of companies in marine energy is need for capital and supportive political scheme (includes regulations, concession laws, access to grid, price subsidies and several other institutional issues). As a result, supportive and effective policy scheme provide opportunity not only for international growth of domestic-companies but also allow international companies for taking advantage of that constructive condition.

-Innovation is the specific instrument of entrepreneurship. The act that endows resources with a new capacity to create wealth.
"Peter Drucker"

3. *International Entrepreneurship*

In this chapter we discuss about the key definitions and previous studies have been done in the fields of international entrepreneurship (IE) and international new ventures (INVs). In doing this, we respectively understand; first, the importance of the subject and previous researchers' works in this field. Then, we consider different theoretical frameworks regarding IE, and afterward we consider the relevant frameworks for factors influence upon IE and our conceptual framework.

In the age of globalization, the internet, and communication the role of international entrepreneurship is much more critical than before. International entrepreneurship (IE) is an important research subject in the junction of the international business (IB) and entrepreneurship theory. IE as a first time introduced by Morrow (1988) and the first practical case about the IE and the phenomenon of early internationalization is reported by McKinsey consultant group in Australia. But, the first empirical study about IE was McDougall's (1989) work on new venture international sales. She defined the international entrepreneurship for the first time as:

> "*International entrepreneurship is defined as the development of international new ventures or start-ups that, from their inception, engage in international business thus viewing their operating domain as international from the initial stages of the firm's operation.*"

But it was just a beginning in defining IE. In 2000 and 2003 they broaden their research field gradually. In 2000, *McDougall* and *Oviatt* suggested their second definition by incorporating entrepreneurial orientation (EO), established firms and cross-national analysis where they define the field as:

> "*A combination of innovative, proactive and risk-taking behavior that crosses or compared across the nation and is intended to create value in business organization* "(McDougall & Oviatt, 2000).

Finally, Oviatt and Mcdougall (2005) suggest their integrative definition of the IE which is adopted by most scholars. This definition is based on the opportunity theory perspective by the Shane and Venkataraman (2000):

> "*International entrepreneurship is the discovery, enactment, evaluation, and exploitation of the opportunities-across national borders- to create future goods and services.*"

This definition is in the intersection of the international business and entrepreneurship theory. All of the related definitions are summarized in Table 3.1.

Table 3.1 Chronological Definition of International Entrepreneurship (adopted partially from Zahra and George, 2002)

- *McDougall (1989)* "International entrepreneurship is defined in this study as the development of international new ventures of startups that, from their inception engage in international business thus viewing their operating domain as international from their initial stages of the firm's operation."
- *Zahra (1993)* define international entrepreneurship as "the study of the nature and consequence of a firm's risk-taking behavior as it ventures into international markets"
- *Gimartino, McDougall and Bird* (1993) heading an entrepreneurship-division-wide panel, suggested that the domain of international entrepreneurship be expanded.
- *Oviatt & McDougall (1994)* state: "…a business organization that, from inception, seeks to drive significant competitive advantage from the use of resources and sale of outputs in multiple countries.
- *Wright and Ricks (1994)* highlighted the growing importance of international entrepreneurship as an emerging research theme. They suggested that international entrepreneurship is a firm-level activity that crosses national borders and focuses on the relationship between business and the international environments in which they operate.
- *McDougall and Oviatt (1996)* state: "New and innovative activities that have the goal of value creation and growth in business organization across national borders."
- *McDougall & Oviatt (2000)* state: A combination of innovative, proactive and risk-taking behavior that crosses or is compared across national borders and is intended to create value in business organization". They note that firm size and age are defining characteristics here. But they exclude non-profit and governmental agencies.
- *Oviatt & Mcdougall (2005)* International entrepreneurship is related to "discovery, enactment, evaluation and exploitation of opportunities, across national borders, to create future goods and services."

3.1. *International new ventures or born global firms*

When a firm is international from the inception we call it born global firm or international new venture (INV). Different terms from the beginning of this subject by McDougall and Oviatt address this phenomenon like *Born Global*, *International New Venture(INV)*, *global start-ups*, *high technology start-ups*, *instant internationals* but the most two popular names are the two first names i.e. born global (Rennie, 1993) and international new ventures (Oviatt & McDougall, 1994).

Born global firms are the firms which view the world as its market from the inception. Moreover, Knight (1994) defines them as the firms which are typically young and rich the exporting sales level of at least 25 percent within three years. However, international new ventures (INVSs) are defined by Oviatt & McDougall (1994) as "*a firm that from the inception seeks to derive a significant competitive advantage from the combination of resources and the sale of the outputs in multiple countries. The distinguishing feature of these start-ups is that their origins are international as demonstrated by the observable and significant commitments of the resources in more than one nation.*" Based on their view in order to determine whether firm is international new venture, or not, first of all researchers should determine that if there is a demonstrated resource commitment to sell the output in multiple countries during the start-up phase. In addition, they distinguish between the different types of the international new venture based on the two dimensions: the number of countries in which the firm is active and the number of activities along the value chain that are coordinated internationally (Oviatt & McDougall, 1994). However, the common standard about the international activity of the firm has not defined yet. Oviatt & McDougall (1994)consider the period of the six years as a standard gap in initiating the international operation, while Knight and Cavusgil (1995) and Rasmussan, Madsen, & Evangelista (2001b) define this period as "when firm's 25 per cent of sales exported within three years after their birth." But Rennie (1993) suggests that born global firms should start to export only after two years when they start.

This type of the firms as a new phenomenon challenge the already exist theories about the internationalization of the firms: the theories like Uppsala or stage-model (Johanson & Vahlne, 1977) and innovation related export-developing models. All of these theories consider the process of the internationalization as a gradual and progressive process which is achievable in the long term (Zucchella & Scabini, 2007) while born globals have proven to be a counter conventional wisdom in terms of gradual internationalization.

Different models have been developed to explain the stepwise internationalization process of firms by concentrating on the internal factors. The first and well known model is *The Uppsala Internationalization Model* (Johanson & Vahlne, 1977). This model explains the market selection based on psychic distance and it describes the internationalization as a process. However, other criticizes this model because it is incomplete. According to Forsgren, (2002) this model could only be valid in early stage of internationalization when the market knowledge and resources are main constraints. Moreover, the effect of experience and psychic distance are not easy to discern in a cross- industry study (Andersson, 2004). More recently, as it is discussed in previous section, international entrepreneurship literature and born global concepts (or international new ventures, global start-ups or instant exporters) proves that internationalization can also happen soon after the inception.

3.2. *Theoretical models of international entrepreneurship*

As we mentioned before, field of international entrepreneurship is the intersection of the two main theories of the international business and entrepreneurship theory with several significant implications for international management, entrepreneurship and strategic management (Autio, 2005; Keupp & Gassmann, 2009; McDougall & Oviatt, 2000). Nevertheless, this field is still highly fragmented due to the lack of common and integrated theoretical frameworks. It is interesting to see, for instance, that about 50% of the articles in this field do not specify any theoretical framework (Keupp & Gassmann, 2009). Therefore, it seems useful to review and integrate some of the most relevant theoretical frameworks which aim to explain international entrepreneurship from different perspectives (Jones & Coviello, 2005; Zahra & George, 2002; Zucchella & Scabini, 2007).

Zahra and Georges's (2002) model identifies three main factors which affect international entrepreneurship: strategic, organizational and environmental. Their model includes such organizational factors as TMT, firm resources and firm related variables like age, size, financial strength, location and origin. Strategic factors are related to strategic management and link firm internationalization with pursuing competitive advantage. Environmental factors include competitive forces, growth opportunities, regulatory environment, industry profitability, institutional environment, and economics of scale. These antecedents factors are connected to the types of international entrepreneurship activities in terms of extent, speed, and scope of a firm's internationalization and international entrepreneurship outcomes (financial and non-financial) that new ventures and established companies pursue from international operation (Figure 3.2.1).

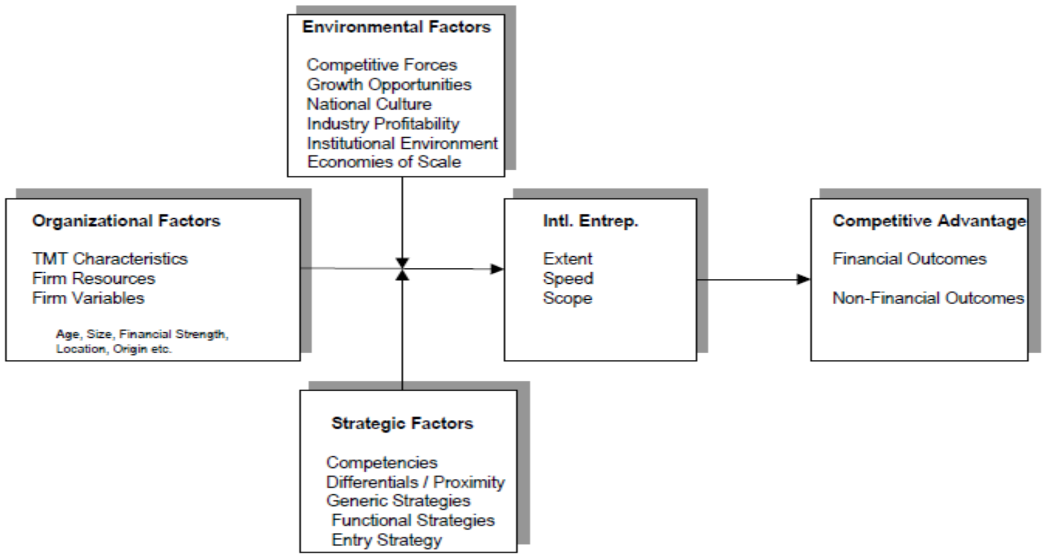

Figure 3.2.1 An integrated model of international entrepreneurship, Zahra and George (2002)

Jones and Coviello (2005) consider internationalization as an entrepreneurial behavior in time. Their dynamic model considers four basic constructs of the entrepreneur, firm, environment and performance. Internationalization behavior driven over time by the entrepreneur and the firm and moderated by the environment consequently determines firm performance. Thus, this model is based on the process of *cyclical behavior* where the entrepreneur and the firm are the main actors. *Finger print patterns* and *profiles*, are defined as a composite of the number and range of cross border business modes established by the firm and the number and distance of countries with which those modes were established at a specific point in time, are also important elements of this model (Figure 3.2.2).

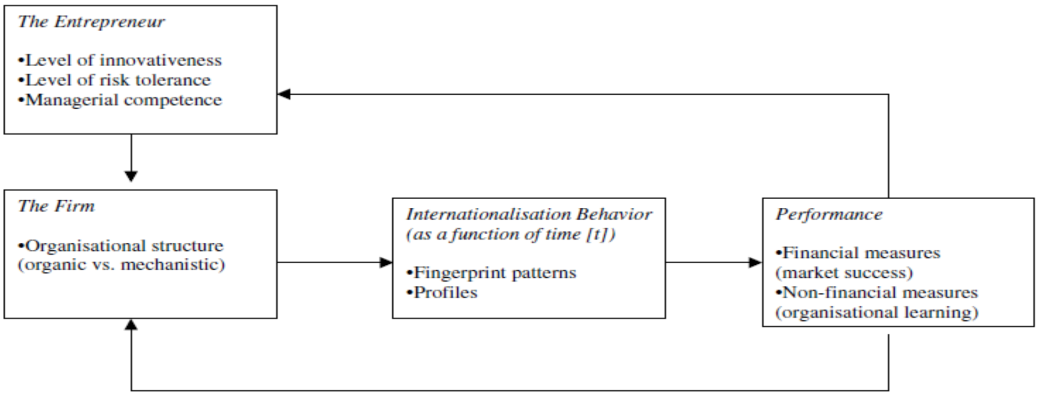

Figure 3.2.2 Precise Model for Empirical Examination, Jones & Coviello (2005)

The third model is based on the RBV theory. In this model Zucchella and Scabini (2007) applied the dynamic capability framework to IE. This approach to IE is useful to justify the creation and improvement of entrepreneurial activities and reconfiguring capabilities. They argue that matters of "innovation, reconfiguration/transformation, learning and path dependency for better performance in the marketplace" are common between two frameworks of IE and dynamic capability. As we can see in the Figure 3.2.3 they used a process view to the internationalization of the firm. At the beginning the entrepreneurs or TMT, search and evaluate the international opportunity. Then, they mobilize and reconfigure the external and internal resources to develop dynamic capability of the firm. Entrepreneurial firms get competitive advantage on the market by outperforming the other competitors in the course of innovation, risk-taking and pro-activeness. At the end of this process dynamic capability of the firm influence the performance of the firm through profitability, growth and export intensity geographical scope and international precocity. Here we can see that the authors integrate the entrepreneurship theory in their model as well when they consider the process of opportunity exploitation (Figure 3.2.3).

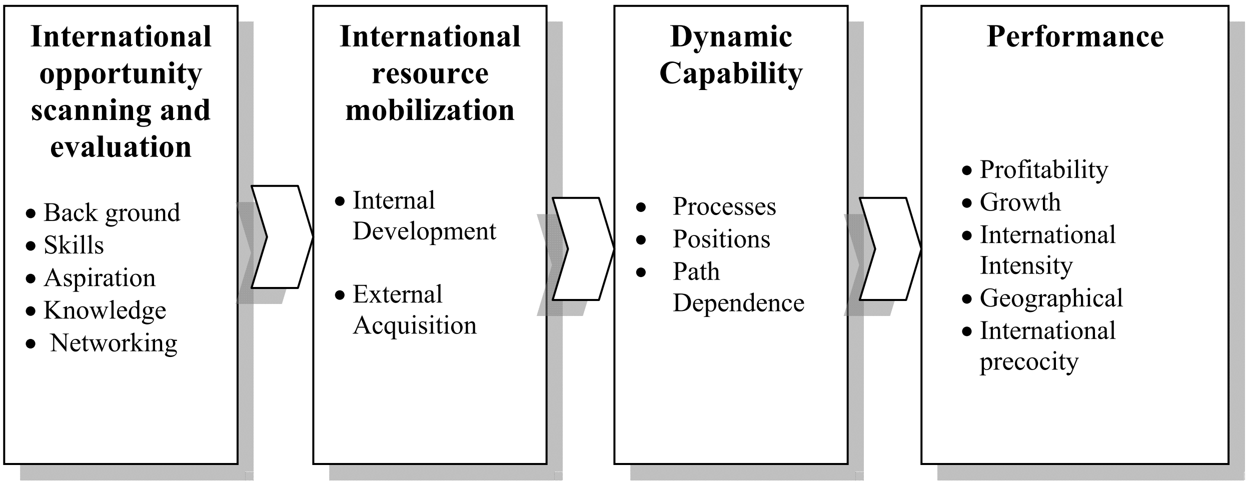

Figure 3.2.3 Conceptual Model of International entrepreneurship, Zucchella & Scabini, (2007)

3.3. *International entrepreneurship and industrial context*

In previous sections we discussed about internal factors influence on internationalization process. Knowledge, learning, level of international experience in terms of firm age, and entrepreneurs' experience are mainly discussed in the literature. Nevertheless, external factors are also important in the internationalization of the firms. In the literature these factors are discussed in terms of network, institutions, innovation systems and industry specific factors. Nevertheless, limited number of studies has dealt with role of environmental factors in entrepreneurial internationalization of firms (M. V. Jones et al., 2011; Peiris et al., 2012; S. a Zahra & George, 2002) and a knowledge gap exist in the literature. Due to focus of this study on renewable energies, knowing about this industry structure is crucial. Industry structure is defined by Porter (1980 p.4) as "basic, underlying characteristics that shape the competitive strategy for a group of firms producing products that are close substitutes for each other." Although the role of industry structure in entrepreneurial internationalization is significant (Bloodgood, Sapienza, & Almeida, 1996; Evers, 2010; Shrader, Oviatt, & McDougall, 2000), few numbers of studies have addressed this relationship.

In order to identify which aspects of an industry structural characteristics are important for the entrepreneurial internationalization of firms, Fernhaber, Mcdougall, and Oviatt (2007) classified twenty pertinent industry structure variables in four "necessary and sufficient elements" of IE framework, put forth by Oviatt and McDougall (1994): (1) internationalization of transactions, (2) alternative governance and mechanisms, (3) foreign location advantage, and (4) control over unique resources. Based upon these four elements, the most significant industry characteristics that influence entrepreneurial internationalization of the firms are reported as: industry concentration, industry evolution, degree of industry internationalization, level of industry venture capital, knowledge-intensity of an industry, global integration of an industry, and regime of appropriability. These relationships are depicted in Figure 3.3.1 to show how seven industry characteristics linked to entrepreneurial internationalization.

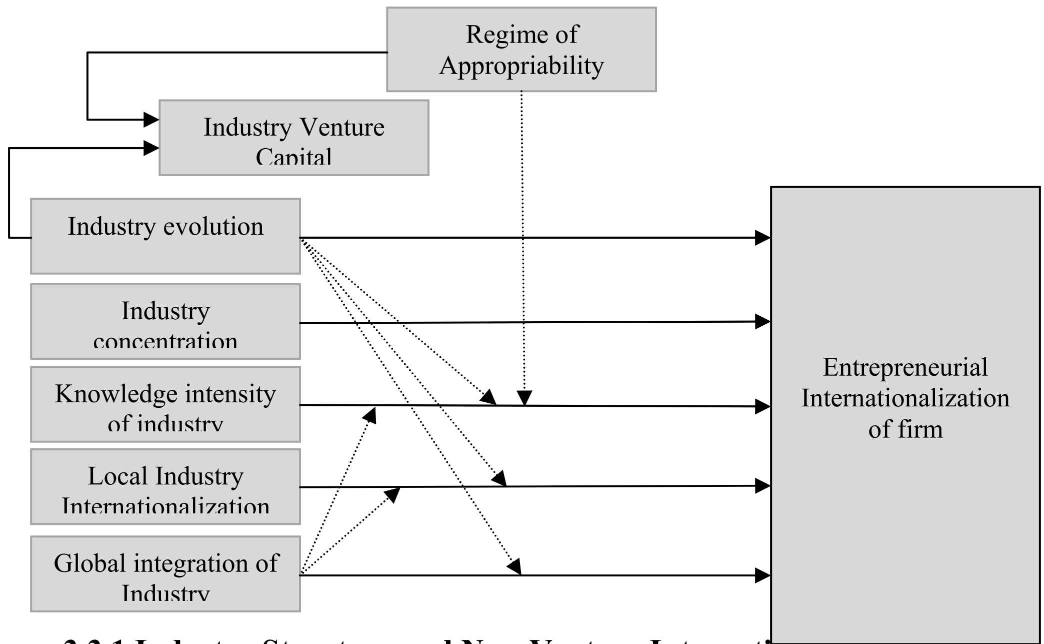

Figure 3.3.1 Industry Structure and New Venture Internationalization adopted from Fernhaber et al. (2007)

- **Discussion and conclusion**

Industry structure, as environmental factor, play significant role in entrepreneurial internationalization of firms. In order to define the industry structural factors, influence on firm internationalization, we need to clarify whether the industry is mature or growing and the firm position in internationalization process. Andersson (2004) describe the strategic decision of the firms in Figure 3.3.2. As it is illustrated in this table the level of international experience and the maturity level of industry are two important determinants in formulating firm strategy in international markets.

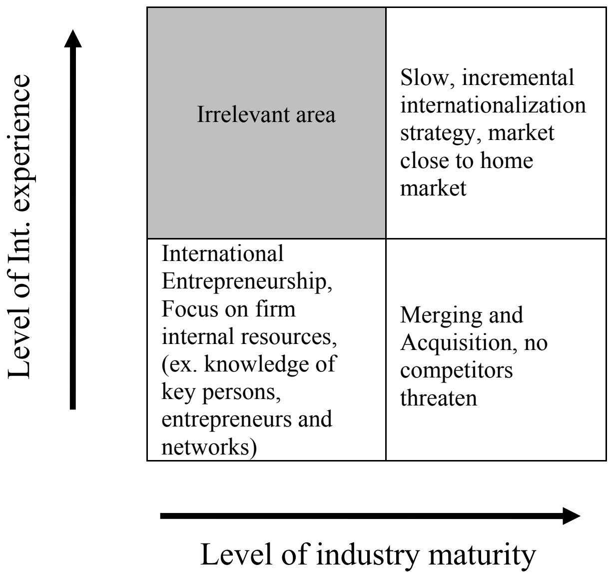

Figure 3.3.2 firm internationalization strategy related to industrial context adopted from Andersson (2004)

According to Andersson (2004), we can conclude that factors focusing on firms' environment like industry are more dominant in the later stage of firms internationalization. He argues that when an industry is in first levels of development it is hard to grasp the environmental factors influence on their international strategy; they need to concentrate on internal resources like entrepreneur, and firm. In first stage, the key resources in firms are individuals and entrepreneurs whom their attitude, orientation, experience, network and interpretation of the environment, affect the market selection and international strategy formulation of the firms. However, in later stages of internationalization, structure of the industry is important in market choice. For instance focal firm behavior affect the other firms market selection.

However, Fernhaber et al. (2007) by integrating insights from industrial economics, international business and entrepreneurship suggest his theoretical framework to identify which structural characteristics of an industry enhance entrepreneurial internationalization of the firm. Although this is a theoretical model that needs to be examined in practical studies, it shows the importance of the relationship between industry structure and internationalization. In this study, we apply the seven structural factors suggested by Fernhaber et al. (2007) to understand how the characteristics of renewable energy industry structure are indeed influential. Moreover, we can understand whether Andersson (2004) assumptions about the relationship between the IE and the industry maturity is valid in this emerging industry or not.

3.4. *International entrepreneurship and entrepreneur*

Although vast majority of researches in IE have focused on the firms level factors (Jones & Coviello, 2005), some early studies in this field argued about the entrepreneurs and their individual characteristics impact on the internationalization of firms (Ibeh, 2003; Kuemmerle, 2002). In these studies the role of entrepreneurs is recognized as the key antecedent (Madsen & Servais, 1997) and locus of the knowledge (Shrader et al., 2000), particularly in Born Globals and international new ventures (INVs). However, the prior studies were not all-inclusive and some knowledge gap is still exist concerning entrepreneur's motivations for internationalization of the firm and the effects of their motivations on mechanism of international opportunity exploitation (Mainela, Puhakka, & Servais, 2014; Zahra et al., 2005).

Two main perspectives have been widely used in the related literature, the process view, which consider entrepreneurs as part of an organization, and the traits perspective, which studies entrepreneurs as principal unit of analysis (Ibeh, 2003). In this study we first have the traits perspective on individual entrepreneurs. In this viewpoint their individual traits such as personality, skills and values effects on their behavior and decisions in internationalization process should be studied (Chrisman, Bauerschmidt, & Hofer, 1999). The second perspective that will be studied is about the effect of the entrepreneur's behavior and decision on firm performance (Cooper, Gimeno-gascon, & Woo, 1994) and in combining capabilities, competences and resources (dynamic capability view) (Eisenhardt & Martin, 2000). However, we should carefully note that both entrepreneur and firm-level behavior can influence internationalization together and independently.

To study the entrepreneurs' impact on the internationalization of the firms, in the following we focus on three sets of variables: philosophic view, social capital and human capital.

3.4.1. *Philosophical view*

One of the main factors related to the individual traits of entrepreneurs is their philosophical stand point. Not only entrepreneurs' beliefs shape their sustainability values, but also it influences their attitude and perceptions about internationalization.

In the IE literature several authors have discussed about the importance of entrepreneurs' value system and these studies consider a central role for entrepreneurs. (Cavusgil, 1984; Covin & Slevin, 1991; Leonidou, Constantine, & Piercy, 1997). A study by Calof and Beamish (1995) shows the major contribution of manger attitude and their perception of the international markets on the mode of entry change. Covin and Slevin (1991) classify the philosophical view point as one of the internal variables together with other organizational factors (resources and competences, structure and culture) that affect the entrepreneurial posture and performance of the firms. They argue that the strategic decisions of entrepreneurs (top management) are influenced by their value structure, beliefs and philosophical view. Consequently, the relationship between the entrepreneur's values and organizational action has been shown clearly in the entrepreneurship literature, where the entrepreneur strategic decisions such as internationalization will affect the firm performance and growth.

Current study focus on entrepreneurs' *general attributes* in IE literature such as age, education attainment, and professional experience (Leonidas, Constantine, & Nigel, 1998). Their *subjective traits* are also considered to understand entrepreneurs' propensity (tendency) toward sustainability issues.

3.4.2. *Human capital*

IE literature, by following the logic of resource-based view of the firm, suggest that human capital like entrepreneur's experience and skills, and their specific knowledge and know-how is one of the key influences encouraging firm to international activity (Chetty, 2002; Eriksson, 2003; Madhok, 1996; Reuber & Fischer, 1997b).

Mcdougall, Shane, and Oviatt (1994) in their pivotal work explain about the role of entrepreneurs' competencies in formation of international new ventures (INVs). They assert that the specific competencies of entrepreneurs such *as knowledge, back ground* and *networks* enable them to combine particular set of resources across national borders. Similar conclusion has been drawn by other researchers in the IE field. A study by Reuber and Fischer (1997) confirm the importance of the *international experience* in the internationalization of the firms. Westhead, Wright, and Ucbasaran (2001) research show companies with founders' *previous experience abroad, denser information* and *extensive management know-how* are more likely to be exporter. This result are also supported by Kuemmerle (2002) study recommending that IE activity is positively related to the "entrepreneur contact to international environment" in either educational or professional context. We can therefore conclude that international experience of entrepreneurs can assist them in the process of internationalization of the firms.

3.4.3. *Social capital*

Social capital is related to the entrepreneur's proprietary network relationship such as formal and informal networks. Extensive attention has been paid to this subject and many IE studies have underscored the influence of the networks on the foundation and growth of the firms in international markets (Andersson & Wictor, 2003; Chetty & Blankenburg-Holm, 2000; Coviello & Cox, 2006; Coviello & Munro, 1997; Coviello, 2006; Gabrielsson, Kirpalani, Dimitratos, Solberg, & Zucchella, 2008; Kontinen & Ojala, 2011; Mort & Weerawardena, 2006; Musteen, Francis, & Datta, 2010; Rasmussan, Madsen, & Evangelista, 2001a; Sasi & Arenius, 2008; Sharma & Blomstermo, 2003; Solberg & Durrieu, 2006; Thistoll & Pauleen, 2010).

By applying knowledge based view and social capital theory these studies illustrate that network ties are positively associated with the companies distinctive knowledge base building and internationalization (Helena Yli-Renko, Autio, & Sapienza, 2001; Helena Yli-Renko, Autio, & Tontti, 2002). They argue that formal and informal network usage assist them in pursuing international opportunities and accelerate the internationalization process (Coviello & Munro, 1997, 1995) and it is suggested that companies with more contact networks are more prone to be international (Westhead et al., 2001).

3.5. *International entrepreneurship and resource based view (RBV)*

The principal of resource based theory (RBV) is that resources and capabilities are not homogeneously distributed among firms and these discrepancies explain why some firms have competitive advantages over others (Barney, 2001). This theory focus on firms' internal factors, resources and capabilities, and it discuss that for achieving sustainable competitive advantage in the market, we need resources and capabilities that are valuable, rare, and difficult to imitate (Barney & Clarck, 2007). In IE, the definition of INV uses the expression of resources to describe assets that may be used to develop company and provide it with competitive advantages. This view is borrowed from Resource Based View (RBV). Several scholars maintain that RBV offers useful theoretical base to analyze the IE phenomenon (Coviello & Cox, 2006; Knight & Cavusgil, 2004; Peng, 2001).

For firms, some innovations and technologies need more resources and time to develop and commercialize. Lund (2006) study about penetration rate of 11 different new energy technologies shows that energy technologies spend decades penetrating the market.
Therefore, new firms need more time and resources for introducing a commercial product to the market. In this case, access to resources becomes extremely important to survive, and RBV provide a significant framework to understand how firms develop and how entrepreneurs assemble and organize resources to build competitive advantages (Alvarez & Busenitz, 2001). Start-ups are typically constrained by the lack of resources (Brush, Greene, Hart, & Haller, 2001). It is similar to INV when new ventures leverage their limited resources in international market (McDougall & Oviatt, 2000; McDougall, 1994; Westhead, Ucbasaran, & Binks, 2004). It is also emphasized by Oviatt and McDougall (1994) in IE definition when INVs "…derive significant competitive advantages from the use of resources…".

According to Zahra et al., (2003), tangible and intangible resources impact the degree and speed of sales internationalization in new ventures in IT industry. Technological reputation and technological network are two intangible resources that play a key role in international sales in combination with tangible technological resources. Consistent with resource based theory, intangible resources by creating casual ambiguity and social complexity create sustainable competitive advantage and new revenue stream (Barney & Clarck, 2007). However, these results need further development in industries other than software industry and it need to be determined how new ventures develop early network relationship. This issue is significant in renewable energies industry where companies need to facilitate and accelerate the process of commercialization (see Figure 3.5.1).

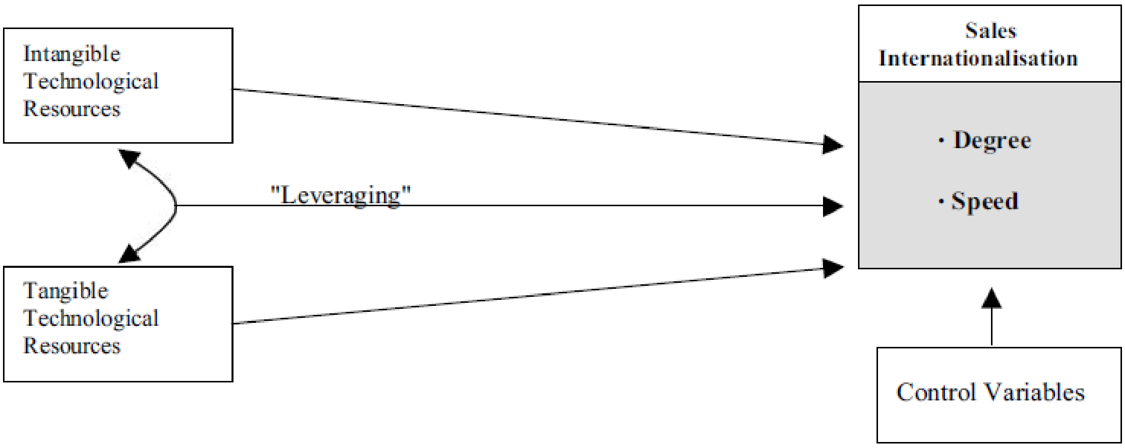

Figure 3.5.1 Leveraging of tangible and intangible technological resources and sales internationalization (Zahra et al., 2003)

3.6. *International Energy Entrepreneurship*

3.6.1. *Sustainability and international entrepreneurship*

Globalization, as the most important phenomenon in this century, has been always been blamed for its negative effects on environmental degradation. Environmental activist has always been suspicious about the internationalization process and they have been against this global trend, for instance anti-globalization protests at the 1999 WTO meeting in Seattle. In the same vein, some scholars have supported this idea and they believe that globalization has often push aside the development of sustainable enterprises (Allen & Malin, 2008; Mol, 2002). They claim that expanding international economic relation and activities of firms have increased environmental deterioration through the intensified use of natural resources, increased transport movement among the others, growing chemical and material waster (Forbes & Jermier, 2010; Keijzers, 2002). A part from environmental impacts, globalization has created social imbalance and widen social divide (Senge, Lichtenstein, Kaeufer, Bradbury, & Carroll, 2007). Some others define globalization in contrast with regionalization and suggest balancing between these two powers as crucial forces for lasting development and sustainability (Coman, 2008).

However, other scholars believe that globalization provide an opportunity to improve global sustainability. For instance, Kirchgeorg and Winn (2006) consider global poverty as an attractive growth opportunity for the firms, while it can improve the poverty level reciprocally. Moreover, some others believe that globalization offer opportunities when market interactions through international value chains promote sustainable development in other countries (Ras & Vermeulen, 2009). In energy industry, globalization also provides opportunity for energy entrepreneurs as agent of change to fix *environmentalism* within new businesses. It allows them to develop renewable energies across the world for creating global sustainable development and tackle environmental problems as global issue. It reflects the importance of integrating energy entrepreneurship in the international context in order to enhance our understanding about the renewable energies in the global markets.

3.6.2. *International Energy Entrepreneurship (IEE)*

Since last decade, the entrepreneurship literature has developed in various streams of thought. Different terms such as social entrepreneurship, institutional entrepreneurship, sustainable entrepreneurship, international entrepreneurship, and recently energy entrepreneurship refer to importance of entrepreneurship theory and also its interdisciplinary nature. In this study we are interested in international entrepreneurship and its combination with energy entrepreneurship. In this part, first, we define international entrepreneurship and then we suggest *International Energy Entrepreneurship* (IEE) at the intersection of these two streams of knowledge.

It is traditionally accepted that for extensive development of viable new technologies we need to rely on effective market actors like incumbent multinational firms that already have experience in commercialization and industrialization of these technologies worldwide. The process of internationalization in these firms is based on conventional internationalization theories such as OLI paradigm (Dunning, 1988, 2000), Uppsala model (Johanson & Vahlne, 1977) and theories of latecomer firms (Mathew's LLL theory) (Buckley, Wang, & Clegg, 2007; Mathews, 2006) . In these theories internationalization process is described in incremental manner with distinct steps to gain experiential learning (Autio, Sapienza, & Almeida, 2000; Kuemmerle, 2002).

Alternatively, internationalization can be achieved through recently established firms or international new ventures (INVs or born global firms) (McDougall & Oviatt, 2000, 2008; Oviatt & McDougall, 1994, 2004). These newly established firms, not only implement internationalization strategies rapidly and widely, but also they are extremely favorable carriers of innovations in the global level (Løvdal & Aspelund, 2011).

Several studies suggest internationalization as successful strategy for small firms (Brown, Hendry, & Harborne, 2007) or new ventures in renewable energies (Wüstenhagen & Wuebker, 2011a). In a study about marine energy industry Løvdal and Neumann (2011) discuss that in this immature industry, entrepreneurs exploit international opportunities as a solution to reach their ultimate objectives: new products commercialization and growth. Moreover, the experiences from wind industry explain that how Danish wind turbine manufacturers (ex.Vesta) took advantage of *the Californian Wind Rush* to accumulate required learning and knowledge from the international markets (Jones & Bouamane, 2011; Perrot & Filippov, 2011; Wüstenhagen, 2003b). Moreover, in an emerging industry like marine energy at pre-commercial phase internationalization is common strategy among the new ventures (Løvdal & Neumann, 2011). Due to barriers in this industry such as need for capital and supportive political context they establish their pre-commercial activity across the borders. Lovdal and Moen (2013) in their study about the international activity of international new ventures (INVs) at pre-commercial phase of technology development in wave and tidal energy industry confirm due to access to the immobile resources (such as testing infrastructure) and being close to industry hot-spot location (because of favorable policy context and obtain more investment from international investor) firms are apt to relocate their activities in other countries.

Based upon previous experiences in similar sector and guided by the rich international entrepreneurship literature, as it is mentioned about the co-evolutionary role of both incumbent and start-ups in sustainability development of industry, the aim of this study is to investigate the process of entrepreneurial internationalization of renewable energy in both incumbents and start-ups. We would like to understand the role of entrepreneurial firms, either new entrants or established firms, in developing renewable energy technologies in the international context. Result of this study will provide detailed understanding of different factors such as entrepreneur, firm, policy, and industry structure potential in inflecting the internationalization process. The focus of this study will be on renewable energy industry, as an emerging industry and its barriers for development, which are not necessarily similar between various renewable energy technologies.

3.6.3. *IEE and renewable energy industry structure*

Fernhaber et al.'s (2007) theoretical framework is developed for internationalization of new ventures and the structural characteristics presented in this model are significant for both incumbents and new entrants' internationalization. Current study apply Fernhaber et al.'s (2007) model to understand entrepreneurial internationalization of firms in the renewable energy industry.

The first important characteristic of an industry is evolution which is defined as evolutionary stage of an industry in emerging, growth or maturity state. Renewable energy industry can be positioned at early stages of industry development, in comparison with conventional fossil fuel energy industry. This industry can be classified as emerging industry with rapid rate of change. Although it is not still competitive with conventional types of energies, *experience curve* or *learning rate*[3] of these technologies shows cost reductions between 8% and 10% by 2020, depending on the growth rate in renewable energies deployment. Considerable cost reduction potentials estimated for these technologies to be cheaper than usual sources of energies till 2025. In general, 30% to 40% cost reduction might be possible in case of large deployment till 2020 (IEA, 2010). The expected trends of costs reduction reveal that renewable energy industry is in early stage of development with lower demand and higher risk (depending on the type of technology), in comparison with other sources of energies. But it demonstrates great potential for future development mainly in international markets. Thus, it is interesting to know how firms internationalize in emerging stage of an industry while Fernhaber et al. (2007) assume that internationalization of the firms is more likely to occur in growth stage than the other stages.

The other key industry characteristic is the *ratio of number* (ratio of big and influential firms and total number of firms in an industry) and relative power of firms in an industry which is defined as industry concentration. As it is discussed in the literature, less concentrated industries such as renewable energies due to the lower economics of scale are more suitable context for new venture formation (Dean & Meyer, 1996) and also achieve higher performance (Mcdougall, Robinson, & Denisi, 1992; Robinson & Mcdougall, 1998). However, lower level of firm concentration may reduce the probability of new firm internationalization because of limited growth possibilities and lower entry barriers (Fernhaber et al., 2007). These contradictory arguments, shows the

[3] Learning curves estimate the percentage cost reduction for each doubling of the installed capacity.

necessary of research to understand if the relationship between renewable industry concentration and firm internationalization is positive, negative or inverted U-shaped.

Knowledge-intensity of an industry is widely discussed in the international entrepreneurship literature and empirical evidences have proved that it is positively relate to entrepreneurial internationalization of the firms (Autio et al., 2000; Coviello & Munro, 1997; Kotha, Rindova, & Rothaermel, 2001; Oviatt & Mcdougall, 1994). Knowledge intensity in an industry is defined as the extent to which firms get competitive advantage in the market by using organizational knowledge and technological learning. Renewable energies, is a high-tech industry based on cutting-edge technologies to capture, for example, solar radiation for electricity generation. Internationalization in knowledge intensive industries assists firms to exploit their unique capability or technology in the foreign markets or derive benefit from strategic advantages of host country.

The other key factor for pursing internationalization is access to the financial resources or venture capitals. Because access to financial resources is a major constraint in sustainable energies (Løvdal & Neumann, 2011), venture capitals play significant role in international development of these technologies in multiple geographical markets (Bürer & Wüstenhagen, 2009; Moore & Wüstenhagen, 2004; Schertler & Tykvová, 2011; Wright et al., 2004; Zacharakis, McMullen, & Shepherd, 2007).

Regime of appropriability is the other important factor, it refer to environmental factors that affect an innovator's ability to capture the profit generated by an innovation (Teece, 1986). For example, an innovation that cannot be patented may be easily copied and exploited by other competitors. There is range of industries from weak to tight regime of appropriability in technology protection. For instance, pharmaceutical industry has tight regime of appropriability and in services this regime is weak and easy to imitate. For the renewable energy technologies this regime seems relatively tight, but in some cases it could be easily imitated by other competitors in the market. For instance, the collector part of dish-stirling technology could be copied by competitors but there are other parts of these systems like engine and storage technologies that are high-tech and well protected by patents. According to Fernhaber et al. (2007) weaker appropriability regime in an industry is a flaw in technology protection that works as driving force for internationalization in order to completely exploit firms' innovation as quickly as possible.

Entrepreneurial internationalization of the firms can be related to other structural factors of an industry. It might be affected by nature of internationalization among incumbent firms due to isomorphic behavior of other firms to reduce uncertainty. Moreover, it could also be related to global integration of an industry. Since solar energies, for instance, are desirable in countries with higher level of sun radiation, the geographical location of countries also affect the market selection of the entrepreneurial firms in countries with favorable environmental condition that allow higher efficiency and consequently better performance.

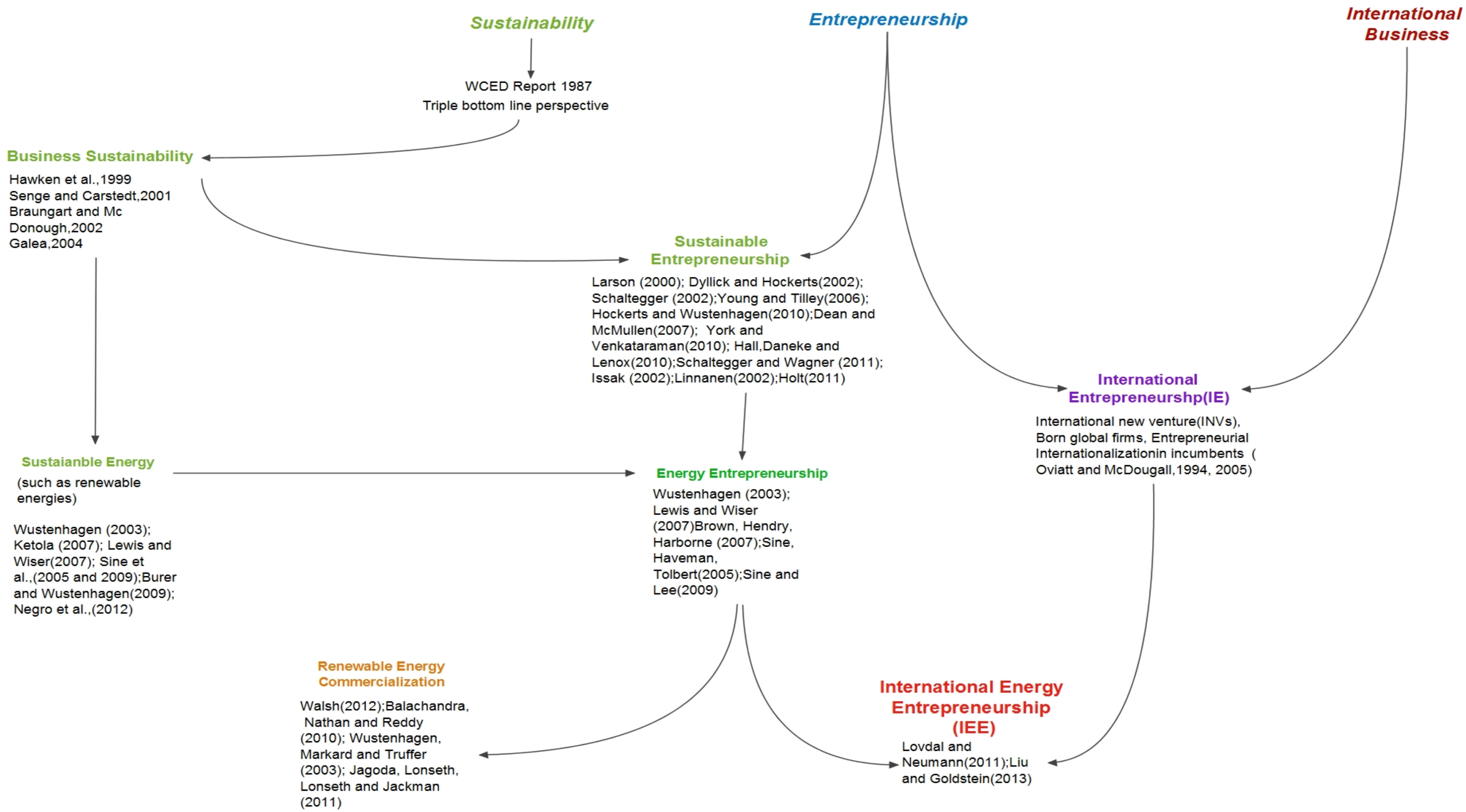

Figure 3.6.3.1 Concept Map of the Literature

-A theory must be tempered with reality.
"Jawaharlal Nehru"

4. *Conceptual Model and Propositions Development*

4.1. *Theoretical or conceptual framework*

As noted earlier, the main research objective of this study is to investigate how technology-based companies act internationally to develop technologies that may produce abundant, clean, renewable energy according to IE principles. In order to design our conceptual model and define our research questions we focus on different filed of research: sustainable entrepreneurship, energy entrepreneurship and international entrepreneurship at four levels of analysis: entrepreneur, firm, industry, policy.

As it is suggested in the beginning, our field of research is an interdisciplinary approach to the internationalization of entrepreneurial companies in renewable energy industry. Thus, we need to adopt an integrative approach to IE and different strands of literature such as sustainable entrepreneurship, energy entrepreneurship and international business. Adopting of these perspectives provide a holistic approach to study the development of renewable energies in international markets. We are going to develop the IE field by incorporating a novel field of study such as sustainable entrepreneurship to understand how firms can deal with a global issue like sustainability with an international approach. In the literature concerning renewable energy industry few numbers of studies have followed this combination of frameworks and in all studies they neglect the role of different levels of analysis (Bjørgum et al., 2013; Løvdal & Moen, 2013; Løvdal & Neumann, 2011). In IE, however, Rialp, Rialp, and Knight (2005) call for using multiple theories and frameworks and they believe "use of a single theoretical framework for explaining the acceleration of international operations by young smaller firms appears to be somewhat reductionist and would likely inhibit any further theory development on this issue" (p. 155).

Two main perspectives can assist us in this study: micro-level perspective and macro-level perspective. Entrepreneurs and firms actually perform the activities—they are the "on-ground-change agents." As Shane, (2003,p.7) expressed it: "Business opportunities do not act on themselves…" Based on these considerations, we need to mainly focus on micro-level perspectives. While these activities can, and must, be facilitated by appropriate policy, regulations, and institutions. These factors are related to the macro-level perspective. As a result, this thesis designed as multi-level study. In contrast with previous studies that dominated by single level studies particularly at firm level and individual level of analysis (Davidsson & Wiklund, 2001), we focus on three different levels and we also consider the industry as overlooked level of analysis which is imperative in our study (Davidsson & Wiklund, 2001; Low & Macmillan, 1988).

These multiple-level are embedded in our conceptual framework based on previous chapters about current conceptual models and theoretical frameworks in IE (Jones &

Coviello, 2005; Zahra & George, 2002; Zucchella & Scabini, 2007) and by taking advantage of available theoretical frameworks associated with other analytical levels: eco-entrepreneur (Linnanen, 2002; Schaltegger & Wagner, 2011; Schaltegger, 2002; Taylor & Walley, 2004; Walley & Taylor, 2002), industry structure (Fernhaber, Mcdougall, & Oviatt, 2007), renewable energy commercialization (Walsh, 2012), company size and type (Hockerts & Wüstenhagen, 2010), structural factors in the firm (Taylor & Walley, 2004) and policy (Wüstenhagen & Menichetti, 2012). In summary, associated fields of research such as sustainability, entrepreneurship, sustainable entrepreneurship, and energy entrepreneurship have contributed to our study and we took advantage of them to design our conceptual model by combining them with IE to define our research questions. The conceptual model of this study (Figure 4.1.1) represents the entrepreneurial internationalization at eco-entrepreneur, firm and environmental factors levels. This model also illustrates the process of commercialization from national to the international market with effect of technology push and market pull.

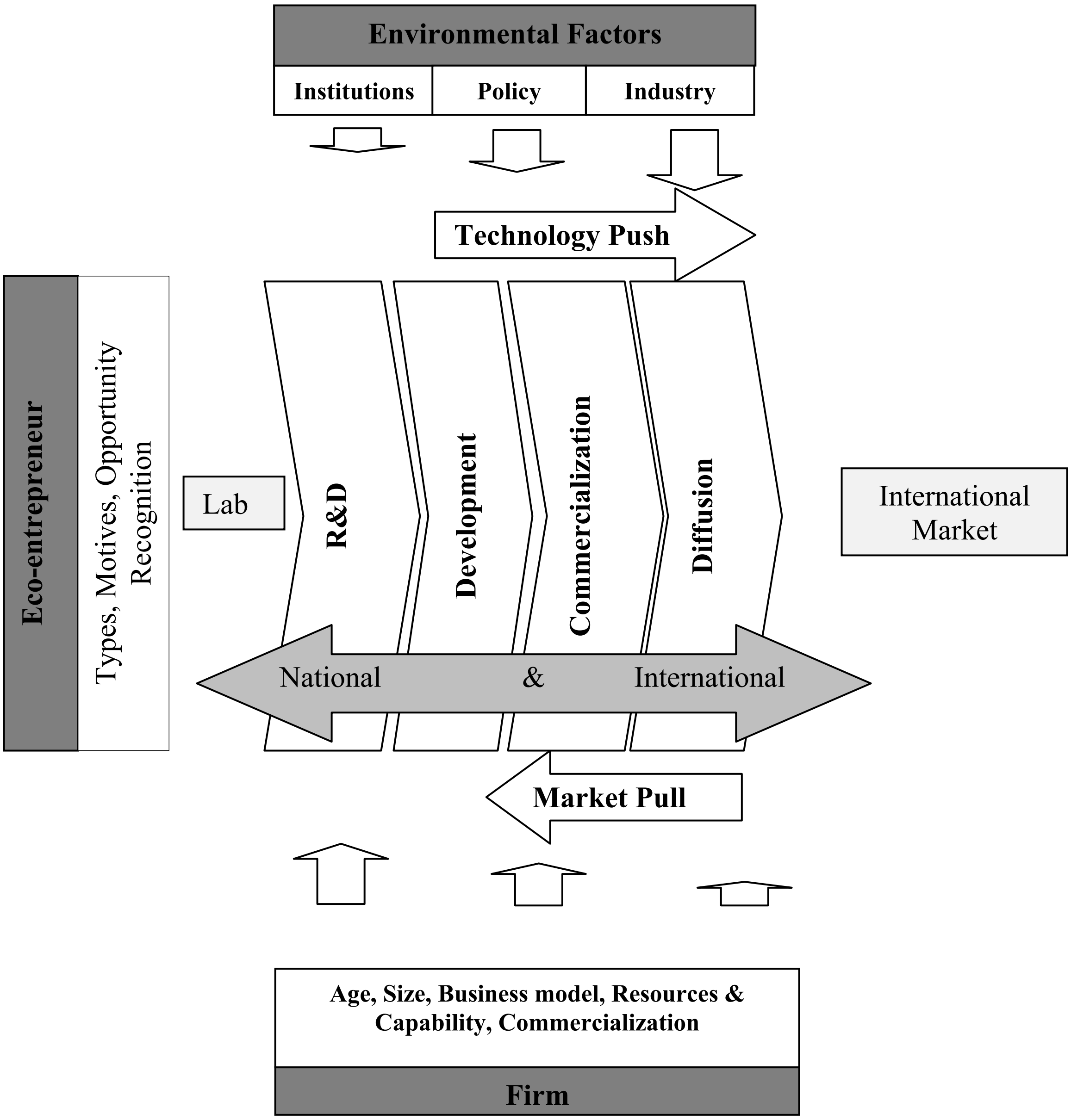

Figure 4.1.1 Conceptual framework International energy entrepreneurship

The conceptual model involves several constructs in four levels of analysis that will affect entrepreneurial internationalization of firms in this specific industry. These constructs eventually affect the international performance of the firms associated with their perceived success in terms of new product development in international markets (later on, in the quantitative section, we will discuss about them in terms of financial performance, operational performance, organizational effectiveness). In the following, we develop our prepositions according to our model and levels of analysis.

4.1.1. *Entrepreneur*

In this model, first of all we looked at the role of entrepreneur as the agent of change in development of renewable energies. Since it is presumed that entrepreneurs in renewable energy are not similar to conventional entrepreneurs and their sustainability concerns impact their entrepreneurial orientation (Kuckertz & Wagner, 2010), it is important to explore their role as eco-entrepreneur. Moreover, personal characteristics of entrepreneurs could also facilitate the process of entrepreneurial internationalization of companies (Westhead, Wright, & Ucbasaran, 2001). Grounded in IE literature, personal traits and experiences such as international business network (social capital) (Coviello & Munro, 1995; Coviello & Munro, 1997; Yli-Renko, Autio, & Sapienza, 2001), international experience (Human capital) (Kuemmerle, 2002; Reuber & Fischer, 1997; Westhead, 2001) and international orientation (Covin & Slevin, 1990; Zahra, 1993) affect positively internationalization of companies. Here we need also consider the role of entrepreneurs in combining competences, capabilities and resources in optimal way to contribute to the internationalization (Chetty & Patterson, 2001; Jones & Coviello, 2005). Drawing upon these theories from IE and sustainable entrepreneurship we can propose that:

> **Proposition 1** Entrepreneurs' values, skills, and experiences affect the entrepreneurial internationalization of renewable energy firms.
>
> **Proposition 1.1** The value eco-entrepreneurs place on sustainability orientation can be reinforced by their entrepreneurial internationalization to address their global concern.
>
> **Proposition 1.2** Specific international characteristics of eco-entrepreneurs (founder, leader) such as international experience, international orientation, and international business relations (network), positively affect international opportunity recognition and internationalization.

4.1.2. *Firm*

The second level of analysis is firm. The role of firm in development and commercialization of renewable technologies in international markets needs to be considered from different aspects. The first one is firm's structure. Size and age of firm are two factors that literature has discussed about them as key structural features that seem particularly relevant to the IE and energy entrepreneurship domain. According to the literature, new established firms are the most important sources of innovation in the early phase of technology development and they are willing to pursue sustainability-oriented opportunity (Hockerts & Wüstenhagen, 2010). These start-ups are also more likely to formulate internationalization strategy for developing and commercializing their technologies and expansion (Bjørgum et al., 2013; Løvdal & Moen, 2013; Løvdal & Neumann, 2011).

On the other hand, incumbent companies' behavior is reactive to new entrants' innovative activities and they enter to the business by corporate sustainable entrepreneurship activities. Actually, they perceive new entrants as a threat for their main stream business. As a result, they try to enter to the niche markets created by them. This interaction between the incumbent and new entrants needs further consideration from two perspectives; first, the co-evolution sustainability between start-ups and market incumbents that make interaction between them as essential behavior (Hockerts & Wüstenhagen, 2010) and the second is how new entrants (INVs) can take advantage of network, cash flow, learning, technology and evolutionary growth provided by established firms' large channels (MNCs). In this way, they can reach to business space rapidly. These aspects are particularly important in the energy industry where traditionally dominated by large and multinational companies that follow newly established companies to generate energy from renewable sources (Bird, Wüstenhagen, & Abakken, 2002). Based on the incorporated differences, opportunities, challenges and interactions between incumbents and start-ups we propose that:

> **Proposition 2** Age and size of the firms impact positively/negatively entrepreneurial internationalization of the firms in renewable energy industry.
>
> **Proposition 2.1** Innovative start-ups in comparison with larger renewable energy companies are more inclined to adopt internationalization strategy for product development and commercialization.
>
> **Proposition 2.2** Incumbent companies in renewable energy industry help start-ups introduce new technologies to the market by providing channels, resources, networks and reputation.
>
> **Proposition 2.3** Interaction between the incumbents and start-ups leads to for international technology development and commercialization.

The second aspect is the firms' resources and capabilities. One part of resources is tangible such as financial, physical and technology. The other part is intangible resources such as human, organizational, relational and network (Barney & Clarck, 2007; Barney, 1991). Results of previous studies in IE emphasize the key role of resources and capabilities in the internationalization of firms (Coviello & Cox, 2006; Laanti, Gabrielsson, & Gabrielsson, 2007). One of the main resources is financial resources and it is an important driving force for firms to enter new foreign markets with favorable financial supports (Oviatt & McDougall, 1995). Moreover, companies require access to the international financing structure in order to expand globally (Gabrielsson, Sasi, & Darling, 2004). In renewable energy industry, funding is a main challenge for entrepreneurial firms. Result of studies from marine energy industry shows that access to funding and capital is the primary challenge of companies in this industry and it is also one of the key motives for their international activities (Bjørgum et al., 2013; Løvdal & Neumann, 2011).

Technological resources are also critical factor, particularly in high-technology firms (Shane, 2008; Zahra, 1996). Technology determines the type and quality of products that a company provides to the market. Different studies have shown the significance of knowledge and technological know-how for taking competitive advantage in international markets (Acs & Preston, 1997; Almor & Hashai, 2004; Autio et al., 2000). Oviatt & Mcdougall (2005) define technology as enabling force that accelerates internationalization of the firms. These resources are categorized as tangible and intangible technological resources. Although tangible technological resources are critical in obtaining competitive advantage in the markets, intangible technological resources like technological network and technological reputation, has proved to be significant predictors of speed or degree of internationalization in software industry (Zahra et al., 2003). In renewable energy industry as high technology and knowledge-intensive industry the role of technology is more highlighted. However, the main challenge in this industry is technological development and slow pace of commercialization (Balachandra et al., 2010; Lund, 2006; Negro et al., 2012). In international markets similar challenges are experienced by renewable energy companies (Bird et al., 2002), and technology development is still a major barrier (Bjørgum et al., 2013). Selecting suitable commercialization strategy could be a solution for these challenges. International involvement and collaboration is accepted practice for new ventures in marine energy development (Bjørgum et al., 2013; Løvdal & Neumann, 2011), but it certainly depends on technology, commercialization environment, innovation type and commercial risk (Walsh, 2012).

Collaborating in international business also is a common practice and it is defined in two formats of formal and informal. In the literature, various terms refer to it such as net, network, cluster, constellations (Chetty & Blankenburg-Holm, 2000) but it is commonly known as network. It is a main intangible resource and could be in different formats: personal, social, official and businesses networks. Many studies put emphasize on the importance of the networks (Chetty & Blankenburg-Holm, 2000; Chetty & Wilson, 2003; Coviello & Munro, 1995; Coviello & Munro, 1997) even with competitors (Chetty & Wilson, 2003) for getting access to required resources and obtain competitive advantage through making trust and reputation. International entrepreneurship literature discuss about networking as a means of international collaboration to compensate limited resources in funding, sourcing, R&D and marketing (Gabrielsson et al., 2008; Laanti et al., 2007). Networks also facilitate international resource development (Coviello & Cox, 2006) and innovation commercialization (Thistoll & Pauleen, 2010). Renewable energy technologies as high-tech and complex technologies increase resource dependencies (Katila, Rosenberger, & Eisenhardt, 2008) between firms in international context i.e. when companies cannot find their required competencies within their current local partners and networks, they are motivated to involve in international networks and partnership to have access to required knowledge (Bjørgum et al., 2013; Løvdal & Aspelund, 2011; Løvdal & Moen, 2013). Drawing upon the required resources and capabilities for entrepreneurial internationalization, we propose that:

> **Proposition 3** Resources and capabilities needed for new energy technologies development, drive renewable energy companies to enter international markets.

Proposition 3.1 Need for financial resources and funding is a driving force for renewable energy firms' internationalization.

Proposition 3.2 Need for technological development and rapid commercialization is driving force for renewable energy firms' international involvement (ex. international commercialization, international sourcing).

Proposition 3.3 The quest for dominant design in industry is driving force for internationalization of renewable energy firms.

Proposition 3.4 Need for resources (technological, financial) that are not available in local environment, encourage entrepreneurial companies in renewable energy to use international networks (personal, formal, or informal) to facilitate resource acquisition.

Proposition 3.5 Need for network resources (channels, required knowledge and technology, financial resources) for product development and fast commercialization drive firms to entrepreneurial internationalization.

The third aspect is business model. Choosing and designing innovative business model affect significantly success of renewable energy companies. Draw on the relevant literature, two factors affect business model decision of entrepreneurial firms in this industry. The first one is the internal factors, which is defined in terms of technological advancement and cost advantage (price).The second critical factor is external factors associated with political, social and institutional factors. Although these two factors mutually facilitate and accelerate renewable technologies advancement, external factors play the prominent role in making decision about proper business model for developing and protecting competitive advantage in the global market. It is suggested that *customer intimacy* business models (Loock, 2012) or *customer-side* business models (Richter, 2012) are more preferable than other types of business models that offer lower price or better technology. However, the concept of business model in development of renewable energies needs further development and in this study we explore its effects. Thus, we propose that:

Proposition 4 In renewable energy, choosing a given type of business model affects positively/negatively the internationalization of entrepreneurial firms.

Proposition 4.1 Choosing customer-driven business model affect positively the internationalization of renewable energy firms.

4.1.3. *Industry*

The third level of analysis is industry. It is part of environmental factors and directly related to the subject of this study which is energy industry. In this study we are interested in all the sectors related to clean energies such as wind, solar, tidal, biofuels, geothermal etc. However, we should consider each of these sectors is at different levels of technological development. Extant literature about IE put emphasize on industrial setting impact on the internationalization of firms (Madsen & Servais, 1997; McDougall et al., 1992; Oviatt & McDougall, 1994, 1997). Some studies related to high-tech

(Kuivalainen, Saarenketo, & Puumalainen, 2012; Majumdar, Vora, & Nag, 2010) and low-tech (Evers, 2011) industries show the influence of different industrial structure on international entrepreneurial firms. Industry characteristics such as industry's degree of internationalization, knowledge intensity and technological intensity affect the internationalization of firms. These industrial variables are described and discussed in Fernhaber et al.,(2007) theoretical framework about IE and industry structure. We can apply this model to understand how these variables impact internationalization of entrepreneurial firms in the renewable energy industry.

The first significant variable is industry evolution. As it is suggested in Fernhaber's model, the growth stage is the most favorable stage for the internationalization of new ventures, because the opportunities are more available, demand grows fast, more room for strategic error, many resources opportunities, and competition is based on innovativeness and uniqueness of new ventures' products and technologies. Moreover, investing in industries at high growth stage is more desirable for venture capitalists. Since this stage, which is considered as growth in multiple countries, provides more opportunities and reduce associated risks. Renewable energy industry is generally defined as emerging industry in comparison with conventional sources of energy (Bjørgum et al., 2013; Løvdal & Neumann, 2011). Though some technologies are more mature than the others (for example wind energy is relatively more mature than wave energy technology), the current market trend shows that there is a high potential for future development of this industry particularly in international markets. Therefore, it is interesting to know how firms internationalize in the emerging stage. Thus, we can propose that:

> **Proposition 5** Favorable industry structure (such as being in the growth phase, high level of venture capital investment, less level of concentration, high knowledge intensity, strong regime of appropriability) affects the internationalization of renewable energy companies positively.
>
> **Proposition 5.1** In emerging renewable energy industries, firms in sectors with higher market potential are more (/less) likely to internationalize.
>
> **Proposition 5.2** In high growth renewable energy industries, firms in sectors with higher level of venture capitalist investment are more likely to internationalize.

The level of firm concentration is the other industry variable that needs to be explained in the context of renewable energy. In this industry, because of standard end-product, which is electricity, we can consider it as concentrated industry with some dominant firms. On the other hand, in this industry there are many start-ups and new ventures, which want to take advantage of new opportunities to generate less expensive electricity. These contradictory characteristics as concentrated and less concentrated industry, shows the necessity of research to explore the effect of industry concentration in renewable energy industry. Thus, we can propose that:

> **Proposition 5.3** Renewable energy industries are high/less concentrated industries with high/less level of internationalization.

> **Proposition 5.4** Renewable energy industries are high/less concentrated industries with high/less level of internationalization and inverted U-shaped relationship.

We can also suggest that renewable energy industry is highly concentrated industry with new ventures that cannot compete with bigger firms based on cost. The strategy of these firms is niche market and product differentiation. Since domestic market for these companies is limited, it is necessary for them to search for larger customer base in international markets. On the other hand, too much concentration can also limit internationalization. Therefore, we can recommend that:

> **Proposition 5.5** Renewable energy industries are highly concentrated, with many new ventures that need to compete based on new technologies differentiation, because of limited domestic market the high level of industry concentration is positively associated with the internationalization of the firms.

Knowledge-intensity of an industry can also affect entrepreneurial internationalization of firms. Knowledge-intensity refers to extent to which firms in an industry makes use of organizational knowledge and learning to gain competitive advantage (Fernhaber et al., 2007). Knowledge provides unique set of resources and capabilities that create competitive advantage and facilitate rapid entrepreneurial internationalization (Autio et al., 2000; Zahra et al., 2003). Results of previous studies in IE show the higher level of internationalization in knowledge-intensive industries such as software industry (Kuivalainen et al., 2012; Majumdar et al., 2010; Moen, Gavlen, & Endresen, 2004; Ojala & Tyrväinen, 2007; Terjesen, O'Gorman, & Acs, 2008). Renewable energy industry is high-tech industry with much technological advancement in all types of energies like solar, wind, and wave energy. Internationalization in knowledge-intensive industry could be defined in terms of propensity of the firms to exploit their inimitable resources and capabilities in a strategic location close to the main partners and customers that foster knowledge creation process (Fernhaber et al., 2007). However, this internationalization pattern is also discernible in low-technology industries such as aquaculture industry (Evers, 2010, 2011) and the positive effect of knowledge-intensity on the internationalization need to be investigated, especially in the renewable energy industry. We can, thus, suggest that:

> **Proposition 5.6** In renewable energy industries knowledge-intensity is positively related to the internationalization of firms (search for proximity to hot spots of technology, willingness to exploit their unique technological advancement.)

Based on institutional theory, mimetic isomorphism is defined as a process of adaptation that basically involves one firm imitates behaviors or characteristics of other firms (DiMaggio & Powell, 1983). This is a common behavior when high level of uncertainty exists and firms imitate less risky behaviors of more established firms. If we compare it to behavior of new ventures in a certain industry, isomorphism mitigates challenges and barriers of recently established firms, when they copy behavior of incumbents. They can also imitate internationalization behavior of incumbent and other firms in their proximity at the same industry (Lu, 2002). Therefore, we can expect that local industry internationalization impact the other firm's internationalization. Hence, we propose that:

> **Proposition 5.7** Local renewable energy industries internationalization affects positively the internationalization of the other firms in the same industry.

The global integration of an industry also affects the internationalization of entrepreneurial firms. Companies in globally integrated industry are more likely to internationalize in order to preserve their competitive position and survive (Fernhaber et al., 2007). Previous empirical studies in IE prove this positive relationship (McDougall, Oviatt, & Shrader, 2003; Shrader et al., 2000). In renewable energy industry, because of the high level of internationalization among the firms, some authors suggest concepts like "born global industry" that refer to high level of global integration of this industry and in this case marine energy (Løvdal & Aspelund, 2011). In this industry better performances of these technologies in desirable geographical locations (for example solar energy in countries with higher level of sun radiation is more favorable) affect the internationalization and market selection of entrepreneurial companies. We can, therefore, suggest that:

> **Proposition 5.8** Global integration of renewable energy industries, affect positively the internationalization of the firms in these industries.

The final factor is regime of appropriability in an industry (Teece, 1986) that range from tight to weak. In tight industry regime of appropriability, it is easy to protect the technology or innovation like pharmaceutical industry, while in a weak industry regime it is almost impossible to protect the technology like service industries. Venture capitals are more likely to do investment in industries with strong regime of appropriability, because the lower risk involved in protection of these innovations. In renewable energy industry level of regime of appropriability depends on the technology, due to the fact that technologies in wind, wave, and solar energies vary from complex ones to easy ones, there is no study that provides this information. Therefore, it needs further investigation to understand the impact of regime of appropriability on internationalization of the firms. Thus:

> **Proposition 5.9** The strong/weak regime of appropriability affects positively/negatively the internationalization of entrepreneurial firms in renewable energy industries, because they have access to more/less financial resource.

4.1.4. *Policy*

Renewable energy is a policy-driven industry and it can foster the development of this industry by creating new opportunities and reducing the perceived risks. All the governments across the world are interested in designing effective policies to encourage the development of these technologies. Best practices such as feed-in tariff are well designed to address the market imperfections and reduce investment costs in this industry. This supportive policy scheme can encourage international firms to look for better opportunities in countries with more policy support. Like a Danish wind turbine company (Vesta) internationalization to the United States (Løvdal & Neumann, 2011; Wüstenhagen, 2003) after a positive policy change in California. However, the impact of these policies for various technologies and in different context would be strong or weak. Although these policies have been successful practices in some countries, their implementation in other countries leads to various outcomes.

Favorable policies can also encourage the development of global renewable energy companies. These policies not only need to support a sizable and stable domestic market, but also to be export-driven. Success story of Chinese companies in PV and Wind industries (de la Tour, Glachant, & Ménière, 2011; Liu & Goldstein, 2013) prove the impact of effective policies in the internationalization of companies. This supportive policy scheme drives international companies to seek new opportunities in a more favorable environment. This is exactly internationalization strategy of companies in marine energy to overcome their industrial barriers: need for capital and supportive political scheme (Løvdal & Neumann, 2011). Both of these internationalizations process are defined in the literature as inward and outward internationalization and the effect of them is reinforcing (Welch & Luostarinen, 1993). Hence, we can suggest that:

> **Proposition 6.1** Supportive political scheme for domestic companies (to create sizable and stable market) positively affect the outward internationalization of renewable energy companies.
>
> **Proposition 6.2** Supportive political scheme affect positively inward internationalization of foreign companies.
>
> **Proposition 6.3** Unsupportive energy policies affect positively outward internationalization of domestic companies to overcome the obstacle of an unfavorable political scheme.

-The problem with competition is that it takes away the requirement to set your own path, to invent your own method, to find a new way.
"Seth Godin" (Author & Entrepreneur)

5. *Methodology*

A distinction should be made between methodology, design, and method. *Methodology* is the philosophical framework that influences the research procedure. The *research design* is a plan of action that connects philosophical assumptions to specific methods, comprising, for example, experimental research, survey research, ethnography, and mixed methods. *Methods* are more specific and refer to the techniques of data collection and analysis, such as quantitative standardized instruments or the qualitative thematic analysis of textual data. The term "investigator" is often associated with quantitative research and "inquirer" is often linked to qualitative research (Creswell & Clark, 2011). In this thesis, we apply both qualitative and quantitative research as *mixed methods* to explore and examine the research questions.

The mixed methods approach is a methodology for conducting research that involves integrating at least one qualitative and one quantitative research method in a study. It is a type of research in which a researcher or a research team combines elements of qualitative and quantitative approaches (e.g., the use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques). Creswell and Clark (2006, p. 5) define mixed methods as follows:

> *"Mixed methods research is a research design with philosophical assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative approaches in many phases in the research process. As a method, it focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone.*"

Some elements of this definition need to be clarified. First, several terms have been used for this approach such as multi-method research, integrated or combined research, quantitative and qualitative methods, hybrid research, methodological triangulation, and mixed methodology (Creswell & Clark, 2006). However, in this study, we use the term *mixed methods research* or *mixed methods*, as recommended by Tashakkori and Teddlie (2002). Second, in talking about quantitative and qualitative data, we consider the close-ended and open-ended nature of data. In this way, we can make a more accurate distinction between quantitative and qualitative data than by only considering the source of data. Moreover, the mixing of data is a key point in this definition. In the literature, three ways of combining data are recommended: merging, connecting, and embedding (Creswell & Clark, 2006). Therefore, simply collecting and analyzing quantitative and qualitative data is not enough, rather we need to mix them in some way to take advantage of them and form a more comprehensive picture of the problems and results. Although the use of both quantitative and qualitative data in mixed methods research takes time and resources, and requires expertise in both quantitative and qualitative methods, the advantages of the approach and the value created are greater than those afforded by a quantitative or a qualitative method per se. According to Creswell and Clark (2006), the advantages of mixed methods includes (i) making up for the weaknesses of qualitative and quantitative research in terms of generalization and contextualization respectively, (ii) providing more comprehensive evidence, (iii) answering double-edged questions in a qualitative and quantitative approach, (iv) encouraging researchers to collaborate in the sometimes complex relationship between quantitative and qualitative researchers, and (v) working with and between multiple paradigms. Finally, it is practical because it allow researchers to choose methods freely to answer research questions.

All the aforementioned advantages and the complexity of research problems call for a new research approach that combines both quantitative and qualitative methods. Such an approach can resolve the drawbacks of each method and it provides multiple forms of evidence to inform practitioners and policymakers.

This approach has been used widely in the social sciences and recently in business studies (Azorín & Cameron, 2010). The complex nature of recent research questions in business and the desire to provide better understanding of a research problem have encouraged researchers to apply methods. However, simply combining qualitative and quantitative research is not *mixed methods* (quasi mixed study): The researcher needs to link the two forms of data and take advantage of all the parts of the study to explain the research results.

5.1. *Philosophical assumptions*

It is necessary for a research design to define and clarify the researcher's philosophical assumptions. In general, there are four worldviews or paradigms for analyzing a phenomenon: post-positivist, constructivist, participatory, and pragmatic (Creswell & Clark, 2006). Some argue that there is only one paradigm that informs mixed methods. For instance, Tashakkori and Teddlie (2002) believe that pragmatism is the only paradigm pertinent to mixed methods. However, others believe that a researcher can accept and adopt one or more philosophical perspectives during the research process, and this enables them to develop an alternative perspective that takes advantage of the strengths of other paradigms. Creswell and Clark (2006b) suggest that there is more than one paradigm involved in mixed methods research and the selection of the paradigm depends on the type of the mixed methods design. For instance, in research moving from a quantitative (e.g., survey) to a qualitative (e.g., case study) approach there may be a paradigm shift from post-positivism to constructivism. It is also possible that the researcher collects both quantitative and qualitative data in the same phase of the project. In this case, the researcher adopts a pluralistic approach and pragmatism best suits the research in terms of answering the research questions by gathering all types of data. Therefore, to clarify the philosophical standpoint, we need to consider the research design and the selection of mixed methods. In the particular case of this study, as it applies *an exploratory sequential design*, the focus shifts from a qualitative exploratory study to a confirmatory quantitative study, suggesting progression from a constructivist perspective to a post-positivist perspective, or according to Tashakkori and Teddlie (2002), a pragmatic approach.

5.2. *Mixed methods research in international business (IB) and entrepreneurship*

As explained previously (cf. Chapter. 3), IE is at the intersection of IB and entrepreneurship. In this subsection, we first explain the application of mixed methods in IB, and then discuss the purpose of using this method in relation to entrepreneurship and IE.

As IB is a multifaceted and relatively new area of research with quite complicated research questions, a narrow or single methodological approach can only partially reveal the reality of the field. Therefore, we need a pluralist approach such as mixed methods to provide a more complete reflection of reality. The literature in IB is dominated by single-method studies (Hurmerinta-Peltom & Nummela, 2006), whereas the mixed methods approach is underrepresented and deserves further attention. The current domination of single-method studies in IB demonstrates that traditional research questions and research designs are not sufficient, rather the complexity of the research questions in IB call for a complex research design with a combination of diverse methods.

The mixed methods approach has scarcely been used in the field of IB. A study by Hurmerinta-Peltom and Nummela (2006) of top IB journals shows that only 68 studies of 484 (approximately 14% of all empirical studies) have used this method. Moreover, the application of mixed methods in IB has largely concerned the data collection phase of study and been undertaken in a sequential manner, i.e., first qualitative and then quantitative. However, the value-added of mixed methods studies increases when this approach is used in the all phases of the research process (initial, implementation, integration, and interpretation).

5.2.1. *Mixed methods in entrepreneurship and IE*

Although the number of mixed methods studies in management research is still limited, amounting to 14.6% in strategic management and 8.1% in entrepreneurship according to Molina-Azorin's (2010) study, this approach has attracted more attention in recent years. One of the main reasons is that this approach provides in-depth understanding of the research subject and it can help to create new knowledge by integrating and interpreting the results of quantitative and qualitative lines of inquiry (Hurmerinta-Peltom & Nummela, 2006). The findings of mixed methods studies in the fields of entrepreneurship and management show higher impact in terms of the number of citations (Azorín & Cameron, 2010).

Mixed methods have rarely been used in the IE field (Coviello & Jones, 2004; Hohenthal, 2007; Hurmerinta-Peltom & Nummela, 2006) and it is dominated by the quantitative studies (Hohenthal, 2007; Jones & Coviello, 2005). However, there are several reasons why mixed methods are a better methodological approach than others. According to Hohenthal (2007), as IE is a new perspective on the early internationalization phenomenon, the mixed methods approach is more suitable in theoretical studies in this field. Moreover, as this study integrates different fields of research, i.e., IB, entrepreneurship, and sustainability, the mixed methods approach is appropriate.

To attain a comprehensive understanding of the area under discussion, in this study we apply quantitative and qualitative methods. This combination could assist us in capturing the dynamic entity of IE and the internationalization process of renewable energy. Moreover, as with most studies on IE (Coviello & Jones, 2004) and IB (Wright & Ricks, 1994), the main focus is at the company level. However, to gain a better understanding of the phenomenon, we also focus on the industry context, policy, the entrepreneur level, i.e., we adopt a multilevel approach. These four levels partly overlap: entrepreneurs are part of the firm, firms are part of the industry context, etc. Nonetheless, it is useful to treat these as separate units of analysis at the analytical level. In what follows, we focus on the sequence of the three phases of the study design.

5.2.2. *Mixed methods case study*

IB researchers have not fully employed mixed methods in case study design (Hurmerinta & Nummela, 2011), although a mixed methods design can increase the validity of case study research. This approach provides deeper understanding of the phenomenon under study and it can create new knowledge (Hurmerinta-Peltom & Nummela, 2006). The application of the case study approach using mixed methods has been limited. Indeed, less than 20% of all mixed methods studies in IB are case studies. These cases are mainly multiple cases and exploratory in nature, with the predomination of quantitative elements and qualitative data playing a supportive role (Hurmerinta & Nummela, 2011).

In mixed methods case study design, two main research strategies have been distinguished (Hurmerinta & Nummela, 2011). The first strategy is *compartmentalization*. Case studies in this strategy are considered to comprise a separate part of a larger study, analyzed separately. Although we can define cases as an independent part of a research project, the integration of the results with the later phase of the study and their joint interpretation can significantly increase the *value-added* of the mixed methods. These characteristics have made this strategy suitable for exploratory studies in a new empirical context or in the case of underdeveloped theoretical constructs. The second strategy is the *aggregated strategy*. Mixed methods can be applied within a case or multiple cases. A range of data are integrated and jointly interpreted within a case or cases, and data collection and analysis are implemented in parallel. A variety of research designs can be assumed with this strategy. The main advantage is that it can provide deeper understanding of the research subject. Moreover, it can be used in a more coherent manner than others. The first strategy, compartmentalization, provides a closer fit to the aims of this study because the first phase of the study is exploratory. Although the separation between the two phases of the study may cause some challenges, such as the underutilization of the qualitative aspect, this can be overcome by the full application of the case studies, including data integration and the joint interpretation of the results in the final phase.

5.3. *Mixed methods design*

As previously mentioned (cf. Chapter.1), in this thesis, we intend to answer both exploratory and theory-testing research questions. Thus, the mixed methods approach is a suitable research design. The next step is to decide which specific research design best fits the problems and research questions. Various major mixed methods designs have been introduced, each with their own history, philosophy, purposes, considerations, and challenges; thus, researchers should choose between such designs, selecting that best suited to answer the research problem. The mixed methods design of this research is based on the following four considerations (Creswell & Clark, 2006):

1. This study adopts a fixed mixed methods design as the most appropriate for exploring different aspects of IEE as a new field of research, then ameliorating concerns regarding the trustworthiness of the findings and generalizability by testing the findings and conceptual framework.

2. As we are new to designing and conducting mixed methods research, a typology-based study design is more appropriate than a dynamic approach because it provides a guiding framework for selecting from design choices. With a typology-based study design approach, we can choose between well-defined designs that facilitate the process of addressing the research problem, and anticipating and resolving challenging issues during the study.

3. In designing a mixed methods study, we should take into account the research problem, purpose, and questions. As the research subject is a new line of research, first we start with an exploratory study to determine the most significant factors in the internationalization of renewable energy firms. Then, we testify to the trustworthiness and generalizability of the results through a quantitative study. Therefore, according to the research problem, we articulate research questions and then design the research based upon the questions.

4. We should express explicitly the reasons for mixing quantitative and qualitative methods in the study. There are number of reasons for wishing to mix quantitative and qualitative data in this study. Greene, Caracelli, and Graham (1989) suggest that triangulation, complementarity, development, initiation, and expansion are the main reason for applying mixed methods. According to Bryman (2008), there are 16 reasons for implementing mixed methods design, including: offsetting weaknesses in processes, sampling, credibility, context, unexpected results, instrument development, explanation, completeness, greater validity (triangulation), having different research questions, illustration, utility, confirmation and discovery, diversity of views, enhancement, and building upon quantitative and qualitative findings.

5.4. *Designing a mixed methods study*

Mixed methods research consists of two major strands: qualitative and quantitative. Each strand consists of the basic processes of conducting quantitative or qualitative research, such as questions, collecting data, analyzing data, and interpreting the results based on the data (Teddlie & Tashakkori, 2009). In designing a mixed methods study, we should define how these two research strands relate to each other. According to Creswell and Clark (2006), four key decisions should be made in mixed method design: (i) the level of interaction between the strands, (ii) the relative priority of the strands, (iii) the timing of the strands, and (iv) the procedure for mixing the results. According to these parameters, several mixed methods designs have been defined by researchers in different fields of study. Considering all these factors and taking into account the research problem and questions, the *sequential exploratory design* fits this study very well. First, it makes it possible to maintain a significant level of interaction between the two strands. In addition, although we do not consider prioritizing one strand – quantitative or qualitative – over the other, because this study is a new field of research, carrying out the qualitative phase in advance makes it possible to explore different aspects of the study in the first phase. Consequently, the sequencing of the qualitative and quantitative parts is important in the research design.

Moreover, the point of interface and the mixing strategy are two key decisions that have to be made in a mixed methods design. In this study, we focus on mixing in the interpretation and design. Mixing during interpretation is a strategy common to all mixed methods design as it permits reflection on the combination of the methods in the final interpretation.

5.4.1. *Major mixed methods designs*

As previously explained (cf. Section 5.4), a researcher working with mixed methods should decide on the available options in design, such as the level of integration, priority, timing, and mixing. There are various research designs according to the researcher's preferences and design options. Of these, there are six major designs that are commonly used in practice: (a) the convergent parallel design, (b) the explanatory sequential design, (c) the exploratory sequential design, (d) the embedded design, (e) the transformative design, and (f) the multiphase design. These predefined designs provide a useful framework and research guide, and assure that the researcher achieves a certain level of rigor, persuasiveness, and quality.

Deciding between typology-based designs depends on the research purposes, problems, and questions. Based on the research questions and purposes, the *exploratory sequential design* is the best fit to the study (Figure 5.4.1). This method is carried out sequentially, and it starts with qualitative data collection and analysis in the first exploratory phase. It needs to be followed by a quantitative study in phase two, drawing on phase one. Due to the novelty of the research subject in this study, emphasizing the exploratory phase in the beginning assisted in discovering various aspects of the research problem, developing a guiding framework or theory, and identifying important variables. Then, based upon the results of the exploratory study, we conducted a quantitative phase to examine and generalize the findings from the first phase of the study. These two phases of the study are not independent and we took advantage of the exploratory phase to construct the theoretical framework for the second phase of the study. Thus, the interaction between these two phases is essential: The primary source of the interface between these two phases is in data collection, in which the researcher can connect qualitative data analysis to the quantitative data collection. From the philosophical point of view, multiple paradigms (or worldviews) are reflected in this design, denoted by a shift from constructivism in the first phase to post-positivism in the second phase (Creswell & Clark, 2006a).

The rationale for this design is to generalize the qualitative findings to a larger sample in the quantitative part of the study. Moreover, the results of the first phase can develop and inform the quantitative method (Greene, Caracelli, & Graham, 1989). The other important issue is that in this design we also emphasized the first phase, which is exploratory. As our line of research is new and interdisciplinary, the exploratory phase is necessary to identify a guiding framework and discover unknown variables and measures.

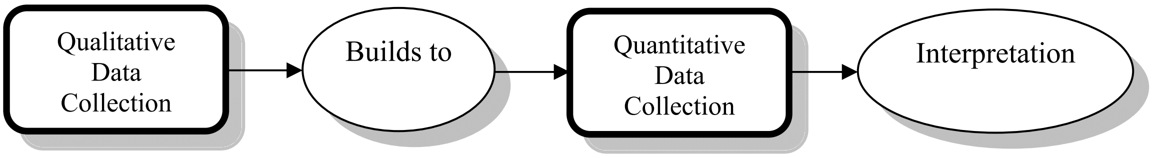

Figure 5.4.1 The Exploratory Sequential Research Design (Creswell & Plano Clark, 2011)

5.5. *Applying an exploratory design*

According to Creswell and Clark (2006), there are four main steps in exploratory research design (Figure 5.5.1). The first step is qualitative data collection and analysis. The next step is the point of interface in which we use results of the qualitative phase to identify the unknown variables and propose a theoretical framework. In this step, we connect the initial phase to the subsequent quantitative part of the study. We implement the quantitative analysis in the third step to test the most important variables and theoretical framework. The last step is to interpret the generalizability of the quantitative results by taking into account the initial qualitative findings. There are two aspects of the exploratory design that need to be clarified:

- Theory development: This entails more emphasis on the qualitative strand, then testing the theory with a larger sample in the quantitative phase.
- Instrument development: This focuses more on the quantitative aspect of the study, with the qualitative phase playing a secondary role in gathering information to build a quantitative instrument.

Step 1

Design and Implement the Qualitative Strand:

- State qualitative research questions and determine the qualitative approach.
- Obtain permissions.
- Identify the qualitative sample.
- Collect open-ended data with protocols.
- Analyze the qualitative data using procedures of theme development and those specific to the qualitative approach to answer the qualitative research questions and identify the information needed to inform the second phase.

↓

Step 2

Use Strategies to Build on the Qualitative Results:

- Refine quantitative research questions or hypotheses and the mixed methods question.
- Determine how participants will be selected for the quantitative sample.
- Design and pilot test a quantitative data collection instrument based on the qualitative results.

↓

Step 3

Design and Implement the Quantitative Strand:

- State quantitative research questions or hypotheses that build on the qualitative results, and determine the quantitative approach.
- Obtain permissions.
- Select a quantitative sample that will generalize or test the qualitative results.
- Collect closed-ended data with the instrument designed from quantitative results.
- Analyze the quantitative data using descriptive statistics, inferential statistics, and effect sizes to answer the quantitative and mixed methods research questions.

↓

Step 4

Interpret the Connected Results:

- Summarize and interpret the qualitative results.
- Summarize and interpret the quantitative results.
- Discuss to what extent and in what ways the quantitative results generalize or test the qualitative results.

Figure 5.5.1 Flowchart of the procedures in implementing an Exploratory Design (Creswell & Clark, 2006a)

5.6. *Qualitative research: exploratory case study*

To understand how and why different factors at multiple levels of analysis affect the internationalization of renewable energy companies, case study methodology was selected for this research. As empirical studies on the entrepreneurial internationalization of firms in this emerging industry are scarce, we adopted a method to gather rich and in-depth data (Yin, 2009). Moreover, the nature of the research questions and the novelty of the subject at the intersection of IE and sustainable entrepreneurship necessitate the choice of an exploratory methodology and approach. The choice of multiple data sources through the nine cases allowed triangulation and enhanced the construct validity of the study (Greene, 1990).

5.6.1. *Case selection*

Following Eisenhardt (1989), we employed a multiple case design with nine entrepreneurial companies in the renewable energy industry. The firms were selected using *purposeful/theoretical sampling* based on Patton (2002) and Yin (2009). This mode of sampling made it possible to collect the required data from individuals and companies with experience of the phenomenon of entrepreneurial internationalization in the renewable energy industry. According to Creswell (2008b), this strategy for selecting the cases constitutes maximal variation sampling, enabling triangulation of the informants by including different persons with various perspectives on the central phenomenon of the study. It also provides useful data for comparative analysis between the firm cases. In this method, as much differentiation as possible is required to make systematic comparisons between the cases. To maximize the differences, we tried to choose different informants and cases. For informants, we selected eco-entrepreneurs, energy experts, institutions that support internationalization and renewable energy development, and energy policy authorities.

To select appropriate cases, we used a database containing companies in ACCIO, ICAEN, and Kic InnoEnergy.[4] These institutions principally support new businesses and start-ups in the renewable energy industry, which ensures that the firms in the sample are engaged in entrepreneurial activities. Based on the field of study and also the IE literature, our criteria for selecting these companies were: (1) being active in the renewable energy industry, (2) being entrepreneurial (engaging in international new ventures), and (3) being engaged in international activity (at least in the first five years of activity). Moreover, to creating maximum variation between the cases, companies of different size, age, and level of technological development were selected. We sent more than 50 invitation letters to senior managers and entrepreneurs, and finally we succeeded in conducting interviews with nine companies.

[4] KIC InnoEnergy is an international institution that assists small companies to commercialize their ideas concerning renewable energies and its partners are ESADE, Gas Natural Fenosa, Institut de Recerca de l'Energia de Catalunya (IREC), Instituto Superior Técnico de Lisboa (IST), Universitat Politècnica de Catalunya (UPC), Iberdrola, Centro de Investigaciones Energéticas y Medioambientales (CIEMAT), and Tecnalia and Energía de Portugal (EDP), among many other institutions and universities in Europe.

5.6.2. *Data Collection*

To gain in-depth information concerning the central topic of the thesis, we used nine case studies and eighteen interviews. As is shown in Table 5.6.2.1, we undertook interviews with entrepreneurs and policymakers. We used several sources of primary and secondary data from the case interviews, and also the information available from the websites of the case study firms and institutions.

The sample population for the study comprises entrepreneurial Spanish firms with international activity in the renewable energy sector. This is an emerging and sustainable industry with a high level of international integration. Both primary and secondary sources of data were collected and construct validity was established based on the principles of triangulation (Yin, 2009). A series of individual in-depth interviews were conducted with entrepreneurs based on the procedure outlined by Eisenhardt (2007) and Yin (2009). The interviews were specially designed to address entrepreneurs and the international activity of the company based on semi-structured questions and face-to-face interviews. These were conducted by the corresponding author in each firm and through follow-up telephone interviews. Each interview lasted between 60 and 100 minutes, sometimes with more than one interviewee at the same time. Interviewees were mainly entrepreneurs, CEOs or senior managers. The interviews were recorded and transcribed, and a database was created to ensure the validity of the data. Altogether, more than 25 hours of recordings and around 230 pages of transcripts were collected in 2014. After the interviews, we sent a copy of the transcripts and case reports to the interviewees to check for any possible errors, and ensure the validity and authenticity of the data collected. The data collected were also triangulated with information from multiple sources of evidence from observation and secondary sources of information, such as online information and reports, the websites of the companies, news releases, material introduced by informants (e.g., company brochures, internal memos, archival data, etc.) to increase the validity of the study (Yin, 2009).

Table 5.6.2.1 Data collection table-Interviews

Company	Affiliation	Date	Time of Interview	Location	Duration of Interview	Sources of data			
						INTW	Website	Brochure & Docs	Other
e-consultant	Entrepreneur and RE Expert	18/04/2014	12-1:30	Company-El Masnou - Barcelona	1h30min	yes	yes		
ACCIO	Expert and renewable energy project adviser	01/04/2014	10-11:15	ACCIO Head quarter-Barcelona	1h20min	yes	yes	Yes	
Energea	Entrepreneur and CEO	02/04/2014	12:00-13:15	UAB-Dept. of Business	1h15min	yes	yes		
ACCIO	Internationalization deputy of ACCIO	14/04/2014	13:00-14:00	ACCIO Head quarter-Barcelona	1h	yes	yes		
ICAEN	Head and Deputy Manager of Renewable Energy Department	25/04/2014	10:00-12:00	ICAEN Head quarter Barcelona	2h	yes	yes		Document
Alstom	Head of Electrical Systems en Alstom Wind	23/05/2014	11:15-12:00	Alstom Wind Headquarter-Barcelona	45min	yes	yes	Yes	
Vidurglass	Technical and Sales Manager at VIDURSOLAR	28/05/2014	12:20- 1:35	UAB-Dept. of Business	1h15min	yes	yes		
Opendomo	Chairman and Int. Sales in	29/05/2014	12:25 - 1:15	Sant Juan-Advance	45min	yes	yes		

Table 5.6.2.1 Data collection table-Interviews

Company	Affiliation	Date	Time of Interview	Location	Duration of Interview	Sources of data			
						INTW	Website	Brochure & Docs	Other
	OpenDomo Services			Building					
Solartys & Accio (R&D Expert)	Cluster Manager and Project Manager (International R&D Services at ACCIO)	11/06/2014	15:00-16:30	Soalrtys Head Quarer-Barcelona	1h54min	yes	yes	Yes	Documents
Watly	CEO and Founder	17/07/2014	17:00-18:15	Skype	1h20min	yes	yes	Yes	
Alstom	Product Manager, Marketing and Sales	18/07/2014	14:30-15:30	Alstom Wind Headquarter-Barcelona	1h8min	yes	yes	Yes	Slides
Smalle Technologies	CEO and Founder	22/07/2014	11:00-12: 20	UB- Dept. Physics	1h20min	yes	yes		Slides and Docs
Tecnoturbines	CEO and Founder	23/07/2014	16:30 - 17:50	Esade-Acrea Polis	1h2min	yes	yes	yes	
Mira-Enerrgia	CEO and Founder	12/08/2014	18:00- 19:30	CCCB-Barcelona	1h22min	yes	yes	yes	Slides and Docs

5.6.3. *Data Analysis*

As recommended in mixed methods research (e.g., Creswell & Clarck, 2006), we needed to develop an instrument or typology based on the results of the qualitative part of the study to be tested and generalized through quantitative data collection and analysis. In this study, we intended to analyze the data using two methods: (i) analysis of the qualitative data in MAXQDA software, using themes, codes, and quotes to develop an instrument; analysis of the quantitative data using descriptive statistics to determine the relative importance of the different dimensions. Eventually, we employed structural equation modeling (SEM) using partial least squares (PLS) to identify causal relationships between the items, which we tested and generalized through inferential statistics.

For the qualitative analysis, we archived the interview transcripts and all the secondary sources of information for all the case studies in a database. We coded and analyzed all these data using MAXQDA software. This software allows the storing, analysis, and coding of qualitative data, and assisted us in the process of data exploration, management, and the discovery of patterns in the unstructured dataset.

In our data analysis, we looked at the internationalization of renewable energy companies from different perspectives. We explored the barriers to and causes of internationalization from different aspects, such as lack of resources and capabilities, rapid commercialization practices, business model selection, eco-entrepreneurs' philosophical standpoints, industry structural factors, and policy in different countries. We also explored the interaction between small and large firms in the process of internationalization. We applied both deductive and inductive approaches in our analysis to provide a better interpretation of the cases in their context and greater understanding of the meaning of each theoretical construct (Sayer, 1992). The analysis as a whole and facets extracted were guided by the research questions, propositions, and themes emerging from the data.

We applied both within-case and cross-case analysis. Within-case analysis involves the description of each case within its context. This analysis is an essential part of delving into each case to allow for better understanding and insights. Eisenhardt (1989, p. 540) comments that "this process allows unique patterns of each case to emerge, before investigators push generalized patterns across cases." In the cross-case analysis, we conducted analysis and interpretation across multiple cases. In this part of analysis, we selected constructs and dimensions, and then inspected the similarities and differences within and between groups (Bourgeois & Eisenhardt, 1988). The results of these analyses are presented in the next chapter.

5.7. *Quantitative research: online survey and PLS-SEM analysis*

5.7.1. *Online survey*

To ensure construct validity and confirm the qualitative results in this study, we employed a survey. The input provided by the insights from the exploratory case studies in the questionnaire development was a crucial part of data collection. Primarily due to the novelty of the topic – IE and sustainable entrepreneurship – and the limited number of studies on clean technologies, the results of the qualitative research helped us inductively to develop particular research hypotheses related to policy, eco-entrepreneurs, and firm-level factors. They also helped us adjust some existing hypotheses at the industry level (Fernhaber et al., 2007). However, in the questionnaire development process, we did not rely solely on the inductive qualitative results (Yin, 2009). The IE and sustainability literature in particular contributed to ensuring the validity and reliability of the constructs.

After designing the questionnaire, we refined it based on feedback from academics, and also renewable energy experts and managers. After changing the layout and the questions, the survey was piloted with the assistance of five managers working in the renewable energy industry in Spain. As the questionnaire was designed in Spanish and English, we also checked the accuracy of the translation between the two languages with the managers. The pilot testing was conducted between February and March 2015. This enabled us to establish whether there were problems in wording of the questions and we asked the respondents if they had any problems understanding the items. The final web-based survey was 9 pages long and comprised 35 questions in different formats: open-ended questions, choice questions, and five-point Likert-scale items. Despite its length, it was still within the limits of a manageable survey (Dillman, Smyth, & Christian, 2014). The questionnaire contained six parts: profile of the company, entrepreneur, technology, internationalization, policy, and industry. As the questionnaire was rather long, to increase the response rate and avoid the respondents becoming bored, we reduced the complexity of the questions by applying several types of questions in different formats, and we designed it in a two main colors, white and green. To increase the credibility of the survey, we applied the UAB logo.

We prepared an email list based on *El Instituto para la Diversificación y Ahorro de la Energía* (IDAE),[5] *ENPI-CBCMED* project contacts, and personal contacts from the *Genera*[6] *fair* held in Madrid in February 2015. This was important to select a representative sample. Therefore, the most important source of data for finding renewable energy companies in Spain was the IDAE online corporate directory. In this database it is possible to search for companies according to the company name, company type, technology area, services, product commercialized, and location. However, as this database is not always updated, we also contacted managers and entrepreneurs who participated in the *Genera* fair, the largest renewable energy fair in Spain. Based on these two sizeable directories and also personal contacts with companies through the *ENPI-CBCMED* project, we constructed a large dataset containing all the managers and entrepreneurs working on all types of renewable technologies, including: bio-fuels, biomass and residuals, energy efficiency, geothermal, wind power, hydrogen and fuel cells, photovoltaic solar energy, solar thermal energy, solar thermal electric energy (except traditional hydraulic power turbines). This database incorporated around 1100 email addresses. Given this population, with a ±7%

[5] http://www.idae.es/
[6] http://www.ifema.es/genera_06/

precision level and a 95% confidence level, a sample of at least 166 companies is required.[7]

The collection of data began in June–July 2015 by emailing the questionnaires, and included two more reminders in August and October 2015. We sent the emails to key informants, such as entrepreneurs, CEOs, director managers, and senior managers. These emails included a cover letter explaining the survey objectives, the beneficiary institutions, and privacy issues. The emails were customized according to the respondents' names and companies, with the names and contact information of the responsible researchers, and the university address and phone numbers. These practices have been shown to increase the credibility of surveys and increase respondent confidence (Dillman et al., 2014).

Finally, we checked the data for non-response bias. In doing so, we compared the three waves of responses. ANOVA and F-statistic tests revealed no significant differences between the three groups of responses (Armstrong & Overton, 1977). This result suggests that bias is not a problem in this study. To test the representativeness of the sample, responding and non-responding companies were compared based on their age and size. T-tests showed no significant differences between the two groups of companies.

One of the main challenges in conducting a survey is increasing the response rate. In this study, we employed several methods to increase the response rate, such as finding the personal contacts of managers and entrepreneurs (form *Genera*), making direct contact with respondents, sending two reminder emails, assuring respondents' anonymity, and a lottery. However, we expected a low response rate because in this study a high level of organizational representative is required (Baruch, 1999). In addition, response rates vary in different countries. In particular, the response rate is lower in the south of Europe than in the north of Europe and North America (Dawson & Dickinson, 1988). In this study, after sending 1100 emails to the whole population of companies that we found, around 213 emails bounced because of expired email accounts or companies having closed down. In total, from 887 valid email addresses, we received approximately 272 complete questionnaires. This result shows a response rate of 31%, which is good in the context of Spain where the response rates are normally low.

Finally, it is important to show the profile of the participating companies in this survey. Specifically, this is represented by the total respondents' position (Table 5.7.1.1), size (Figure 5.7.1.2), technology (Figure 5.7.1.3), as well as born globals and non-born globals (Figure 5.7.1.4), and ownership (Figure 5.7.1.5). The descriptive statistics of Age and Size are also reported in table 5.7.1.2. Moreover, our results show that around 98% of respondent companies are established in Spain.

[7] Sample size calculated using the following equation: $\mathbf{n= N/1 + N (e)^2}$, where n = required sample size, N = size of population, and e= level of precision or sampling error.

Table 5.7.1.1 Distribution of respondents by position

Position	Frequency	Percentage
Founder	161	43.51
CEO	60	16.22
Technical Manager	64	17.3
Commercial Manager	85	22.97
Total	370	100

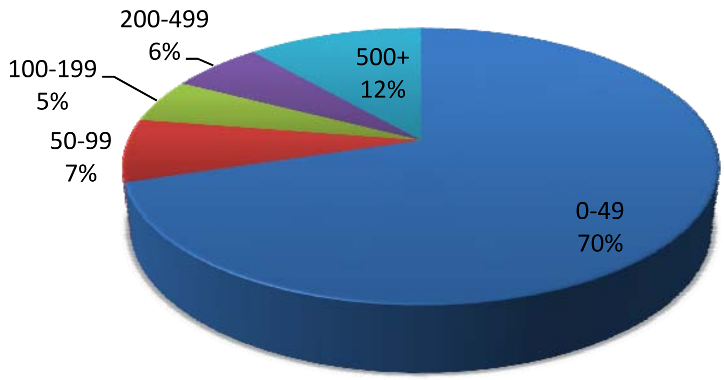

Figure 5.7.1.2 Distribution of firms sample by size

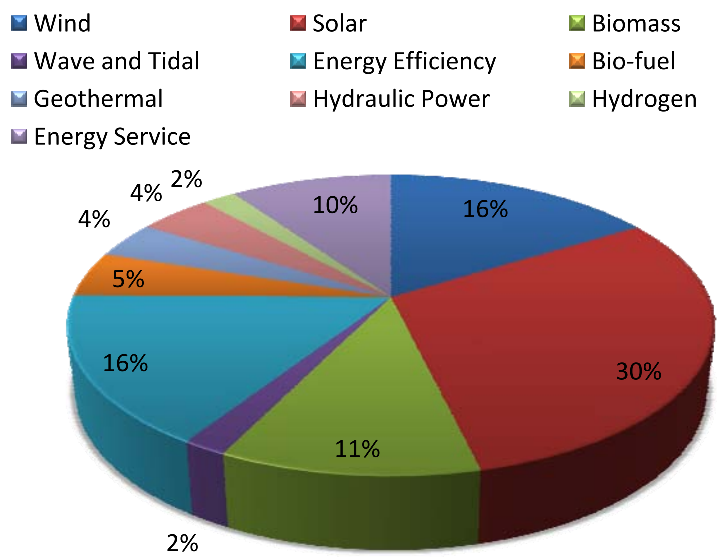

Figure 5.7.1.3 Distribution of firm's sample by technology

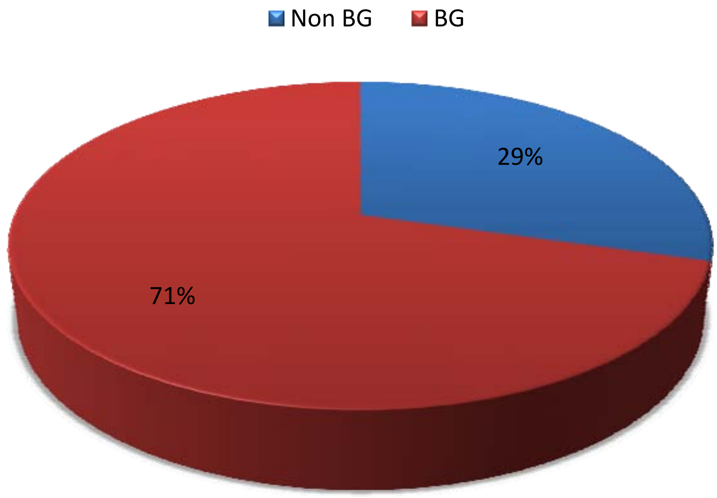

Figure 5.7.1.4 Distribution of firms' sample by born globals and non-born globals

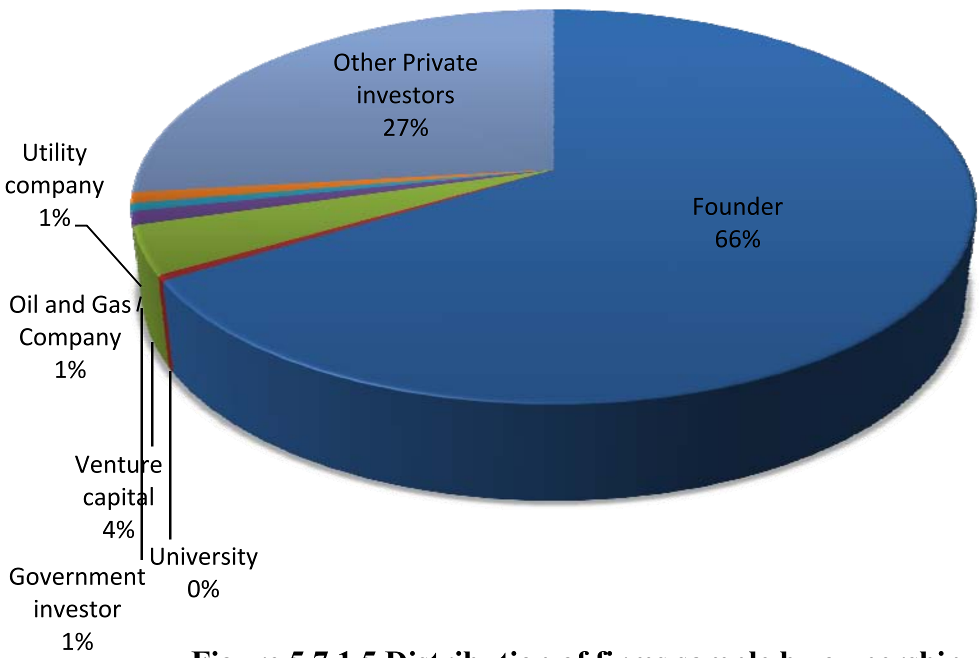

Figure 5.7.1.5 Distribution of firms sample by ownership

Table 5.7.1.2 Distribution of respondents by position

	Range	Minimum	Maximum	Mean	Std. Deviation
Age	75.00	0.00	75.00	13.1199	14.67145
Size	30000	0.00	30000	881.28	3986.308

5.7.2. *Applying PLS-SEM*

In survey-based IE researches, the dominant analytical approaches are regression and M/ANOVA, while SEM has scarcely been used in the literature (Coviello & Jones, 2004). PLS-SEM is an ordinary least squares (OLS) regression-based estimation technique within SEM. There are several reasons for using PLS. Some researchers believe that PLS is a useful method for small sample sizes and when the data base does not follow normal distribution. Other researchers suggest the use of PLS for complex models that AMOS cannot handle or when the sample size is small (Hair, Hult, Ringle, & Sarstedt, 2014). However, the main justification for using PLS over AMOS is that it affords the development of measurement models based on formative and reflective constructs. Moreover, applying interactions and moderators in the model is easier in PLS than in covariance-based methods like AMOS.

5.7.3. *Data preparation*

There are several issues that we need to consider before analyzing our data with the PLS-SEM method. Based on our research questions, we designed our measurement scales as continuous scales and Likert scales. As Hair et al. (2014) suggest, Likert scales should be symmetric and equidistant, thus behaving more like an interval scale, enabling the corresponding variables to be used in SEM. Therefore, we used five-point Likert scales in our study. Regarding the sample size, although some researchers believe that sample size is not significant in PLS-SEM analysis (Barclay, Higgins, & Thompson, 1995), we should apply OLS regression principles to measure the minimum sample size requirement based on the number of arrows pointing to a construct and the significance level. For example, the optimal sample size for 10 indicator variables at a 1% of significance is between 64 and 256 when the R^2 varies between 0.10 and 0.75 (Hair et al., 2014). Our data fulfill this requirement perfectly.

Moreover, PLS-SEM normally makes no assumption about the data distribution. However, based on Hair et al.'s (2014) suggestion, we checked the normal distribution of the data before entering them in our analysis. Two important tests are recommended to check the normality of data: the Kolmogorov–Smirnov test and the Shapiro–Wilk test. We checked the data for normal distribution in *STATA*, and in the case of the age and size of the company, we used the *Log* because the data were positively skewed. In the case of speed of internationalization speed, the data exhibited high kurtosis. To address this problem, we used specific transformations to normalize the data distribution to a greater extent.

The other important issue that we need to take into account before undertaking the analysis is that the number of missing values per observation should not exceed 15%. A proportion of missing values less than 5% can be treated with mean replacement or imputation. The last point before starting the analysis is related to the single-item indicators. Under specific conditions, we can use single-item measures. Hair et al. (2014) proposed that single-item measures are suitable in the case that the population being surveyed is small. Moreover, for single-item measurement we do not need to define whether the measurement model is reflective or formative.

5.7.4. *Structural models and measurement models*

The initial phase in PLS-SEM is to define the structural and measurement models. The *structural model* (or path model) connects variables/constructs based on theory and logic. This model visualizes the hypotheses that will be tested in the study. In this study, based on the theoretical models, current literature, and results of the qualitative analysis, we prepared diagrams showing the relationships between the main theoretical constructs. This includes theoretical constructs at the eco-entrepreneur, firm, industry, and policy levels.

The *measurement model* shows the relationships between the constructs and their corresponding indicator variables. Hypothesis testing is only reliable and valid when the measurement model justifies how the constructs are measured. This model can be developed based on published frameworks or scale handbooks. In this study we developed measurement models based on previous studies, the theoretical framework, and our research findings from the qualitative part of the study.

5.7.5. *PLS model analysis*

After designing the structural model and defining the measurement models, we need to analyze and interpret the results of the PLS model. The analysis and interpretation of the results is a two-step process. First, we assess the reliability and validity of the two types of measurement models, i.e., *formative* and *reflective* models. The second step is general evaluation of the structural model. In what follows, we describe these two steps.

To evaluate the measurement models, we should distinguish between the reflective and formative models. Internal consistency, reliability, and validity are the used to assess a reflective measurement model. That is, specific measures, including composite reliability, convergent validity, and discriminant validity, are applied in this measurement model. For formative measurement models, we apply content validity before collecting the data and convergent validity after the model estimation.

5.7.5.1. *Analysis of reflective measurement models*

In this study we followed three steps to evaluate the reflective measurement model including: internal consistency, individual indicator reliability and average variance extracted (AVE). For *internal consistency reliability* instead of traditional *Cronbach's Alpha*, we applied *composite reliability* which is better estimate of reliability. The analysis of the composite validity is similar to *Cornbach's Alpha* and the final result of this assessment varies between 0 and 1. Values in a range of 0.6 to 0.7 are acceptable, 0.7 till 0.9 are satisfactory, and over 0.9 are skeptical and below 0.6 show the lack of internal consistency. For *convergent validity* we consider the *outer loading* of the reflective indicators and *average variance extracted* (AVE). A rule of thumb suggests that the outer loading should be 0.7 or higher (Hair et al., 2014). Outer loadings lower than 0.4 should be removed and between 0.4 and 0.7 should be eliminated only when deleting the indicator improves the composite reliability and AVE. *Average Construct Extracted* or *AVE* is a criterion equivalent to communality of a construct. The value of

AVE should be higher than 0.5 and it shows more than 50% of the variance in the indicators are explained by the construct.

The last step is *discriminant validity* analysis. Discriminant validity measure to what extent a constructs is different from the others. We can measure discriminate validity by examining the cross loadings or applying Fornell-Lacker criterion. For establishing the discriminant validity, the square root of each construct's AVE must be higher than its correlation with other constructs.

5.7.5.2. *Formative measurement model analysis*

One of the strong points of the PLS-SEM is the distinction between the reflective and formative models analysis. In formative measurement models indicators are independent causes for the constructs and thus the indicators are not necessarily correlated highly. In this measurement models, formative indicators are considered error free (Diamantopoulos, 2006; Edwards et al., 2000), It means that we cannot apply similar measurement methods as reflective models to assess the formative models. Evaluating formative models are implemented through *content validity*, *convergent validity*, *collinearity*, and *bootstrapping*.

Content validity requires formative indicators show all or major facets of a construct. For example, we considered industry structure and IE as formative because of the distinctive characteristics of these constructs as reflective measures and also because of the theoretical grounding. Industrial factors are formative, drawing upon the current studies at the industry level (Andersson, 2004; Fernhaber et al., 2007; Zahra & George, 2002). IE is also considered as formative based on the seminal IE's model proposed by Zahra and George (2002).

The first practical step in evaluating formative measurement models is *convergent validity*. In this method we measure the correlations between the indicators of the same construct. The second step is assessing the model for *collinearity* issues. Existence of high correlation between the two indicators can be problematic in formative measurement models. This problem cause serious problem in estimating the weights and statistical significance (Hair et al., 2014). The common methods to evaluate the collinearity are *variance inflation factor* (VIF) and *tolerance analysis*. Tolerance value higher than 0.20 or VIF value of 5 and higher indicates a potential collinearity problem (Hair, ringle, sarstedt, 2011). Solutions for collinearity problem are eliminating the indicator with high level of collinearity, combining the indicators, or considering higher-order constructs. The third step is assessing the contribution of indicators in outer weight. By comparing the outer weight of the indicators we can decide about the contribution of each indicator to the construct. In this step *bootstrapping* calculate *t* values to assess the significance of each indicator. Making decision about retaining formative indicators is based on the indicator outer weight, outer loading and the significance test with bootstrapping. When both outer weight and outer loading are not significant, there is no reason to keep an indicator in the model and it should be removed.

5.7.5.3. *Evaluation of the structural model*

After measuring and assessing the reflective and formative constructs, the final step is structural model assessment. The results of this part confirm the theory/concept that we applied in our model and it represents how well our data support our path model. The evaluation of the structural model can be done in several steps. The first step is checking the collinearity between each set of predictor variables with VIF level less than 5.00. The second step is calculating path coefficients after running the algorithm and it show the hypotheses relationships between the constructs. Value of path coefficients is between -1 and +1 and it represents strong negative and positive relationship between the constructs respectively. By bootstrapping and calculating empirical *t* values we can determine the significance level of coefficients. We can also support these results by reporting the p-values. Next step is evaluating coefficient of determination or R^2. This is the most common measure for evaluating the structural model. This measure shows the model predictive accuracy. This value also represents the number of variance in the endogenous construct explained by exogenous constructs that are associated with it. R^2 value is in a range of 0 to 1 and the higher values show the higher level of predicative accuracy. However, one of the inherent limitations of R^2 is that it is biased when many exogenous constructs exist. Therefore, selecting models only based on R^2 is not accurate and we need to determine it with Adjusted R^2 which is corrected according to the sample size and number of exogenous latent variables. The last two steps for assessing the path models are designed according to the model specifications. In effect size F^2 analysis we check the structural model by excluding or including an exogenous construct and we compare the results through effect size. Last step of assessment is about blindfolding procedure and predictive relevance Q^2. This measure indicates the predictive relevance of the model but this method cannot be used for formative endogenous constructs. Thus the blindfolding procedure is applied to endogenous reflective constructs and endogenous single-item constructs. Q^2 Value more than 0 shows the predictive relevance of the model while Q^2 value of 0 and less than zero suggest a lack of predictive relevance. However, in many empirical studies in this field of study (entrepreneurship and international business) two basic indicators: variance explained (R^2) and the path coefficient (β) are applied to evaluate the structural model (Acedo & Jones, 2007; Moreno & Casillas, 2008).

5.7.5.4. *Mediator and moderator analysis*

It is sometimes confusing to make distinction between the mediation and moderator analysis. In PLS-SEM method we can distinguish these two models easily and analyze the results based on these two models. In mediation models we examine the mediating effect of one cause-effect relationship. The important point in defining mediating effect is theoretical support for this effect. Baron and Kenny (1986) define the following conditions to assess the mediating effect:

- Variation in the level of the independent variable account significantly for the variation in the designed mediator. Although this condition is not necessary, it makes the analysis and interpretation of the results easier (Zhao, Lynch Jr., & Chen, 2010).

- Variation in the mediator account significantly for the variation in the dependent variable.
- When the two above mentioned relationships are controlled, the relationship between the dependent and independent variable should change significantly. In this step we use *Variance Accounted For* (or VAF) formula (i.e. indirect effect/total effect)

The *Moderator analysis* in PLS-SEM is quite straight forward. This analysis can determine that whether the relationship between two variables is moderated by another variable. In this analysis first we should consider whether the moderator variable is reflective or formative. If it is reflective we continue our analysis with *Product Indicator Approach.* In this approach we can test the effect of moderating effect directly in the model by choosing the dependent, independent and moderating variables in an interactive page. However, if the moderator variable is formative we should follow it up in *Two Stage Approach* where we need to first to calculate the moderating effect and then we should copy the latent variable score of moderating variable in a new model with single indicators. It is like second order HCM model analysis (Hair et al., 2014).

-The only relevant test of the validity of a hypothesis is comparison of prediction with experience.
"Milton Friedman"

6. Qualitative research and hypotheses development

6.1. Introduction

In this chapter we apply the case study analysis with MAXQDA software coding system and the final result will be refined hypotheses that need to be examined with quantitative method. For analyzing the case studies after giving a short description of nine case studies, we implement the cross case analysis in terms of the four levels of analysis.

6.2. Overview of the nine cases

6.2.1. Alstom

Alstom is a large company and their range of activities encompass from train manufacturing to hydraulic and thermal power plants. They have small businesses section in renewable technologies about ocean, tidal and solar energy. Main Alstom activity is related to the wind business, and they can provide the EPC projects from wind turbine manufacturing to installation of wind turbines in the wind farms and also the infrastructure that surround the wind turbines.

Alstom is part of the large *Alstom Group* that they do three main activities in four sectors: thermal power, grid, transport and renewable power. Renewable energy sector is the newest one and its level of sales is about €1.8 bn, which is less than the three other sectors. About 10% of employees work in renewable energy sector and this sector provide multiple solutions related to the various types of technologies in wind power, hydro power, solar power, geothermal power and tidal power. Wind department is the most successful and international section of the renewable energy sector where they present in the different international markets such as Europe, Africa, South and North America, Asia and Oceania (Australia). They installed over 5.7 GW of wind energy across these five continents. They have their network of international partners for research and development in wind energy. They hold wide range of products from 30 kW onshore turbines to 6000 kW off-shore turbines. They provide services and consultation from wind farm development to operation and maintenance.

Wind section created after the acquisition of *Ecotècnia* in 2007 for €350 Million. This company was manufacturer and installer of wind turbines and established in 1981 at Cataluña-Spain. Headquarter of this company was in Barcelona. Before merging to Alstom in 2007 the main market of this company was Spain and about 10% international installation in France, Portugal, Japan and India. After joining to Alstom they developed their activities by hiring more than 800 employees and active participation in international markets.

Due to the *deep crisis* and energy policy change in Spain, in February 2013, the company announced the cut of 35% of jobs in Spain and they closed wind turbine component factories at Galicia, and, Castille and Leon.[8] They transferred their offshore wind turbine production and assembly line from Spain to France[9].

6.2.2. *Vidurglass*

Similar to Alstom, Vidursolar is a spin-off of a bigger company. This family-owned company is a rather old company with more than 50 years experience in glass industry. Although they have essential international guarantee certificates for glass and photovoltaic sector such as TÜV Rheinland, they have had limited presence in international markets and domestic market has been their main focus traditionally.

In 2004 they begun a research and development project for the development of PV module glass and in 2006 they started to work with PV for industrialization and put it in the market i.e. they decided to perform all the business development, certificate processes, and marketing and make projects. It means that they developed their own technology form the scratch and their main focus was local market in Spain.

In 2008, they planned to make exportation program and they also setup a business plan for internationalization. They had a list of countries that have favorable policy frameworks, and where they did not have too much competitors. So, first priority countries for them were Italy, France, and Portugal. But mainly Italy was a focus because they just had a good political framework, language and culture similarity, so they really took this market actively.

The second priority for them was passive internationalization. It means that they were not actively looking for market development in these countries but it occurred because they had contracts and projects in these countries like UK, United Arab Emirates, Germany and USA. The second plan entailed fierce competitions.

Till 2008, they were growing well in the domestic and the international markets, but in 2009 due to the policy change and break down in the Spanish renewable energy market all their bases for expansion demolished. Since 2010, the parent company decided to limit the PV solar glass development and they are reluctant to promote it actively.

6.2.3. *Energea*

Energea main field of activity is energy efficiency (ESCO) and sustainable building consulting. They provide services to their clients to reduce environmental impacts and operating costs through energy saving. They provide wide range of services from renewable energy system design to sustainable construction, preventive and corrective maintenance, monitoring and energy management, energy audit, renewable energy and

[8] http://www.windpowermonthly.com/article/1172771/alstom-wind-cuts-35-jobs-spain

[9] http://renews.biz/80162/alstom-cuts-ribbon-in-saint-nazaire/

facilities, carbon footprint, and energy coaching and training. Recently the company is making facilities for renewable energies from biomass cogeneration absorption systems and solar energy.

Energea is founded in 2010 with only two employees. Now they are about 10 employees and they achieved several international and national projects about the renewable energy development.

In 2013, they started their activities in international markets by establishing an area office at Chile. Moreover, since 2010 they have participated in several European projects for applying energy monitoring and control and also developing renewable energies for public building. They have also taken advantage of their knowledge in international markets by implementing biomass eco-generation boiler with an Italian partner.

6.2.4. *OpenDomo*

OpenDomo is a start-up in control system, energy efficiency and ESCO sector. In 2011, they started their business in ESADE's incubator with financial support from Kic InnoEnergy. This is an international institution that assists small companies to commercialize their idea about renewable energies and its partners are ESADE, Gas Natural Fenosa, Institut de Recerca de l'Energia de Catalonia (IREC), Instituto Superior Técnico de Lisboa (IST), Universitat Politècnica de Catalunya (UPC), Iberdrola, Centro de Investigaciones Energéticas y Medioambientales (CIEMAT), Tecnalia and Energía de Portugal (EDP) among many other institutions and universities in Europe. Apart from ESCO services for homes and enterprises, they produce physical product for three sections: energy, control and gateways.

Before complete commercialization of their products, they outsourced some components from international partners and they have also received some financial helps from this international consortium, Kic InnoEnergy. But since 2013, they have started actively to look for the international markets due to the fact that domestic market has not been promising. UK was the first international market and they planned to develop it in South America, especially Colombia and Chile.

6.2.5. *Smalle Technologies*

Smalle Technologies is a spin-off of University of Barcelona (UB). This company founded in 2011 with the mission to exploit new form and source of clean, renewable energy from waves' movements. This is an energy harvesting technology where small-scale energy is recovered. They started this business from a patented technological idea from physic department of UB and Spanish National Research Council (CSIC). Then they developed it with collaboration of *ESADE* business school and Kic InnoEnergy institution. The most immediate use of this technology is in the maritime sector like Buoys and Sailboats. Smalle Technologies is developing devices than can be incorporated into buoys and sailboats.

Although they have recently entered to the commercial market, they have had wide range of collaboration and partnership over the border in the process of product commercialization and dissemination. They received financial supports from *Kic InnoEnergy*, *ACCIO*, *Eco-Empranador* (*Barcelona Activa*), *Reposl Foundation* and also a university in France. They have also had technological collaboration with companies from USA, China and Portugal.

After the process of product development and commercialization, they defined a specific niche market for their technology to be applied in the buoys market. Buoys market is an absolutely international market and they expect that less than 5% of all their sales in the future will be from Spain.

6.2.6. *Tecnoturbine*

Tecnoturbines was founded in 2012 by group of engineers to design and develop micro turbines for electricity generation from water. This company produces: grid tied turbines, off-grid turbines, and solar pumps. These micro turbines are designed to recover excess energy in the water hydraulic network. These micro-turbines convert the hydraulic energy to electricity in small-scale from 4 kW to 500 kW. They have also recently developed solar pumps for irrigation systems in remote areas.

They developed this technology with domestic and international collaboration. They have received financial support from Kic InnoEnergy as a main consortium for supporting renewable energy ideas in Europe. For technological solutions they had close contacts with international partners and big companies like ABB, Siemens and Vacon and they mainly got technical support from Siemens for developing micro-turbines.

At the beginning they were interested in the domestic market and they believe that there is a lot of potential in the Spanish market especially for micro-turbines. However, in international markets they envision a promising market for solar pumps. They have already made some agreements for expanding solar pumping and irrigation system in developing countries like Kenya and Morocco, where the grid system is not accessible everywhere or maybe it is too expensive. This system is the most simple and economical pump water system in areas without grid-connection or for those who want to have an independent source of renewable and cheaper energy.

6.2.7. *Watly*

Watly is a recently founded start-up, in 2013. Their idea related to provide a holistic solution for energy, fresh water and connectivity, the major problems of underdeveloped societies, in one single product. They designed this cutting edge clean-tech hub for developing and underdeveloped countries to deliver the access to energy from solar source, purifying the water and a satellite internet connection center. This product life span is for ten years with minimum maintenance.

This case is a good example that connects two concepts; entrepreneurial internationalization and sustainability. On the one hand, we have an entrepreneurial idea for developing a clean-tech idea and; on the other hand, the global mindset of entrepreneur from a developed world considers the needs of people in the developing world. It means that this product designed from the very beginning for the international markets, and we can call it a born- global firm.

As the founder believes, they have been *multinational* from very beginning. The product development, the physical development, has been made in Italy because of proximity to the technology providers while the company is registered in Spain. For R&D support they have also been in Netherland. Non-critical components are supplied from the international markets while the critical ones are designed and manufactured by the company. In general, they received technical support from the internal players and so they are looking for any financial support to develop their product.

This product is designed for the international markets and their target market is developing countries and underdeveloped world. Since the first prototype is introduced, they have received pre-orders and agreements from African countries such as Kenya, Congo, and Senegal and other developing countries like India, United Arab Emirates and Qatar. In advanced countries, they have international partners for example from Greece to install this machine in remote areas where the accesses to these facilities are limited. Moreover, international organizations like *Red Cross* and *Doctors Without Borders* are also among their clients.

6.2.8. *Mira Energia*

They established their company in 2011 for providing consulting services in maximizing energy efficiency and applying renewable energies. Their field of expertise is solar cooling systems, solar thermal, ESCO services and co-generation. Main clients of the company are promoters, architects, energy service companies, research centers and public administration.

Although they started their business without any external financial support, their international activities have assisted them for solving technical problems and also to be involved in more projects. One of the works, for example, was especially done about participation in *International Energy Agency*'s (*IEA*) projects as Spanish representative at *Solar Heating and Cooling* program. This technology has mainly developed in Austria and Germany and this collaboration enabled them to transfer this knowledge to Spain where they have relationship and networks with domestic market and companies. After their participation in several tasks of IEA projects and also other European projects, they have kept their international contacts for further technical supports and future projects in this field.

In 2011, they started their first international project in Tunisia for solar cooling systems and they have been part of international projects with *The Catalonia Institute for Energy Research* (IREC[10]), *Institute CERDA*[11], *AIGUASOL*[12] , *GAS Natural*[13] and also as a partner in some European projects.

[10] http://www.irec.cat/en/
[11] http://www.irec.cat/en/
[12] http://aiguasol.coop/en/
[13] http://www.gasnaturalfenosa.com/es/1285338501612/inicio.html

The issue that makes this case interesting is the participation of service companies in international markets. First of all, we should keep in mind that the internationalization of service companies (ESCO) may seems easier than companies that they want to export a physical product. On the other hand, their path of internationalization is mainly based on international projects. The other important note about service companies was to explore how these small companies strive to survive in the flux environment, where the panorama of the future domestic market is obscure.

6.2.9. *e-consultant*

E-consultant is a small international consultant company in the field of renewable energy, especially in wind energy industry. They provide services and consultancies to local and international companies for implementing renewable energies projects in Spain. The company offers various disciplines of services such as project developing and management, market studies, key account management and facility management programming.

They started this business in 1991, when they were in Germany. They started there as a sub-supplier for a project that opened a lot of doors to many large companies like AT, Siemens, and also to the international companies. They implemented their first international project after establishing with China. In 2000 they started their business in Spain with their previous experience form Germany, Denmark and Norway. But at that time energy- saving was not a topic in the Spanish market, so they started their business in Spain with consultancy related to the wind energy.

What makes this case different from the other cases is that this company works as an international company in Spain. It means that they are principally providing services to the international companies willing to invest and implement projects in renewable energy industry in Spain. Their man field of expertise is related to introducing wind energy companies from north of Europe, such as Denmark, Norway and Germany, to the local Spanish companies. Since 2003, this company have gathered some of the most well-known specialist companies in wind energy (such as Siemens and Vestas) with the objective of providing developers, owners, utility companies, original equipment manufacturers (OEMs), sub-suppliers and maintenance companies. They are also responsible for an international event which is called OWB or Offshore Wind International Business2Business for networking between companies in offshore wind. Therefore, this case not only could provide information about the Spanish renewable energy market, but also it can reflect the idea of international companies that they have been present in Spain's renewable energy market.

Table 6.2.1 The investigated case studies

Company Name	Interviewee (s)	Number of Employees	Technology	Establishment year	First International activity	Level of maturity
Vidurgalss	Technical and sales manager	100-200	Building Integrated PV-Solar	2004-2006	2008(10 countries)	Growing Phase
OpenDomo	Co-Founder	5	Energy Efficiency	2011	2013 (UK, France, United Arab Emirates)	Growth Phase
TecnoTurbine	Co-Founder	5	Hydraulic electric turbine	2012	2014 (Germany, Tunisia, Germany, Kenya)	Introduction Phase
Mira Energia	Founder	1	Solar cooling and renewable energy projects	2011	2011 (Germany, Austria, Tunisia)	Introduction Phase and Growth
Alstom	Head of the Innovation department and Sales manager	500 and before 200-250	Wind energy	2007	2007 (30 Countries)	Growing and Mature
Energia	Founder and CEO	10	ESCO, biomass cogeneration, absorption systems and solar energy	2010	2012 (Italy, Chile)	In growth Stage

Company Name	Interviewee (s)	Number of Employees	Technology	Establishment year	First International activity	Level of maturity
e-consultant	Founder and CEO	2	Wind Energy	2000	2006 (Denmark, Germany, Norway)	Growing and Mature
Smalle Technologies	CEO and Cofounder	12 (6 full time and 6 part time)	Wave energy	2012	2013 (China, USA, Portugal)	Introduction Phase
Watly	CEO and Founder	7 (50% in Italy and the rest in Spain)	Solar Energy	2013	2014 (Italy, Cameron, Ghana)	Growing Phase

6.3. *Eco-entrepreneurs*

Entrepreneurs are agent of change and current IE literature admits the significant influence of them on the internationalization of firms. Based upon the firm cases, we explored notable aspects of eco-entrepreneurs such as values, skills, experiences, and network which are idiosyncratically associated with the entrepreneurs in renewable energy industry.

6.3.1. *Eco- entrepreneurs' motivation*

According to the case studies, what differentiate eco-entrepreneurs from the conventional entrepreneurs is related to their mix incentives and motivation, i.e. financial (profit maximization and making money) and non-financial motivations, values and commitments (social inclusion and generating environmentally friendly and green energy).

At the first glance, eco-entrepreneurs and conventional entrepreneurs seem identical, because both are looking for higher profit in the market and they need to survive. In the other words, monetary issue may appear to be the only important issue for both groups of entrepreneurs. When we asked about the particular characteristics of eco-entrepreneurs in renewable industry, the policy makers and the institutions could not distinct them from the typical entrepreneurs. For example, when we asked about the eco-entrepreneurs' traits, informants from *ICAEN* and *ACCIO* asserted that they cannot differentiate them from the normal entrepreneurs.

On the other hand, based on the case studies, parallel to the financial factors, the main reason that motivates eco-entrepreneurs to entre to the renewable energy industry is their inner values and commitment which is driven by their non-financial incentives and we observed that there is a lot of altruism in their way of thinking. For example, founder of Energea believes in contributing to the society and the environment. The e-consultant founder calls attention to the importance of non-financial incentives and putting an end on using fossil fuels. He interprets the term of "ecologic" as:

> "*The three first letters of ecology, comes out of the economy and the rest of it is logic.*"

Mira-Energia's founder remarks the importance of business philosophy and making the world a better place to live. She mentions that:

> "*I think behind business there is a general idea or philosophy to invest my time on something that makes the world better*!"

One of the co-founders of OpenDomo mentions that sustainability is their priority from the very beginning they started their business. They are also collaborating with the companies that express common concerns regarding environmental issues. They particularly choose their business partners if they hold all the environmental certificates and keep their environmental impact as low as possible. Moreover, co-founder of this company takes advantage of their products for his own residence. It shows how eco-entrepreneurs' believe in sustainability and they are practicing it in their business interactions and everyday life.

Smalle Technologie's story represents how eco-entrepreneurs' sustainability values and incentives influence on starting a green business. Company's founder before starting his own business used to work for the banking industry. After the financial crisis he decided to change his job because he did not like to work in an industry that caused this economic and social disaster. Then, he realized that the climate change is a big challenge for the society and he established a company (before *Smalle Technologies*) which is called "Arboliza[14]". The idea behind this company was planting trees wherever a person or a company decides, through their website. This company is still working and they are still planting trees in certain areas determined by their customers. After that, when he started his MBA, he decided to seek opportunities for developing a new technology to change the current energy consumption pattern. Consequently, he gets to know about an idea from University of Barcelona (UB) for generating electricity from wave's movements. All the above-mentioned stories describe how the personal incentives and believes can lead to the starting an eco-entrepreneurial firm. Although he had well-paid job in a private bank, he quit the job for starting his own sustainable business to satisfy his inner desire to do something useful for the society.

Tecnoturbine's founder started his job as an engineer for motorcycle company fuel catalyst. He has had always the idea to design a catalyst and engine that can consume less fuel with better performance. Then he started his business about generating electricity from the hydro pumps. As he mentioned, he has been always cautious about the environment and had focused on the environmentally friendly products. He believes that being an eco-entrepreneur is not all about the money and being the richest person, but about thinking about the planet, taking care of the environment and helping to the people in the base of pyramid.

Vidurglass technical manager, based on his extensive knowledge of photovoltaic sector and also working with other eco-entrepreneurs, comments that they are special type of entrepreneurs who set-up their company in this industry. They are very sensitive to environmental aspects and also they have certain social empathy. They are not a typical businessman, because it was not thought to just make money but to have environmental and social level benefits and often sustainable economy and social level inclusion.

Founder of Watly is a serial entrepreneur. He describes working in this industry as a "shot of luck". He thinks that not only this industry creates technological impact in the world, but also it has valid impact on humanity. He explains the relationship between the financial and non-financial incentives for eco-entrepreneurs and he puts more emphasize on non-financial incentives than financial incentives. The following quotes explain more clearly his point of view:

> "*Our education since very beginning has been always based on competition. Basically you have the mission of making your life a successful life and normally successful life means money. That was kind of education that I have received for years and years. I was looking for the financial goals, but then I found*

[14] http://arboliza.es/

something completely new! Money is the consequence when you do something that you really love. It is not the final target! ...and then I answered to the following thing: I rather die as a poor man but with remember for doing something to this planet and to this people rather than a rich man hated by everybody because you destroyed the planet. … I cannot stand the way humanity is destroying this planet. So, I see in the renewable energy the soul… the unique opportunity we have to sustain a nice standard of living at the same time with changing of our approach to the nature is difficult for us if you want to survive. So, to make it short, the money is welcomed but it is not the final goal. Being respected and remembered as somebody making positive impact worth millions of time more than money in your bank account."(Watly)

This statement clearly represents an eco-entrepreneurial mindset. This case can be an extreme case of the eco-entrepreneurs who are more driven by non-financial values because the founder is not worry about copying his technological idea since he believes that:

> "*…more companies doing this (copying) the better for the world and for me it is quite nice good news*."

And he also expresses his inner values and sustainability commitments by questioning about conventional way of making money in business:

> "*I am really fed up about the fact that industries wants to make money out of destruction and exploiting the markets and exploiting the customers. They don't want to give the benefit to their customers. They want to have income coming from the customers, no matter how*!"

In general, we can say that in this industry eco-entrepreneurs' motivating factor is not only the financial goals and they are following their inner values and non-financial incentives such as sustainability, altruism, helping to the other people (in the base of the pyramid) by providing sustainable sources of energy.

However, when we are talking about renewable energies, eco-entrepreneurs' objectives for these technologies development is not limited to the borders of a certain country. They are thinking about the all humankind in all over the world, such as people who do not have access to cheap and reliable sources of energy. Furthermore, the impacts of developing sustainable energies are not limited to the boundaries of a country while it could influence all the people who are living in this planet. It means that when sustainability is related to protecting the environment against global warming, producing lower level of CO_2in Spain has also positive impact on all over the world. Thus, we can conclude that eco-entrepreneurs' motivation and incentive is a global value for making this world a better place to live and we can consider it as a *global inner value*.

6.3.1.1. *Global inner value*

When we asked eco-entrepreneurs about the reasons they entered to renewable energy industry and their inner values, they all express their desire for making the world a better place to live. It is exactly in line with Gibbs (2009) and Isaak (2002) view about eco-entrepreneurs that they all have internal commitment to improve the world. In the cases that we studied, we found this incentive to contribute to the global market. These quotes from the eco-entrepreneurs represent their global view:

- Founder of e-consultant considers "*fossil fuels consumption as global concern affected the world adversely*". Moreover, he thinks "*we are in a global society; we have to think global on energy production and consumption*."

- Mira-Energea's founder believes that it is necessary to work for more sustainable world. She says: "*I think behind business there is a general idea or philosophy to invest my time in something that makes the world better*."

- The other interesting case is Tecnoturbine. Its founder believes that their technology can help to the people in the bottom of the pyramid in developing and underdeveloped countries. He thinks that "*with this product we can also help a lot to the development of the rural community. At the end the business is the business but at the same time you feel that you are helping to the other people. In Morocco, for example, we believe there is great potential in both business and social help*."

- The other extreme case is Watly. Their product is particularly designed to address basic needs of the far distance communities and poor people from developing countries. Founder of the company asserts that:

> "*My market has been always from the very first beginning a market of developing countries. I would not be surprised selling machines in Spain in certain areas. I will not be surprised at all selling machines in Greek islands, for instance, but I do not think these countries are our main market. Our main market is African continent, the south of America …India, and China. We are looking at these markets*." (Watly)

They have received their first pre-order form one of these countries, Kenya, and they are working with some non-profit and philanthropy organization like the *Doctors Without the Borders* in developing and emerging countries.

> "*We have order from Kenya. I think it was the very first one. A community of a school about five hundred people in Kenya. They need this machine because they want to place this machine next to the school in order to provide water and electricity to kids. This is the very first one. But immediately after this we had a few others like from Senegal as I mentioned to you and Congo, the more and less the same community based request. People who live in communities, we are talking about three, four, five hundred people, and they need that kind of service. This is our main target, medium sized communities*."(Watly)

He believes that this industry, by definition, is a global industry because positive impacts of renewable energies technological solutions are for the world to stop global warming and climate change. He calls it "*renewable approach*".

"*But in renewable energy as the wide range of products we have such as Solar, wind, geothermal, and etc.… they are global for definition. It is quiet necessary for all companies to look at the big picture. The thing which is important is the beneficial impacts of these solutions. These are beneficial for the world because of the climate change. The moment I want to solve the problem in Spain that supposed we focus on environmental impact in Spain. The moment we save our nature in Spain, we contribute to save the nature of our neighbors and the neighbors next neighbors and so on…we cover the world. This is what I call renewable approach."* (Watly)

As it is mentioned above, eco-entrepreneurs follow non-financial incentives as well as financial incentives. Moreover, their values and philosophical view is not limited to their home countries boundaries. They are thinking about a global solution to prevent global warming and environmental degradation in the worldwide scale. However, we can also realize different levels of internationalization among them based upon their technological solutions, beliefs, incentives and desire to be a truly international company. For example, Mira-Energia is working about solar cooling systems and their technological solution is limited to certain countries with enough level of sun radiation and also their usage of cooling systems. Consequently, they cannot enter every market because of the technological requirements and also market needs. Yet, Watly product is basically designed for the developing countries. Thus, they will have more extensive potential markets.

- **Conclusion**

In order to explore the factors that influence the entrepreneurial internationalization of renewable energies, we studied eco-entrepreneurs. Current literature put emphasize on the importance of the eco-entrepreneurs' motivation. A comparative result from the cases shows the importance of the non-financial incentives as well as financial incentives for eco-entrepreneurs.

The analysis also shows that this type of entrepreneurs are not limited to their home country borders, because they are thinking about a global value which is making this world a better place to live. It means they start their business from the beginning with the motivation of changing the world and current paradigm of producing and consuming fossil fuels. This notion connect two rather distinctive streams of literature, i.e. *IE* and *Sustainable Entrepreneurship*, that shows that entrepreneurs underlying motivation and commitment for changing the world can affect the internationalization behavior of entrepreneurial firms.

We can conclude this part by two quotes from the eco-entrepreneurs. Following quote from Watly's founder explains that how we can make distinction between eco-entrepreneurs and typical entrepreneurs. He argues that:

"*There is a strong need for all of us to send this fact to the world that we are entrepreneurs, we are creating economic benefits. The only way we are doing this is through providing benefits to the world. We are not new-age guy and we are not dreamers. We impact people and this is quite interesting to people to* *know. It is important that people know we are promoting viable solutions.*" (Watly)

In the following quote, we can see eco-entrepreneurs' global perspective toward sustainable entrepreneurship. Since they are addressing a global problem, which is global warming and energy poverty, they need to have a global mindset to solve this problem and this is exactly what connect IE to renewable energy industry.

"*... These eco-entrepreneurs are approaching to this. They want to make money out of implementing positive things to the humanity and to the planet and that it is. Instead of destroying the forest, they want to make money out of planting and seeding the trees. That is the approach. That is the definition of Eco about creating not destroying.*" (Watly)

Therefore, we can hypothesize that:

Hypothesis 1 Mix of non-financial motives (Internal commitment to make the world a better place to live and contribution to the global market) and financial motives will affect positively internationalization of firms.

6.3.1.2. *Interplay between the financial and non-financial motivations*

Sustainable entrepreneurs have mix motivations of green, ethical, social and economic motives that are inseparable. As it is suggested in the literature there is interaction between the financial and non-financial motives for eco-entrepreneurs to create *creative tension* for conceptualizing and promoting more sustainable practices (Schaltegger, 2002; Schick, Marxen, & Freimann, 2002; Walley & Taylor, 2002) and both of them are necessary for rising eco-entrepreneurs (Pastakia, 2002).

Although these two types of motivations exist in eco-entrepreneurs and their relation is not negligible, the intensity and priority of these motivations for every entrepreneur is different. Based on these differences of incentives we can categorize the entrepreneurs. Varieties of taxonomies of eco-entrepreneurs are suggested in the literature. Some of them are simple quadrants that categorize eco-entrepreneurs according to their incentives and orientations. which is recommended by Linnanen(2002), Post and Altman (1994), Taylor and Walley (2004), Walley and Taylor (2002). Although there is a broad overlap between the concepts and definitions of eco-entrepreneurs in these models, the matrix recommended by Schaltegger (2002) is more close to our findings. An interesting point about this model is that it is dynamic. It means that the priority of sustainability objectives of entrepreneurs and their organization effect may shift in the course of the firm growth and increasing the market effect and we can track these changes in this continuum. The extended version of this framework (Figure 6.3.1.1) included more options and more clearly illustrate this dynamic sense (Schaltegger & Wagner, 2011).

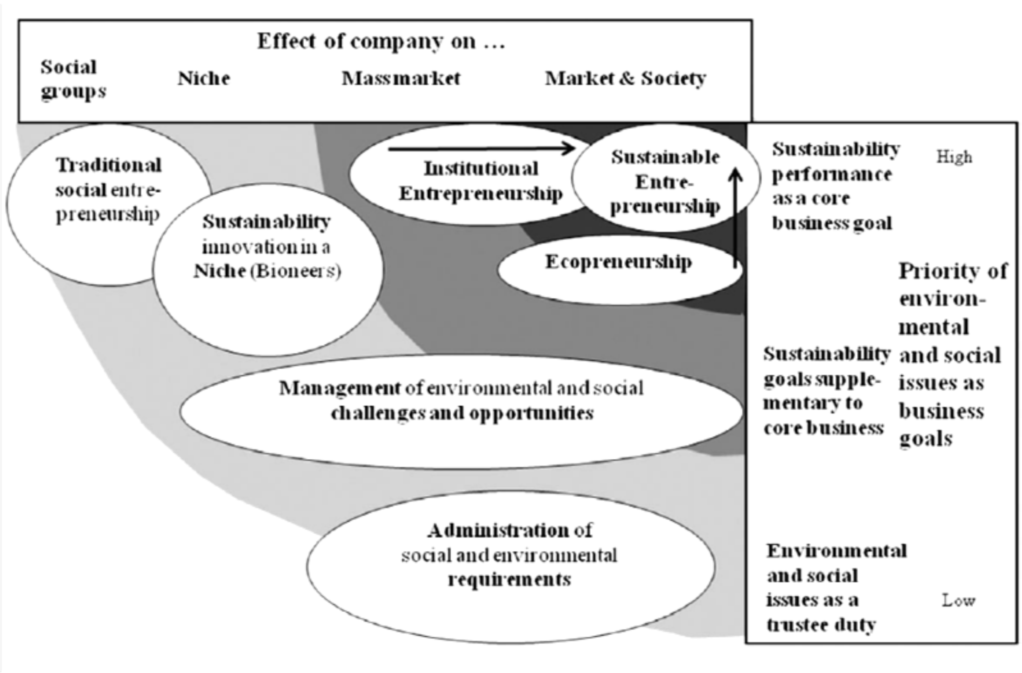

Figure 6.3.1.1 Sustainable entrepreneurship and sustainable innovation development (Schaltegger & Wagner, 2011)

6.3.1.3. *Eco-entrepreneur motivation, product marketability and firm size*

In this study we included several cases at various levels of product marketability. Some cases like Tecnoturbines and Smalle Technologies are in the early stages of commercialization and some others like Alstom and Vidurglass provide more marketable product. If we compare these companies based on their priority of sustainability objectives and market effect, we observed that Tecnoturbine and Smalle Technologies entered to the market recently, thus the market effects of these companies and their businesses is small and in the niche market. Therefore, we can categorize them as *Bioneers*, ["The expression 'bioneer' is a combination of 'bio' and 'pioneer' and attempts to express the central role of research and development and the attempt to find customers with high preferences for their inventions and innovations. Bioneers focus on "attractive market niches with their customer focused eco products." (Schaltegger & Wagner, 2011)] . Contrary to the Bioneers, there are other companies like Alstom and Vidurglass. Position of these companies according to their market effect has improved on the horizontal axis from the niche market to the mass market. They achieved their position by increasing marketability and market effect of their product on both market and society sides. In fact, according to this framework we should locate these companies as sustainable entrepreneurs or eco-entrepreneurs. But evidences from the cases show that by improving the market effect, the priority of the environmental issue decrease. It means that after entering to the mass market, financial issues are more important than non-financial objectives such as sustainability, environment and social issues. Evidences from our cases show that for example when a big utility company entered to renewable energy business, environmental and social issues is not their first priority whilst the financial objective are more important. So, the pattern which is seen in the cases can illustrate this trajectory of the renewable energy entrepreneurs from *Bioneers* to more *typical business managers* where the sustainability goals are not their first priority and core of their business. For example, the managers of e-consultant with more than 20 years experience in the wind energy argue that eco-entrepreneurs are different but due to the changes in this industry, improving the market position of wind energy industry from the niche market to the mass market, their perspective may change. He discuss about the differences between the eco-entrepreneur and typical entrepreneurs as following:

> *"Definitely they (entrepreneurs in renewable energy industry) are different and at least a lot of those still connected with R&D departments a lot of them have started out with conviction of making better place ... they are more driven by non-material goals than pure business. So, there is a lot of altruism in their way of thinking still. But of course, due to the fact that it has been a lot of changes in this industry to be a part of supply chain of the energy market this is really a serious business for the big companies. The utility companies which own big installations are definitely driven by finance and the monetary objectives. It is never harming you if you can have a green profile... Now there are lots of companies who want to have green profile because they think that it makes them more responsible. For instance, you don't go to advertise that you have the nuclear plants. Nobody do. But when you have wind turbines or solar plants everybody will do. So, it is today a business. It is business driven!"* (e-consultant).

Manger of Vidurglass, with extensive experience from the solar and PV industry also comments that eco-entrepreneurs have changed in the course of development of this industry and its market progress. He believes that entering of big utility companies in this market has changed the eco-entrepreneurs.

> **"***It has changed ... because all of the big businesses entered to this sector and also if you go to PV fairs there has been a quite big change. At the beginning there were a lot of people, it was a big family with the same mentality that changed completely with big financial incentives and utility companies*." (Vidurglass)

- **Conclusion**

The first part of Schaltegger and Wagner's framework is matched with eco-entrepreneurs in the first stage of market entry or Bionners. However, as it is shown in the cases the priority for sustainability and social issues declined after their entry to the mass market. Although they are still eco or sustainable entrepreneurs but non-financial objectives is not high priority for them.

We can also relate these changes instead of the entering to the mass market and marketability, to the size of the firm. It might be difficult for an entrepreneur to transfer his view and values in his organization as the size of the firm increase. It means that it will be harder to transfer the same mentality to every employees of a big organization, while in an entrepreneurial company, because of the smaller size, it is easier to translate the mission and vision of the entrepreneur to a small group of employees. As a result, from the IE perspective, in this study we are interested to explore the effects of size and level of marketability on the relationship between the eco-entrepreneurs' philosophical stand point and the internationalization of firms. Thus, we refined the prior propositions as the following:

> **Hypothesis 2a** The effect of eco-entrepreneurs' philosophical perspective on the internationalization of firms will be higher for smaller firms than larger firms.

> **Hypothesis 2b** The effect of eco-entrepreneurs' philosophical view on the internationalization of firms is higher for firms with lower level of marketability of their products (or technological development) than firms with higher level of marketability.

6.3.2. *Human capital*

Human capital determines the effect of eco-entrepreneurs' experience and skills in the internationalization of renewable energy companies. Multiple case studies evidences show how international experience, energy industry experience, and entrepreneurs' academic and professional know-how affect their internationalization decision. This finding follows IE literature that shows human capital is positively associated with rapid and successful entry of entrepreneurial firms to the foreign markets (Kuemmerle, 2002; McDougall et al., 1994; Westhead et al., 2001).

International experience defines firms' internationalization setting. Energea's founder believes their experience from the international projects in Italy allowed them to consider internationalization as a business development option. They established their subsidiary at Chile because the company founder's academic experience in South America where he became familiar with the future business partners. This case illustrates how international activity and education help the eco-entrepreneurs to enforce their social ties and networks to establish their subsidiary in the foreign markets.

The second case is e-consultant. Founder of this consultancy company believe that his extensive engineering and studying experience in the international contexts has enabled him to confront with different kinds of culture. He admits that:

> "*Actually these differences (in culture) do not surprise me. I think the biggest advantage of have been working outside of your own country is that you actually understand that you must be open to the all cultures, otherwise you will never get positive feedback out of the contacting other people*." (e-consultant)

Mira-Energia experience from some international projects with *International Energy Agency* (IEA) and *European Union* (EU) about solar cooling systems, has allowed her to identify the first entrepreneurial opportunity in the market for establishing her company related to the cooling systems.

Co-founder of Opendomo has international education and professional experience. He comments that international experience developed his language and communication proficiency as well as his international business skills for presentation and negotiation with the international partners and clients. Although international network does not helped Smalle Technologies's founder to develop his business in the global market, his experience in working and studying in Germany provide him with invaluable social skills and experience of cultural sensitivity. Similar to Opendomo he thinks that this experience allowed him to contact different people, with various cultural back ground and culture.

> "*I think cultural sensitivity is very important thing that you can acquire with having contact with different people from other countries… it helps a lot to build good relations to make things more fluent."* (Smalle Technologies)

The primary idea for establishing Tecnoturbine is from the founder's close friends. He has gained knowledge about the field of hydro turbines from his previous job in a multinational company. Although his international network has not helped him yet for entering new markets, in the near future he will take advantage of them to develop his international activities. In the process of commercialization of their product in ESADE's incubator his informal networks such as friends and colleagues as well as formal network provided by Kic InnoEnergy introduced them to the large international companies as potential partners.

Sales engineer of Vidurglass had studied in Germany in solar sector and he had worked for *Fraunhofer*[15], a research center about renewable energy in Germany, then he joined Vidurglass. Building integrated PV (BIPV) was only a research project in the company and they were looking for somebody to inseminate their premature idea. Based on his experience from Germany, first of all he put all of his effort to prepare the final product. Then for entering to the international markets he has helped company to get all the required standards and accreditations from the international institutions. He gained experience about all of these standards' procedures from his previous job at *Fraunhofer* institution:

> "*… I have contacts there (Franhaufer) that helped me to make the certification, for example in Germany technical contacts helped me a lot…"* (Vidurglass)

Founder of Watly is a serial-entrepreneur with several years of experience in IT, artificial intelligence and renewable energy. He has been founder, co-founder and CEO of several companies. He studied in Italy and UK and he is now working in Spain. He believes that he can leverage all of his previous experiences to implement his idea in renewable energy sector. He states that:

> "*Connecting dots (experiences) make sense only if you looking into the past.*" (Watly)

He also notes that in pursing his professional career he needs to be international:

> "*I can see now there is a path that I can see clearly through professional steps that I have been walking through. It makes almost to be international today. You cannot make huge impact if you only focused on a specific culture and you do not see the big picture. It is not a country focus it is a worldwide focus that we need to have."*(Watly)

[15] http://www.fraunhofer.de/en.html

Our evidences from the other institutions also prove the importance of the human capital in the internationalization of the firms. One of the experts in the internationalization of the firms in ACCIO mentions that:

> "*The previous experiences can affect the market choose. In a small company with ten people, if two employees are from Morocco or they have worked in Morocco for ten years, for sure Morocco could be the best options in their short list because they have previous contacts there*." (ACCIO)

They also note that one of the main reasons that companies from Spain prefer to enter to the Latin America markets is the language knowledge and cultural similarities.

- **Conclusion**

IE literature place emphasize on the importance of human capital on the internationalization of firms (Chetty & Campbell-Hunt, 2003; Eriksson, 2003; McDougall et al., 1994; Reuber & Fischer, 1997; Westhead et al., 2001). International education and experience of eco-entrepreneurs impact their internationalization behavior, business partner selection and market entry. As we observed in the multiple cases, international education has developed the international skills of eco-entrepreneurs to confront cultural differences. It has also allowed them to improve their language skills for making contact with people over their country borders. In some cases this international experiences and skills helped them to find their future business partners or customers. Thus, we can conclude that:

> **Hypothesis 3**: Eco-entrepreneurs' foreign work and experience positively affect the internationalization of firms.

6.3.3. *Networking*

Social capital has also helped companies to identify and exploit international opportunities. Social capitals are defined in terms of formal and informal networks. In the cases that we studied, we observed that both types of networking positively affect the firms' internationalization behavior.

Founder of Energia asserts that his informal networks such as university friends and family (his cousins) helped him to establish the second branch of his company in Chile. E-consultant also accepts the importance of informal networks for establishing company in new cultural contexts. He believes that network in a new country allows entrepreneurs to adjust and understand the new environment. He points out that:

> *"I think networking is extremely important. When you want to break into the new culture then you need somebody who says that well this is the way. It is also depending on how the culture of the host country is open to the strangers. If you go for instance to the United States it is pretty much workable while I could imagine if I want to go to Morocco or south of Spain there would be actually different experience*." (e-consultant)

E-consultant founder also believes in the value of the formal networks in the internationalization of the companies. They, therefore, established formal networking events in the wind industry. This network includes companies from all levels of supply chain in offshore wind energy and it is called OWIB (offshore wind international business 2 business).

Mira-energia has taken advantage of international informal networks from international and European projects to participate in the new international projects. She also uses his networks for solving complicate technical issues that she encounters in the projects. Her networks in Spain and international context provide her with this possibility to transfer her knowledge about solar cooling systems from her international network to the domestic network. Informal and personal network such as friends and old colleagues has also assisted the Opendomo's founders to expand their business across the borders.

In Smalle Technologies, although founder and CEO of the company did not mention about his informal networks, formal networks from ESADE business school alumni, provide them with this opportunity to know about a patent in the other university (UB) that need to be commercialized. Accordingly, this network has also connected them to another formal international network, Kic InnoEnergy, which has assisted them in the process of product development and commercialization in Portugal, USA and China.

Since Tecnoturbine is in the early stages of commercialization, they expect that to use their international experience and links for the further improvement of their international activities in the future.

> "*Not really so far (...we have used our international contacts), but I hope it will. I mean I kept those contacts not only form the UK but from my international experience from the company I used to work and the international projects. I think at some point they will help me*." (Tecnoturbine)

In case of Vidurglass since the sales engineer is from Germany and he have some contacts in Germany, it helped him to make the first contacts with German companies that they were interested in their product in the international fairs.

> *"In Inter-solar fair, we made the first contacts with the German companies that were interested in our products."* (Vidurglass)

Watly founder initially started his idea with one of his friend who is now CTO (Chief Technology Officer) of the company. Then he started to build his team from his own network in Italy. Although this company is established in Spain but a great majority of their team members are from Italy, the home countries of the founder of the company.

- **Conclusion**

Formal and informal networking in the domestic and international markets has positively affected the internationalization of the firms in renewable energy industry. Informal networks (like personal and family ties of Energea), and formal networking (like Kic InnoEnergy and OWIB) were positively influenced the firms' discovery of new opportunities and process of internationalization. This is exactly in line with extensive IE studies that suggest networking is a determinant factor in process of opportunity recognition and internationalization of the firms (Chetty & Blankenburg-Holm, 2000; Coviello & Cox, 2006; Coviello & Munro, 1997, 1995). Thus we can conclude that:

> **Hypothesis 4:** Eco-entrepreneurs' networking capability positively affects internationalization of the firms.

6.3.3.1. *Social capital, human capital and opportunity recognition*

Evidences from the case studies show the major effect of the human capital and social capital on the process of opportunity recognition in international markets and internationalization of renewable energy companies. A new stream of IE literature shows how entrepreneurs recognize and exploit opportunities across the borders (Zahra et al., 2005). It has also shown the relationship between the human capital and social capital on the international opportunity recognition (Chetty, 2002; Eriksson, 2003; Eriksson, Johanson, Majkgård, & Sharma, 1997; Kontinen & Ojala, 2011; Madhok, 1996; Reuber & Fischer, 1997b; H Yli-Renko, Autio, & Tontti, 2002; Helena Yli-Renko et al., 2002). Sustainable entrepreneurship literature discuss about how sustainable entrepreneurs take advantage of opportunities provided by environmentally relevant market imperfections to resolve the environmental problems of socio-economic system (Cohen & Winn, 2007; Dean & McMullen, 2007; Pacheco, Dean, & Payne, 2010).

Mira-Energia's founder experience from some international projects with *International Energy Agency* (IEA), allowed her to identify the first entrepreneurial opportunity in the market for establishing her company. In partnership with the international projects' colleagues, she started working on the European projects. Social capital was a key factor that helped Energea for opening and developing company's branch in Chile. Founder of the company has some family ties in Chile and more importantly the subsidiary manager is the founder's best friend during his studying abroad.

Tecnoturbine case also represents the effect of social ties on opportunity recognition. The initial idea for this company was from a close friend and colleague of the company's CEO and Co-founder. In addition, he elaborated and expanded the immature idea with the help of his ex-colleagues in a multinational company. His formal network in Kic InnoEnergy helped him to find about the international partners.

International working experience of Smalle Technologies's founder helped him to realize that he is interested in doing business in a field that can contribute to the society. His international experience also assists him to encounter different cultures in product development process. His formal networks helped him first through ESADE alumni to know about a patent from university of Barcelona (UB) that need to be commercialized. Moreover, he found potential international partners for product development and commercialization in Portugal, USA and China through Kic InnoEnergy's networks.

When the founder of e-consultant realized that he cannot follow his idea about energy efficiency in building in Spain, he took advantage of his own personal networks and skills and expertise about wind energy to connect Spanish companies, in the entire value chain of wind industry, to the international companies (mostly from north of Europe, where he used to work there before his moving to Spain).

> "*Since I came to Spain in 2000, it was still very premature talking about energy saving in great scale here. Then I slide into wind energy because I had some knowledge about the supply-side and the utility-side."* (e-consultant)

The BIPV (Building Integrated Photo Voltaic) technology has developed by exploiting both human capital and social capital. When technical manager of Vidurglass joined this company, they had only an idea for producing building integrated PVs. In fact, his responsibility was to commercialize this idea. During the process of opportunity exploitation, he employed his social ties and international experience to introduce the final product to the market. In the same way, OpenDomo's founders took advantage of their formal networks and also their experience from previous projects to make an energy efficiency intelligent system.

The case of Watly represents evidently the influence of human capital and social capital on the opportunity recognition and exploitation. Founder of the company has previously worked in the same industry (about 7 years ago). He discovered the potential of working in this industry and then he begins from the scratch with one of his friends and they could have the first prototype design after one week. The founder applied his experience to discover the opportunity and taking the first steps to exploit that idea. He asserts that:

> "*I step back six or seven years ago when I found the renewable energy a technological impact that I was looking for. In order to establish a company and make at the same time a valid contribution to the humanity... Many years of professional experience related to the renewable energy is behind it. That was the first time in my life that I actually seen the great opportunity that I have been looking for…*" (Watly)

> "*At that time I had just one single idea, the idea of purifying the water with sun. It was a phone call at nine o'clock in the evening. I called to a person today is CTO (Chief Technology Officer) of the company. I called him and asked him... can we do that and I explained him what I want to have as a final result and he said yes we can and one week later we had already one drawing of the first prototype*." (Watly)

Between the companies that we studied, Alstom is absolutely different case given that wind department is created after the acquisition of *Ecotecnia*, a wind energy company from Spain. Wind department takes advantage of the international skills and expertise within parent company and they also seek to develop their international markets by taking advantage of networks, partners and markets that are already established by Alstom. Their entry into the Brazilian market describes how they could employ the networks and partners they already had in Brazil to win the international project bid with lower price than other competitors. With local contacts in Brazil, they could have access to cheap financing for developing onshore wind turbines. Now they are actively looking for entering Japan because they see an opportunity there after the tsunami. Japan is an interesting market with lower level of competition intensity and enormous feed in tariff. But they are not willing to enter to Indian market because they do not have access to the required networks and contacts and it seems that it would be really complex and risky. The same reasons also made them reluctant about the other markets in Germany and United States.

In the process of international market opportunity recognition what differentiate Alstom from other small companies is that their approach for internationalization is more proactive and systematic. As their marketing manager mentioned, they appraise different parameters like market potential, intensity of the competition, policy regime before entering to an international market. He asserts that:

> "*…We cannot go for every wind opportunity that arrives. When we want to focus on the market first we consider the market potential with Megawatts per year. So we need to consider that if it is a 50 MW market or it is going to be 5 GW market. Then we need to consider what the intensity of the competition is, what the policy is, and what the constraints and requirements of the market are."*(Alstom)

But some companies follow a *passive mechanism* to enter to an international market. They enter to a market only if they just receive an order, while they do not have enough knowledge and information about that specific market. This type of entry can cause some disadvantages for the companies and they may fail because of lack of knowledge. Nevertheless, Alstom is different from the other cases because it is a large and multinational company with lots of human and financial resources and we cannot apply correctly human and social capital principles to an individual or an entrepreneur.

- **Conclusion**

For concluding this part about the importance of the social capital and human capital in the opportunity recognition and exploitation, results of case studies, in line with extant IE literature, remarks the significant role of human and social capital in the process of internationalization (Chandra, Styles, & Wilkinson, 2009; Coviello, 2015; Di Gregorio, Musteen, & Thomas, 2008; Vaghely & Julien, 2010). The evidences illustrate that how eco-entrepreneurs seize the available opportunities in the international context by relying on their international skills, experiences and education. Personal and formal networks of eco-entrepreneurs have certainly help them to recognize and exploit the opportunities to address the environmental degradation and contributing to the society (Dean & McMullen, 2007). Therefore, we conclude that:

- **Hypothesis 5a** Eco-entrepreneurs' international skills and experiences positively affect the international opportunity recognition and exploitation.

- **Hypothesis 5b** Eco-entrepreneurs' formal and informal networks positively affect international opportunity recognition and exploitation.

- **Summary**

From the multiple-case analysis at the individual level we can infer that social capital and human capital are the determining factors in the opportunity recognition and exploitation. Human capitals such as education, skills and experiences enable entrepreneurs to discover and implement new opportunities in international markets. Moreover, social capitals such as formal networks and personal ties facilitate and accelerate the process of internationalization. In particular, these factors are important in renewable energy industry where the commercialization speed is relatively slow (Negro et al., 2012) and companies need to seize and exploit sustainability relevant opportunities to resolve a global problem.

Moreover, our findings show how entrepreneurs' mix of motivations about sustainability and internationalization intersect in one point where the combination of entrepreneurs' perception of sustainability and internationalization inspire them to identify and exploit new opportunities beyond the national borders. Furthermore, individual level analyses provide us with empirical evidences about the different types of eco-entrepreneurs, while the current studies typology of eco-entrepreneurs is only based on the speculation and theoretical reasoning. The dynamism and change in eco-entrepreneur's typology in the process of firm growth and development is also justified by our results.

The other outcome of this section is related to the impact of external factors on eco-entrepreneurs. In the literature some authors suggest that institutional factors such as government regulation and policy can affect the entrepreneurial activity of the firms (York & Venkataraman, 2010). Results from the case studies show that how formal institutional factors like energy policy influenced the opportunity identification and exploitation in Spain and beyond its border, especially before and after the policy change in 2012. However, the internationalization of the renewable energy companies entails a favorable policy like supportive export regulation in China for renewable energy technologies (de la Tour et al., 2011; Liu & Goldstein, 2013). The other external factor is industry. Industry structural factors indicate the level of firms' internationalization and international opportunity recognition. For example, renewable energy industry is an infant industry and firms are provided with more government supports; therefore, in this industry it is more probable to find opportunities than in more mature industries such as apparel or food industry. The results about eco-entrepreneurs are summarized in Table 6.3.3.1.

Table 6.3.3.1 Eco-entrepreneurs cross cases analyses

Company	Human capital	Social capital	Opportunity Recognition and Exploitation	Motivation	Type of Entrepreneur
Alstom	•Merging give them this opportunity to have access to required competencies to enter to the international market	•Alstom take advantage of its own network of international partners in other industries to develop their international activities in renewable energy industry	•Entering to the international markets where the parent company (Alstom) had been present there •Example of entering to Brazil market shows that how they could take advantage of the human capital and social capital in the company and host country to enter successfully to this market •New opportunity in Japan		
Energea	•International education and working in international project in Italy, knowledge about bio-fuel boilers from Italy	•Family ties and informal networks (friends) in Chile with no language and cultural barrier	•Identifying the market opportunity through personal networks, establishing their subsidiary in Chile with assistance of human and social capital	Contributing to the society and environment	Bioneer and innovative opportunitist
Mira Energea	•International experience (professional and education) •Working in EU and international projects (IEA) and getting knowledge about solar cooling systems	•Informal networks allow the founder to be involved in more international projects •Friends and international colleagues from the international projects	•Identifying more job opportunity and involving in international project through professional and personal networks	To make the world a better place to live	Bioneer and innovative opportunitist

Table 6.3.3.1 Eco-entrepreneurs cross cases analyses

Company	Human capital	Social capital	Opportunity Recognition and Exploitation	Motivation	Type of Entrepreneur
e-consultant	•Founder of company has extensive international professional and educational background	•He sued all of his previous contacts and networks to connect international suppliers with Spanish one in the wind energy •He is also coordinator of a formal network and event about offshore wind turbines	•Using personal and professional networks from previous job experience to connect Spanish and other international companies in the entire of wind energy value chain	Non-financial incentives, environmental degradation	Bioneer (or eco-entrepreneur) and innovative opportunitist
OpenDomo	•They had prior knowledge about developing similar systems with open source software, they produced the hardware themselves to understand how their system works	•Formal networks from Kic InnoEnergy provided them with required contacts to develop their idea •Social skills through international ties (How to deal with cultural and language differences)	•Since the hardware related to their product does not exist in the market, they realized it as an opportunity to make it themselves •Opportunity exploitation with help of formal networks (Kic InnoEnergy)	Environmental challenges and sustainability as priority	Bioneer and innovative opportunitist
SmalleTechnologies	• International experience and education (working in Germany)	• International network and social skills (how to encounter cultural differences) •Formal Network of ESADE Alumni (to identify opportunity) • Formal networking (Kic InnoEnergy)	•Exploitation of the opportunity with international partners from Portugal, USA and China •Opportunity recognition through human capital and social capital (Formal networks of ESADE Alumni)	Climate change as a key challenge	Bioneer and innovative opportunitist

Table 6.3.3.1 Eco-entrepreneurs cross cases analyses

Company	Human capital	Social capital	Opportunity Recognition and Exploitation	Motivation	Type of Entrepreneur
Tecnoturbine	•Knowledge of the field •Working experience in multinational company •International professional and education experience (at UK)	•Using informal network (friends and colleagues) for opportunity recognition • Using formal network (Kic InnoEnergy network such as Siemens)	•Using both formal and informal networks for identifying the business idea and developing their business	Taking care of the planet and people in the base of pyramid	Bioneer and innovative opportunitist
Vidurglass	•Knowledge and experience from previous job at renewable energy research center and study abroad	• Using personal contacts to get in touch with companies in Germany	• Industrialization and make a marketable product by using his prior knowledge and expertise •Using personal contacts for international presence of the product in international fair	Environmental concern and social empathy	Bioneers and Ad hoc environperneur
Watly	• Extended international working experience and international experience •Being a serial entrepreneur •Having knowledge about the technology by working in the same field for more than 7 years	• He mainly used his informal network for making his team •Using social ties to find about potential of the first idea (opportunity recognition)	•Taking advantage of both human capital and social capital in opportunity recognition and exploitation	Valid impact on humanity plus technological impact	Bioneer (or eco entrepreneur), Visionary champion

6.4. *Firm*

Although entrepreneurs are defined as agent of the change, but there is an iterative interaction between entrepreneur and firm, or action and structure according to Taylor and Walley (2004). Organizational factors are part of *hard structural factors* that affect entrepreneurial activity of firms (Taylor & Walley, 2004). Drawing upon the cases and extant literature about IE and sustainable entrepreneurship, we looked at wide variety of firm level factors that can affect entrepreneurial internationalization of the firms such as firms' structure, governance, entrepreneurial orientation, product offer and so on. In particular, we explored the effect of firm level factors that are more relevant to the renewable energy industry and Spanish context.

6.4.1. *Firm age and size*

Current literature about sustainable entrepreneurship discuss about the accepting the green strategy for incumbent firms and new entrants. Prior studies have shown the effects of green strategy on the performance of the large companies (Ambec & Lanoie, 2008; Porter & Linde, 1995; Senge et al., 2001). New stream of researches shows the positive influence of greening strategy on new ventures and small firms. They discuss that since small companies are more flexible and it is easier to infect new business owners, they are more apt to adopt greening strategies (Dibrell et al., 2011b; Gibbs, 2009). On the other hand, concepts like born global or international new ventures (INVs) specifically define internationalization of new ventures i.e. firms that internationalize in their early phase of their organizational life cycle (Madsen & Servais, 1997; McDougall et al., 1994). Thus, firms' age and size are significant factors in IE and sustainability literature that need to be considered in our analysis.

The case studies, according to the IE literature, are all in the category of INVs or born global firms (except Alstom Wind). They started their international activity in less than three or five years after inception. These companies exported their services and products after their establishment and in some cases they started their internationalization activity in the process of commercialization. Watly, Tecnoturbine, and Smalle Technologies are examples of companies that began their international activity even before entering to the international markets and in the process of pre-commercialization. The similar phenomenon is observed in the internationalization of wave energy companies (Bjørgum et al., 2013; Løvdal & Aspelund, 2011; Løvdal & Moen, 2013).

Alstom is different from the other cases because a large energy company acquired a small company like Ecotecnia to enter successfully to a wider international market. This case shows although large corporations like Alstom are not as flexible as small firms to adopt radical innovations (like renewable energy), their broader resource base provide channels, resources, reputation and network for international development of these technologies. For example, reasons for joining to Ecotecnia are:

> *"Alstom brand is well known throughout the world. So, it means it is not the same as Ecotecnia, a local manufacture. It has been Alstom which is equipping 25% of power installation in all over the world. So, through Alstom they have*

access to a powerful sales network, powerful brand; and other businesses of Alstom that means they can create synergies. They are represented in many countries, with service networks, with contacts and they can make lobby with local authorities." (Alstom)

This quotation shows the role of large companies in the international development of a renewable energy company.

- **Conclusion**

Evidences and information from the local and national institutions prove that large companies have fewer difficulties if they want to enter to the international markets because they have access to more resources and they hold higher level of knowledge about the international markets. As a result they may have better performance in international markets. ACCIO asserts that:

> "*The main problem of our companies is small size of them. We are a country with 98% of small and medium size companies. If you want to export you can be small company but if you want to be global player you have to be big."* (ACCIO)

However, drawing upon the results from the cross-cases analyses, these small companies are more flexible and agile to adopt international strategy to enter to the international markets from the inception. Even in some cases they have started their international activities in pre-commercial period. Therefore, we may expect that small firms outperform larger competitors. From these contradictory results we conclude that:

Hypothesis 6a Age of the renewable energy companies is negatively/positively associated with their international performance.

Hypothesis 6b Size of the renewable energy companies is negatively/positively associated with their international performance.

6.4.1.1. *Maturity of technology and firms' size*

Although size and age of the firms are significant parameters in the internationalization and survival of renewable energy companies, maturity of the technology can influence the effect of the size on firms' internationalization. In the other words, larger companies with more mature technologies are more successful in international markets. While in the less mature sectors like solar energy there is interaction between the large and small firms. Larger firms are participating in the big projects because they have financial resources and small firms are engine of innovation for developing more efficient technologies or they are producer of small components. Following quotes from the case firms recommend that technology maturity moderate the effect of size and age on firms' internationalization:

> "*Depending on the type of renewable energy, for instance when wind farms started at Catalonia, only small and medium-size enterprises were present in the*

market. But now the only companies that are active in wind farm projects are big companies. So, there are some small enterprises that enter the business as subcontractors of the big companies, but they cannot make wind farms and large projects. Like Ecotecnia when they became part of Mondragon. The big firms in solar energy like Abengoa, Abantia and COMSE EMTE, in comparison with the small ones have more financial capacity to do big investments. But in solar energy only small companies can manufacture collectors. So, it depends on the technology and the type of activity they want to do." (ICAEN)

"*There are many small companies but it's also depends on the technology. In CSP (concentrated solar power) for instance we have five or six big companies and many small companies. In photovoltaic, we do not have big companies now and most of them are medium and small size companies*." (Solartys)

In summary, age and size are significant factors in the entrepreneurial internationalization of renewable energy companies and energy industry is traditionally dominated by large and multinational companies that impact this industry substantially. Therefore, it is critically important to investigate the linkage between the firms' size and age and their internationalization behavior. However, we cannot deny the inherent challenge of large firms in adopting radical changes. It means that it is not easy for established companies such as Alstom to adopt new sources of energies within their organization and for small firms due to the lack of resources it would be hard to survive while enduring the double risks of newness and internationalization.

6.4.2. *Interaction between large and small firms*

As it is mentioned about small and large firms, results of previous studies show that despite the fact that larger firms have broader access to the resources and capabilities, they have inherent challenge with radical innovation because it can threat their existing assets (Christensen, 1997). Instead of large companies, small firms are engine of innovation and radical changes. If we apply a dynamic perspective of evolutionary economics to the renewable energy industry (Hockerts & Wüstenhagen, 2010) we can explain not only the interaction between the small and large firms, but also the transformation of this industry. This novel perspective identifies the different phases of industry development and the different roles of small and large firms in the change process.

Between the cases, wind energy is the most consolidated technology, where the dominant design is exist and companies are striving to make more efficient turbines, while other technologies are still struggling to get to the standard products in the markets. Our results prove the dynamic view of the industry transformation in three phases that characterized by 1) idealistic *Davids* in the initial phase 2) pioneering *Goliath* in the second phase and 3) the co-evolution of both *Goliaths* and *Davids* to sustainable transformation of energy industry by scaling up and building sustainability as core business (Hockerts & Wüstenhagen, 2010). According to these three specific phases, the transformation of industry is not possible, unless small and big companies make use of economics of scope and scale in international markets. Evidences from the cases explain that interaction between small and large firms is essential for developing entrepreneurial initiatives in international markets. It justifies why small and large firms interact and how big companies may assist small ones in the process of product commercialization and foreign markets entry.

In this study we observed the co-evolution of the small and big firms in this industry from the very beginning of their activity. Large companies in this industry begin their partnership and collaboration with small firms from the very first activities. This is in contrast with Hockerts and Wüstenhagen's (2010) suggestion that these firms just co-evolve in separate spheres and they just interact based on the evolutionary perspective (i.e. there is high degree of variation from the small companies' side and after reaching to the dominant design is the turn for large firms to select among new entrants).

For example, in the case of Smalle Technologies, they started their collaboration with a large company for producing their electrical generators in the USA from the very beginning of the commercialization phase.

> "*We know the Johnsons Electric because we were looking for some companies through Internet. We have already looking for some other companies to consider possible substitute to improve this part of technology. Actually Johnson Electric is an international company and they have distributor in Spain.*" (Smalle Technologies)

Moreover, Tecnoturbine initiated international activities with the collaboration of the large companies like Siemens to manufacture their technological hardware. Watly collaborate with large firms for financial supports and also technological advancements in water treatment and solar collectors. They even expect higher level of interaction in the future. The company founder states that:

> "*…We had some interactions …; I think these kinds of interactions are going to be more frequent and more intense in the future. We already have few contacts with major companies like Philips at the very beginning and another big company here in Spain called Fluidra which is a water treatment specialist.*" (Watly)

In the case of e-consultant, they had interactions with the large firms for some projects and they drag them to the international markets. For renewable energy service providers companies (ESCO) such as Energea and Mira-Energea it is essential to keep partnership with big companies as the sub-contractor because in this way they can be involved in major projects that they cannot achieve it alone. This interaction is also necessary for facilitating their internationalization. Founder of Energea asserts that:

> *"In Chile there is a big company in the energy sector and this company sub-contracting the works to the small companies. Now we are sub-contracted with a big company to do the same work because it is difficult to contract with the public sector and it's better to do it through a big company."*(Energea)

Larger firms have different types of interaction with small firms. First of all, they do not have any collaboration for any part related to their core business and for their core technologies and businesses they acquire the small firms. Their interaction with small firms is like sub-contractor, supplier, or maintenance. So, they do not have extensive collaboration with the small firms. Moreover, they do not have any preference to collaborate with domestic firms or international small firms. They are just looking for a reliable partner with enough financing and competencies to support and accompany them in any market they enter for a long period of the time. A quote from Alstom's production manager shows the process of small partner selection in a large company:

> *"…the company we want to work with has to go through kind of audit. It means that we have to be sure that the company is able to supply us in the long-term. So we have to analyze their financial situation, their capabilities and everything. When we got the green light, then we work with them…"* (Alstom)

In the wind energy sector, small pioneer companies develop new technologies and when the technology became mature enough it is common to be acquired by the large companies. For example, Alstom acquired small companies in renewable energy industry to enter in this business. They bought Ecotecia in Spain, and a small solar company in the UK. Apart from *Ecotecnia* and Alstom, we can follow similar pattern in the other international companies in this industry. Siemens, for example, entered to this industry by acquiring *Bonus*, *Vestas* merged with *NEG-Micon*, and *GE* bought *TAKE*.

6.4.2.1. *Collaboration for internationalization*

Collaboration between the small and large firms facilitates the internationalization process. Large companies need sub-suppliers to pursue them in the all international markets and small firms take advantage of the large firms' broader access to resources for product development in international markets.

In many cases, large and multinational companies have forced small companies to follow them in international markets. In other words, they forced them to become international. Alstom, for instance, expect that its small partners and suppliers go after them in the other countries. We can, therefore, presume that large companies somehow oblige small companies to internationalize passively.

> *"Our blades are produced in Spain for Spanish wind farms. If our blades suppliers could not deliver blades in the other markets, then they will be out. They have to be able to follow us. It is mandatory for them."* (Alstom)

> *"What Alstom brought to Ecotecnia was a financial capacity. So, they invest money and then we were able to reach foreign markets like Latin America… Alstom had very good relations with Brazilian utilities and that helped us to sell our products there"* (Alstom)

It also happened for e-consultant that after four or five years of their establishment they were forced to follow their main contractor as a multinational company in international markets. E-consultant's founder believes that:

> "*Some of this (small) companies are actually been driven by the OEMs to the international markets. For example, they may say okay we are going to the US. If you want to supply us you have to come with us. If you want to keep on*

supplying us, we want to make a global agreement with you. So, lots of them have been forced by their own clients to go international!" (e-consultant)

This collaboration can also facilitate internationalization of the small companies. In case of the Smalle Technologies these large companies helped them to enter to the international markets by providing them with networks and contacts. *Reposl* as big energy provider in Spain helped them to go to the international fairs and provide them with the international contacts.

> "*Repsol, for instance, helps us because they have some contacts with the organizers of showrooms in fairs and they allowed us to enter the other markets. That was the way they helped us the most in international markets*" (Smalle technologies)

This company collaborates internationally for the technological development and product commercialization. They have partnerships with *Johnson Electrics* in the USA and the other Chinese companies. They also tested their product in Portugal in a wave energy lab in *Wavec*.

Tecnoturbine's technology is also developed by international collaboration between this company and other partners in Germany. They started this collaboration for technological development and also commercialization. Company's founder believes that interaction with strong partners allows them to attain better knowledge about the available markets and assists them in the process of product commercialization:

> *"… they (large companies) have the more industrial way to accelerate the technology development. They are very different and we believe that they are very complimentary to our activities as well. Since they are international company with presence in 54 countries, we believe and we hope that it become like a key for us for internationalization and for standardization of our technology. They allow us to get the knowledge in the industry in order to improve our company and our products*." (Tecnoturbine)

Policy makers and institutions also admit that in the process of internationalization large firms can take small firms to the international markets:

> "*For the big companies there is a huge advantage because they can apply for international tenders and for these companies it's really usual they use small companies as sub-supplier (sub contractor) for their projects. For instance, Abengoa, they are in charge of constructing a big CSP power plant in California and they buy their components from Spanish companies because they have had previous experiences and it was positive and they repeat their good experiences with other small Spanish companies. It has happened a lot; maybe a big company buys products and services from small ones, especially in CSP*." (Solartys)

> "*Big companies know that this small company has a good know how or has a good technology and product. So, when ,for instance, Abengoa constructing big power plant in California, they look for small companies for their for example wires or for tiny components, thanks to this project in California, small*

companies have this opportunity to make international profile by participating in these international projects. This creates the opportunity for small companies" (Solartys)

- **Conclusion**

As it is discussed above, interaction between the large and small companies not only contributes to the transformation of renewable energy industry, but also it can facilitate and accelerate the process of internationalization. Large companies in international market need reliable sub-suppliers that follow them over the national borders to participate in the international projects. On the other hand, small companies are engine of innovation and variation of technology. These companies are sources of new knowledge and new technologies and partnership with them help to adopt disruptive and radical technologies. Moreover, this interaction facilitates the international progress of small renewable energy companies. Large companies by providing the required knowledge and capabilities like market knowledge, reputation and networks assist small companies to enter to the international markets. We can call it *passive internationalization*, because small companies might be more willing to be active in the domestic market but in order to keep their partnership with the large companies they are forced to follow them in international markets.

In general, this industry needs interaction between both small and large firms. There have been growing tendency for large energy companies such as BP and Shell to invest in renewable energy projects. These companies can help to the further development of this industry by combining wide range of knowledge from conventional energy production to aeronautical and marine industry. However, after the oil price reduction in the recent years, major energy companies seem reluctant to invest on new energy technologies.

In summary, this industry needs interaction between the large and small firms for its further development. As ICAEN mentions, this interaction is necessary for the evolution of this emerging industry:

> "*There is no one company with its own resources that can build its own power plant in renewable energy industry. Most of the big players are utility companies and they sub-contract their projects to the different smaller companies. Most of these changes on the global value chain comes from SMEs and this is a big complimentary between these two types of companies. And then SMEs also can use technologies for the big players on producing the machinery needed for the power plants. There is the exploitation of the power plants which is normally done by utility companies and then there is a construction which is usually done by big construction companies like ABENGOA. We have the machinery and the technologies that big players and wind turbine producers are there. But the control, the sensors, the engineering, the maintenance, the very specific materials, and technologies …all of these issues are provided by SMEs."* (ICAEN).

Grounded on the evidences from the cross-case analyses we hypothesize that:

Hypothesis 7: Collaboration between the large and small companies facilitates the internationalization of the firms and positively affects their internationalization.

Following table summarizes how small and large companies collaborate with each other and how this collaboration facilitated their internationalization.

Table 6.4.2.1 Interaction between the small and large firms cross cases analyses

Company	Collaboration With small and Large firms	International Collaboration
Alstom	•Collaboration as merging and acquisition •Limited collaboration as sub-contractors, suppliers, maintenance •No preference for choosing domestic or international small company •Selecting reliable and long-term partners	•Small firms following them in international markets • Developing market for the small companies and helping them to enter foreign markets
Energea	• Collaboration with large companies when it is difficult to enter to a sector	•Partnership with large Italian company to enter the bio-fuels boilers markets
Mira Energea	• Technological collaboration with large companies and international institutions (IEA)	•No significant collaboration with the large companies in international markets •Participating in international and EU projects through international institutions' network
e-consultant	• Technological collaboration with large companies • International collaboration in wind energy technologies	•Partnership with large companies to enter the international markets •Large firms provide contact and networks for internationalizations •Large firms provide knowledge of the international markets
OpenDomo	• In process of negotiation with the large firms	• In process of initiating international collaboration
SmalleTechnologies	• Technological collaboration • International collaboration • Financial support (Repsol)	•Providing networks and contacts for internationalization •International technological collaboration in USA, China, Portugal
Tecnoturbine	• Technological collaboration • Market knowledge • International collaboration	•International technological collaboration for technological development and commercialization of the final

Company	Collaboration With small and Large firms	International Collaboration
		product
Vidurglass	•Limited collaboration with both small and large firms	•No significant international collaboration
Watly	• Collaboration for financial support (Philips) •Technological collaboration with large firms (Like Fluidera for water treatment)	•International collaboration for financial support •Technological collaboration for product development (water treatment and solar collectors)

6.4.2.2. *Level of technology maturity and standardization*

Interaction between the small and big companies depends on the type of technology and technology maturity. For instance, since wind energy is a mature technology, wind sector is a play ground for utility companies that they have a lot of resources to develop this technology. This is also true about solar energy. But there is no dominant company in the market for the wave energy sector. Smalle Technologies's founder asserts that they may need this type of collaboration with the large firms when their technology becomes more advanced and mature:

> *"If we develop our technology in the long-term for larger scale application like in tidal and wave energy we could have more contacts with big companies. But our final goal is that to develop this technology for the larger market such as getting energy from the waves in big scale than buoys and sail boats. For this objective we need the collaboration of big players in the future."*(Smalle Technologies)

Watly owner believes that big companies are not still interested in their product because they do not see any market opportunity for it but in related industry there are only small companies that are providing new technologies and innovation to the market.

6.4.3. *Resources and capabilities*

By applying resource based view (RBV) (Barney, 1991, 2001) we can identify the importance of the resources and capabilities in the internationalization of entrepreneurial firms in renewable energy industry. As it is defined in the literature, two groups of resources are known in organization that contribute to sustained strategy of the firms: tangible and intangible resources (Barney & Clarck, 2007). Tangible resources include physical, financial and technological resources of the firm, while intangible resources include the firm's human, relational, organizational, brand and networks. Results of studies in IE literature highlight the key role of the resources and capabilities in the internationalization of firms (Andersen & Suat Kheam, 1998; Calof & Beamish, 1995; Coviello & Cox, 2006; Coviello & Munro, 1997, 1995; Dhanaraj & Beamish, 2003; Laanti et al., 2007; Paul Westhead et al., 2001; Zahra et al., 2003). Limited literature about the internationalization of wave and tidal energy companies also point out that lack of resources is one of the key factors that hinder the process of internationalization of these firms (Bjørgum et al., 2013; Løvdal & Aspelund, 2012; Løvdal & Moen, 2013; Løvdal & Neumann, 2011), especially financial resources.

6.4.3.1. *Financial Resources*

Financial resources are the key and most visible resource, that impact new ventures survival and growth (Cooper et al., 1994). IE Literature has shown the effect of financial resources in the internationalization of new ventures (Gabrielsson, Sasi, & Darling, 2004). Although new ventures in comparison with large firms have limited access to financial resources that sometimes put them in disadvantageous situation or prevent them from international competition (Almor & Hashai, 2004; Lu & Beamish, 2001), they are still encouraged to compete internationally. Existing literature about renewable energy industry underscore the key role of financial resources in marine and wave energy industry (Bjørgum et al., 2013; Løvdal & Aspelund, 2011). Løvdal and Neumann (2011) argue that need for capital is one of the most challenging barriers in marine energy industry.

In Spain, financial resources are one of the primary barriers for renewable energy companies. Need for capital is more challenging in this country, where the economy is still struggling with financial crisis and budget deficit. Between our cases different firms have encountered with this problem and they have tackled it with internationalization. In the following part, first we describe why need for capital is challenging issue in this industry, and how this problem affected the companies, then we will see how companies are overcoming this limitation. Finally, we argue about the internationalization as the common strategy to resolve this problem.

6.4.3.2. *The importance and effect of the financial limitation*

All the cases and also the institutions confirm that financial support is one of the main barriers and challenges in renewable energy industry. With financial crisis and latest policy changes, which has removed the supportive financial regulations, not only companies' access to funding is restricted, but also they cannot get loans from the banks and financial institutions. Here we reflect on the effects of lack of enough financial resources on the case studies.

Energea have developed a biomass boiler with an Italian partner, but they cannot commercialize and patent it because they need an investment about €300,000 to enhance and patent this technology. They also state that funding and financial resources is the primary barrier for small renewable energy companies in Spain, since banks after the crisis and budget deficit are not willing to provide financial supports for renewable energy projects. One of the reason they start their international activity in Chile is that there they can get their money back sooner than Spain.

E-consultant founder thinks because of the huge investment in big capital intensive projects in the wind energy, small firms are in disadvantageous position in comparison with large firms. He guesses that in the near future many of small firms in this sector will disappear, except the companies that produce high-tech products. For large firms because of the competition between the firms they will outsource their manufacturing facilities to the low cost emerging countries like China. He notes that at the moment OEMs (original equipment manufacturers) in Spain are about three major companies while in China at the moment there are about 75 OEMs.

Mira Energia's founder asserts that the main challenge for starting her business was the initial investment and managing the financial issues. She thinks as a small firm they do not have enough resources to participate in the large projects. She states that the only experience in other projects and good profile of the company is not enough, and they need financial support to create trust and confidence for working in big projects with large partners.

In OpenDomo they did the software development by themselves, but for physical development of product they needed financial support. He also found investment on start-up as a challenging issue in Spain and they could not find an investor from inside of Spain.

For Smalle Technologies financial problems had made trouble for them to have a good team for developing their commercial product. They needed financial resources to pay for good engineers to develop the first prototype of the product.

6.4.3.3. *How firms tackle the financial restrictions*

In case of Energea, they have used their own money like a small funding from the all colleagues to support them for implementing the projects. The other solution for them was to go to the international markets. One of the reasons they started their international activity in Chile is that they get paid from the public sector sooner than Spain. In case of Mira Energia because of the lack of financial resources, they tried to start collaboration with major firms to work with them as sub-contractor in major projects.

OpenDomo when was disappointed of the domestic support for their product, they started to look for other supports from over the borders. They applied for *Kic InnoEnergy* as a European consortium to get some funding and support. He mentions that:

> "*It is really hard in Spain, and in the sense it is funny because when we went to other countries we found companies and investors were interested in our company that they were already interested in investing significant amount of money to bid for us in fact, and in Spain it is really hard and you have to fight really hard to get finance*." (OpenDomo)

Therefore, they applied for the international supports to develop the physical part of their product and he believes that at the begging they were really helpful.

In the case of Smalle Technologies, first they asked for the domestic sources of financing. They participate in different contest to get funding and they have received support from *ACCIO* and *Barcelona Activia* (eco-entrepreneur contest) for about €20,000. But this amount of investment was not enough for their research and development and starting their business. They received the first international financial support from a university professor in France and they applied for the grant form *Kic InnoEnergy* institution. This center also helped them to start their business and provide them with €40,000. They are continuing their business further with the financial support from *Repsol Foundation*. Although they were successful in getting both national and international funding, the founder of company believes that the "most difficult thing was getting funding".

Tecnoturbine like Smalle Technologies applied for the both domestic and international funding. Although they had good idea, they were not as successful as Smalle Technologies in getting domestic funding. However, as same as Smalle Technologies they received financial support from *Kic InnoEnergy*. They think that without this support they could not continue with the project. The founder of the company believes that the principal challenge for starting their business was getting financial support in Spain because of the crisis and people mentality in Spain to support new ventures and start-ups. He states that:

> "*The main challenge for entrepreneurs in Spain is to getting the financial support*." (Tecnoturbine)

Watly's founder like other companies thinks that the principal problem for small companies in this field is financial support. He also refers this problem to the mentality of the people here in Europe that they are not willing to invest and take the risk for high technology companies and start-ups because they are risk-adverse. He says:

> "*We have a weak part which is financial but the technology is our strength*." (Watly)

The case of Vidurgalss is different from the others, they have started their business before financial crisis and the parent company let them to develop their production line and also their market. However, this company is affected by the financial crisis and then they decided to reduce the number of employees and halt their international expansion. He thinks that they need financial support to produce quicker with larger volumes to get into the more international markets.

The institutions and policy makers acknowledge that financing is the major problem for small companies in this sector:

> "*Like other sectors they have financial problem. It is difficult to have access to financial market for most of the companies. Obviously this is more difficult for the small and medium-size enterprises and most of the companies in this industry are SMEs."* (ICAEN)

> "*(the main challenge for these companies is) ...economic resources and investment, at present time the main problem is finance. ... Most of them (the companies) they do not have resources. They come here and they do ask for money we try to find an investor for them but it is quite complicated. Since private investments only want to go to the projects that they see that everything in Okay. It is quite difficult. It is mixture of the private and public funding sometimes but it is also quite complicated*. " (ACCIO)

Finally, if we compare these cases of small and medium size firms with a large company like Alstom we can distinguish that how their access to the financial support helped them to develop their business in international markets. One of the reasons Ecotecnia merged with Alstom was that Alstom could brought them financial capacity to develop their international activity in Latin America and Europe.

> "*Yes, in 2007 if Alstom hadn't had acquired Ecotecnia, probably it would not be exist today. By that time Europe and Spain almost stopped installing wind farms, so the market dropped down dramatically, especially in Spain. So, we had few customers here and Alstom brought money and new potential customers in other countries*." (Alstom)

However, in this case we can see that how this company took advantage of low cost financing from local international bank to develop their business in Brazil and now Alstom is one of the key suppliers of the wind turbine in Brazil. If they want to start any collaboration with smaller firms first they audit the financial condition of them, because for them a reliable partner should have enough funding to support them in all the market that they enter.

- **Conclusion**

As discussed above and according to the evidences from the multiple cases, one of the well accepted solutions for companies to get funding and financial support is the international markets. In the Table 6.4.3.1 we summarized the main challenges and difficulties of our cases and how they could overcome this challenge. Based upon these findings and practices in renewable energy industry we hypothesize that:

> **Hypothesis 8:** Need for financial resources and funding encourage renewable energy firms to internationalize.

Table 6.4.3.1 Financial challenges and solutions cross cases analyses

Company	Financial Challenges Effects	Solutions
Alstom	• Financing is not a big challenge for them •First financial challenge for Ecotecnia to develop their market	• They are looking for any possibility to get low cost financing in international market (ex. local banks in Brazil) •After merging and acquisition they provide them with financial support to go to the Latin America market.
Energea	• Limited funding for projects •No funding for new product development and commercialization •Limited external (international)	•Participating in the international and EU projects •Making an internal saving (bank) for investment in projects

Company	Financial Challenges Effects	Solutions
	investment in this sector	
Mira Energia	• They cannot get involved in the big Projects •They need financial resources to create confidence and trust with partners	• Working with large firms as sub-contractor
e-consultant	• More exit of the small firms in the wind energy sector •More projects for larger firms	•Small companies as technology and knowledge provider • Outsourcing of manufacturing line to the low-cost countries ex. China
OpenDomo	•Financial support for product development • No financial support from the domestic investors	• International financing easier way to get the finance •Getting support from Kic InnoEnergy
SmalleTechnologies	•The most hard thing was getting funding •They needed funding to make a good group of researcher	• Getting financial support from international foundation and institutions •Participating in the different national contest to find suitable investor
Tecnoturbine	• Financial support as one of the main challenges for starting the business •Domestic financial support is not exist to commercialize their idea	• International support helped them to commercialize their product (Kic InnoEnergy)
Vidurglass	• Cutting all the cost in the company •Firing the workers and make the number of employees half • Stopping the progress of the business for further development	• Reducing the number of employees •Reducing the production
Watly	•Financial support as a key challenge	• Entering national and international contest for entrepreneurs •Getting international finance (from Netherland) •Getting financial support from EU (Horizon 2020 program)

They also believe that these companies in order to survive they need to internationalize. In order to internationalize they also need financial support which is not easy to get:

> "*Before Spain was leading the renewable energy industry worldwide and now all the companies are trying to export. But if you want to export, then you need financial resources and you have to be more competitive and if you don't have access to the financial market, then you cannot export and you cannot stay in domestic market because it is slowing down. So, this is the reality of these companies*." (ICAEN)

> *"Of course they will go abroad but not many of them because you need a lot of resources to go outside."* (ACCIO)

Many companies go to the international market to acquire funding. The main target for them is EU finding. For instance, they may apply for European funding programs. ACCIO internationalization expert says:

> "*In the case of research and development they go to European programs to get funding. For example, now many company looking for financial funding in horizon 2020*." (ACCIO)

6.4.4. *Physical product and technological resources*

Technology defines the type and quality of the product in the market. Large body of knowledge about entrepreneurial companies is related to high-tech companies and they have discussed about the positive effect of the technological knowledge for taking competitive advantage in the market (Lee, Lee, & Pennings, 2001; Shane, 2008; Zahra, 1996). IE literature has shown companies with superior technological capability are more likely to get competitive advantage in the international markets (Aspelund, Madsen, & Moen, 2007; Lee, Kelley, Lee, & Lee, 2012; Mcdougall, Oviatt, & Shrader, 2003; Mort & Weerawardena, 2006; Rialp, Rialp, & Knight, 2005; Weerawardena, Mort, Liesch, & Knight, 2007; Zhang & Dodgson, 2007).

The effect of the technological advancement on the competitiveness of the firm is highlighted more in the renewable energy industry as knowledge intensive industry. An international study about renewable energies shows that product design and new renewable energy sources are key factors in the market penetration of these technologies (Bird et al., 2002). Yet, it seems that technology development is still a challenging factor in marine energy industry (Bjørgum et al., 2013). In this study we want to understand what technological factors and how affect entrepreneurial internationalization of renewable energy companies and how they overcome these barriers.

6.4.4.1. *Technological knowledge*

In this section we will have overview of our cases and how technological issues have hindered their process of international presence. In the case of Energea, although they are mainly a service and ESCO company, they have their own technological instrument to apply for monitoring energy consumption and energy efficiency systems. They have also their own technological capability that they developed with an Italian partner about biomass boiler. One of the main barriers for them is that these energy efficiency systems and software are designed as closed system while they need to customize the software and product for each projects, so they have their team that customize the software and product for them. The main barriers for their technological development and R&D activity are lack of financing to commercialize their technological innovation. They do not have enough financial support for doing research and development; therefore, they participate in the EU funded projects to get knowledge and know-how from these projects. For example, now they are working in two EU funded projects for developing renewable energy in Mediterranean area, they also participate in a projects about IT and energy efficiency between five European partner countries.

Energea founder believes that some technologies like wind is strategic sector that needs lots of capital and government support, while the other technologies like solar energy do not have this role as strategic sector.

In the case of e-consultant they had a problem for developing a special kind of magnet system and they had international collaboration to get enough knowledge from the leading countries in this field. He argues that wind technology is still young and need further development. Since in wind energy there is no standard yet, lots of opportunities for introducing a new technologies or more efficient system are still expected.

Mira Energia activity related to solar heating and cooling system (HVAC) and consultancy. The main technological challenge for them is access to the latest knowledge about this technology in Spain. Thus, she keeps contact with other international colleagues to be aware about the most advanced and innovative technologies.

Main technology in OpenDomo is a device for the measurement and controlling electrical systems. They have developed a completely new concept for energy efficiency system with domestic and commercial applications. This technology provides cheaper systems with multiple features, in comparison with the similar products in the market. The main challenge for them was time because the first prototype took a lot of time to be prepared for the market.

The technology in Smalle Technologies is related to energy harvesting from wave energy. In order to commercialize their product they had collaboration with several domestic and international centers and institutions. In order to solve their technological barriers, they tested and developed part of their product in *Wavec* which is a research center for wave energy in Portugal. They took advantage of their simulation systems for marine technologies tests. They had also developed their special electrical generators in collaboration with an American company (Johnson Electric) and their Chinese manufacturer. Although they are not satisfied with the collaboration with large firms because of slowing down their product development, in general they think that their international partnership was useful for their product development. The final product has nothing to do with their patented idea at begging, due to the all changes they have made to improve this technology.

The main technological challenge for Tecnoturbine is integrating several technological components in one product. In doing so, they took advantage of partnership with main international technological providers in the market like Siemens to have seamless product. They had problem to introduce the first prototype to the market. They speed up this process by doing comprehensive research before they start making the first prototype.

Although Watly is registered in Spain, they have a significant part of their team in Italy. These people are responsible for the design and technological development of their product. The founder of the company believes that their product not only should be technologically powerful, but also it should look nice. Therefore, they have their design team in Italy to improve their product as a stylish technological artifact. The physical development has been made in Italy and the other critical technological parts are developed by the other companies, such as a water purifier that does not need maintenance. This system is developed in collaboration with large companies like Philips and Fluidra.

In the case of Vidurgalss, they developed the product completely based on a project in the R&D center of their company. Their main challenge at the beginning was to get the required standards to introduce their building integrated PVs to the markets. This problem was solved by hiring an expert in this field from Germany to enhance the technology to be accredited by the international standards.

Again if we want to compare the situation between these small and medium size companies and Alstom we need to consider that this large company has lots of resources and financial supports for research and development. They have also access to a large network of research centers all over the world. More importantly a large company like Alstom is always customer driven, it means that they do not want to push their product in the market but they are following customer needs. For example, they have different types of the product with various capacitates in order to satisfy the customer needs. Recently, because of the market trends they have observed for the offshore wind turbines, they started to do investment for manufacturing these types of wind turbines. They have a special process to assess the market needs with other teams in R&D, marketing and logistic departments and they call it *Advanced Product Offering Dialogue*:

> "*We have a process called Advanced Product Offering Dialogue. In this product management process we have discussion with R&D group because they have also the view of the market. They are in contact with other suppliers, customers and different counterparts. They can also tell us what they see, think and what they would like to develop. Then we share with them our view of the markets and customers. This is like exchanging of ideas and it is very important because otherwise you are missing a part of the view of the company.*" (Alstom)

Moreover, for solving the technological problems they first try to find a solution within their network of research centers. For example, they developed the offshore wind turbines and also direct gear system within the company R&D. However, sometimes they have logistic problem and they cannot, for example, transport large blades to the other countries. In this case, they sometimes do collaboration with the local manufactures. For instance, in Brazil they had partnership with small local companies for developing onshore wind turbine.

- **Conclusion**

According to our previous discussion and cross-case analyses (Table 6.4.4.1), we observed that Mira Energia is the only company that needs internationalization to have access to the latest knowledge about solar cooling and heating systems. Since Spain is one of the leading countries in renewable energy technologies (especially in wind and solar energy) we can confer that Spain is hot-spot of the knowledge in this industry. Therefore, need for technological knowledge may not be strong enough to motivate companies for taking the risk and enter to the international markets. However, many of these companies have already established international partnership to develop their technologies like Smalle Technologies, Tecnoturbine, Watly, Energea and Alstom. These inconsistent outcomes need further investigation. Thus we can conclude that:

> **Hypothesis 9:** Technological resources are positively associated with internationalization of renewable energy companies.

Table 6.4.4.1 Technology cross cases analyses

Company	Technological Product or Expertise	Technology Challenges	Solution for Technological Challenges
Alstom	•Wind turbines	•More efficient product •Logistic of Blades •Timing to the market	•Internal and International R&D centers •Collaboration with local manufacturer
Energea	•Energy efficiency and controlling system •Biomass Boiler	• Lack of Investment in R&D •Lack of financing for commercializing their technological innovation	•Participating in public projects •Involved in the international and EU projects
Mira Energia	•Renewable energy services and consultancy •Consultancy about the solar heating and cooling systems	•Access to latest knowledge about solar heating and cooling systems •Challenge for installing the solar cooling and heating systems in another context	•Having contact with countries who have access to the most advanced and innovative ideas •Getting advice from previous partners in the international projects

Company	Technological Product or Expertise	Technology Challenges	Solution for Technological Challenges
			•Collaboration with IREC (Cataluña Energy Research Institute)
e-consultant	•Wind energy	•Producing electro-magnetic system	•Technological collaboration with international partners
OpenDomo	•Energy Efficiency systems •Measurement and controlling devices	•Late introduction to the market •Late entry of the first prototype to the market	•Starting getting help from Kic InnoEnergy •Collaboration with other company in agriculture sector for controlling the irrigation systems
SmalleTechnologies	•Wave energy technology	•Technological commercialization •Low speed of commercialization with large firms	•Collaboration with international and domestic centers •Collaboration with international research centers •Collaboration with international companies •Changing the large partner with a same size partner
Tecnoturbine	•Micro Hydro Turbine	•Integrating different technologies in a product •Preparing the first prototype	•Partnership with international partners for technological integration •Doing research and development in advance
Vidurglass	•PV modules and Building integrated photovoltaic	•Getting the standard required for selling the product •Stopping the R&D activity	•Hiring an international expert for developing the product for getting the required standards
Watly	•Solar Energy hub for providing electricity, fresh water, and internet connection	•Design a stylish and high-tech product •Purifier without maintenance •Patenting	•Design and physical development in Italy •Collaboration with large domestic and international companies

Company	Technological Product or Expertise	Technology Challenges	Solution for Technological Challenges
			•Getting financial support from international institutions

6.4.4.2. *Commercialization*

The commercialization process of renewable energy technologies can be determined by the type of technology and policy scheme. For instance, wind energy is a well developed technology and there are many patents in this sector. Legal framework in Spain has supported this technology for many years and the development of this technology has been a successful experience. However, the expansion of solar thermal and PV systems was almost a disastrous story in Spain. When government decided to do not support these technologies, companies stopped the process of commercialization of latest technologies in this field like CSP (Concentrated Solar Power) or CPV (Concentrated PV). In the following, first we overview the commercialization challenges in each case study and the limitations they experienced in this process. In the last part, we discuss how our cases have resolved their commercialization challenges.

In case of Energia, they have their team of engineers and they possess the technological resources like biomass technology. But they could not develop biomass technology due to the lack of financial support. Since patenting is expensive for many small companies, they could not even patent their new technology.

Mira Energia has developed its own system of evaluation for installing a proper renewable technology for buildings. With their distinctive evaluation procedure they can help architectures to have holistic view of the all available technologies in the market and to select between these technologies such as: thermal, PV, biomass, and etc. Mira Energia's founder also believes that the policy support can facilitate and accelerate the process of commercialization of renewable energy technologies, and he makes example of successful cases of wind energy and current development of biomass technologies. He also explains about the difficulties for commercializing solar energy and solar thermal systems in Spain.

For OpenDomo the commercialization process took a lot of time and they are looking for possible solutions to speed up this process. The other challenge for them is related to the domestic market demand. Since people think that these devices are unnecessary and expensive, these technologies are not very well adopted in the society.

Smalle Technologies's founder thinks that the commercializing challenge is collaboration with the large firms, like Johnson Electric, and slow pace of technology development. The problem is that work progress is not quick enough and the size difference makes the interaction between companies difficult.

> "*I would say generally is much easier for us to connect with smaller companies. We are talking with the same language. As we experienced with Wavec, for*

instance (they are not very big and they are SME) everything was more fluent with them. But with Johnson Electrics, there are millions of the steps in the middle and things went very slow with Johnson Electric." (Smalle Technologies)

They had the same difficulty with the other large companies as distributor of their products. This major company could not fulfill all of their commitments and finally they broke up their agreements. However, Smalle Technologies states that they need collaboration with large firms to commercialize their product in the mass markets:

> "*If in the long-term we develop our technology for larger scale applications like in tidal and wave energy, we should have more contacts with big companies. Our final goal is that to develop this technology for the larger markets to get energy from the waves in big scale instead of buoys and sail boats. For this objective, we need the collaboration of big players in the future."* (Smalle technologies)

Tecnoturbine's CEO thinks that the key barrier for the commercialization is to preparer the first prototype of the product that functions properly. He asserts that:

> "*Since the idea is very disruptive and it is a new technology, as long as you do not have anything that is really works, you cannot do that much*." (Tecno turbine)

Although they were really fast in making the first prototype in 5-6 months, because of prior research for more than one year, convincing people to buy their technology was one of the key barriers for their technology insemination. Because of the technology novelty, it is hard to convince customers to buy the product; therefore, they need to demonstrate a final product that is functioning correctly to persuade people to invest on this technology.

However, the main issue in the commercialization of Watly has been financing and patenting. If they want to get the financial supports from business angels or other investors, they ask them for patenting their idea. On the other hand, patenting is expensive and unaffordable for a start-up company. Watly's founder and CEO states that:

> "*We have a weak part which is financial but the technology is our strength*." (Watly)

One of the main issues for Vidurgalss at the begging was commercialization. They had developed their idea to integrate PV in the normal glasses, however; they did not know how they can get the required standards to sell their product in the national and the international markets. For that reason, they hired an international expert to enhance their product to be accredited with international standards. This consultant who is now the sales engineer of the company improved this technology to be qualified for the international standards. This was an important step to sell this product in the other markets.

The remarkable case is commercialization of the new product by Alstom. As it is described by the product manager of the company, they customize their product for each market and for them the most important things are the market needs and customer preferences. Here he explains about how they consider different requirements for the international markets:

> *"I can give you an example. Maybe you think that the high tower wind turbines in the US have market. Actually, there is no need for this kind of product because it is a high CAPEX product and right now there is no need for it. Even though the R&D group wants to develop it, there is no market for this kind of product in the USA. So, we give up developing this product in the US market. But maybe this product will be interesting for Germany or Finland*." (Alstom)

As it is explained above, Alstom as a large company starts the process of product development based on insights from the marketing department. However, in small companies with novel technologies, they try to commercialize their new products by creating market for it.

But the main challenge for the big companies in the process of the commercialization is the *timing to the market*. Since the process of development of the product takes time, and they need to respond to the market needs as soon as possible, even before finishing all the required tests. This issue is critical to compete with the other manufactures.

> " *…time to the market is something that normally goes against the interest of the innovation or the designer. The marketing people say we need to sell this new type of product which doesn't exist. But we should design it and do the prototype and then test it. You need time for it. But the marketing department wants it as soon as possible, and normally what happens is we take that time to design, to manufacture and install it, and once you install it, you accumulate working hours and experience. And normally what we say as a designer is don't produce big volumes, because there is a certain risk that we need to check with the prototype that everything is working. But the problem is that normally this process is overlapped by the serious production. So, normally we do the prototype and at the same time we are producing very big volumes, so we don't have time to react. Because they are already selling massively and we are testing at the same time, and this is like a nightmare because sometimes we discover that we did the calculation wrong, we need to make changes, and by that time we have 50 wind turbines around the world, we installed, and changing has a cost, and they don't give us the time to completely validate the test*." (Alstom)

6.4.4.3. *Commercialization and internationalization*

IE literature mainly discuss about the internationalization in terms of international sales, number of entering countries and how many years after the establishment of the firms they start their international activity (Zahra & George, 2002). In contrast with the current literature, the process of internationalization of the companies in renewable energy industry may start before entering to the market i.e. companies start their international activities in the pre-commercial phase. Recent study about the wave and tidal companies reveal and extensive international activity of these companies even in their development phase to have access to the resources (Løvdal & Moen, 2013).

As we have explored in the cases, some companies have already started their international activity to respond to the challenges and difficulties associated with the process of product development and commercialization. Alstom has its own network of the research and development with partnership with more than 10 research center in Europe and North America. However, the main challenge for them in the process of commercialization is the market acceptance and time to the market. They respond to these challenges with customizing their wind turbines for each market and also they keep their R&D activity inside of the company to respond to the market quickly.

Energea have had problem in developing its Biomass technology because of the financial problems, but now they are taking advantage of it in the projects that they are doing with their Italian technological partner, without protecting it as a patent.

Mira Energia although does not provide any technological product, but they consider that the commercialization of the technologies is related to the type of the technology. For example, wind and biomass technologies are supported by policy makers while other technologies like solar and thermal energies lost policy support in the recent years due to the financial burdens. She, therefore, believes that they need policy and socio-political acceptance to develop these technologies. As we can see the recent supportive policy for installing energy efficiency systems in buildings, companies like OpenDomo thinks that financial crisis was an opportunity for them to develop their technology particularly for the public buildings.

Smalle Technologies for solving its technological and financial problems took advantage of the international partners. They had partnership with large companies and an international institution that supported them financially and technically to develop their final product.

Tecnoturbine challenges for the commercialization were related to the financial support and also to set up their technology for the demonstration phase. They start their activity with Kic InnoEnergy to support them financially. They had also made the prototype of their product based on the technology partnership with Siemens, a German energy company. The founder of the company thinks that the other main challenge could be the market acceptance i.e. how they can persuade the customers to buy their products.

Watly’s technology is well developed and they think they do not have any challenge related to it. However, the founder of the company thinks that as a small company their main challenges are financing and patenting, which are not mutually exclusive, because they need financial support to pay for patent. They resolved this issue by applying for the Dutch government funding program and also partnership in an EU project (Horizon2020).

Vidurgalss experienced challenge in the process of commercializing when they need the international technical standards to apply their technology in the buildings. They received the international standards and accreditations when they improved their product under supervision of an international expert.

Since funding and policy affect commercialization and R&D activities of companies, policy makers agree that the possible solution for Spanish firms is to commercialize their product in the foreign markets. One *ACCIO*’s expert states that:

"*I think the issue is technology because when they were affected by the crisis the first things they did was to reduce the investment in research and development. So, other companies may have better technologies and once you go abroad, your technology can be more expensive and less efficient than the other competitors. I think it is another issue companies should face because they couldn't keep investment in the new technologies*" (ACCIO)

Moreover, in Solartys they provide services to accelerate the commercialization of the technologies in international markets.

"*We have just finished a project which is called "Spanish Solar Tech". This is a catalog about innovative technologies from Spain. This catalog shows the companies technologies and with this catalog we will go to the international conferences, international trade shows and all the international missions that we participate. With this we will have an international insemination*." (Solartys)

- **Conclusion**

Evidences from the multiple cases prove that commercialization of the renewable energy companies is slow. Factors that can hinder the process of commercialization are related to: financial supports, policy support and market needs. It means that lack of these factors may motivate renewable energy companies to internationalize. Therefore, need for commercialization is a possible motivation for the internationalization of renewable energy companies (Figure 6.4.4.3). This internationalization, in contrast with IE literature, may start in pre-commercialization phase when the final product is not ready yet to enter the market. Therefore, we hypothesize that:

Hypothesis 10: Need for commercialization of products positively affect renewable energy firms' internationalization.

Table 6.4.4.3 Commercialization and internationalization cross cases analyses

Company	Commercialization Challenge	Solution
Alstom	•Market Acceptance •Time to market	• Customize the product for each market •Keeping the R&D activity inside of the company and overseas research centers
Energea	•Financial Support to develop and patent the Biomass technology	•Working with an Italian partner to develop the Technology
Mira Energea	• Lack of support for developing solar thermal technologies	•N/A
e-consultant	• N/A	•N/A
OpenDomo	•Community and market acceptance	• Policy support •Socio-political acceptance

Company	Commercialization Challenge	Solution
Smalle Technologies	• Financial and technological support	•Collaboration with other (large) firms for technological solution •Getting financial support from the international partner (Kic InnoEnergy)
Tecnoturbine	•Financial and technological support •Market Acceptance	•Partnership for financial support •Collaboration for technological development
Vidurglass	• Getting the required standards for applying the technology in buildings	•Employing an international expert for getting the required accreditation
Watly	•Financing and patenting	•Participating in EU project

6.4.4.4. *Network*

Networking is one of the key intangible resources that IE literature has proven the positive effect of it upon entrepreneurial internationalization of the firms (Chetty & Wilson, 2003; Sylvie Chetty & Campbell-Hunt, 2003; Coviello & Munro, 1997, 1995; Etemad & Lee, 2003; Freeman, Edwards, & Schroder, 2006; Loane & Bell, 2006; Mort & Weerawardena, 2006; Sharma & Blomstermo, 2003). Many different types of networks exist such as social, international, personal, official and business network and extant literature has discussed about the importance of each types of networking. However, in our analysis we discuss about networks in two general categorizes: formal and informal.

As it is discussed in our cases, network has been used as a means and facilitator to overcome resources constraints and limitations, particularly in international markets.
Like other small firms, informal network provide Energea with the access to enter to an international market. Energea's founder has some family ties in Chile and he believes it helped him to have knowledge about this market. On the other hand, one of his friends from his study period in Argentina is now responsible about their branch in Chile. These two types of family and personal ties helped them to gain knowledge about the Chilean market and to establish their first branch there.

E-consultant's founder thinks that networking is extremely important. When they established their company in Germany, they had partnership with large firms in the international projects. He thinks that international collaborations with large firms connected them with their future international partners. This company now is using the previous international networks from their previous job experience in Norway, Germany and Denmark to connect these northern European companies with Spanish wind energy and utility companies. Apart from renewable energy consulting, they are responsible for the Offshore Wind International Business to Business (OWIB) conference, which is designed to connect all manufacturers and supplier at all levels of production chain.

Mira Energia's founder established her company based on her professional networks that she has had created in her previous job at International Energy Agency (IEA) project. In this way she knows the people who are working in the field of solar heating and cooling systems. She takes advantage of her professional network for finding solution for technical problems. She often collaborates with them in some international projects. About the importance of the networking in the internationalization she thinks that:

> "*The important things about networking are first the networks that you establish between people and then the confidence that you make with other people when you work with them. When other people see that you have international activities they recommend you to the other similar projects*." (*Mira Energia*)

For Ecotecnia, as a small company, having access to all the commercial networks of Alstom enables them to successfully develop in international markets. We observed that merging in international markets provide them with the access to Alstom powerful international sale network because Alstom is equipping more than 25% of power installations all over the world. The good example of networking is the entry of Alstom to Brazil where they already had their local network. This example shows the importance of the commercial and formal networks for internationalization of the wind energy in the other countries. Moreover, Asltom have developed a network of the local and international research and development centers. It is clear that for a large company formal networks can be more important than informal networks.

OpenDomo, established based on the informal networks between some friends and colleagues. They have used contacts provided from the Kic InnoEnergy. This institution not only has given them with financial supports, but also it has helped them to establish their company by providing them with international contacts in the international fairs and exhibitions in Spain, Germany, and Netherland. The founder of the company believes that these contacts at the begging helped them to make a lot of contact with interesting firms in international markets. They have also been member of the DOMOTYS association for home automation sector.

In Smalle Technologies, the founder has mainly used formal networks for establishing and initiating international activities. He used his formal network in ESADE business school to find about a patent that need to be commercialized. Based upon the network they had from Kic InnoEnergy and University of Barcelona (UB) they received financial support for about €100,000. This network also helped them to contact *Wavec* as an international partner in Portugal to test their product in their simulation Lab. They hold formal networks with large companies like Johnson *Electrics* and *Repsol*. These companies helped them for finding technological solutions in the international setting. For example, Johnson Electric connects them to Chinese manufacturers and also Repsol helped them to participate in the biggest international showroom in buoys industry. It helped them to make contact with potential international customers.

Technoturbine's founder started his business with their personal network i.e. friends and colleagues. He has used his personal network for technological and business development. They also use the formal networks provided by Kic InnoEnergy and large companies. Partnership with Siemens as an international company helped them to solve their technological problems and they try to make contacts with all possible customers in fairs, workshops and congresses.

Vidurglass has taken advantage of the formal networks from *Solartys* association and events to meet their potential customers or partners. The sales engineer of the company has used his personal networks in Germany to find the technical solution for acquiring the international standard certificates. He also contacted German companies that were interested in BIPV technology at inter-solar fair. However, he mentions that for better establishment in international markets and to revive their position in the market they need again to reactive their international networks.

Watly founder has mainly used his informal network from Italy and Spain to develop this solar purifier technology. Although his personal network has been effective for getting financial support or solving technological problems, it has not helped him to generate direct customer. For finding possible customers he is trying to use formal networks in the events like *Doctors Without Borders* congress or investment forums. Watly is the only company among our case studies that is working on communication through social networks to introduce their product and company. They have a communication expert whose is responsible to promote them in the virtual networks like Linkedin, Twiter or Facebook.

Since networking is a well accepted practice for industry development, government agencies and institutions put effort to develop formal networks between firms in domestic and international context. *Solartys* and *ACCIO* help companies to shape their formal networks in these two contexts. These institutions have also their own networking events. But *ICAEN* has its own networks of the firms that provide technological solutions in Spain.

- **Conclusion**

Results of our study put emphasize on the importance of the formal and informal networking in the home country and the target foreign markets (Figure 6.4.4.2). Our cases normally take advantage of their formal and informal networks to overcome their limitations and to enter the foreign markets. However, it seems that small companies are more convenient to exploit their informal ties more frequently than large firms to deal with their problems and internationalization. Thus, we can hypothesize that:

> **Hypothesis 11** Networking (formal and informal) affects positively internationalization of renewable energy companies.

Table 6.4.4.4 Networking and internationalization cross cases analyses

Company	Formal Networks	Informal Networks	Internationalization
Alstom	•Sales and commercial network of Alstom • Local and international R&D network		•Access to the international sales network of Alstom for Ecotecnia •International R&D network collaboration
Energea		•Personal contact	•Establishing their first branch in a country they

Company	Formal Networks	Informal Networks	Internationalization
		•Family contact	have personal and family ties
Mira Energea	• Professional network ex. Job, Experience, education	•Personal network: friends and colleagues	•Using professional network for making trust and participating in new international projects
e-consultant	•Collaboration with large companies •International network: OWIB networking event		•Working with companies form home country (Denmark) and North of Europe (Germany and Norway) •Connecting international companies in offshore wind energy
OpenDomo	•Kic InnoEnergy formal network •DOMOTYS formal network	•Personal network: colleagues and friend	•International contacts from Kic InnoEnergy
SmalleTechnologies	•Kic InnoEnergy network •ESADE network •Collaboration with large firms (Johnson electrics and Repsol) •Buoys show rooms and fairs •ACCIO		• International funding •International technological support •International contact with potential customers in Buoys show room
Tecnoturbine	•Kic InnoEnergy formal network •Collaboration with large firms •Congress, workshops and forums	•Personal network: colleagues and friends	• International technological support •Meeting potential international customers in events likes fairs and workshops
Vidurglass	•Events like fairs, workshops and exhibitions •Solartys and ASIF association •ACCIO	•Personal networks: from Germany	•Meeting potential customers in international markets with Solartys helps and in events
Watly	•Events like workshops, exhibitions and fairs	•Personal network •Social network	•Personal network in Italy and Spain •Formal networks in events to find customers •Social network for introducing the product and company

6.4.5. *Business model*

Business models define how entrepreneurs planned to create value with their business. However, it is one of the less studied subjects in sustainability literature and need further investigation. As it is discussed in the literature there are two types of the business models. The first one is the utility-side business models based upon few numbers of large projects for commercial purposes. However, customer-side business model is based on the large number of small projects. Despite the fact that utility -side business model create more revenue and incur lower risk, the other customer-side business model are needed for sustainable future (Richter, 2012).

Between the cases most of them adopted *utility-side business model*, no matter if they are large like Alstom or small like Tecnoturbine, Smalle Technologies. In this model which is similar to the large utility companies, firms are looking forward to make money by applying the traditional business model of the utility firms which is based on centralized energy system. For these companies the interaction between the large and small firm is essential for participating in major projects. The only company that adopted the *customer-side business model* is Watly. This company is created to respond to the needs of the people in the bottom of pyramid, especially in poor and developing countries. They have developed an artifact for basic needs of these people such as: fresh water, energy and communication. But as the founder of the company insists, big companies are not that much interested in their business and he may need to develop this product in as many countries as possible to outweigh the risk of decentralized renewable energy system. Therefore, we may infer that the degree and speed of internationalization in the customer-side business model might be higher than the utility-side business model. But we think that there are few companies in the market with this type of business model and applying utility-side business model incur lower risk. Therefore, we hypothesize that:

> **Hypothesis 12:** The utility-side business model impacts positively/negatively the international performance of renewable energy companies.

6.5. *Industry*

The effect of industry structure on the competitive position of the firms within an industry is defined by Porter (1980) in the five force analysis. In this framework he discuss about rivalry between the firms, bargaining power of suppliers and customers, threat of the new entrants and threat of substitutes as the five forces that define the competitive advantage and strategy of a firm within an industry. International entrepreneurship literature has discussed about the industry structure effect on the internationalization of the firms (Andersson, 2004; Autio, 2005; Bloodgood, Sapienza, & Almeida, 1996). Conventionally many studies investigate about IE in high-tech industries like software industry (Bell, 1995; Coviello & Munro, 1997; Dib et al., 2010; Gabrielsson & Gabrielsson, 2004; Kuivalainen et al., 2012; Lopez, Kundu, & Ciravegna, 2008; Majumdar et al., 2010a; Moen et al., 2004; Ojala & Tyrväinen, 2007; Reuber & Fischer, 2011; Terjesen et al., 2008) and some studies show the entrepreneurial internationalization in the low-tech industries like aquaculture industry (Evers, 2010, 2011) , hotel industry (Quer, Claver, & Andreu, 2007), apparel industry(Chetty, 1999) or furniture industry (Andersson, Eriksson, & Lundmark, 2006). However, few studies explored IE in renewable energy industry as emerging industry. Even though main technologies in this industry have been successfully commercialized and developed in international markets such as wind energy, solar energy, biomass and geothermal technologies, current literature about this industry is limited to a few studies about marine and wave energy industry (Bjørgum et al., 2013; Løvdal & Aspelund, 2011, 2012; Løvdal & Moen, 2013; Løvdal & Neumann, 2011).

Energy industry is a mature industry in general term and it is dominated by large and multinational companies, but renewable energy industry is an emerging industry and the structural factors of this industry should be different from the conventional energy industry, which is a mature industry. In this industry some companies have successfully developed in all the international markets such as *Vestas*, a Danish wind energy company, internationalization in Europe and North America (Wüstenhagen, 2003) and some other technologies are still in the introduction phase and need further development such as wave and tidal energy, and concentrated solar power (CSP). For analyzing this industry we applied the Fernhaber, Mcdougall and Oviatt's (2007) framework based upon seven structural factors. This framework assists us to understand how and why structural characteristics of renewable energy will affect entrepreneurial internationalization of companies in this industry.

6.5.1. *Industry evolution*

As it is suggested by Fernhaber et al. (2007) it is more likely firms enter the international markets when the industry is in the growth stage. As we studied about the case studies, although this industry is in the emerging stage, many of the companies have already begun their international activities even at the pre-commercialization phase. Companies like *Vidurgalss*, *Smalle Technologies*, *Technoturbine*, and *Watly* started their internationalization in the commercialization process.

Despite of the fact that renewable energy industry, in general, is in the emerging stage of technological development, some technologies are more mature like wind energy, and some others are in the introduction phase such as wave energy. Following quotes from the case studies confirm this issue:

> "*I think the wind energy is right now in the process to get to the maturity level. So, there are some markets that we reached to the grid parity and we are competitive with other conventional sources of energy without subsidies and without help of policies.*" (Alstom)

> "*There are different (maturity) curves for different industries (technologies) and it is difficult to shape an average curve for all. We could say the wind industry, especially on-shore wind turbine, is mature and off-shore wind industry is not so mature. Solar thermal plants are at the beginning. Biomass, the technology is mature, but if you want to use synthetic-gas (syn-gas), then it is not so mature.*" (ICAEN)

Therefore, companies in the wind energy sector, particularly on-shore wind turbines, follow different internationalization strategy than the other small companies. In this industry we think the technology maturity could be a better determining factor in entrepreneurial internationalization of the firms. For example, Alstom as wind energy company seeking economics of scope and scale by internationalization. They believe that:

> "*…we have to internationalize, otherwise you are out (of the market) and it is a matter of size and volume*." (Alstom)

However, we can see that the offshore technology is not still a mature technology and its need to be develop further in order to reach grid parity like onshore wind energy. In summary, although renewable energy industry in comparison with conventional sources of energy is in emerging phase of industry evolution, companies in this industry still need to practice internationalization for growth and survival. On the other hand, we can conclude level of maturity of the industry is not a significant factor in the internationalization of the firms and the technology could be more significant factor. Thus we can hypothesize that:

> **Hypothesis13a** There is no significant relationship between the level of industry evolution and internationalization of the renewable energy companies.
>
> **Hypothesis13b** In renewable energy industry companies with more mature technologies are more willing to internationalize.

6.5.2. *Level of concentration of the industry*

Level of concentration is related to the number of dominant firms in an industry. According to the Fernhaber et al., (2007) if we consider the inverted U-shaped relationship between the industry concentration and internationalization of the firms, renewable energy industry, in general, is in the middle of continuum of level of concentration. Since on the one hand we have some large utility companies like Alstom, Iberdrola, Endesa, and Gas Natural particularly in more mature technologies like wind energy, on the other hand, we have the small firms like this study case studies: Smalle technologies, Watly, Technoturbine, Energea, Mira Energia, OpenDomo, and e-consultant that they are competing in the niche market with product differentiation because they cannot compete based on the price with the larger firms.

> "*Small companies would probably start in area what we call mini-wind turbines. They can start from the niche market*." (e-consultant)

Fernhaber et al., (2007) explain that these companies internationalize to have access to a wider market and this is particularly true about small companies when we asked them about the main reason for internationalization. We can, therefore, conclude that the level of concentration significantly affect the internationalization of the firms.

> "*Probably small companies will need to buy some time until things get more reasonable here and I think it is a good moment to export. Since in other countries it makes more sense, they have an opportunity to grow.*" (OpenDomo)

However, the level of technological maturity is again different for each technology and it would affect the level of concentration related to each technology. For example, if we compare the wind technology and tidal and photovoltaic and solar thermal we can see that level of concentration in wind energy is higher because there are many utility companies who have their plants and the major manufacturers of wind turbines are mainly large companies. On the other hand, in some other technologies such as tidal and wave, big companies have not entered to this industry yet and they are waiting for superior technological development from the small ones.

> "*Wind energy is becoming the game of utility companies or the big utilities. It is time of Iberdrola, EDF, EDPR, ENEL these kinds of companies*. (Alstom)

> "*In case of wind, there are big companies, because there is no place for small companies. Nowadays it is a big market and they need a lot of financial muscle (financial power) to support the technology. PV and solar thermal traditionally in Spain has been made by small companies and there are lots of small companies in these sectors."* (Mira Energia)

> "*I cannot say which one is dominated…there are a lot of small companies with ideas and projects in different stages, but any of them are not mature yet and there are few big players looking at them and waiting for exploiting and buying a good technology which is developed by the small ones. I would say there are many small players and it dominated by small companies and there are some big players that are waiting and see small ones to develop the technology because it is something that has to be developed at first stages by small companies*." (Smalle Technologies)

The policy makers and institutions believe that in renewable energy industry in Spain there are many small companies, while for internationalization and growth of this industry in Spain they need more large companies that increase the competition and also level of industry concentration.

> **Hypothesis 14:** High level of industry concentration and existence of many new small ventures affect positively the internationalization of the firms in this industry for finding new foreign markets.

6.5.3. *Knowledge intensity*

Renewable energy is a high-tech industry in which companies need access to the latest technologies for developing and enhancing their products. In this knowledge intensive industry companies need to exploit their inimitable resources and capabilities in a strategic location close to the main partners and customers to foster knowledge creation process. As it is suggested by Fernhaber et al. (2007), knowledge-intensity of an industry affect entrepreneurial internationalization of the renewable energy companies in an industry.

As it is discussed in our cases, since Spain has been always one of the technological hot-spot for renewable energy technologies, companies started their business in this country. For example, now Spain is one of the leading countries in generating electricity from the wind energy (more than 40% of the all electricity generated in the country), and this country used to be one of the leading countries in the renewable energy technologies such as: wind, solar and CSP technologies. Therefore, we cannot expect that being close to the technological centers is the main reason for the companies' internationalization. On the contrary, Spain has been one of the host countries for many international and multinational companies.

> "*Spain was leading the renewable energy industry worldwide and now all the companies are trying to export…" (*ICAEN)

Although some cases like Mira Energia or Smalle Technologies have developed part of their technology with international collaboration (because solar cooling and wave energy are not well developed in Spain), access to the latest knowledge is not the key driving force for their internationalization. Based upon these findings we can conclude that:

> **Hypothesis 15:** Knowledge-intensity of renewable energy industry cannot be positively related to the internationalization of firms.

6.5.4. *Isomorphism*

Based on institutional theory, mimetic isomorphism is defined as a process of adaptation that basically involves one firm imitates behaviors or characteristics of the other firms (DiMaggio & Powell, 1983). Internationalization of new ventures can be explained with this theory when these companies imitate internationalization behavior of incumbent and other firms in their proximity at the same industry (Fernhaber et al., 2007; Lu, 2002).

As we explored the cases, most of them have not followed other companies to enter to the international markets. *Vidurglass* and *Alstom* say that they are not following any company in international markets and they independently make decision about their target markets and internationalization strategy. They explain that they make their decision to enter a country based on the available market opportunities or favorable policy scheme. However, in some cases, small companies are somehow forced by the large companies to follow them in international markets. For example, e-consultant entered to the foreign markets to pursue its partner company.

> "*Some small companies are driven by OEMs. They say, okay… we are going to China, if you want to supply us you have to move with us, and we want to make a global agreement with you. So, lots of them have been forced by their own clients to go international*." (e-consultant)

In summary, we cannot approve that internationalization of the local renewable energy companies affect the internationalization of the other companies in the same proximity. Since we could not find any evidence to support the *mimetic isomorphism* behavior in this industry, we hypothesize that:

Hypothesis 16: Local renewable energy industry internationalization cannot positively affects the internationalization of other firms in renewable energy industry.

6.5.5. *Global integration*

As it is suggested in Fernhaber et al.'s (2007) framework, global integration of an industry positively affects the internationalization of firms. However, how can we identify a globally integrated industry and how is it related to the firms' internationalization? As it is discussed in the literature, market situation, costs, competition intensity and environmental factors are possible drivers for globalization of an industry (Løvdal & Aspelund, 2011). In renewable energy industry, presence of the competitors across the world enforces companies to think globally. For example, there are many manufacturers of the wind turbines in Spain, Germany, Denmark, US, China and Japan. E-consultant's founder believes that:

> *"It doesn't matter where you are; you just have to be all over the world. It is very different from other industries in the sense that you have to be international and it's not something that you can choose. If you want to be part of this industry and deliver to the big companies you automatically forced to think international*." (e-consultant)

The other factor is market. For instance, in the case of photovoltaic, many countries are potential markets for the development of this technology. These markets can be developed countries such as the US, and Europe or developing countries like India and Africa. Therefore, wide international markets of this technology make it a global industry. *Alstom* and *Smalle Technologies* think that:

> "*Our customers are getting more and more global. So, we have to be able to follow them to the places they go and our suppliers have to be able to follow us to the markets we are going. Otherwise, our business does not work."* (Alstom)

> "*This is a global market. In Spain I do not know how much we can sell, but less than 5% of all our sales in the future will be in Spain*." (Smalle Technologies)

Environmental factors also affect globalization of this industry. One of the relevant environmental factors is the better performance of renewable technologies in the certain geographical areas. For example, wave and tidal energy are better developed in countries with access to the ocean waves like Portugal, Australia, UK and Norway. Solar energy is well accepted in Mediterranean countries, Middle East and other countries with higher level of sun radiation. Wind energy is installed in certain places where wind streams are strong enough to rotate the blades of turbines. Smalle Technologies' CEO asserts that:

> "*We need to go to the international markets. Maybe we look for a special location because of geographical reasons and to be close to the seas and oceans*." (Smalle Technologies)

Finally, the last factor that affected internationalization of this industry is technological development. Now these technologies are developing globally. As it is explained in the cases, the technological development is one of the major reasons that this industry is global. For example, Mira Energia and e-consultant say that:

> "*Nowadays the development of the technology happens globally. For instance, for PV and solar thermal collectors, China is the main producer. In my opinion, the technology internationalization does not affect the development of technology itself.*" (Mira Energia)

> "*There is like a cluster of five hundred companies that are participating in the developing of the wind turbine industry. The turbines of Vestas and Siemens are two market leaders in the wind turbine industry. A lot of these solutions that are integrated in these turbines have been developed by sub-suppliers not by the engineers of Vestas or Siemens. So, they have asked of international sub-suppliers*."(e-consultant)

> "*We are talking about a really high- tech industry which needs best knowledge to have in touch. So, if you need some technological partners and there is someone in Malaysia which is doing that, you are going to look for them because it's not easy to find the right people*." (Smalle Technologies)

Finally, the ultimate product of this industry makes it a global industry. Renewable energy is about electricity which is common and standard product everywhere. Therefore, this product makes this industry a global industry. On the other hand, with these technologies we are providing a solution for the global warming and air pollution. The beneficial impacts of these solutions are favorable for the world because of the climate change. Policy makers in *ICAEN* believe that this industry is global because it is solving a global problem:

> "*Since renewable industry is solving a global problem, if your policy promotes solving a local problem, that can be easily scaled up or replicated all over the world or in some areas of the world with the same problem. This industry is an international industry and SMEs with novel products have global market."*(ICAEN)

It is similar to *Watly's* founder opinion about the global impact of the renewable energy industry:

> "*The moment I solved the problem in Spain that supposed we can focus on the environmental impacts in Spain. But the moment we save our nature in Spain, we contribute to save the nature of our neighbor and the neighbor of neighbor and so on…we cover the world. This is what I call renewable approach."* (Watly)

The above mentioned evidences from the case studies prove the global integration of this industry. Prior studies about wave and tidal sources of energy offer the concept of *born global industry* to describe the level of internationalization of new ventures in wave and tidal energy (Løvdal & Aspelund, 2011, 2012).

Among the cases we have studied, all of them assert that in this industry they need to be international to survive. This shows that internationalization is essential for companies if they want to continue to exist and grow. This supports the previous studies that show the linkage between global integration of an industry and the survival of firms. Following evidences from the cases prove this issue:

> "*You have to be global at least for wind turbine manufacturers and big suppliers of blades, towers, electrical components, and alike. For technological suppliers of control systems or the very specific technology you can be local and you can be a Garage Company but for the big components you have to be global.*" (Alstom)

> "*The wind industry is actually one of the most international industries you can work in today, because the OEMs are forced to go to the all kinds of markets. That means you have to have relations with all kinds of markets*." (e-consultant)

> "*Since we have a niche market and you cannot sell to one or three countries. You have to sale to many countries to survive*." (Smalle technolgoes)

> "*So I would say there are a lot of rooms for exploiting markets that are around but at some point the more markets you take, the more chances to survive you will have in the future. Since your small markets will be already exploited and taken in the future*."(Tecno Turbine)

> "*It's absolutely compulsory. If you have not started your international growth, the company will die. It is essential for solar industry to go abroad. It is mandatory for companies to go to the international markets*." (Solartys)

According to these quotes regarding the internationalization of the firms in renewable energy industry and aforementioned evidences that support the global integration of this industry we can hypothesize that:

> **Hypothesis 17** Global integration of the renewable energy industry affects positively the internationalization of the renewable energy companies.

6.5.6. *Patenting and copying*

In some industries like pharmaceutical industry it is easy to protect the technological and innovative idea, while in other industries like restaurant it is not easy to protect your business initiative. As it is suggested by Fernhaber et al. (2007) when it is not easy to protect an idea, companies in order to mitigate the risk of copying business idea try to internationalize to take the most advantage of their technological advancement before it will be copied by the other competitors in the market.

According to our cases and renewable energy industry experts' perspective, renewable energy industry is not tightly protected industry like pharmaceutical industry, while this industry is more close to other side of the spectrum and in many cases companies can make copy of the other companies' ideas and their technological products. Therefore, companies instead of investing their money and time for a technology that can be copied by the competitors prefer to develop their technology and market. For example, *Energea* preferred to develop its technology and apply it in their international projects (in Italy) instead of spending time and money (resources) for patenting. *OpenDomo* also thinks that it is technologically complicated and expensive to register a patent and for small firms it is not their first priority. *Smalle Technologies* although started to commercialize a patented idea from UB university, they left this patent because for small companies it is too expensive to keep a patent and it is unaffordable to sue the companies that infringed their patent. *Tecnoturbine* also prefer to exploit their idea in the markets as much as possible and *Vidurglass* holds the idea that in photovoltaic industry it is quite easy competitors copy your idea and companies are opt to not protect but to produce a more efficient product with better quality. *Watly's* founder asserts that they are not interested in patenting, what they need to be successful is constant evolution of their product not protection. As it is explained about these companies, they believe to be the first in the market is more important than to be well protected:

> "*I think to be the first in the market is more important than to be well protected because it is not going to be easy to avoid copies*." (Smalle Technologies)

> "*I rather focusing on marketing and positioning of the company in the community rather than saying to the world I have worked for five years and nobody knows me but I have doing a lots of patents and now I have field five or ten patents worldwide. What, five years later patents worth?!...probably nothing*." (Watly)

Patenting also depends on the level of technology maturity. Some technologies, in some countries, are better protected like wind energy in the United States. Alstom admits that although wind turbine concept is not patented and it is common technology that can be copied easy, some companies still have barriers to enter to the United States market because of *GE* (General Electric) patent about some components. For example, *Mitsubishi* had this problem because of infringing *GE* patent in the USA. Alstom, as a result, prefers to keep away from the US market.

Therefore, strict copy right policies in some countries can be considered as a barrier for the internationalization of the firms. For example, internationalization of the wind energy companies to the US. Alstom is cautious about entering to the USA market, OpenDomo do not even consider getting in the US market. These companies prefer to stay in the European markets because patenting policy in the USA is aggressive, in comparison with consolidated patenting system in Europe.

The other challenging issues for patenting are companies' size and financing. Patenting is expensive and needs lots of technological development before applying for it, therefore small companies in this condition prefer to keep their funding for their market development than to patent it. *Energea* did not develop patent because it cost them for about €300,000. This is also true about *OpenDomo, Smalle Technologies,* and *Watly* they think that patenting is technologically complicated, expensive and it is not cost-effective.

> "*I think you could have the money but maybe it is not efficient to do it (patenting). You would have a patent that is not effective because your patent doesn't really work or if you want to patent something it's difficult to get it*

through because always there are people who have already did it and it's difficult to find something to be new. So, we have never looked at this and I think it is not very important thing." (Vidurglass)

The issue of patenting and copying the idea also related to the *strategic position* of the company in the market. Since in this industry other companies can make copy of your idea easily, companies cannot get competitive advantage in the market with their protected technology or patent. As it is suggested in our cases the way to gain sustainable competitive advantage in the market is to keep investing on research and development (R&D) to improve the technological product and be always market leader. *Tecnoturbine, Watly* and *Vidurglass* advocate this idea and they mention that:

> *"…with the technology that we have, almost everything can be copied. I believe, after one year something similar will come up. That is why you have to keep working in research and development and innovation. So, you keep improving it and you keep getting new stuff to the market. I mean protection is good and it is essential actually, but does not really secure you"* (Tecnhoturbine)
>
> "*So we are not interested in patenting things. What we need to do in order to guarantee or success is to speed up our company continuous evolution. As a company we need still to be completely focused on evolution at the very moment to launch a new product to the market. We are thinking about next product … we need to be a step forward of any competitors to have competitive advantage. It is not protection… it is vision, completely focusing on evolution of your business idea or technology*." (Watly)
>
> "*… the companies opted not to protect, they just want to be better than the other and to go on and searching for the new features*." (Vidurglass)

- **Conclusion**

Although patenting is important in this industry and many companies apply for it (Peña, 2002a), or it might be required by venture capitalists, it is not a determining factor in the success and survival of the firms. This issue is particularly true about small firms because they need to allocate lots of resources (time, technological resources, financial resources, and human resources) to get a patent and keep it for long term. Large companies because of less resource restrictions might find it cost-effective to invest in patenting (ex. wind energy companies in USA). But for small companies patenting is not their first priority. As it is discussed about the cases, many of small companies find their investment in patenting ineffective and they prefer to investment this money for product and market development. Part of this market is international market and many of these companies have already begun to enter the international markets to exploit their ideas. This is in line with Fernhaber et. al.'s (2007) suggestion that in the weak regime of appropriability firms internationalize to take most advantage of their idea because they have less access to venture capitalist resources.

However, we need to consider that the size of the firm and also maturity of the technology can affect the patenting strategy of a firm. For mature technologies and large firms patenting can be more significant factor that determines the sustainable competitive advantage of the firms in international markets. While for small firms, like most of the cases we have studied, it is more effective to develop their markets and technologies than to invest on patenting of an idea that will be copied soon or late by the other competitors. As a result, for small companies it is not vital to have patent, but they need to invest in research and development to keep their niche market position and to protect themselves from the competitors to achieve sustainable competitive advantage in the market. On the other hand, as it is discussed about the cases, patenting policy of each country can be a barrier for internationalization of the other companies. For example, wind energy companies like Alstom keep away from the US market because of the aggressive policy regarding energy in the US. OpenDomo because of the hostile policy in the United States also prefer to stay in the European markets. Therefore, we can hypothesize that:

> **Hypothesis18:** The strong regime of appropriability in the target markets affects negatively the internationalization of renewable energy companies.

- ### Summary

As it is discussed above, according to our cross cases analysis, which is summarized in Table 6.4.4.2, we figure out that among industry structural factors suggested by Fernhaber et al. (2007), in renewable energy industry maturity of the sector, level of concentration, global integration and knowledge intensity and regime of appropriability are determinant factors in the internationalization of firms. However, we could not find any strong evidence about the influence of the isomorphism on the internationalization of the cases.

We can compare these results by Andersson's framework (2004). He suggests that level of international experience and level of industry maturity are two main factors that determine international strategy formulation of the firms. According to him, environmental factors like industry are more significant in the more mature stage of the industry development. For example the behavior of the focal firms may affect the international strategy of the other firms.

Evidences from our cases represent that the level of technological maturity is one of the main factors that determine the internationalization behavior of the firms. Alstom for entering wind energy sector acquired Ecotecnia, a successful SME in the wind energy sector. On the other hand, small firms in the emerging sectors like wave and tidal energy, BIPV, and micro hydraulic energy have exploited their internal resources, particularly entrepreneurs, to carry out international entrepreneurship. Finally, since this industry is policy driven, this environmental factor can influence the internationalization decision of the firms from the outset and level of maturity of the industry cannot be a major factor influencing their internationalization strategy. In the next section, we discuss more about the policy effect.

Table 6.5.6.1 Industry cross cases analyses

Company	Level of concentration	Isomorphism	Level of maturity	Patent and copy	Global integration
Alstom	•In wind energy industry there are more large companies	• Entering of the other competitors into another market is a hint but they do their own market study for example they do not enter to Indian market	•Wind energy is the most mature renewable energy technology but in comparison with conventional sources of energy it is in the emerging phase	• It is easy to make copy of wind turbine idea • However, there are some patents for some components •Patenting can be one of the barriers for internationalization of the wind energy companies because they cannot enter to the market with patented components	• In wind energy companies need to internationalize to take advantage of economics of scope and scale. • Customers are getting more and more global • For surviving they need to keep their market share. So, they need to internationalize
Energea	•There are many small companies but big companies have control of the industry	• We received news about the market opportunity in Chile and entering of the other firms and we had our own networks and we started there	•Renewable energy technology in developing phase •Wind energy is the most mature technology	• Patenting is expensive and need technological development • They save the money from patenting to develop their product and market	• We can have access to the larger markets with internationalization • Internationalization as necessity for them •Domestic market is not enough

Table 6.5.6.1 Industry cross cases analyses

Company	Level of concentration	Isomorphism	Level of maturity	Patent and copy	Global integration
Mira Energea	•Level of concentration is related to the technology. Wind energy sector is more concentrated and solar thermal is less concentrated •There are both small and a large firms •Each company has its own niche market •Competing with large firms is impossible	•Companies need to follow the other companies to survive	•Wind energy in the maturity part of technological curve and other renewable energies in the starting part of the industry evolution •Level of maturity depends on the technology. Wind energy is more mature than the other technologies.	• It is easy to copy an idea •Nowadays everybody is making Photovoltaic • If they have distinctive product they want to exploit it in international markets	•Development of the technology happen globally
e-consultant	•Large companies are dominated in wind energy industry •There are also room for small companies to enter this industry for example to be as sub-supplier of the efficiency models	•It is not only imitation of the behavior of the other companies in the industry, sometime small companies need to follow large firms in international markets because they are sub-contractor and they have to be there	• Renewable energy in developing phase •Wind energy as the most mature technology	•This Industry is not tightly protected •In wind energy industry there is no standard yet • This industry is not still like mature industries such as aeronautic industry, its need lots of improvement to reach to a common standard	•Wind energy one of the most international industry •Wind energy companies are forced to go to all kinds of markets •Wind energy industry forced me to become international because we where sub-contractor of the large companies
OpenDomo	• This industry is concentrated with large firms • They need to internationalize because it is hard to compete with large		•Renewable industry in the developing phase, not growth phase	• It is not easy to make patent: it is technologically complicated to make patent and it is	

Table 6.5.6.1 Industry cross cases analyses

Company	Level of concentration	Isomorphism	Level of maturity	Patent and copy	Global integration
	firms			expensive • we have open source license for our products	
Smalle-Technologies	•About wave energy I cannot say which one is dominated there are many small firms that are developing these technologies •Large firms are waiting for future technological development •Competition based on high technology niche market for small firms		•Wave and tidal energy in the introduction phase of industry evolution	•They started from the patented idea to commercialize it •It is easy to copy your idea in this industry • They left their patenting because it is too expensive for them to protect it •Global patenting may cost them 100,000€	•They have global market for their product •They need to sell their product in international markets, Spain market less than 5% of their total market share •Companies in this industry needs to enter the international markets •Companies need to be international to survive
Tecnoturbine	•There are mix of the large and small firms in this industry •Competition in the niche markets with better technology •They go to the international markets to get access to new	•Companies follows each other for market opportunities in this industry	•Micro hydraulic system in the introduction phase	• They have patented their technology • It is easy to copy their idea •They need to keep investing in research and innovation to protect their	•Lots of markets exist that need to be exploited •More market, more chance to survive

Table 6.5.6.1 Industry cross cases analyses

Company	Level of concentration	Isomorphism	Level of maturity	Patent and copy	Global integration
	market opportunities			competitive advantage in the market •They prefer to exploit their idea in the market as soon as possible	
Vidurglass	•In PV sector there are more small companies	•We do not follow anybody in international markets. It is our decision to enter a market or not •We do research about each market	• Renewable energy in Spain has not experienced the growth phase • Renewable energy industry as developing industry	•In photovoltaic it is really easy to copy the idea and now there are many PV producers •PV technology is loosely protected •Research and development better strategy to gain sustainable competitive advantage in the market, not patenting and protection •It is not efficient to invest money for patenting because it is complex and the other competitors can easily copy it	

Table 6.5.6.1 Industry cross cases analyses

Company	Level of concentration	Isomorphism	Level of maturity	Patent and copy	Global integration
Watly	•In consolidated technologies like wind energy there are more large companies while in solar there are more small companies		•Renewable energy industry is in the last phase of introduction	•It is easy to copy idea in this industry •Patenting is expensive for about 200,000-300,000€ •If you think you can protect your idea for ten years it is wrong •We are not interested in patenting, what we need to do in order to guarantee or success is to speed up continuous evolution of our company	•We are already a multinational company and we are present in Spain, Italy and Netherland •Energy as common and standard product all over the world •The impact of renewable energy on the global issues: global warming and air pollution •Renewable energy industry is for definition global
ICAEN	•There are mix of small and large companies in renewable energy industry •The problem in Spain is that they do not have big companies, because the growth of the firms is limited or stopped			•It is easy to copy the ideas in general and it also depends on the technology	•Renewable energy as global industry because it is solving a global problem
ACCIO	•There are more small and medium size companies than large firms in this industry			•Small companies cannot pay for patenting and they sell it to large companies •Patenting is important	

Table 6.5.6.1 Industry cross cases analyses

Company	Level of concentration	Isomorphism	Level of maturity	Patent and copy	Global integration
				but not similar to pharmaceutical industry	
Solartys	• It depends on the technology, in CSP there are five or six large companies and the other are small companies •In PV industry there is no large company	•Regulation and market opportunities determine the target market of the renewable energy companies than the only imitation of other companies		•It is not that much easy and nor hard to copy the ideas in this industry •There are always Chinese companies that make copy of ideas	•It is necessary for the companies in this industry to internationalize to survive

6.6. *Policy*

Entrepreneurship literature consider policy as formal or hard institutional factor that determine the extent and intensity of entrepreneurial activities (Salimath & Cullen, 2010). IE literature have widely discussed about the national institutional context effect on the internationalization of the companies, especially in the context of emerging and developing countries (P. Aulakh & Kotabe, 2008; Bevan, 2004; Bruton, Ahlstrom, & Puky, 2009; Kiss & Danis, 2008).

In renewable energy industry, because the cost of electricity is not still competitive with the conventional sources of energies, it needs to be supported by a favorable policy scheme. This mechanism is effective where systemic failure or system imperfection exist (Negro et al., 2012). Therefore, development and growth in renewable energy industry as policy sensitive industry is highly related to the policy support. Countries interested in renewable energy development have designed and implemented different policies according to their legal and social structure. Consequently, these policy in different contexts resulted in different outcomes. For example, the Feed-in tariff (FiT) in Spain is not as effective as Germany and each country has tailored its renewable energy policy. Such policy supports, as fiscal and financial incentives, can be more attractive in one country than the others and it can also encourage companies to develop their activities in international markets. Policy makers should consider that the renewable energy policies should be effective in the domestic market and also encourage internationalization of the firms such as the current supportive policy for exporting wind turbines and PV technologies in China (de la Tour et al., 2011; Liu & Goldstein, 2013). Moreover, supportive policy effect is not limited to outward internationalization but it may lead to inward internationalization i.e. entry of international companies to a country with more attractive renewable energy policy framework (Korhonen, Luostarinen, & Welch, 1996; Welch & Luostarinen, 1993).

6.6.1. *Renewable energy policy in Spain*

In Spain the ministry of Industry, Tourism and Trade is responsible about implementation and monitoring of the renewable energy policies and regulations. In 1980, before joining the European Union, Spain passed the first law for *Energy Conservation* to support renewable energy technologies. Since then and after joining the EU in 1986, Spain has implemented a variety of policies that support renewable electricity generation through grid access, particular tariffs for renewable electricity and market premium options for certain renewable sources. In 2005 and 2010, they published the plans that describe the country plan to achieve its renewable energy targets and objectives. European Union binding law has also forced many countries to support development of renewable technologies. In order to meet the EU objective of 20% total energy being provided by renewable sources till 2020, Spain has followed the EU directive and has published *National Renewable Energy Action Plan* (NREAP) that explains how the country will achieve its renewable energy target to supply 40% of electric power generation by 2020. This law gives the priority to the renewable sources for grid access, feed-in tariff and market premium incentives (Brown, 2013).

However, Spain is one of the good examples that show how countries should not design and implement renewable energies policies. For example, in mid 2000s they established one of the most generous renewable electricity incentive programs for solar PV, and in 2008 Spain became the largest global market for solar power installation. Nevertheless, due to financial crisis that started from early 2007 and badly designed and expensive regulatory, the government could not continue its financial incentives program to support renewable electricity generation (Robinson, 2013). Therefore, since 2010 they have started frequent regulatory reforms. In 2012 they suspend all the feed-in tariffs and market premium incentives for new renewable electricity generation. Furthermore, In July 2013, because of tariff deficit of €30 billion that has accumulated since 2001, they decided to make retroactive cuts to the Feed-in tariff for all the projects that have already installed. This decision caused many companies to sue the government in the international courts about their retroactive decision to cut FiT. The other drawback is that renewable energy policy in Spain is only designed to support domestic market consumption and there is no specific policy to support the export of renewable energy technology.

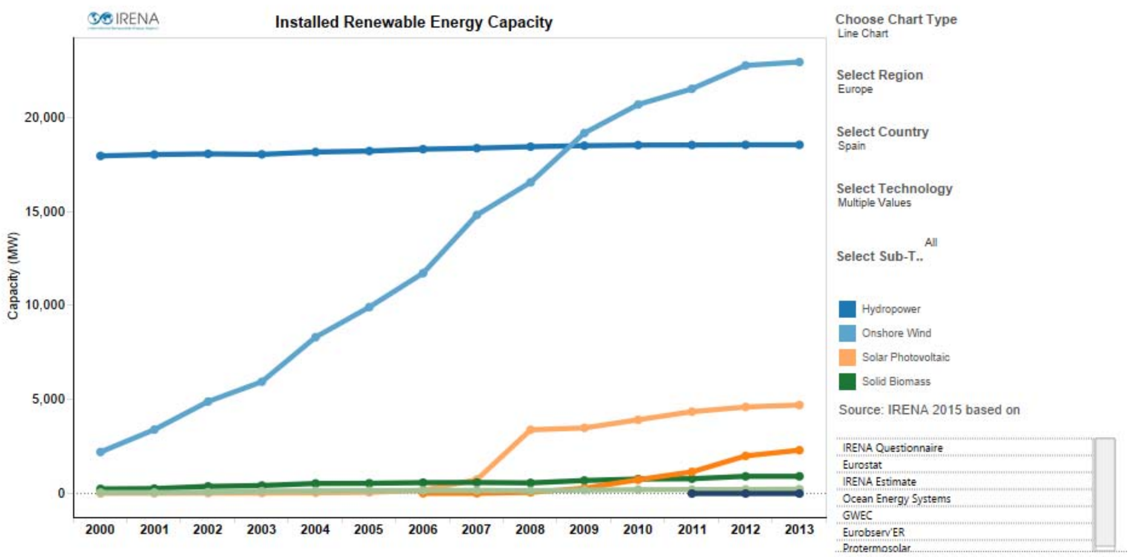

Figure 6.6.1.1 Installed renewable energy capacity in Spain (IRENA, 2015)

In order to illustrate the effects of the policy on the installation of the renewable energy technologies in Spain, we present the effect of various policies on the total renewable energy installation. As it is shown in Figure 6.6.1.1 after the financial support cut in 2012, the installation of different types of clean energy technologies is halted. For better understanding, in Figure 6.6.1.2 we can follow the effect of 12 different policies over the time between 1997 till 2013 on the installation of renewable sources. As it is shown in this chart the level of installation has increased after implementing supportive policies at points 11, 10, 9, 8, and 7. However, we can clearly see decreasing number of installations in points 6, 5, and 4 after the first policy reform in 2010.

We believe policy change should be considered as double-sides sword; on the one hand, it affects the development of domestic market and stop companies form internal activities. On the other hand, policy change not only pushes many companies to start their international activities (or intensify it), it may also create opportunities for some other companies in other sectors such as energy efficiency to offer solutions for cutting energy costs.

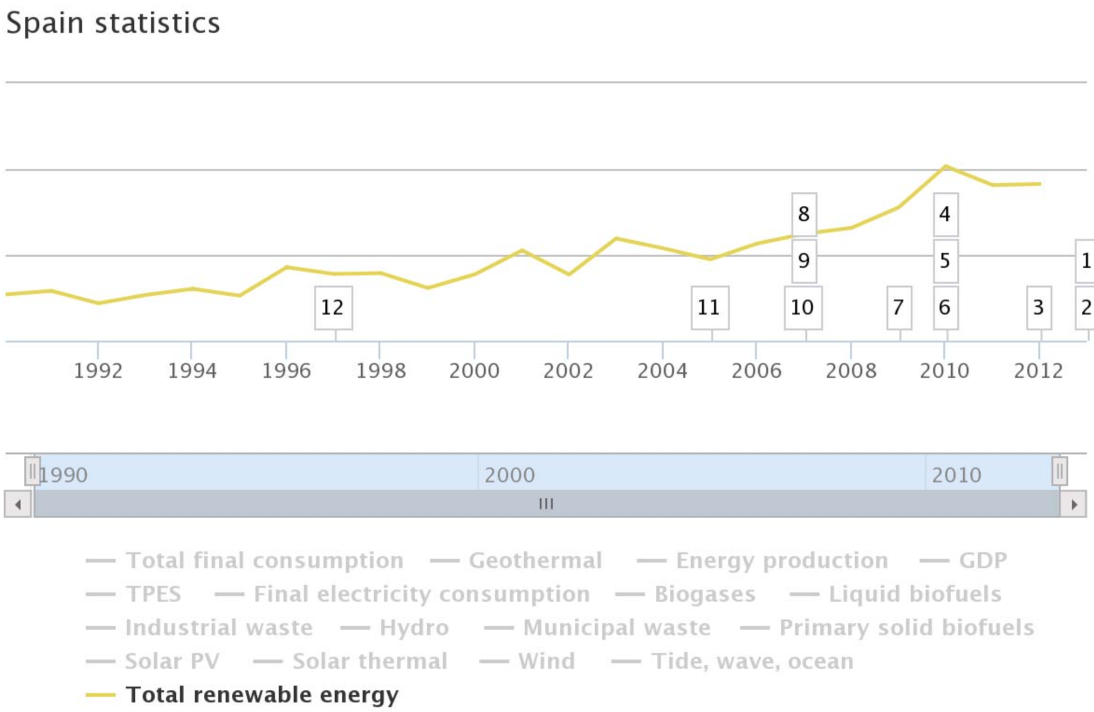

Figure 6.6.1.2Policy effect and renewable energy installation (Source: IEA)

Table 6.6.1.3 Spain renewable energy policy review (source: International Energy Agency)

No	Name of Policy	Policy type	Renewable energy	Date	Description	Status
1	Royal Decree Law 9/2013 on urgent measures to guarantee financial stability in the electricity system	Regulatory Instruments, Economic Instruments, Fiscal/financial incentives, Feed-in tariffs/premiums	Multiple RE Sources, Multiple RE Sources, Power	2013 (July 14th)	•Royal Decree Lay 9/2013 has completely abolished feed in tariffs (FIT) with retroactive effect for all renewable energy plants on the Spanish territory with effect as of July 14th. The FIT is replaced by a flat fee investment incentive. •The goal of the reform is: -To establish a regulatory framework to guarantee financial stability in the electricity system. To remove deficit in the electricity sector once and for all, preventing future deficit and guaranteeing supply to consumers at the lowest possible cost and with increased transparency. -To simplify and clarify electricity bills and encourage competition in domestic electricity tariffs to foster competition towards consumers, while maintaining the discount known as the "social bonus".	In force
2	Royal Decree Law 15/2012 on tax policy aimed at energy sustainability	Economic Instruments, Fiscal/financial incentives, Taxes	Multiple RE Sources, Multiple RE Sources, All	2013 (January 1st)	•The Law imposes a 7 percent tax on electricity generation starting Jan 1, 2013. To be applied to all the electricity generators. •An amendment to the Law, eliminates the right to be remunerated under the premium-based system for the sale of electricity attributable to the use of fuels at generation facilities that use any non-consumable renewable energy as a primary energy source, except in the case of hybrid	In force

No	Name of Policy	Policy type	Renewable energy	Date	Description	Status
					facilities that use consumable and non-consumable renewable energy sources, in which case the use of consumable energy could qualify for the premium.	
3	Royal Decree Law 1/2012 on revocation of public financial support for new electricity plants from renewable energy sources, waste or CHP	Policy Support	Multiple RE Sources, Power	2012 (Jan 27th)	•The remuneration pre-assignment registry processes will be temporarily cancelled. •The financial support for new installations that produce electricity from renewable energy sources or waste, or for new CHP installations, will also be temporarily abolished. •The actual installed capacity from wind power, solar thermal electric and notably that from solar photovoltaic has gone beyond the objectives set up in the Renewable Energy Plan (REP) 2005-2010. Hence, the costs of the financial support for the electricity from renewable energy sources have been significantly higher than had been anticipated. •This situation together with the complex economic and financial current climate, advises the withdrawal of economic incentives for these installations, on a temporary basis, while the reduction of the system's tariff deficit is achieved; this is, the difference between the income from transport and distribution grid access tolls, and regulated activity costs.	In force

No	Name of Policy	Policy type	Renewable energy	Date	Description	Status
					•The rule is not retroactive, meaning that it will not affect, neither power plants already running, or feed-in tariffs already authorized, or installations already registered within the pre-assignment registry. This action will not put at risk, neither the national security of supply, or the achievement of the national renewable energy targets set up by the European Union •The Government maintains its commitment to renewable energy as an essential part of Spain's energy mix. In 2011, renewable energy covered 33% of the electricity demand, constituting Spain as one of the more advanced countries in this area.	

No	Name of Policy	Policy type	Renewable energy	Date	Description	Status
4	New tariff regulation for the production of photovoltaic electrical energy (Royal Decree 1565/2010)	Regulatory Instruments, Economic Instruments, Fiscal/financial incentives, Economic Instruments, Fiscal/financial incentives, Feed-in tariffs/premiums	Wind, Multiple RE Sources, Solar, Solar photovoltaic	2010 (adjusted 2011)	• Modify the support framework for renewable energy projects •Cutting financial support especially for PV •PV plants support limited to 25 years •Feed in tariffs cut down by 5%, 25% and 45% for small, medium and large installations •Support technical integration of Combined heat and power and renewable energy •Support for innovative onshore Wind •Current tariffs for PV electricity (for those installations pre-registered on the 2011 second-quarter call) are: - Small-size roof installations: EUR 289/MWh - Medium-size (21 to 100 kW) roof installation: EUR 204/MWh - Ground installations: EUR 135/MWh	Ended
5	New regulation on electrical energy from wind and thermal electric technologies (Royal Decree 1614/2010)	Regulatory Instruments, Economic Instruments, Fiscal/financial incentives, Economic Instruments, Fiscal/financial incentives, Grants and subsidies,	Wind	2010	•Adjusts electricity feed-in tariffs allocated to wind generated power • The latest will be cut down by 35% as from early 2011. -Establishes for wind electricity a share of equivalent generated hour per year, eligible for government support. Once that limit is reached, the excess electricity generated by that particular installation during that particular year will not be entitled for any financial support.	Ended

No	Name of Policy	Policy type	Renewable energy	Date	Description	Status
		Economic Instruments, Fiscal/financial incentives, Feed-in tariffs/premiums				
6	Correction of the tariff deficit in the electricity sector (Royal Decree-Law 14/2010)	Regulatory Instruments, Economic Instruments, Fiscal/financial incentives, Economic Instruments, Fiscal/financial incentives, Grants and subsidies, Economic Instruments, Fiscal/financial	Solar, Solar photovoltaic, Multiple RE Sources	2010	•For reducing the tariff deficit • emergency measures ranging from 2011 to 2013 have been taken by the Cabinet of Ministers. •The main measures are: - As of January 1st 2011, electricity generators from both special and ordinary regimes will be required to pay a fee of a value equal to EUR 0.50/MWh for electricity fed into the grid. - As already witnessed for wind and thermal power installations, the number of equivalent hours of solar photovoltaic generated electricity eligible for government support is limited. Once that limit is reached, the excess electricity generated by that particular installation during that particular year will not be supported and will be sold at the wholesale electricity market price. Between 2011 and 2013, the share of equivalent hours will remain as	Ended

No	Name of Policy	Policy type	Renewable energy	Date	Description	Status
		incentives, Feed-in tariffs/premiums			established in the Renewable Energy Plan 2005- 2010 and concerned power stations will then enjoy three extra years of Government support, scaling up the support period from 25 to 28 years.	
7	New regulatory framework for administrative procedures for renewable energy facilities	Regulatory Instruments	Wind, Bioenergy, Biomass for power, Geothermal, Power, Multiple RE Sources, Power, Ocean, Solar, Solar Thermal	2009	•Starting in May 2009, future renewable energy power projects must be pre-registered before they can be eligible to receive feed-in tariffs. The provision does not apply to solar photovoltaic facilities. •In order to be registered, a planned facility must meet all regulatory and administrative requirements, including building permits, provisions for transportation and distribution, grid access, and have adequate funding to cover at least 50% of investment costs. A financial guarantee also needs to be deposited with the Directorate General for Energy Policy and Mines, in the amount of EUR 20/kW, and of EUR 100/kW in the case of solar thermal technology.	In force

No	Name of Policy	Policy type	Renewable energy	Date	Description	Status
8	Feed-in tariffs for electricity from renewable energy sources (Special regime)	Economic Instruments, Fiscal/financial incentives, Grants and subsidies, Economic Instruments, Fiscal/financial incentives, Feed-in tariffs/premiums	Wind, Bio-energy, Bio-energy, Biomass for power, Geothermal, Hydropower, Ocean, Solar	2007 (modified 2009)	•Establishing new tariffs and premiums for each kind of facility covered and incorporating renewable energy, waste to energy, hybrid systems and cogeneration plants into the special regime. •Up to 50MW, operators can choose between receiving a feed-in tariff price, or a feed-in premium paid on top of the market electricity price. The feed-in tariffs are paid during the entire time of a systems operation, though these are reduced after a specified number of years. This period is 25 years PV, ocean and hydro systems, 20 years for wind and geothermal and 15 years for biomass systems. Between 50 and 100MW, operators receive a bonus amount for the electricity produced. Solar PV systems are exempt from this arrangement; they receive guaranteed feed-in tariffs which are adjusted every quarter for new systems. •In September 2008, new tariffs and a new cap were established for solar PV. Systems registered prior to 29 September 2008 are eligible for a feed-in tariff of between approximately EUR cents 23/kWh and EUR cents 44/kWh (depending on system size). The installation cap of 371MW established by the law has been adjusted upwards to 500MW as of 2009, while the feed-in tariff has been reduced to EUR cents 32/kWh for ground systems and EUR cents 34/kWh for rooftop systems. A registry of systems eligible to receive the new tariffs has been	Ended

No	Name of Policy	Policy type	Renewable energy	Date	Description	Status
					established as of January 2009. • The remuneration through the price market + premium is eliminated (premium = 0 c€/kWh) and the upper and lower limits for all special regime technologies in which these concepts were not equal to zero. The remuneration of all the special regime facilities will be under the regulated tariff formula, unless the titleholder of the facility decides to perceive only the market price, but without a premium. •New law (2/2013) this premium replaced by a regulated tariff.	
9	Technical Building Code	Regulatory Instruments, Codes and standards	Solar Thermal, Solar, Solar photovoltaic	2007	**Energy Saving Document:** • Efficiency of heating/air-conditioning systems. •Energy efficiency of lighting systems •Minimum solar contribution to the hot water supply. •Minimum photovoltaic contribution to the electrical power supply	In force

No	Name of Policy	Policy type	Renewable energy	Date	Description	Status
					•ensuring that part of this consumption comes from renewable sources of energy	
10	Offshore wind power regulations	Regulatory Instruments, Codes and standards, Regulatory Instruments, Other mandatory requirements	Wind, Offshore	2007	•establishes the administrative procedures for processing permit applications for electricity generation facilities in Spain's territorial waters. For offshore wind farms, this rule requires a minimum installed capacity of over 50 MW	In force
11	Renewable Energy Plan 2005 - 2010	Economic Instruments, Fiscal/financial incentives, Policy Support	Multiple RE Sources, Power, Multiple RE Sources, Multiple RE Sources, All, Multiple RE Sources, CHP, Multiple RE Sources, Heating	2005	•The plan aims to maintain the government's commitment to meet at least 12% of total energy use from renewable sources by 2010, while incorporating other indicative targets - 29.4% of electricity generated from renewable sources and 5.75% (more accurately 5.83%) of transport fuel needs to be met from biofuels by 2010 - adopted after the previous Plan came into effect. •Funds for feed-in tariffs comprise EUR 4.956 billion of the total budget. The energy industry is expected to finance 77% of the overall cost of the renewable energy plan, and other private sector industries another 20% and the government, the remainder. Tax incentives will also be offered.	Ended

No	Name of Policy	Policy type	Renewable energy	Date	Description	Status
12_1	Subsidies for Solar Energy Photovoltaic and Solar Thermal	Grants Renewable Energy Industry	Solar photovoltaic	2002		Ended
12_2	Modification to the Biomass, Waste and Wind Energy Premiums	Feed in		2003		Ended
12_3	Low interest loans	Consumer Loans	All renewable	2002		Ended
12_4	Financing for Renewable and Energy Efficiency	Corporate Loan / Capital	All renewable	2002		Ended
12_5	Feed-in Tariffs	Feed in	All renewable	2002		Ended
12_6	General Electricity Law 54/1997	Regulatory Instruments, Policy Support	Multiple RE Sources, Multiple RE Sources, Power	1997	•Liberalization of the electricity, plan for the promotion of renewable energy and the plan for achieving the goal of 12% of primary energy consumption from renewable sources by 2010, •This law is implemented through royal decrees, most notably Decree 2818/1998, which specified the feed-in tariffs from which the generating plants under the "special	Superseded

No	Name of Policy	Policy type	Renewable energy	Date	Description	Status
					regime" may benefit, •The law also established a premium, so that the price of electricity sold under the special regime is 80-90% of the mean price of electricity charged to final consumers.	

6.6.2. *Policy effects on the internationalization*

According to the cross-case analysis results, renewable energy policy scheme in the domestic market is an imperative driving force for firms' entrepreneurial internationalization. In the following parts first we discuss about the effect of the supportive policy in Spain regarding the case studies and then we explore how the policy change affects their activity and how these companies managed to circumvent the obstacles.

6.6.2.1. *Supportive policy in Spain*

Supportive policy in the domestic market is essential for growth and development of renewable energy as emerging industry. Many countries such as Denmark and Germany first start to support the domestic companies to develop renewable energy within their countries and then after creating the industrial clusters within their countries, they foster the development of these technologies in international markets. Thus, domestic support is necessary for the development of this industry. Policy makers (ICAEN) and managers assert that:

> "*…We didn't focus on creating the industry, the manufacturing industry which is going to produce all the equipment required for the plants and there is a gap and if you see now the objective of German government or Denmark they are very ambitious in implementing renewable energy production. Their idea is not only creating a big power plant for electricity generation, their idea is to produce all the equipments that are required for producing electricity and the second step is to export these technologies to the other parts of the world. This is the main gap in renewable energy industry in Spain and also a challenge for Catalonia, because we are an industry based economy and there are more traditional sectors involved in this industry. They realized the opportunity in the renewable energy technologies and a lot of new SMEs and new spin-offs started to be created as manufacture of these technologies and equipments. But if you see the whole Spanish market it wasn't so industrialized and this culture is different since there is no manufacturing industry…*" (ICAEN)

> "*I think the important thing for the country is to develop industrial cluster or infrastructure (tejido industrial). The pace of this growth was so fast and then they stopped and they changed law very fast because they reached the maximum potential in two or three years. Then in three years you do not have enough time to make an industrial cluster.*" (Mira Energia)

Evidences from the case studies prove that some companies started their business in Spain when the policy support was favorable and excessively attractive. For example, Energea started its business after 2007 when the government introduced the law of "*Codigo Tecnio de la idificaion*". Alstom as a one of the major energy solution provider from France entered to the Spanish market in 2007 when the supportive policy scheme in Spain established as one of the most attractive FiT programs in the world. E-consultant's funder believes when the energy policy in Spain was very favorable, many international companies came to Spain such as E.On and RWE from Germany, Eni from Italy, and other Japanese and Chinese manufacturers.

Mira energia also confirms that before changing to the new legal framework many international companies entered the Spanish market:

> "*Some years ago the market was growing, I am referring to about before 2008, between 2002 and 2008 it appeared that both solar thermal and PV markets was developing a lot in Spain because there were lots of small Spanish companies and also some companies from abroad like Germany or Austria that they came here to establish jointly with bigger companies to sell their products here. They did engineering and made their investment here. Mixture of small companies and medium size companies were involved*." (Mira Energia)

Vidurglass insists that the first policy framework in 2006 was good but the government could not implement it well. He thinks that this policy was excessively attractive and even better than FiT system in Germany with lower sun radiation than Spain:

> "*I think the framework in 2006 was so good, but it was completely not well done, and they showed the wrong signals and it was not sustainable. In Germany they give you 40 cents per KW hour according to German radiation situation but in Spain they offered 44 cents per KW!! It doesn't make any sense. At that time government bought electricity in Germany for 4 Euro per Kilowatt peak but in Spain they paid 6 Euros per Kilowatt peak. And this doesn't make any sense. I don't know why government decided such a good law* ...!" (Vidurglass)

Watly's founder also says:

> "*They had a very nice approach few years ago they were establishing themselves as a reference in the market. Spain was a reference and they deployed enormous projects and they were very fast mover and everybody was happy about this*." (Watly)

Solartys also notes that before policy change companies did not need to go to the international markets:

> "*Before the policy change, there was no need to internationalize because we had huge market here in Spain. Our members they were building lots of solar power plants, photovoltaic, CSP,… they had good returns on the investment. So, they did not have to go abroad. They invested a lot also in R&D and this made us as very competitive country in all over the world. Thanks to this, Spain had a great name in international markets and most of the international projects wanted to have some Spanish product or Spanish know-how. This made the growth of the sector and a lot of companies were created and I think Spain at that time was the most powerful country in solar energy even better than Germany.*" (Solartys)

ACCIO thinks there was inward internationalization when the policy was favorable:

> "*Even when we had financial crisis some companies from Korea and big companies they wanted to come and invest in Spain. But now they realized that there is no way*." (ACCIO)

On the other hand, we can also define policy support in terms of incentives for export and internationalization. As we mentioned before, some countries like China providing these supports related to the wind and photovoltaic sector (de la Tour et al., 2011; Liu & Goldstein, 2013). In the contrary, no specific policy that promotes internationalization of the renewable energy technologies exist in Spain. According to our evidences from the cases, recent reforms in renewable energy legal framework can be powerful incentives for renewable energy companies' internationalization:

> "*We have focused on legal framework to help companies to internationalize, once the internal demand has gone. If you see the figure of the percentage of Catalan exporting that is increasing year by year since the crisis began because this is the only way for companies to survive."* (ICAEN)

According to evidences and results from the analysis we can hypothesize that:

> **Hypothesis 19:** Unsupportive renewable energy scheme in the domestic market, affect negatively the internationalization of companies.

6.6.2.2. *Supportive policy framework in the host country*

One of the main reasons that encourage firms to internationalize in renewable energy industry is policy scheme in the target markets. In Alstom policy is the first factor they need to appraise for evaluating the market they want to enter. With policy analysis they understand about the market potential, technical requirements and the benefits of the financial incentives in the host country like FiT support. For example, they were successful in Brazil and they tried to take advantage of the financial incentives in this market because they knew about cheap finance from the local market. In comparison with the other competitors for the international bid for developing Brazil's wind energy they could offer a lower price. However, they are reluctant to enter the other international markets like Germany or USA. Although these markets are huge for about 2 GW and they may offer better financial profits, policy in these countries is really strict about technical requirements. The other example is Argentina. There are huge potential for installing wind energy in this country, but because of the non-supportive financial policy there they are not willing to enter this market. Wind energy market in Japan, after Fukushima disaster, is recently developing and Alstom is considering it as a likely future market due to the huge Feed-in tariff support from Japanese government. Moreover, the other policy barrier in the host countries is local content; it means the some components and parts of the technology should be manufactured inside of the host country rather than to be imported.

Energea entered Chilean market because of the favorable energy policy there and also they can get their invested money back sooner than Spain.

> "*In Chile for the self- financial investment we paid from our cash flow and we put money to implement the project. In Chile, the difference is that in 30 days normally you have the money in your account and the payment is fast. But in Spain for the payment from the government, you might wait for one year or six*

> *month. It is normal because in Spain there is no financial support but in Chile the payment is quick*." (Energea)

E-consultant's founder believes that there should be compatibility between the firm and policy of the target market. For example in the United States they have specific regulation which is called *UL* and firms should follow it if they want to enter to this market. About wind energy development in Japan, he also believes that:

> "*Of course the market should have a significant feed in tariff, for instance, Japan is now going to attract investments due to dramatic need of energy supply sources. They want to make offshore wind turbines right away on the ports, so they notice that it's going to be expensive, so they have to attract the international companies, and now they don't have feed in tariff. They are in the process of introducing new policy and it is going to be one of the highest in the world.*" (e-consultant)

Mira Energia's founder asserts that policies and legal framework in each country affect the development of renewable energy technologies:

> "*What affect technological development are politics and legal frameworks of each country to promote these technologies*."(Mira Energia)

Solartys note that for internationalization studying about the energy policy scheme and legal framework in the host country is an essential task for companies before considering internationalization:

> "*Well, the solar sector and renewable energy sector is really sensitive to the policy. So there is no organic growth in terms of internationalization, so you cannot say Okay now my market is South America and I start with Brazil and then I go to Mexico and then I go to Chile. You cannot do this. It depends on the Regulation. It depends on the law. So this is the main reason for the companies to decide where to go.*" (Solartys)

> "*The regulation in the target market, if they have feed in tariff or if they have any PPA (power purchase agreement). If it fit to our interests then we will go there.*" (Solartys)

Grounding on the above mentioned evidences from the case studies and the positive effect of the favorable renewable energy policy framework in international markets we can hypothesize that:

> **Hypothesis 20** Supportive renewable energy policy framework in the host country, affects positively the outward internationalization of renewable energy companies.

6.6.2.3. *Policy change and non-supportive domestic policy effect*

Policy change or "*stop and go*"-policies are one of the main challenges for the development of renewable energy companies not only in Spain but also in other countries like Netherlands, Sweden, and UK (Negro et al., 2012). Constant change in the policy is one the main challenges for renewable energy companies because it can discourage entrepreneurs and investors to take the risk and develop new technologies. Lack of trust to government not only affects the current renewable technologies expansion, but also influences the future development of it.

In Spain, policy change has affected many companies from large ones to small companies in different aspects. A company like Alstom that has only produced wind turbine for the Spanish market, now need to follow its customers in international markets because the policy reform abolished the domestic market and they cannot forecast any development of the renewable energy market in the future.

> "*Our biggest market was in Spain but right now there is not wind turbine installation in Spain. So first of all most of our customers who can afford that have gone to the other markets and we have to follow them if we want to keep them as customers and of course it affects our strategy as well ...because we were producing wind turbine for Spain and now it is not the case anymore*." (Alstom)

Energea's founder believes that uncertain policy environment has affected the *confidence and trust* between the main actors in this industry and the government:

> "*The problem is that there is no confidence from the main actors in this sector because of constant changes in the rules. In this way external investors are not willing to come to Spain and invest in the new energy technologies. Now in Spain we do not have this kind of companies that show interest in doing investment in Spain and they go to North America or North Europe where this sector is working well."* (Energea)

> "*At the begging in 2006 the FiT was €0.44 per kWh, two years after 2008 they changed this price €0.32 per kWh two years after they changed this price in 2010 to 0.24 euro per kWh and then in 2012 it is forbidden! There was a document in the government at the begging in 2006, says that in the next 25 years this price is secure (fixed) price. But what happened. In six years they canceled it and all the initial investment do not make profit. You can imagine that the plants with 4000 kW or one Mega Watt that they need a bank to get loan for this investment, but government in different years have changed the FiT rates and owners of power plants have to pay loans to the banks. Nowadays, there are a lot of people who stopped the plant and are bankrupted."* (Energea)

Tecnoturbine also believes that this policy change may affect the trust to the government:

> "*I think that the policy in Spain needs to be more secure and safe. You cannot change the rule of the game one year after the other. So you cannot write a law saying A and then next year law gets over-written and say that A is not any more but is going to be B. What happened with all you have done in order to follow the law and all investment and everything? It is a disaster; you cannot rely on the Spanish government anymore!"*(Tecnoturbine)

In the case of Mira Energia the founder of the company believes that policy change and financial crisis has been the main challenges for renewable energy companies since last three years.

> *"…the big challenges are to overcome the mixture of the financial crisis and policy change in the last three years in Spain. It is the main constrain in our country. It is a bad point for developing the industry cluster and to increase the employment in our country."* (Mira Energia)

The other company which widely affected by the policy change is Vidurglass. He explains how policy changes affected their business:

> "*We were successful, until 2008 we were growing fast. In the first year we made one installation and in the second year we set up a business plan. We went in line, in 2008, we made a business of a volume of half a million euro, so this was perfect, and next step was to make near €1 Million…and then from half million in 2009 we only did €200,000 and in 2010 and 2011 and 2012 we did only €100,000 and it was nothing."* (Vidurglass)

One of the less affected companies is *OpenDomo*. Since the policy changes are mainly designed to influence other types of technologies except energy efficiency and energy control systems. However, this company is developers of control systems for solar energy and they are affected indirectly with the fewer numbers of customers:

> "*We are affected by policy change not directly but indirectly, because our main customers are companies that are using our equipment for their customers. These companies are from renewable energy especially solar power and of course they are affected. They get fewer projects, so they purchase less equipment from us*." (OpenDomo)

The similar condition has been observed about Smalle Technologies and Technoturbine because they are not dependent on the fiscal policy support like FiT.

> "*We are not affected by policy change because we are not an energy producer as another kind of renewable energy companies because we don't get paid by selling energy. I mean we don't get feed in tariff (FIT) and we only sell the device*." (Smalle Technologies)

> "*Fortunately it does not affect us these new regulations. But we were actually quite scared about the new regulation because we did not know it could affect us. Once we analyzed it and we went through it and we found that it has not really changed that much from what it is used to be. So, for hydraulic technology it has not affected us*." (Tecnoturbine)

Nevertheless, OpenDomo and Technoturbine foresee this crisis in the energy sector as an opportunity. For OpenDomo, increasing of the electricity cost makes people conscious about energy consumption and they feel the necessity of using energy control systems. Tecnoturbine founder thinks that:

"*The current situation can push people to become entrepreneurs. Lot of people become entrepreneur not because they wanted to, but because they needed to and that combined with the fact that how complicated is in Spain for entrepreneurs and it going to make them fail*." (Tecnoturbine)

Watly is not also affected by the policy change because they established based on the international markets.

"*We are not affected, because we do not sell the modules to people here in Spain. We do not place Watly in the balcony. We are placing Watly in the world where policy is not against the sun and it is not against the survival*." (Watly)

On the other hand, policy reforms and blaming renewable energy support as one of the main reason for general economic crisis can also affect the trust of the people to renewable energy in the future. It means that they may not rely on these technologies and it would affect the future of renewable energy market in Spain.

"The message that gets to people is that we are in crisis … we are paying with our incomes and our taxes to the renewable energy and also there is a crisis in the electric sector due to what we call tariff deficit…now in public opinion it has been established that the big part of this problem is the support to renewable energy. In parallel to the breakdown of the industry, there would be a negative effect on the perception of people. To me, I consider it as a very negative point in the devolution of the society. It is pity! People think that this renewable energy is too expensive and why we have to pay for it. " (Mira Energia)

This policy change not only prevents new projects development from getting the Feed-in tariff, but also this new law affects the previous projects that were accepted by the government. This retrospective law enforcement, as an illegal act, has damaged many international companies and they filled in petition against the government in the international courts.

6.6.2.4. *Policy change effect; attention shift of policy makers*

As it is discussed in the literature, one of the significant challenges related to the development of the renewable energy companies is "policy maker's attention shift" related to a technology or its application. This phenomenon has been observed in other countries like UK, Netherland and also Sweden when government policy focuses change from a technology to the other technology or to its other application over the time (Negro et al., 2012). In Spain, we have observed the same phenomenon related to the biomass and energy efficiency companies. New trends of policy supports are related to these two types of technologies and related applications of them, while policy does not support any more other types of renewable technologies. Although we believe that energy efficiency support is necessary, renewable energy support can complement this new policy. Mira Energia thinks that:

"*Yes their tendency is in order to promote more the energy efficiency, but I think both are necessary form my point of view. First energy efficiency I agree with that but later on you have to promote the renewable. For instance, if you have a building* *and you are thinking about to put a solar panel in your roof and you have a high energy demand. You do not have enough roof space to put all the PVs and you have to have lower energy demand with implementing energy efficiency then you will have enough roofs to put your PV there."* (Mira Energia)

6.6.2.5. *Internationalization as solution*

As we discussed above, financial crisis and tariff deficit are the main reasons for the renewable energy policy change in Spain. Change of the renewable energy policy has made the internal market unfavorable environment and they need to resolve this problem. Results of the cross-cases analysis show that internationalization is the common solution for the renewable energy companies from Spain to overcome their constraints and difficulties in the domestic market. For example, Alstom mentions that:

> "*…we were producing wind turbine for Spain and now it is not the case anymore. So we have to go to the other markets and we are directly impacted by that*." (Alstom)

These companies need to adapt to the new situation by compensating the domestic market with the international markets. It means that if they have been already in international markets they need to intensify their international activity. In case of Energea they entered to Chile because they could not foresee any future market in Spain:

> "*We had this news that these partners or companies have more activities in Chile than in Spain, it is true. In Chile nowadays there are a lot of constructions, buildings and demand for energy is high but in Spain all this kind of project are stopped… It is important to continue our work… if we cannot work in Spain we have to go out of Spain*." (Energea)

E-consultant asserts that the solution for the companies is to enter the other markets for reducing the risk:

> "*It is obvious that they have to spread the risk and they have to go for the other markets. It would be unreasonable not do so. The construction of renewable energy plants will always hang on the good will of the politician in all countries. You have to be present in all countries if you want to have a piece of the cake*!" (e-consultant)

In case of the Mira-Energia, CEO of the company suggests that in order to survive your business, you have to be international:

> "*In fact at the moment in Spain if you want to establish your business and if you want to develop the business, I think it is necessary to internationalize. Since now in Spain there are not so much activities. Then you have to find projects abroad if you want to survive*." (Mira Energea)
>
> "*I think there is a need. Because when there is a need, you do the things. This is the main driver for the internationalization of the renewable energy companies*

from Spain. There are two things: crisis and also bad policy condition that had been established here. Both were important." (Mira Energia)

Although OpenDomo has not affected by policy change, he recommends that companies should consider international markets as an alternative to ensure about the ultimate changes in the policy scheme:

"*Probably they will need to buy some time until things get more reasonable here and I think it is a good moment to export. Since in other countries it makes more sense, they have an opportunity to grow.*" (Open Domo)

For Smalle technologies, there are two factors that may drive companies in this industry to enter the international markets; one of them is access to geographical areas with better wave sources like Australia, UK, and Portugal. The other driving factor is looking for favorable public policy support. They think now UK is a suitable location for developing marine energy technologies.

"*Yes, there are two main drivers; one is where the big waves are. They can install it in Spain, UK, and Australia… focal points to try their devices. And the other reason is maybe how public supports are available for these technologies. For some years Spain was a good place to develop their idea for example in Canary Iceland and in north of Spain. Nowadays, it is difficult for new projects to get into the reality. Some other countries like UK have more advantage*." (Smalle Technologies)

Technoturbine suggests that moving to countries with stable legal framework is the only solution:

"*The problem is that companies cannot do anything about it. The solution will be to become international and present at countries where the stability of the laws and regulations are higher and the law has a real commitment with the industry. I think that is the only solution*." (Technoturbine)

One of the interesting solutions is from Vidurglass because when they faced with policy change they implemented *inaction strategy* instead of *adaptation*, in comparison with other companies:

"*Well, we really saw policy change… our business volume went down and in near future would be really difficult, the company decided to cut down the Vidursolar. So it affected in nothing concrete in the international aspect, just the Spanish went down. The international were going up because people were looking internationally also for providers of these type of products and we came up more in the web search and more contacts but not actively but reactive only*." (Vidurglass)

Vidurglass also thinks that many companies in PV industry have changed their business and they are just doing maintenance or ESCO services, because these sectors are less affected by policy change:

> "*I think a lot of companies shut down their installation parts and focused on service maintenance or on engineering services internationally or they diversify in PV or to energy efficiency and ESCO services*." (Vidurglass)

In case of Watly, from the beginning they have established their business for international market; therefore, they are not affected by the policy change. They assert that, after the policy change many companies are searching for entering the international markets:

> "*Of course lots of renewable energy companies based in Spain are looking to the South America for example or they are looking for Africa because they need to survive and they need to sell that technology. Since in the domestic market there is not demand, they go abroad and this is not surprise. Maybe some Spanish company will be also successful company but not because of the domestic market because of the foreign markets*." (Watly)

ICAEN also believes that because of the crisis and policy change many companies are considering internationalization as solution because they need to survive:

> "*If you see the figure of the percentage of Catalan exporting, it is increasing year by year since the crisis began. This is the only way for companies to survive. But I think we have focused in the internationalization because of crisis because before it wasn't a priority for Catalan government*." (ICAEN)

> "*…the internal demand slowed down and there is no any more activity as it was before and now many companies try to export their services and products abroad. Before Spain was leading the renewable energy industry worldwide and now all the companies are trying to export. But if you want to export, then you need financial resources and you have to be more competitive and if you don't have access to the financial market, then you cannot export and you cannot stay in the domestic market because it is slowing down. So this is the reality of these companies.*" (ICAEN)

ACCIO mentions that already many big companies left the Spanish market and they are active in international markets:

> "*Some big companies went out of Spain. For example, Gamesa is the company that went abroad. Other example is Iberdroal that their main business is in fossil fuels and nuclear energy but they made research about renewable. Two weeks ago the president said the price of electricity is really low and many companies want to go outside and then they are making research in the north of Europe. There is another company which is called Abengoa they are headquartered in Seville and they are making investment in the USA and Europe. Of course they will go abroad but not many of them because you need lots of resources to go outside*." (ACCIO)

Solartys think that after policy change companies are in need to internationalize to survive:

> "*I think nowadays the main reason for the internationalization of renewable energy companies from Spain is to survive. In Spain is really difficult especially after the last policy change. This law has finally made it even much more difficult to continue with solar energy. The main reason is to continue the activity of their companies, that's why they started the internationalization process*." (Solartys)

6.6.2.6. *Moderating effect of the technology maturity on policy change*

One of the main factors that may moderate the effect of the policy change is the technology maturity. As the technology become more and more mature, it is less policy dependent. For example we can see that wind energy industry has been less affected by the policy change in comparison with solar energy. They explain that:

> "*My view is that wind industry becomes less and less dependent on subsidies and policy support because it is getting to its maturity. There would be one point in which to compete against other conventional sources of energy generation without barriers and without needs to be supported and then your internationalization strategy would be less policy dependent and you can decide where you want to go because of some other factors not because of there is supportive policy there. I think it is good for wind industry that our technology is becoming mature*." (Alstom)

Energea also believe that wind energy companies are also not affected by the policy change as same as solar energy. The same was observed related to the other solar technologies. We have the case of photovoltaic and CSP in comparison with more mature technologies like wind, Mira Energia's founder thinks the effect of the policy change depends on the technology:

> "*I know that the problems are related mainly to PV, CSP, CHP and Biomass. Not with wind energy because this technology is more mature and there were not so dependent of this FiT*." (Mira Energia)

> "*It depends very much on the technology… the ones that produce electricity for instance photovoltaic. The market was developing a lot when the political situation was favorable and then in fact it made the technology grow and had a lot of mass production of photovoltaic, market development and it creates industrial network. But when the FiT completely stopped, then the market was broken. In the other technology like CSP, Spain was one of the main leaders in the world and CSP moved a lot of money and in my opinion it is now completely broken or stopped due to the politics of the government*." (Mira Energia)

The same was observed about OpenDomo, Smalle Technologies and Technoturbine. Since these technologies are in the introduction phase and they were not dependent to Feed-in tariff.

> "*Fortunately it does not affect us these new regulations. But we were actually quite scared about the new regulation because we did not know it could affect us. Once we analyzed it and we went through it we found that it has not really*

> *changed from what it is used to be. So, for hydraulic technology it has not affected us."* (Technoturbine)

We can also observe the effect of the policy change in PV industry in comparison with wind energy. Vidurglass thinks PV has been affected more than wind energy because PV can be installed everywhere and can be used as self-consumption:

> "*It was especially for PV. Wind energy is quiet well and is driven by the utility companies because it's a very cheap technology but it is not applicable, like PV, close to the consumer. You have to install it like a power plant and it has other environmental aspects. I think it's a good energy but it's not the same as PV. PV has other advantages; you can set it up close to the consumer point at any place*." (Vidurglass)

ICAEN explains the reasons why PV and Wind energy are different. They think that the development in the wind was incremental but in PV sector the development was radical and the industrial policy and energy policy were not aligned well to control the unexpected growth in this sector.

> "*…but not in the case of wind energy, because in the wind industry they did it correctly because the development of the power plants was linked to the development of the factories to manufacture the wind turbines ... but in the case of solar energy, for instance, there was a really fast development and implementation of photovoltaic plants and it wasn't linked to industrializing policy. So, energy policy has to be linked with industrial policy and national factories should be able to provide utilities and technologies for implementing of the power plants. I think it is really important because if not it has not any other added value. This happened in the wind industry. But if you see the incremental development of installation of wind farms in Spain, there was around 1000 MW each year, this incremental development that allows factories to install in Spain and to provide the technology. But in the case of solar industry Spain installed in one year the same amount of solar panels installed across the world. No Spanish company was able to manufacture this large amount of solar panels and all of these panels were imported from abroad*." (ICAEN)

- **Conclusion**

As we discussed above, renewable energy policy change has affected radically the renewable energy industry in Spain. As summarized in the Table 6.6.2.1, we can see these effects according to each cases and also policy makers. However, the effect of the policy change has not been equal and it affected more developed technologies like wind and solar technologies than emerging technologies like biomass, wave and tidal and micro hydro energies. Surprisingly, some cases like energy efficiency firms have seen this policy change as an opportunity for developing their activities. Therefore, we can conclude that the level of policy change effects on the firms' development and international expansion is mixed and it depends on the level of technology maturity and type of technology. Thus we can hypothesize that:

Hypothesis 21: Renewable energy policy change has affected the internationalization of the renewable energy companies positively/or negatively.

Following table provides an overview of the policy change effects and internationalization as a strategy to adapt to the new market circumstances. Moreover, this table shows the importance of the favorable policy scheme of the host country as a determining factor in the international market selection.

Table 6.6.2.1 Policy cross cases analyses

Company	Policy Change and Its effects in Spain				Policy scheme in the host country
	Before policy reform	Policy reform	Policy reforms effects	Solutions	
Alstom	•Big domestic market in Spain • Alstom as French company acquired a Spanish wind company called Ecotecnia to enter to the Spanish market	•Cutting all financial incentives	•Abolishing the domestic renewable energy market •Small companies in disadvantageous position •They cannot forecast any development of renewable energy market in Spain •They cannot rely on a single market	•Policy change was necessary but not like cutting the all incentives •Entering to the international markets to mitigate the risk of single market •Without internationalization they will die •Intensify international activity: adapting to new situation with replacing the domestic market with the international markets	•Evaluating the policy support in the host country for possible financial support like FiT •Compatible and attractive policy for entering to Brazil and Japan but other markets such as Argentina, USA, and Germany are not attractive •Local content as one barriers for internationalization
Energea	•Supportive policy for further market development •Supportive policy for example codigo tecnio de la idificacion	•New laws that make the development of renewable energy solutions impossible •Paying utility companies for accessing the grid system for electricity	•Constant Change in the Policy and electricity price (FiT) •Lack of trust and confidence on government •Solar energy is the most affected technology than wind energy •Photovoltaic installation is forbidden and many	• Internationalization to the markets with more favorable energy policy like Chile •Adapt to the new situation	•Policy in Chile supporting renewable energy development •They can receive their liabilities from the public sectors sooner than Spain

Company	Policy Change and Its effects in Spain				Policy scheme in the host country
	Before policy reform	Policy reform	Policy reforms effects	Solutions	
			investors are bankrupted		
Mira Energia	•Too much favorable policy design •Profitable investment in PV •Very fast market development •They reached to the maximum potential in two or three years •Entering of the international companies to the market	•Reducing FiT for PV •With policy change in 2010 payback time changed from 6 years to 10 years •The second round of changes in 2012 lead to stop and breakdown of this industry	•Policy Change effect depends on the technology maturity •Limited R&D activity of the firms •Tariff deficit •Affect social acceptance about renewable energy with wrong message to consumers: "renewable energy supports lead to crisis". •Companies are closing •People losing job	•It's a need for companies to enter the international markets •Finding another market to survive	•Technology development affected by the legal framework of each country

Company	Policy Change and Its effects in Spain				Policy scheme in the host country
	Before policy reform	Policy reform	Policy reforms effects	Solutions	
e-consultant	•Industry reliance on subsidies •Renewable industry was made too attractive •Inward Internationalization (Many international renewable companies came to Spain)	•Sending wrong signal to the international markets •Applying retrospective law enforcement •Changes overnight	•It may encourage renewable energy companies to look for more cost-effective solutions •Many international companies sued Spain government •Closing down of the power plants •Creating a non trustworthy industry environment •Stopping investment in Spain from international companies	•Internationalization as perfectly possible scenario • They have to spread the risk and go for other markets • Removing all the manufacturing plants (they may keep R&D)	•Local content as barrier for internationalization •Compatibility with the target markets' policy scheme (Like UL in USA) •Policy support in Japan for developing offshore wind turbines
OpenDomo		•Increasing crisis in the energy sector •Keeping the energy cost high	• Affected indirectly/less customers •Policy change as an opportunity to install energy control system •Small companies more vulnerable	•Right moment to export to see what will be the ultimate effect of the policy change	

Company	Policy Change and Its effects in Spain				Policy scheme in the host country
	Before policy reform	Policy reform	Policy reforms effects	Solutions	
Smalle Technologies	•Spain one of the leaders in renewable energy technologies •Spain as suitable country for developing wave technologies in north of Spain and Canary Island	•This policy change affected companies that have been developing based on the subsidies from the government/ wave energy is not part of it	• They are not affected by policy change because they do not dependent on FiT •In the future if they become major electricity producer they will be affected •Losing position in renewable energy technology development	•Moving to the countries that provide more public support like UK	• They may go to countries like UK because they have attractive policy support
Tecnoturbine	•Spain as leader in renewable energy technologies	• Making PV installation and self consumption forbidden	•Losing trust to the government •Most of the companies are closing •Many investors went out of Spain •Policy change as an opportunity for starting business	•Presenting in countries with stable law and regulations	

Company	Policy Change and Its effects in Spain				Policy scheme in the host country
	Before policy reform	Policy reform	Policy reforms effects	Solutions	
Vidurglass	•Excessive favorable framework in 2006 but not well implemented •PV was seen as future opportunity for the company •Company was successful till 2008 and they were growing	•No subsidies •Punishment for self consumption by law/ paying for using PV •They made retroactive policy change	•No stable policy framework •New policy give a signal to PV industry that they have to go out of the market •After the breakdown of the PV market they lost all of their bases for development •Installation at 2003 level •Many companies only do maintenance and service	•Pushing government to amend the new policy framework •Parent company down sized the solar energy department •Maintaining PV sector but they do not promote it actively • Main strategy for them was inaction instead of adaptation •Entering of the companies in the maintenance and service	
Watly	•Establishing Spain as reference in renewable energy technologies	•PV installation is illegal and sun is private	• Not affected by policy change because their product designed for developing and under-developed countries	•Government should make using fossil fuels illegal • They established their market internationally from the beginning •Many companies in renewable technologies are looking for internationalization	• They enter to the markets where the policy is not against solar technology
ICAEN		•New policy support focused on energy efficiency,	• Internal demand slowed down	•Internationalization as a solution in the crisis time	•Need to create an industrial cluster (tejido) which is going to

Company	Policy Change and Its effects in Spain				Policy scheme in the host country
	Before policy reform	Policy reform	Policy reforms effects	Solutions	
		biomass and thermal generation			produce all the equipment
ACCIO	•Inward internationalization from other countries			•ACCIO is mainly responsible for the internationalization of the companies •Internationalization as solution	•Policy in Spain and EU support internationalization of the firms
Solartys	•Before policy change there was no need to internationalize because they had large domestic market • Spain as one of the leading countries in renewable energies		•Small companies are more affected by the policy change	•After policy change they need to internationalize to survive	• Policy scheme information is necessary for firms internationalization •They provide information about new energy legislation in each country

- ## Summary

According to our cases, since renewable energy industry is a policy sensitive industry, supportive energy scheme is the most critical factor that affects internationalization decision of these companies. Both unfavorable domestic energy policy and favorable energy policy in the other countries can motivate companies to internationalize. However, we should keep in the mind that the effect of the policy change can be alleviated by type and level of maturity of the technology.

As we have asked many policy makers, as well as companies, regarding the most important challenges and difficulties for the renewable energy companies, they acknowledged unanimously that legal framework and policy change is major problem in this industry now. For ICAEN, legal framework is the main challenge for renewable energy companies in Spain:

> "*In electricity generation the main challenge is legal framework. As you know there was a way to promote renewable energy with feed in tariff system, which stopped two years ago and now there is no more incentive for companies to produce electricity. So the businesses have stopped in this field and this is the main challenge right now."* (ICAEN)

ACCIO and Solartys also thinks policy support is one of the main challenges for renewable energy companies:

> "*Policy affects the financial support and resources of the firms. In this sector it is really risky because they cut lots of funding. When they started to work in this field, government used to pay for the energy you were generating but I think now we do not have 25 years support anymore and companies should work and develop the technology to become independent of the subsides (FiT)."* (ACCIO)

> "*The main challenges companies have is the legislation change. Because this is a very sensitive sector regarding this issue…*" (Solartys)

However, ICAEN asserts that policy change has affected the two separate sectors differently; renewable energy and energy efficiency. As they explain:

> "*It is quite different. We have two different sectors renewable energies and energy efficiency sectors. For energy efficiency, it is easier for us to help them because for example in Catalan government we are trying to reduce the energy consumption and we want to reduce the energy cost of the Catalan government and we do it by a new business model which is called ESCO services… an external company do the investment in refurbishment of the building and they can recover this investment, obviously their profit too, by means of getting a part of the reduction of energy costs. This new law is about public buildings. So, we are focusing on to create an internal demand in order to create green jobs. ACCIO is more focused on external market and it's in the external market where renewable energy production has more opportunities because we cannot change the legal framework. So we have focused on energy efficiency in order to promote this market here and these technologies can also easily be exported abroad."* (ICAEN)

6.7. *Internationalization and survival*

Few IE studies have discussed about the effect of the internationalization on the survival of the firms. Results of these study shows the positive effect of the internationalization (Lee et al., 2012) or early internationalization (Mudambi & Zahra, 2007) on the survival of the firms particularly in riskier industries (Mudambi & Zahra, 2007).

As we discussed before, different factors encourages firm for internationalization. It could be related to the needs for: financial support, technological knowledge, markets and customers, and social objectives of the firms. Results from the cross-case analyses show that the ultimate goal for internationalization of renewable energy companies from Spain is survival. With current market situation in Spain, where the policy is not supporting anymore and customers have lost their trust to renewable energies, and financial support is not accessible, internationalization is the only solution to survive. In this part first we see how internationalization can save renewable energy companies and then we discuss about internationalization as a strategy to reduce the risk.

6.7.1. *Internationalize to survive*

Evidences from the cases show that the pivotal driver for the internationalization of the renewable energy companies in Spain is survival. For example, Alstom mentions that:

> "*We cannot focus on Spain right now because there is no wind turbine installation in Spain. If you are not international you will be dying. So it is a matter of risk-mitigation and you have to be as international as possible in order to always have different market in which you can sell your products*." (Alstom)

> "*If you want to survive you need to keep your market share because otherwise competitors will come and take your market share and if you are shrinking, you have less volume and then you have less negotiation power and you will be less profitable and then you start losing money and then the game is over! So, you have to be global at least for wind turbine manufacturers and big suppliers…*" (Alstom)

Small companies also need to survive with internationalization. Since these companies have been always pending to the domestic market, now they want to adapt themselves to the new condition and they internationalize to survive.

> "*They could have continued their business. The problem was that they were small company and in order to survive they need to be international and they did not have financial support to be international*." (Alstom)

Energea's CEO thinks that for their companies internationalization was the only solution because the domestic market in the energy sector is almost dead.

> "*We need to go to the international markets. Nowadays, there are a lot of crazy things happening in Spain and a lot of people cannot work because there is not work for all of us… The internationalization decision is because of the situation*

> *in Spain that there are no energy projects and we need more inputs to make this business profitable."* (Energea).

e-consultant also believes that many companies in this industry need to stop their activity in Spain and go to the international markets. They may keep their R&D centers here in Spain, but their main market is over the borders.

> "*I think internationalization is a perfectly possible scenario in Spain that a lot of them do so. They might not remove their R&D department, at least in the short-term but lots of the production will definitely be disappearing. They are closing down plants in Spain, I think Galicia have been closed down one of the blade plants and will do it more*." (E-consultant)

Mira Enrgia thinks that internationalization is essential for firms in this industry because of the crisis that has been created after the policy change, otherwise companies will be died.

> "*I think in Spain many companies are moving abroad for the crisis (in renewable energy market). If you do not have business in Spain and if you do not move abroad, you will be died. I think engineering companies that have not been able to go for this step, have not survived.*" (Mira Energia)

> "*I think there is a need. Because when there is a need, you do the things. This is the main driver for the internationalization of the renewable energy companies.*" (Mira Energia)

OpenDomo also believes that firms need to go to the international markets to survive:

> "*Yes I am sure and in CeBIT and in other exhibition I have seen good proposals and solutions from other companies that they do not need to stay in the national market*." (OpenDomo)

> "*Probably they will need to buy some time until things get more reasonable here and I think it is a good moment to export. Since in the other countries it makes more sense, they have an opportunity to grow*." (OpenDomo)

For a company like Smalle Technologie where they are active in the niche market, internationalization is the only viable strategy to overcome their limited domestic market and to survive.

> "*Yes, because we have a niche market and you cannot sell to one or three countries you have to sell to many countries to survive."* (Smalle Technologies)

Tecnoturbine market is an unexploited market and it needs to be developed. Not only Spanish market is important for them, but also they are also thinking about other potential international markets to survive.

> "*As I told you this market have not been exploited. So wherever you go there is a lot of market to exploit. It is like a Blue Ocean. I would say there is a lot of room*

for exploiting markets that are around but at some point the more market you take, the more chances to survive you have in the future." (Tecnoturbine)

Watly's founder thinks that with current changes in the Spanish market, many companies need to go to the international markets.

> "*Of course lots of renewable energy companies based in Spain are looking to the South America, for example, or they are looking for Africa because they need to survive and they need to sell that technology. Since in the domestic market there is not demand they go abroad and this is not a surprise. Maybe some Spanish company will be also successful company but not because of the domestic market but because of the foreign markets*." (Watly)

ACCIO also thinks that companies need global market to survive:

> "*The crisis exists and your market should be more global to survive*." (ACCIO)

ICAEN comments that internationalization is inevitable for the Spanish renewable energy companies:

> "*The government stressed all the attention on reducing deficit of electrical sector and it's really stopped all the projects of renewable energies and nearly energy efficiency too. So the internal demand slowed down and there is no any more activity as it was before and now many companies try to export their services and products abroad*." (ICAEN)

> "*For example, companies that were in international markets before crisis they could make balance between squeezing domestic market and the international markets. The companies that started their internationalization before the crisis it was much easier for them to move the productions or the sale abroad."* (ICAEN)

Solartys suggest that companies should be international, otherwise they will die:

> "*It's absolutely compulsory. If you have not started your international growth your company will probably die. It is essential for solar industry to go abroad. It is mandatory for companies to go to the international market*." (Solartys)

> "*I think nowadays the main reason for the internationalization of renewable energy companies from Spain is to survive. In Spain it is really difficult especially after the last policy change. This new law makes it even much more difficult to continue with solar energy. The main reason is to continue the activity of their companies. That is why they start the internationalization process*." (Solartys)

Based upon these comments and quotes from the firms and policy makers we understand the internationalization is unavoidable strategy for renewable energy companies to continue to exist. This cross-case analysis is summarized in Table 6.7.1.1.

6.7.1.1. *Internationalization as a tool to reduce the risk*

According to Acedo and Jones (2007) one of the main reasons for internationalization of entrepreneurial firms is reducing the risk. According to our evidences from the cases, e-consultant and Alstom internationalization could be a solution for them to mitigate the risks.

> "*Actually we cannot rely on a single market. Renewable and winds are really policy-driven. So, you cannot focus on Spain right now because there is no wind turbine installation in Spain. If you are not international you will be died. So it is a matter of risk-mitigation and you have to be as international as possible in order to always have different markets in which you can sell your products*." (Alstom)

> "*It is obvious that they have to spread the risk and they have to go for the other markets. It would be unreasonable not do so. The construction of renewable energy plants will always hang on the good will of the politician in all countries. You have to be present in all countries if you want to have a piece of the cake!"* (e-consultant)

ACCIO expert also believes that internationalization helps companies to diversify the risks that they take.

> "*The main reason for them to go abroad is to diversify their risks of the local crisis and achieve a decent level of income. This is the consequences of the severe crisis that we are suffering. This is because the domestic market is shrinking and the only solution they have is to sell their product abroad*."

Table 6.7.1.1 Internationalization and survival cross cases analyses

Company	Speed	Scope	Extent	Mode of entry	Firm Strategy	Market	Survive
Alstom	•Soon after merging and acquisition	•Brazil, Japan, Europe •Merging with Alstom increase the scope of the internationalization form only Europe to the other countries like USA, Brazil, and Japan	•Before policy change main market Spain •Now main market is international	•Acquisition of Ecotecnia •Strategic alliance in Brazil	•They are following different strategy in different context, but their main base of competition is price	•The main reason for Alstom for internationalization is to be close to the potential markets	• They need to internationalize to survive •If they do not internationalize they will be died
Energea	• After four years	•Italy and Chile		• Branch and networks • Niche market position	• High tech services and product in the niche market	• More market opportunities abroad than domestic market	• They have to go out of Spain because of lack of market •Adaptation to this new situation and internationalization
Mira Energia	• International from the inception	• Europe and Morocco		• Entering to the international markets with personal networks and through projects	• Niche market in Solar cooling technologies	• To be close to main customers	• Renewable energies need to go to the international markets, otherwise they will died

Table 6.7.1.1 Internationalization and survival cross cases analyses

Company	Speed	Scope	Extent	Mode of entry	Firm Strategy	Market	Survive
e-consultant	•Established as an international company	•North Europe: Germany, Denmark, Norway and Spain		• Providing services to the international clients • Niche market position • Participating in the international projects	• High quality services related to the wind industry	•Domestic market is saturated	•Many companies stop their activity in Spain and they will go to the international markets
OpenDomo	•International from 2014	•UK and South America		• Alliance with other companies to enter market in UK • Direct entry to South America market	•Niche market strategy	•Internationalization to have access to the more markets	• They have still their Spanish market because new policy does not affect them •Internationalization for buying time to observe domestic market situation
SmalleTechnologies	• International from the inception	•North European countries and poor countries	95%	•Direct sales and also main distributors	•Niche market position in Buoys systems	•Increasing the sale and access to new markets	• More market, more chance to survive
Tecnoturbine	• International from the inception	•Europe and north Africa(Morocco, Kenya)		•Direct sale	•Niche market position for lower power generators and also solar powered water	•Looking for new markets	• For their companies they have still enough internal market

Table 6.7.1.1 Internationalization and survival cross cases analyses

Company	Speed	Scope	Extent	Mode of entry	Firm Strategy	Market	Survive
					pump		
Vidurglass	•4 years after establishing	•European countries, UK, Germany, Portugal, France and Asia (United Arab Emirates), and South America (Mexico, Brazil and Chile)		•Direct sale and distributor	•Differentiation of the product with high quality BIPV	•Internationalization for access to more markets	• Strategy of inaction to adapt to the new situation •To be in the service and maintenance to survive
Watly	• International from the inception	•Developing countries and Africa Kenya, Congo, Senegal and Philanthropic Institutes from developed countries		•Direct sale	•Niche market for solar purification and energy hub	• Having access to the new markets mostly in the developing countries	•Many companies needs to go to the international markets because there is no demand
ICAEN						•Internal market slow down	• Due to the market slow down many companies trying to Export

Table 6.7.1.1 Internationalization and survival cross cases analyses

Company	Speed	Scope	Extent	Mode of entry	Firm Strategy	Market	Survive
ACCIO						• They need definitely to go to the international markets for commercializing their products	•All companies particularly small companies need to go abroad, there is no market in Spain •The national market is almost dead
Solartys						•Internationalization for access to more markets	•Without international growth companies will probably die

6.8. *Conclusion*

In this part we want to discuss and summarize what we found in our case studies and finally we summarize all of our findings and hypotheses in Table 6.8.1.

Results of our case study analyses show the differences between the internationalization of the firms in renewable energy industry from the other industries at four levels of analysis: entrepreneurs, firm, industry and policy. Entrepreneurs in this industry are different from conventional entrepreneurs and we can call them eco-entrepreneurs. Although human capital and social capital in this industry contribute similarly to the entrepreneurial internationalization of the firms, entrepreneur's motives and philosophical perspective in this industry is different because the ultimate goal of them is to make this world a better place to live. More importantly, eco-entrepreneurs in this industry are trying to find a solution for a global problem which is environmental degradation and global warming; therefore, they need to keep their global perspective over this international challenge and to forge their solution in a global scale.

At the firm level, similar to the other industries, factors like firm's resources and capabilities, strategy, and the product commercialization are significant variables in the internationalization of the firms. However, there are some specific differences between this industry and other types of industry. First of all, the interaction between the small and large firms is particularly important for the firm growth and internationalization. Moreover, companies in this industry start their international activity at commercialization or even pre-commercialization phase. Type of business model whether it is customer-driven or utility-driven may affect the intensity of the international activity of these companies.

At the industry level, we realized that in contrast with the literature that suggest the internationalization of the companies mostly take place at the growth phase, internationalization of the renewable energy companies may happen in the all levels of industry growth; introduction, growth and maturity. The only important factor is the technology maturity may affect positively the internationalization of the companies. Results of our study at the industry level also confirms that level of concentration of the industry, isomorphism and patenting cannot be highly significant factor in the internationalization of the companies. However, the strong patent protection in the host country and also global integration of this industry are the most important factors that encourage companies to internationalize.

Renewable energy industry is a policy–driven industry. The primary factor that determines the internationalization of the renewable energy companies from Spain is policy support. This policy support can be related to the international markets or the domestic market and it can lead to inward or outward internationalization of the firms.

The last factor that may affect internationalization of the firms is market. In renewable energy industry some factors like policy scheme or technological suitability to certain geographical location can be the main reason for market selection. Market entry strategy for companies depends on the size of firm. It could be either foreign direct investment (FDI) or merging and acquisition (M&A) for the large companies. For the small companies and start-ups, niche market and being international from inception (INV) are common strategies.

In general, results of this explorative qualitative study show that internationalization of the renewable energy companies from Spain is the only viable solution to survive. With current domestic market condition which is damaged severely by the financial crisis, tariff deficit and quick policy changes, companies have no other way to internationalize, otherwise they will die.

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches: IE	Previous Related Researches: Sustainable and energy Entrepreneurship	Primary propositions	Cross-case Findings	Hypothesis Derived
Eco-Entrepreneur	**Values and Motivations**	**Philosophical view:** Cavusgil, 1984; Covin & Slevin, 1991; Leonidou, Constantine, & Piercy, 1997	Kuckertz & Wagner, 2010; Gibbs, 2009; Isaak, 2002;	**Proposition 1** Entrepreneurs' values, skills, and experiences affect the entrepreneurial internationalization of renewable energy firms. **Proposition 1.1** The value the eco-entrepreneurs place on sustainability orientation can be reinforced by their entrepreneurial internationalization to address their global concern.	•Apart from financial motives, eco-entrepreneurs believe in the values for making the world a better place to live •Internal commitment of eco-entrepreneurs to improve the world through providing energy to people in the base of pyramid and fighting against global warming •Eco-entrepreneur contribution to the global market •Eco-entrepreneurs have mix motivations of green, ethical, social and economic motives that are inseparable. •There is interaction between the financial and non-financial	•**H1:** Mix of non-financial motives (internal commitment to make the world a better place to live and contribution to the global market) and financial motives will affect positively internationalization of firms.

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches		Primary propositions	Cross-case Findings	Hypothesis Derived
		IE	Sustainable and energy Entrepreneurship			
					motives for eco-entrepreneurs.	
			Schaltegger, 2002; Schick, Marxen, & Freimann, 2002; Pastakia, 2002; Linnanen; 2002, Post and Altman 1994; Taylor and Walley,2004; Walley and Taylor, 2002;Schaltegger & Wagner, 2011		•The intensity and priority of these motivations for every entrepreneur is different. Based on these differences of incentives we can categorize the entrepreneurs •Firm size and marketability of the product determine the priority of eco-entrepreneurs' motivation and type of eco-entrepreneurs	•**H2a:** The effect of eco-entrepreneurs' philosophical perspective on the internationalization of firms will be higher for smaller firms than larger firms. •**H2b:** The effect of eco-entrepreneurs' philosophical view on the internationalization of firms is higher for firms with lower level of marketability of their products (or

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches		Primary propositions	Cross-case Findings	Hypothesis Derived
		IE	Sustainable and energy Entrepreneurship			
						technological development) than firms with higher level of marketability.
	Human Capital	Kuemmerle, 2002; Mcdougall et al., 1994; Westhead et al., 2001;Chetty & Campbell-Hunt, 2003; Eriksson, 2003; Mcdougall et al., 1994; Reuber & Fischer, 1997b; Paul Westhead et al., 2001		**Proposition 1.2** Specific international characteristics of eco-entrepreneurs (founder, leader) such as international experience, international orientation, and international business relations (network),	•Eco-entrepreneurs previous international professional experience and education helped them to find international partner, to gain skills for international business for communication and negotiation	•**H3:** Eco-entrepreneurs' foreign work and experience in energy sector positively affect the internationalization of firms.

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches: IE	Previous Related Researches: Sustainable and energy Entrepreneurship	Primary propositions	Cross-case Findings	Hypothesis Derived
	Social Capital and Network	Svante Andersson & Wictor, 2003; S Chetty & Blankenburg-Holm, 2000; Coviello & Cox, 2006; Coviello & Munro, 1997; Coviello, 2006; M. Gabrielsson, Kirpalani, Dimitratos, Solberg, & Zucchella, 2008; Kontinen & Ojala, 2011; Mort & Weerawardena, 2006; Musteen, Francis, & Datta, 2010; Rasmussan, Madsen, & Evangelista, 2001; Sasi & Arenius, 2008; Sharma & Blomstermo, 2003; Solberg & Durrieu, 2006; Thistoll & Pauleen, 2010;		positively affect international opportunity recognition and internationalization.	•Formal networks help companies to develop their activity in the international context •Informal and personal networks facilitated the internationalization of the firms	•**H4**: Eco-entrepreneurs' networking capability positively affect internationalization of the firms.

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches		Primary propositions	Cross-case Findings	Hypothesis Derived
		IE	Sustainable and energy Entrepreneurship			
		Westhead et al., 2001;Coviello & Munro, 1997, 1995				
	Opportunity recognition	Chetty, 2002; K Eriksson, 2003; Kent Eriksson, Johanson, Majkgård, & Sharma, 1997; Kontinen & Ojala, 2011; Madhok, 1996; Majocchi, Bacchiocchi, &	Cohen & Winn, 2007; Dean & McMullen, 2007; Pacheco, Dean, & Payne, 2010		•Human capital such as international skills, experiences positively affect entrepreneurial opportunity recognition and exploitation in the global context •Social Capital positively affect the	•**H5a**: eco-entrepreneurs' international skills and experience positively affect the international opportunity recognition and exploitation.

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches: IE	Previous Related Researches: Sustainable and energy Entrepreneurship	Primary propositions	Cross-case Findings	Hypothesis Derived
		Mayrhofer, 2005; Reuber & Fischer, 1997; Yli-Renko, Autio, & Tontti, 2002; Yli-Renko et al., 2002			process of opportunity recognition and exploitation in international markets	•**H5b:** Eco-entrepreneurs' formal and informal network positively affects international opportunity recognition and exploitation.
Firm	**Age and Size**	**Born Globals or INVs:** Madsen & Servais, 1997; Mcdougall et al., 1994	Hockerts & Wüstenhagen, 2010;Bjørgum et al., 2013; Løvdal & Moen, 2013; Løvdal & Neumann, 2011; Bird, Wüstenhagen, & Aabakken, 2002	**Proposition 2** Age and size of the firms impact positively/negatively entrepreneurial internationalization of the firms in renewable energy industry. **Proposition 2.1** Innovative start-ups in comparison with larger renewable energy companies are more inclined to adopt internationalization strategy for product development and commercialization.	•Although large companies internationalization is easier than small firms(because of access to the wider range of resources and capabilities), most of the small companies are born globals or INVs and they entered to the international market from the inception •Small firms are more flexible to adapt to the	•**H6a:** Age of the renewable energy companies is negatively/ positively associated with their international performance. •**H6b:** Size of the renewable energy companies is negatively/ positively associated with their international performance.

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches		Primary propositions	Cross-case Findings	Hypothesis Derived
		IE	Sustainable and energy Entrepreneurship			
					international context and their internationalization is faster •Some companies in this industry start their international activities in the pre-commercial period and before establishment	

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches		Primary propositions	Cross-case Findings	Hypothesis Derived
		IE	Sustainable and energy Entrepreneurship			
	Interaction between the large and small firms	(Prashantham & Birkinshaw, 2008)	Hockerts & Wüstenhagen, 2010	**Proposition 2.2** Incumbent companies in renewable energy industry help start-ups introduce new technologies to the market by providing channels, resources, networks and reputation. **Proposition 2.3** Interaction between the incumbents and start-ups leads to for international technology development and commercialization.	•Collaboration between the small and large firms is essential •Large firms needs small firms in international market as sub-supplier and provider of the high-tech and innovative technology •Small firms take advantage of large firms resources like networks, market channels to accelerate and facilitate internationalization •Moderating effect of level of technology maturity on the interaction between the large and small firms	•**H7:** Collaboration between the large and small companies facilitates the internationalization of the firms and positively affects their internationalization.

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct		Previous Related Researches: IE	Previous Related Researches: Sustainable and energy Entrepreneurship	Primary propositions	Cross-case Findings	Hypothesis Derived
	Resources &Capabilities	Financial Resources	Cooper, Gimeno-gascon, & Woo, 1994; Almor & Hashai, 2004; Lu & Beamish, 2001	Bjørgum et al., 2013; Løvdal & Aspelund, 2012; Løvdal & Moen, 2013; Løvdal & Neumann, 2011	**Proposition 3** Resources and capabilities needed for new energy technologies development, drive renewable energy companies to enter international markets. **Proposition 3.1** Need for financial resources and funding is a driving force for renewable energy firms' internationalization.	•Financial trouble is the primary barrier for development and internationalization of renewable energy companies in Spain especially after the general financial crisis and Feed-in Tariff cuts •Many companies looked for funding from outside of Spain and EU supporting projects •Type of technology may affect the necessity to access to the financial resources. For mature technologies this issue is more challenging	•**H8:** Need for financial resources and funding encourage renewable energy firms to internationalize.

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct		Previous Related Researches: IE	Previous Related Researches: Sustainable and energy Entrepreneurship	Primary propositions	Cross-case Findings	Hypothesis Derived
		Technological Knowledge	C. Lee, Lee, & Pennings, 2001; Shane, 2008; Zahra, 1996; Aspelund, Madsen, & Moen, 2007; H. Lee, Kelley, Lee, & Lee, 2012; Mcdougall, Oviatt, & Shrader, 2003; Mort & Weerawardena, 2006; Rialp, Rialp, & Knight, 2005; Weerawardena, Mort, Liesch, & Knight, 2007; Zhang & Dodgson, 2007	Bird, Wüstenhagen, & Aabakken, 2002; Bjørgum et al., 2013	**Proposition 3.2** Need for technological development and rapid commercialization is driving force for renewable energy firms' international involvement (ex. international commercialization, international sourcing).	•Having access to the latest knowledge and technology is not a strong motive for renewable energy companies to enter the international markets, because Spain is already a hot-spot of knowledge about renewable technologies particularly in solar and wind energy •However, many companies established international partnership. This international partnership is maybe related to mitigating the risk of investment in new technologies •Mira-Energia is the only company states that they need	•**H9:** Technological resources are positively associated with internationalization of renewable energy companies.

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct		Previous Related Researches: IE	Previous Related Researches: Sustainable and energy Entrepreneurship	Primary propositions	Cross-case Findings	Hypothesis Derived
						internationalization to have access to the latest knowledge because Spain is not leading country in the solar HVAC	
		Commercialization	Løvdal & Moen, 2013; Thistoll & Pauleen, 2010; Bjørgum et al., 2013;	Balachandra et al., 2010; Jagoda, Lonseth, Lonseth, & Jackman, 2011; Negro et al., 2012;Walsh, 2012; Wüstenhagen et al., 2003, 2007	**Proposition 3.3** The quest for dominant design in industry is driving force for internationalization of renewable energy firms.	•Commercialization of renewable energy technology in Spain is slow •Other factors can slow down the process of commercialization of renewable energy companies like policy support, financing,	•**H10:** Need for commercialization of products positively affect renewable energy firms' internationalization.

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct		Previous Related Researches: IE	Previous Related Researches: Sustainable and energy Entrepreneurship	Primary propositions	Cross-case Findings	Hypothesis Derived
						and market demand •Internationalization could be a possible solution to overcome technological development difficulties •Because of challenges in product commercialization, many companies started internationalization in pre-commercial phase	

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct		Previous Related Researches: IE	Previous Related Researches: Sustainable and energy Entrepreneurship	Primary propositions	Cross-case Findings	Hypothesis Derived
		Networks	Chetty & Blankenburg-Holm, 2000; Chetty & Wilson, 2003; Coviello & Munro, 1995; Coviello & Munro, 1997; Gabrielsson, Kirpalani, Dimitratos, Solberg, & Zucchella, 2008; Laanti et al., 2007; Coviello & Cox, 2006;	Katila, Rosenberger, & Eisenhardt, 2008; Løvdal & Aspelund, 2011	**Proposition 3.4** Need for resources (technological, financial) that are not available in local environment, encourage entrepreneurial companies in renewable energy to use international networks (personal, formal, or informal) to facilitate resource acquisition. **Proposition 3.5** Need for network resources (channels, required knowledge and technology, financial resources) for product development and fast commercialization drive firms to entrepreneurial internationalization.	•Networking has been used as a means and facilitator to overcome resources constraints and limitations, particularly in international markets •Companies take advantage of their formal and informal networks to enter to the international market	•**H11:** Networking (formal and informal) affects positively internationalization of renewable energy companies.

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches		Primary propositions	Cross-case Findings	Hypothesis Derived
		IE	Sustainable and energy Entrepreneurship			
	Business Model		Loock, 2012, Richter, 2012	**Proposition 4** In renewable energy, choosing a given type of business model affects positively/negatively the internationalization of entrepreneurial firms. **Proposition 4.1** Choosing customer-driven business model affect positively the internationalization of renewable energy firms.	•More companies adopted the traditional business model like conventional utility companies and it incur lower risk •Only Watly adopted customer-side business model •For customer side business model companies may are more inclined to be international •The degree and speed of internationalization in customer-side business model companies is higher than utility-side business model companies	•**H12:** The utility-side business model impacts positively/negatively the international performance of renewable energy companies.

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches: IE	Previous Related Researches: Sustainable and energy Entrepreneurship	Primary propositions	Cross-case Findings	Hypothesis Derived
Industry	**Industry Evolution**	Madsen & Servais, 1997; Mcdougall, Robinson, & Denisi, 1992; Oviatt & McDougall, 1994; Oviatt & Mcdougall, 1997;(Kuivalainen, Saarenketo, & Puumalainen, 2012; Majumdar, Vora, & Nag, 2010; Evers, 2010, 2011; Andersson, 2004; Autio, 2005; Bloodgood, Sapienza, & Almeida, 1996; Fernhaber, Mcdougall, & Oviatt, 2007	Bjørgum et al., 2013; Løvdal & Aspelund, 2011, 2012; Løvdal & Moen, 2013; Løvdal & Neumann, 2011	**Proposition 5** Favorable industry structure (such as being in the growth phase, high level of venture capital investment, less level of concentration, high knowledge intensity, strong regime of appropriability) affects the internationalization of renewable energy companies positively. **Proposition 5.1** In emerging renewable energy industries, firms in sectors with higher market potential are more (/less) likely to internationalize.	•Although this industry is emerging industry and many technologies are still in the introduction phase, companies they have started their international activities even in the pre-commercial phase. Therefore, the stage of the development of the industry may not be a significant factor in the internationalization of the firms in this industry. •Companies in this industry still need to practice internationalization for growth and survival •We can conclude level of maturity of	•**H13a**: There is no significant relationship between the level of industry evolution and internationalization of the renewable energy companies. •**H13b:** In renewable energy industry companies with more mature technologies are more willing to internationalize.

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches		Primary propositions	Cross-case Findings	Hypothesis Derived
		IE	Sustainable and energy Entrepreneurship			
				Proposition 5.2 In high growth renewable energy industries, firms in sectors with higher level of venture capitalist investment are more likely to internationalize.	the industry is not a significant factor in the internationalization of the firms and the level of technological development could be more significant factor	

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches		Primary propositions	Cross-case Findings	Hypothesis Derived
		IE	Sustainable and energy Entrepreneurship			
	Level of concentration of industry			**Proposition 5.3** Renewable energy industries are high/less concentrated industries with high/less level of internationalization. **Proposition 5.4** Renewable energy industries are high/less concentrated industries with high/less level of internationalization and inverted U-shaped relationship. **Proposition 5.5** Renewable energy industries are highly concentrated, with many new ventures that need to compete based on new technologies differentiation, because of limited domestic market the high level of	•In renewable energy industry in general there are mix of large and small companies • Companies internationalize to have access to a wider market and this is particularly true about small companies in the niche market • The level of concentration depend on the technology, wind energy is highly concentrated while solar and tidal are less concentrated	•**H 14:** High level of industry concentration and existence of many new small ventures affect positively the internationalization of the firms in this industry for finding new foreign markets.

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches		Primary propositions	Cross-case Findings	Hypothesis Derived
		IE	Sustainable and energy Entrepreneurship			
				industry concentration is positively associated with the internationalization of the firms.		
	Knowledge intensity			**Proposition 5.6** In renewable energy industries knowledge-intensity is positively related to the internationalization of firms (search for proximity to hot spots of technology, willingness to exploit their unique technological advancement.)	•Spain has been always a hot-spot for renewable energy technology and knowledge •Being close to the technological hubs is not the main reason for the internationalization of the renewable energy companies from Spain •This factor was only important for Mira-	•**H15:** Knowledge-intensity of renewable energy industry cannot be positively related to the internationalization of firms.

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches		Primary propositions	Cross-case Findings	Hypothesis Derived
		IE	Sustainable and energy Entrepreneurship			
					Energia and Smalle Technologies, with less level of these technology development in Spain	
	Isomorphism			**Proposition 5.7** Local renewable energy industries internationalization affects positively the internationalization of the other firms in the same industry.	•We could not find any evidence that support this idea that mimetic isomorphism is the reason for the internationalization of the renewable energy companies	•**H16:** Local renewable energy industry internationalization cannot positively affects the internationalization of other firms in renewable energy industry.
	Global integration			**Proposition 5.8** Global integration of renewable energy industries, affect positively the internationalization of the firms in these	• By considering the market, competitiveness, cost and also environmental factors this industry is truly a global market.	•**H17:** Global integration of the renewable energy industry affects positively the internationalization of the renewable energy

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches: IE	Previous Related Researches: Sustainable and energy Entrepreneurship	Primary propositions	Cross-case Findings	Hypothesis Derived
				industries.	•This industry is globally integrated (born global industry) • Internationalization for companies in this industry is essential.	companies.
	Patent and copy (regime of appropriability)			**Proposition 5.9** The strong/weak regime of appropriability affects positively/negatively the internationalization of entrepreneurial firms in renewable energy industries, because they have access to more/less financial resource.	•Evidences from the cross case analysis do not support the idea that in renewable energy industry because of the low level of patenting protection companies prefer to enter international market to take the most advantage of their idea. • High level of protection can make barrier for entry to that market. (such as entry to US wind energy market)	•**H18:** The strong regime of appropriability in the target markets affects negatively the internationalization of renewable energy companies.

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches		Primary propositions	Cross-case Findings	Hypothesis Derived
		IE	Sustainable and energy Entrepreneurship			
Policy	**Supportive domestic political scheme**	**•Institutional Perspective:** Aulakh & Kotabe, 2008; Bevan, 2004; Bruton, Ahlstrom, & Puky, 2009; Kiss & Danis, 2008 **•Policy and internationalization:** Bell, Ireland, Mcnaughton, & Zealand, 2000; Morck, Shaver, & Yeung, 1997 **• IE in Renewable energy:** Løvdal & Neumann, 2011; Bjørgum et al., 2013	**•Renewable energy internationalization:** Wüstenhagen, 2003; de la Tour, Glachant, & Ménière, 2011; Liu & Goldstein, 2013; Lewis & Wiser, 2007 **•Renewable energy policy:** Bürer & Wüstenhagen, 2009; Laurentis & Cooke, 2008; Provance et al., 2011; Wüstenhagen & Bilharz, 2006	**Proposition 6.1** Supportive political scheme for domestic companies (to create sizable and stable market) positively affect the outward internationalization of renewable energy companies.	• In the past years supportive political scheme has helped to the development and international expansions of renewable energy industry particularly wind energy. • Although this policy was more and less successful for development of the wind energy (especially in the Basque country region) , it could not lead to the development of the renewable industry related to other technologies like solar and photovoltaic, because of the fast policy change.	**H 19:** Unsupportive renewable energy scheme in the domestic market, affect negatively the internationalization of companies. **H 20:** Supportive renewable energy policy framework in the host country, affects positively the outward internationalization of renewable energy companies. **H21:** Renewable energy policy change has affected the internationalization of the renewable energy companies positively/or

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches		Primary propositions	Cross-case Findings	Hypothesis Derived
		IE	Sustainable and energy Entrepreneurship			
	internationalization			**Proposition 6.2** Supportive political scheme affect positively inward internationalization of foreign companies.	•Since the policy support for renewable energy in Spain was very generous, many international companies came to Spain. • Before policy change, there was no need for internationalization of the Spanish renewable energy companies.	negatively.

Table 6.8.1 Case studies conclusion and hypotheses development

Level of analysis	Construct	Previous Related Researches		Primary propositions	Cross-case Findings	Hypothesis Derived
		IE	Sustainable and energy Entrepreneurship			
	Internationalization			**Proposition 6.3** Unsupportive energy policies affect positively outward internationalization of domestic companies to overcome the obstacle of an unfavorable political scheme.	• Unlike China, in Spain there is no exporting incentive. • Main reason to enter an int. market is favorable policy framework of the host country. • Constant changes of the policy have made entrepreneurs de-motivated and they cannot trust on the government. Policy changes have hindered the international expansion through organic growth. •Policy change can create opportunities for other technologies such as energy efficiency, wave energy companies, and biomass. • The main solution for companies to overcome the policy change effect is internationalization.	

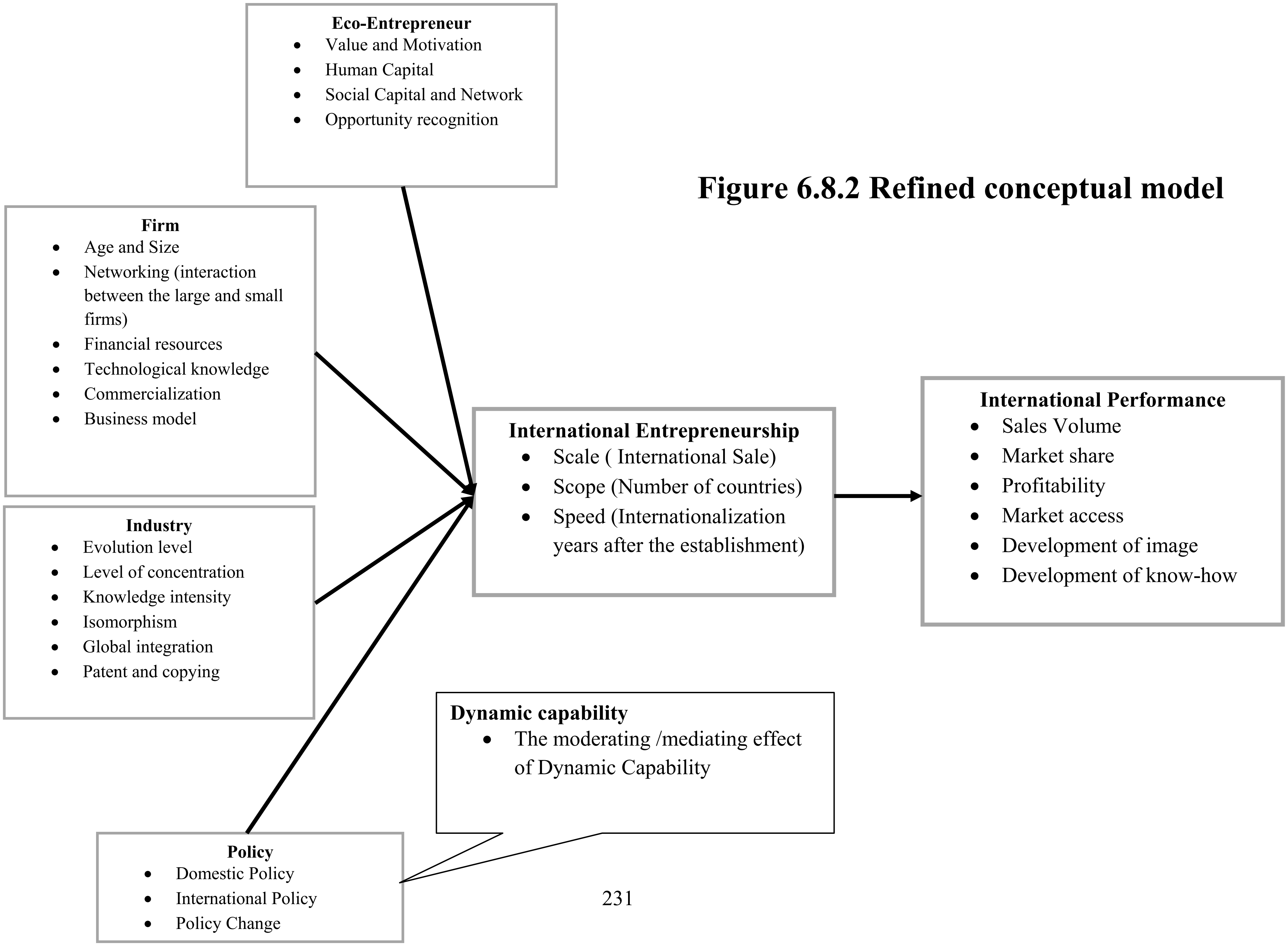

Figure 6.8.2 Refined conceptual model

-There is no justifiable prediction about how the hypothesis will hold up in the future; its degree of corroboration simply is a historical statement describing how severely the hypothesis has been tested in the past.
"Robert Nozick" (Philosopher)

7. *Quantitative research and hypotheses testing*

7.1. *Introduction*

IE in sustainable industries is a new line of research that has recently attracted scholarly attention. According to the case studies findings, in this emerging industry many factors like entrepreneurial intention, firm level predictors, policy scheme support and industry structural factors are determining factors in the internationalization of firms. Renewable energy, as emerging and high-tech industry, is one of the most interesting green industries at the intersection of the two rather different lines of researches in entrepreneurship i.e. IE and sustainable entrepreneurship. Many countries have introduced short-term and long-term plans for developing clean energies as one of the strategic industries and many leading countries in these technologies are looking for any opportunity to develop these technologies in the foreign markets. On the other hand, energy poverty in the developing and under-developed countries and negative environmental consequences of the fossil fuels calls for global development of these technologies.

In this chapter, on the basis of the extant literature and our findings from the case studies presented in previous chapter, first, we refined our constructs at multiple levels: entrepreneur, firm, industry and policy and ,then, we examined the relevant hypotheses with equation models. For comprehensive understanding of our models and detailed analysis of our survey, we implemented PLS-SEM (Partial Least Squares Structural Equation Modeling).

7.2. *PLS-SEM models*

As we mentioned in the methodology part, there are several reasons for applying PLS-SEM method. The more general reasons are small sample size and distribution of data (Hair et al., 2014). More importantly, applying PLS-SEM allows us to distinguish between the reflective and formative measurement models. However, in the other structural models methods such as AMOS we cannot distinct these two measurement models.

In this method, first we specify the structural models and measurement models. The structural model defines the relationship between theoretical constructs based upon the theories or the research findings. The measurement models based on the literature and characteristics of the indicators of each construct can be defined as formative or reflective. In this method, we can also define the impact of moderating and mediating factors easily. For example, if we divide our data to Born Global (BG) and Non-Born Globals (Non-BGs), we can examine the effect of a moderating factor (which is type of firms) on the international performance of companies. Moreover, according to the current theory, we can assess the effect of international entrepreneurship dimensions (i.e. extent, scope and speed of internationalization) as mediating factor.

7.3. *Measurement and refinement of the constructs*

7.3.1. *Defining the measurement models*

The measurement models are mainly designed based on the previous studies and the proposed constructs in the literature. However, in defining the measurement of the constructs, the only presence of scales in previous studies is not enough. According to Covin and Miller (2014) study about conceptual consideration in IEO, they suggest applying qualitative studies to adapt the measures based on the research objectives and context.

> "*In closing,… most of the literature on IEO—the vast majority of it in fact—is based on quantitative studies or conceptual contributions. What are missing are fine-grained qualitative pieces of research that could help to lay bare the concept of IEO—or its nature in different national contexts. In order to enrich our understanding of what an EO consists of in different societies, it may be useful to undertake qualitative studies of entrepreneurs at different levels of society: How do they differ in their beliefs, attitudes, preferences, and behaviors that might lead us to country- or culture-specific predictions?"(Covin & Miller, 2014)*

In this study, therefore, based on the results of case studies and research objectives we suggested some new items to develop and adjust the model measurement constructs. In the following we discuss about the defining the measurement construct at different levels of analysis; eco-entrepreneur, firm, industry and policy.

7.3.1.1. *Eco-entrepreneur*

An important issue about eco-entrepreneurs is their different characteristics in comparison with conventional entrepreneurs. These distinct characteristics are presented in our structural model and in connection with the two streams of literature i.e. IE and sustainable entrepreneurship. For designing our path model, we used Zahra and Georges' IE framework (2002) which shows the relationships between the entrepreneur level factors (TMT), IE and International Performance.

We developed the measurement models based upon the suggested constructs relevant to entrepreneurial internationalization (Jones & Coviello, 2005; Zahra & George, 2002). Following Jones and Coviello (2005), we categorized the entrepreneur level constructs into philosophical view, human capital and social capital. We adjusted philosophical view scale according to eco-entrepreneurs' environmental and global vision with questions about entrepreneurial intentions such as financial and non-financial motivations. All the amendments to the philosophical perspective measure are based upon the results from the qualitative part. Moreover, the human capital construct is measured in terms of entrepreneurial and management competence, international experience, education and language proficiency (Jones & Coviello, 2005; Ruzzier, Antoncic, Hisrich & Konecnik, 2007). Social capital also measured about entrepreneurs' contacts and we also measured it as entrepreneurs' networking capability (Coviello & Munro, 1997, 1995; Jones & Coviello, 2005; Mort & Weerawardena, 2006).

In order to keep the model parsimony, we defined another path model to show the effect of opportunity recognition on IE and International Performance. The opportunity recognition antecedents can be measured as a combination of environmental forces, individual characteristics and capability of entrepreneurs (Zahra et al., 2005). The environmental forces are defined as environmental uncertainties caused by competition intensity, technological change, regulatory pressure, and market turbulence (Cadogan, Diamantopoulos & Siguaw, 2002). Since the effect of environmental factor is important in the context of Spain, especially after the renewable energy policy change, we developed a measurement model based on unpredicted environmental factors that draw the companies to international markets. In this model again we applied human capital and social capital measures to examine the effect of the entrepreneurs' quality and knowledge on opportunity recognition (Ardichvili, Cardozo, & Ray, 2003; Chandra, Styles, & Wilkinson, 2009; Jones & Coviello, 2005). These constructs are shown in Tables 7.3.1.1, 7.3.1.2 and 7.3.1.3.

Table7.3.1.1 Human capital indicators

Indicators for Formative Measurement Model Constructs	
Eco-Entrepreneur	
Human capital	
1. International Education	How many years of education abroad?
2. International Job Experience	How many years of job experience abroad?
3. Language	Lack of language proficiency as a challenge in the internationalization
What kind of experience do you have in the management team?	
1. Int. Business	(There is international business experience) in the management team
2. Research	(There is Research experience) in the management team
3. Energy and Utility	(There is energy and utility experience) in the management team
4.Entrepreneruship	(There is entrepreneurship experience) in the management team
5.Netwroking	(There is networking experience) in the management team

Table7.3.1.2 Philosophical view indicators

Philosophic View	
Please rate the factors that motivate Eco-entrepreneurs to start their renewable energy business	
1.Global sustainable incentive	To have better world with sustainable energy
2. Financial incentive	Making money and profit
3. Sustainability incentive	Sustainability and environment degradation
4. Both financial and sustainability incentive	Both financial and sustainability issues equally motivate eco-entrepreneurs

Table7.3.1.3 Opportunity recognition motivation indicators

Opportunity Recognition Motivation	
Environmental Forces	
Please rate the factors that draw your firm to the international markets:	
1. Financial Resources	Lack of financial resources in the domestic market
2. Technological knowledge	Knowing about the latest technology
3. Policy	Supportive policy in the host country
4. Single market risk	Reducing the risk of having single market in Spain
5. Searching new markets	Lack of domestic market
6. Competition Intensity	Competition intensity in the domestic market

7.3.1.2. *Firm level analysis*

Firm level constructs were developed according to the IE theoretical frameworks and our findings from the case studies. In this study we developed the measurement models for several firms' level constructs i.e. Resources, Networks, International Performance, Commercialization, Business Model, Age and Size.

Two simple indicators are applied to measure the age and size of the firms. We measured these variables by asking about the number of employees to examine the effect of the size of the company. Age of the companies is measured based on the year the companies founded (Table7.3.1.4). According to the IE literature, this indicator together with the year the companies started their international activities identify the born globals (BGs) or international new ventures (INVs) (Cavusgil & Knight, 2003; Madsen & Servais, 1997; Oviatt & McDougall, 1994; Rennie, 1993). Although there is no widely accepted definition of the born global firms, we considered the firms that started their international activity within five years of their founding (Kuivalainen et al., 2012). Based on Zahra and George's (2002) framework, IE dimensions are measured in terms of scale /extent, scope and speed of internationalization. Scale is the percentage of foreign sale, scope is the number of countries that a company have international relation with and speed is the number of years it takes from the establishment till the companies initiate their international activities. Following Madsen (2013) and Gerschewski, Rose and Lindsay (2015) we applied extent, scope and speed of internationalization to identify the BGs or INVs.

Table7.3.1.4 Age and size indicators

Age	
2_1_Yr_Co_Found	Year of company establishment?
Size	
1_3_No_Employ	Total number of employees (full time and part time)

International performance of the firms can be measured from the different aspects. Zahra and George (2002) measure it as financial and non-financial indicators. However, in our study, applying objective international performance measures could be challenging because entrepreneurs and owners of small businesses are not keen to share this information with researchers (Sapienza, Smith, & Gannon, 1988). Therefore, following the other IE studies (e.g. Gerschewski, Rose, & Lindsay, 2015; Jantunen, Nummela, Puumalainen, & Saarenketo, 2008) we applied multi-dimension subjective performance measures in terms of economic and non-economic measures (Hult et al., 2008; Katsikeas, Leonidou, & Morgan, 2000), which can be a valid approximation of objective measures (Dess & Robinson, 1984). These indicators are shown in Table 7.3.1.5.

Table7.3.1.5 International performance indicators

Indicators for Reflective Measurement Model Construct	
International Performance	
Financial	
1. Sales Volume	How satisfied have you been with your international market share
2. Market Share	How satisfied have you been with your international sales volume
3. Profitability	How satisfied have you been with your international profitability
4. Market access	How satisfied have you been with your international market access
5. Development of image and brand	How satisfied have you been with your international development of image and brand
6. Development of the know how	How satisfied have you been with your know how
7. In general	How satisfied have you been with your international sales in general

According to the current literature and our results from the qualitative analyses we could distinguish between two types of business models in renewable energy companies; utility-side business model and customer-side business model (Richter, 2012). In this study we would like to know about the effects of business models on the international performance of the companies (Table 7.3.1.6).

Table7.3.1.6 Business model indicators

Indicators for Formative Measurement Model Constructs	
Business Model	
How is your business model? Please select one:	
2_3_Biz_Model_Typ	1. We sell our product or technology to the end users (Decentralized renewable energy system)
	2. We sell our product or technology to the utility companies (Centralized renewable energy system)

Firm resources are measured in terms of financial resources, technological resources and networks (Jones & Coviello, 2005; Zahra & George, 2002). According to the findings from the case studies and previous studies in renewable energy industry (Bjørgum et al., 2013; Løvdal & Aspelund, 2011) lack of financial resources is one of the main obstacles in the international development and rapid commercialization of the firms in this industry. Therefore, we asked companies about the effect of limited financial resources on firms' internationalization behavior and commercialization process. Technological resources are measured as R&D expenditure (Zahra & George, 2002) and the level of technological development of the firms. Since in this industry there is range of technologies extend from infant to mature, according to product life cycle theory and industry evolution (Andersson, 2004; Fernhaber et al., 2007; Vernon, 1966), the effect of the technological maturity on the internationalization of firms can be significant. All these constructs are shown in Table 7.3.1.7.

Table7.3.1.7 Resources indicators

Indicators for Formative Measurement Model Constructs	
Firm	
Resources	
4_1_RD_Invst	Total amount spent on R&D on your concept or product so far?
1_7_1_Tek_Dev_Level	Your product technical development level?
Please rate the factors that draw your firm to the international markets:	
5_5_1_Intzshen_Rizens_Finacial	Lack of financial resources in domestic market
5_5_2_Intzshen_Rizens_Tek_knwl	Knowing about the latest technology
Foreign Market Knowledge	
Please rate the challenges for internationalization of your company:	
5_6_2_Intzshen_Int_Mkt_	Lack of knowledge about the international market
5_6_6_Intzshen_Languge	Lack of language proficiency

- **Networking**

Networking is one of the most well known organizational theories that can extend the domain of IEO measurement (Covin & Miller, 2014). Position of a firm in a network of small or large organizations can facilitate or hinder the internalization process (Coviello & Munro, 1997, 1995; Etemad & Lee, 2003; Mort & Weerawardena, 2006). This issue is especially important in the energy industry that traditionally dominated by the large energy companies and network position of the firms can be either beneficial or disadvantageous (Hockerts & Wüstenhagen, 2010). Entrepreneurial networks can be classified as formal and informal (Littunen, 2000) and these networks can affect internationalization of the firms (Coviello & Munro, 1997, 1995; Neck, Meyer, Cohen, & Corbett, 2004). The formal networks are characterized of being weak and costly. These networks can be between firms or persons and other institutions like government agencies, trade associations, professional associations, customers and suppliers. The informal networks are between the friends and family. They also call this network as social networks (Zhou, Wu, & Luo, 2007). According to *network compensation hypothesis* and *coopetition strategy* (Bengtsson & Kock, 2014; Ritala, 2012), in this study we examine whether the interaction between large utility companies and small innovative firms can compensate the less favorable human capital and restricted financial resources in this industry (Brüderl & Preisendörfer, 1998). The impact of different types of networks on the entrepreneurial internationalization of firms can be different; therefore, in the measurement model we consider the effect of these two types of networks (Table 7.3.1.8 and Table 7.3.1.9).

Table7.3.1.8 Networking indicators

Indicators for Formative Measurement Model Constructs	
Networking	
Please indicate the extent to which these networking and cooperation activities with following items helped you to internationalize:	
3_5_1_Netw_Friend	Friends and colleagues
3_5_2_Netw_Prof_Assc	Professional associations
3_5_3_Netw_Trade_Assc	Trade Associations
3_5_4_Netw_Gov_Agncy	Government agencies tales
3_5_5_Netw_Fair	Participating in the international conferences or exhibitions
3_5_6_Netw_Customer	Customers
3_5_7_Netw_Suppliers	Suppliers
3_5_8_Netw_Distributers	Distributors

Table7.3.1.9 Firm interaction indicators

Indicators for Reflective Measurement Model Construct	
Firm level networking- Small and Large	
Please rate the following statements. Interaction between the small and large firms provide us with:	
2_4_1_Small_Big_Int	Easier entry to the international markets
2_4_2_Small_Big_Teknlgy	Access to the knowledge and new technologies
2_4_3_Small_Big_Resources	Access to more resources (brand, network, distribution channels)

- **Commercialization**

Drawing upon qualitative analysis findings and also current literature about renewable energy technologies (Negro et al., 2012), one of the main challenges in development of renewable energies is the slow diffusion of these technologies. Based upon the case studies results and also current IE studies in marine energy industry (Bjørgum et al., 2013; Løvdal & Moen, 2013) we suggest that internationalization is a common strategy for the firms to overcome their difficulties in process of technological development and commercialization. Thus, we designed a set of indicators to assess the process of technological development in this industry and also to realize how companies accelerate this process (Table. 7.3.1.10 and 7.3.1.11).

Table7.3.1.10 Commercialization indicators

Indicators for Formative Measurement Model Constructs	
Commercialization	
Please rate the solutions that your company uses to overcome the commercialization problems:	
4_2_1_Comercilz_Prtnship	Through international partnership
4_2_2_Comercilz_IntFund	International funding
4_2_3_Comercilz_Sup_Policy_Cou	Going to the countries with supportive policy
4_2_4_Int_Part_Bfor_Comerz	Finding international partners before product commercialization

Table7.3.1.11 Commercialization challenges indicators

Commercialization Challenges	
Please rate the factors affect commercialization of the renewable energy companies:	
4_3_1_Comercz_Chlng_Res	Lack of resources (ex. Financing)
4_3_2_Comercz_Chlng_Mrkt_Demnd	Lack of market demand
4_3_3_Comercz_Chlng_Polcy_Supp	Lack of policy support
4_3_4_Comercz_Tkngy_Kwldg	Lack of technological knowledge
Please rate the factors that draw your firm to the international markets:	
5_5_4_Intzshen_Rizens_Rapid_Co	Rapid commercialization of our technology

7.3.1.3. *Industry*

Although many studies have emphasized on the importance of the industrial factors on the entrepreneurial internationalization of firms (Andersson et al., 2006; Andersson, 2004; Evers, 2011; Kuivalainen et al., 2012), there is a lack of empirical research about the effect of industrial factors on the internationalization of the companies. One of the limitations in applying industrial factors might be related to measuring these factors. In the absence of reliable secondary data related to renewable energy industry, current study, draw on prior studies (Aulakh, Kotabe, & Teegen, 2000; Cavusgil & Zou, 1994; Hult et al., 2008; Lages, Jap, & Griffith, 2007), use perceptual scale to measure the effect of the industry structural factors. In this study according to the theoretical framework recommended by Fernhaber, McDougall and Oviatt (2007) we defined our measurement model to examine the effect of the industrial factors associated with industry evolution, industry concentration, knowledge intensity of industry, local industry internationalization, and global integration of industry (Table 7.3.1.12). We also defined the constructs of structural model based on an integrated model of IE recommended by Zahra and George' model (2002).

Table7.3.1.12 Industry indicators

Indicators for Formative Measurement Model Constructs	
Industry	
Evolution	
1_Ind_Maturity	Which of the following phases describe better the level of maturity in renewable energy industry
Concentration	
Concentration_1	In this industry there are more small companies than large companies
Concentration_2	This industry is dominated by large companies
Concentration_3	Because of small domestic market, small firms need to go to the international markets
Concentration_4	Because of intense competition in domestic market, small firms need to go to the international markets
Knowledge intensity	Being close to technological centers (hot-spots) encourage us to go to other countries
Isomorphism	We entered to the international market because other major companies in our industry entered to the same international market
Global Integration	At this industry it is essential for companies to be international
Regime of Appropriability	
Regime of appropriability_1	In this industry to be first in the market is more important than to be well protected by patent
Regime of appropriability_2	Strict patent policy in the target country prevents us to enter that market

Table 7.3.1.13 IE indicators

Indicators for Formative Measurement Model Constructs	
International Entrepreneurship	
Extent/scale	Approximately, how many percents of your total sales are from the international sales (%)
Scope	How many countries do you have international activities with?
Speed	(Year company first internationalization - Year the company established)

7.3.1.4. *Policy*

As it is mentioned before, renewable energy industry is a policy driven industry (Bürer & Wüstenhagen, 2009; Lewis & Wiser, 2007; Wüstenhagen & Bilharz, 2006) and policy support mechanism in domestic and target markets may affect firms' internationalization decision (Bjørgum et al., 2013; Lewis & Wiser, 2007; Løvdal & Aspelund, 2011; Løvdal & Neumann, 2011). However, no empirical study has examined the effect of policy on the internationalization behavior of companies and this issue has been neglected in the literature. To fill this research gap, in the present study we propose and test empirically the effect of renewable energy policy and regulatory environment of domestic and foreign markets on the internationalization of firms (Coeurderoy & Murray, 2008). Moreover, we examine the effect of the policy change on the internationalization of the firms drawing upon the case studies findings (Table 7.3.1.14).

The second part of our analysis associated with the companies' reactions to the policy change (or dynamic capability). This construct is defined according to "reconfiguring entrepreneurial firms' asset base and process" suggested by Jantunen, Puumalainen, Saarenketo, and Kylaheiko (2005). By including this construct in the prior model, we will discuss about the moderating effect of dynamic capabilities on the policy change influence on IE and International Performance (Table 7.3.1.15).

Table 7.3.1.14 Policy and Regulatory Environment

Indicators for Formative Measurement Model Constructs	
Policy	
Please rate the following statements about renewable energy policies:	
6_1_1_Policy_Int_Policy_Supp	Policy support in the other countries motivates us for internationalization.
6_1_2_Policy_UnSupp_Dmstik_Pol	Unsupportive policy scheme in Spain encourage us to enter the international markets.
6_1_3_Policy_Policy_Change_Int	Renewable energy policy change in Spain motivates us for internationalization.
6_1_4_Policy_Policy_Change_Dif	Renewable energy policy change hinders the internationalization of our company.
6_1_5_Policy_Policy_Change_Opp	Policy change was an opportunity for our company to promote our products.
Copy Right and Commercialization Policy	
4_2_3_Comercilz_Sup_Policy_Cou	Going to countries with supportive policy (factors to overcome commercialization problems)
4_3_3_Comercz_Chlng_Polcy_Supp	Lack of policy support for commercialization of the firm (factors to overcome commercialization problems)
5_5_3_Intzshen_Rizens_Supp_Pol	Supportive policy in the host country (as factors draw the firm to the international market)
5_6_9_Intzshen_Chalng_Cpy_Righ	The risk of infringing any copy right in other countries (as internationalization challenge)
5_6_10_Intzshen_Chalng_Cpy_Cop	The risk of copying our idea and technology by other firms (as internationalization challenge)

Table 7.3.1.15 Dynamic Capability

Indicators for Formative Measurement Model Constructs	
Dynamic Capability	
After renewable energy policy change in Spain we achieved the following changes in the company:	
6_2_1_Dynmik_Cap_New_Strtgy	Implementation of the new internationalization strategy
6_2_2_Dynmik_Cap_Change_Struct	New or substantially changed organization structure to move abroad
6_2_3_Dynmik_Cap_Change_Mktng_	New or substantially changed marketing method for foreign markets
6_2_4_Dynmik_Cap_StillWait	We did nothing and we are still waiting

7.3.2. *Refinement of the data*

7.3.2.1. *Dealing with missing data*

The first step after exporting the database is to clean the data and dealing with missing values. For eliminating the missing values several solutions are recommended like mean replacement, case-wise deletion, pair-wise deletion, EM imputation, and multiple imputations. The last method is more complex and labor intensive method that is supported in the other statistical packages. In this study, in order to avoid biases in the results, because of the variation decrease, we avoid the options that recommend deleting observations with missing values. Thus, according to Hair et al. (2014) suggestion first we apply EM imputation to deal with missed values.

7.3.2.2. *EM imputation*

When the missing data is less than 5% the more common way for reducing missing values is case-wise or pair-wise deletion. However, in the current study because these methods may reduce our sample size we choose EM imputation. As it is recommended by (Hair et al., 2014) EM Imputation in SPSS is the preferred method to deal with missing data and it is the more accurate method for dealing with missing data than simply mean data replacement or regression substitution. In fact, the other techniques generate bias estimates and more importantly underestimates standard errors while expectation maximization (EM) overcomes these errors.

Before conducting EM imputation we used the pattern analysis to check the number and the pattern of missing values in the database. This test ensures us that the missing values are random and it is not biased. Moreover, we conducted Little's MCAR (missing value completely at random) test and the result was not significant at 95% of confidence interval. After these tests we were sure that the missing values are random and it is only about 5% of whole data (Figure 7.3.2.1). These results show that our data is ready for implementing EM imputation. In order to have more accurate imputation and speeding up the process we did imputations at multiple relevant subscales.

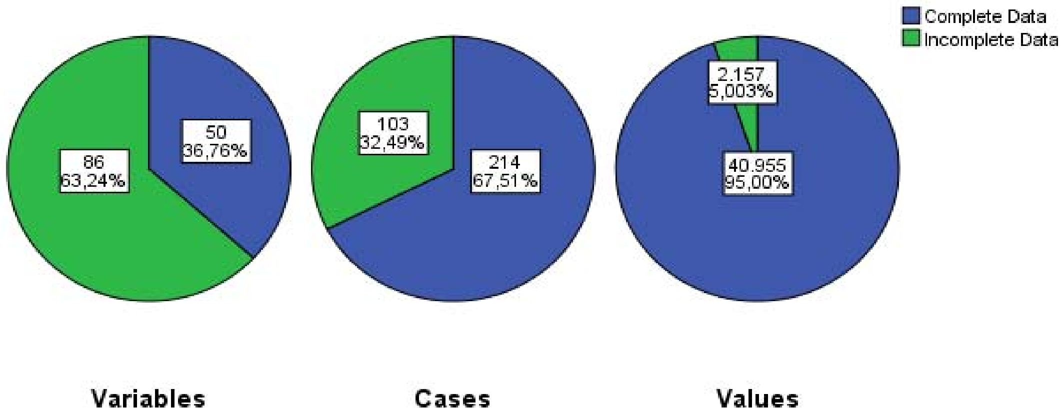

Figure 7.3.2.1 Missing values summary

7.4. *Industry level analysis*

In the first part of our analysis we check for the algorithm. The stop criterion is 11 which is less than the maximum number of iteration (i.e.300) and shows it is converged. The first construct to evaluate is International Performance. Since this construct is reflective, we measured its outer loading for assessing the convergent validity of the indicators of this construct. As you can see in Table 7.4.1 all the outer loadings are higher than 0.7 which is suggested as modest construct reliability. The indicator reliability is more than 0.50 and it shows that more than 50% of the variation in the items are explained by the construct and is described as the variance extracted from the item. Moreover, we checked composite reliability which is 0.9442. It is in the range of satisfactory results and show that this reflective construct has high level of internal consistency reliability. Convergent validity on the construct level is measured by AVE (average variance extracted) which is .07087 and it shows this construct present more than 50% of the variance of its indicators (Table 7.4.1). Finally, we used discriminant validity, following Fornell-Larcker criterion. According to its principle the square root of each construct's AVE should be larger than its highest correlation with any other constructs. According to our results the square root of International Performance's AVE (0.8418) is higher than this construct correlations with the other latent variables in the path model (ex. correlations with IE= 0.4714) (Table.7.4.2).

Table7.4.1 Results summary for reflective measurement models

Latent Variable	Indicator	Outer Loading	Indicator reliability	Composite Reliability	AVE	Discriminant Validity
International Performance	5_9_1_IntPerform_Vol	0.8678	0.7530	0.9442	0.709	Yes
	5_9_2_IntPerform_MktShare	0.8746	0.7649			
	5_9_3_IntPerform_Profit	0.8458	0.7153			
	5_9_4_IntPerform_Mkt_Acss	0.8619	0.7428			
	5_9_5_IntPerform_Image_Dev	0.7633	0.5826			
	5_9_6_IntPerform_KnowHow_Dev	0.7332	0.5375			
	5_9_7_IntPerform_InGeneral	0.9296	0.8641			

Table7.4.2 Fornell-Larcker Criterion

	Global Integration	IE	Industry Evolution	International Performance	Isomorphism	Knowledge intensity	Level of concentration	Regime of Appro.
Global Integration	1							
IE	0.5353	1						
Industry Evolution	0.0876	0.096	**Single item Construct**					
International Performance	0.2869	0.471	0.1114	**0.8418**				
Isomorphism	0.1686	0.0561	0.2026	0.1144	**Single item Construct**			
Knowledge intensity	-0.0223	-0.1826	-0.0286	-0.1426	0.1666	1		
Level of concentration	-0.268	-0.3256	-0.1075	-0.1718	-0.0934	0.1554	1	
Regime of Appro.	-0.0301	-0.1916	0.0259	-0.0521	0.2719	0.3011	0.2399	1

7.4.1. *Formative measurement model analysis*

The first step in the path model design is making decision about the indicators and how they could be related to the other constructs. In this part we will focus on the formative indicators at the industry level. However, one of the limitations of formative measurement is that when there are large numbers of indicators, outer weight of some indicators may show non-significant results. In order to resolve the potential negative effect of large number of indicators, Cenfetelli and Bassellier (2009) suggest to group indicators into two or more separate constructs. Therefore, according to the nature of constructs and also theoretical support we considered Level of Concentration, Knowledge Intensity, Global Integration, Regime of Appropriability and IE as formative constructs. These constructs are formative because items of these constructs are not mutually interchangeable (Jarvis, Mackenzie, & Podsakoff, 2003). Moreover, relevant literature and conceptual frameworks represent IE (Zahra & George, 2002) and industrial factors (Fernhaber et al., 2007; Zahra & George, 2002) as formative constructs.

Initially we checked the stop criterion and it show that the algorithm stopped after 11 iterations. According to the formative measurement model assessment procedure, first we examined convergent validity. Since the global single item measure is not applicable about our study, we skipped this step and we checked for collinearity between the items. As you can see in Table 7.4.1.1 and 7.4.1.2 **,** VIF values for all the constructs are below the threshold value of 5 and we can conclude that collinearity is not an issue for estimation of the PLS path model.

Table 7.4.1.1 VIF of IE

IE	
Indicators	**VIF**
International Extent	1.11
International Scope	1.09
International Speed	1.03
Mean VIF	**1.08**

Table 7.4.1.2 VIF of Industry

Level of Concentration		**Knowledge Intensity**		**Global Integration**		**Regime of Appro.**	
Indicators	**VIF**	**Indicators**	**VIF**	**Indicators**	**VIF**	**Indicators**	**VIF**
7_3_3_in~s	1.14	5_5_2_in~l	1.12	5_5_7_in~e	1.15	5_6_10_i~p	1.44
7_3_4_in~t	1.12	7_4_1_in~t	1.1	7_4_3_in~l	1.15	5_6_9_in~h	1.39
7_3_2_in~e	1.08	5_6_3_in~v	1.03			7_4_5_in~_	1.32
7_3_1_in~l	1.06					7_4_4_in~t	1.3
5_6_4_in~i	1.03						
Mean VIF	**1.09**	**Mean VIF**	**1.08**	**Mean VIF**	**1.15**	**Mean VIF**	**1.36**

The last step in assessing the reflective model is analyzing the indicators. Bootstrapping help us to understand the indicators' significance and relevance. The contributions of the indicators to the constructs are shown based on outer weights and t values. As you can see in the Table 7.4.1.3 we calculated the outer weight, outer loading, t value, significance level, p value of each indicator. Looking at the significance levels, we find that indicators are significant except 7_3_2_Industry_Large_Dominate, 5_5_2_Intzshen_Rizens_Tek_knwl,7_4_4_Industry_Structur_Patent,5_6_10_Intzshen_ Chalng_Cpy_Cop, and int_speed. Bootstrapping sign change option shows the same results about non-significant indicators.

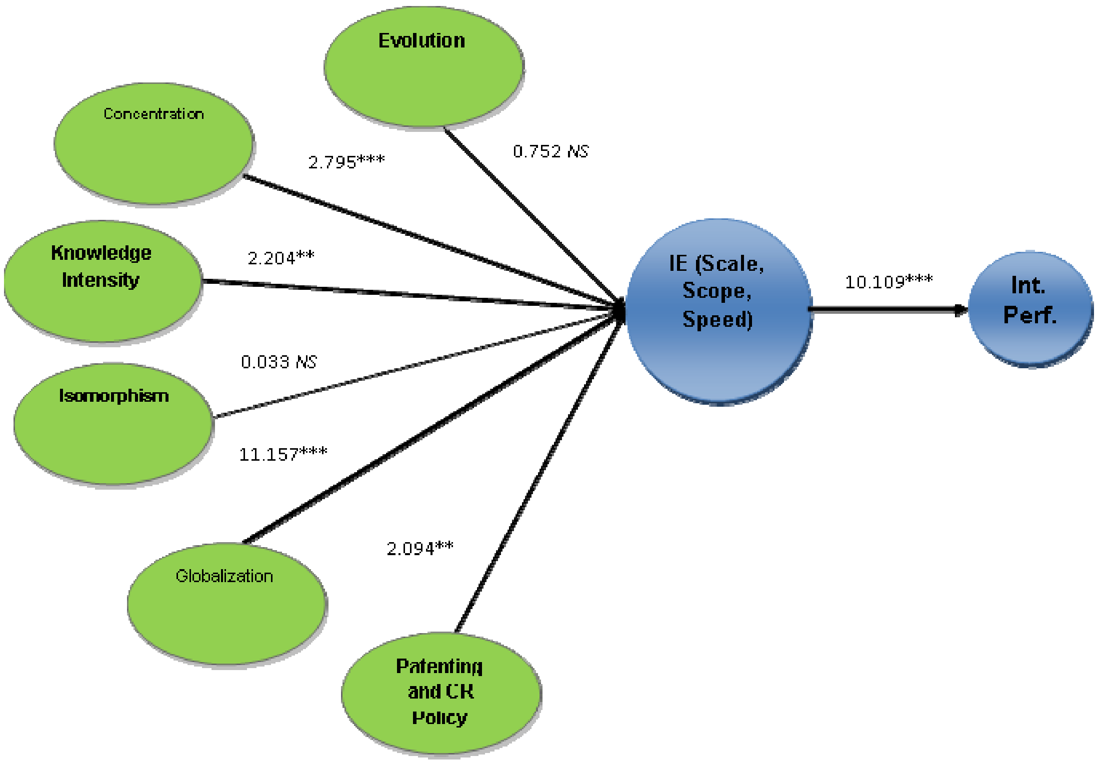

Figure7.4.1.1 Industry Level Path Model
(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

Table.7.4.1.3 Bootstrapping of Industry and IE

Formative construct	Constructs	Formative Indicator	Outer weight	Outer loadings	t Value	Significance Levels	p Value
Industry	Industry Evolution	Single Item					
	Level of concentration	7_3_1_Industry_MoreSmall	-0.3062	-0.2374	1.8306	*	0.0681
		7_3_2_Industry_Large_Dominate	0.1877	0.2343	1.1153	NS	0.2656
		7_3_3_Industry_S_Domstik_Mkt_S	0.8936	0.7068	7.8420	***	0.0000
		7_3_4_Industry_Intense_Competition	-0.4177	-0.1943	2.5814	***	0.0103
		5_6_4_Intzshen_Chalng_Small_Si	0.4442	0.3841	2.6650	***	0.0081
	Knowledge Intensity	7_4_1_Industry_Structur_Near_T	0.5220	0.4915	1.8223	*	0.0694
		5_5_2_Intzshen_Rizens_Tek_knwl	-0.2143	0.0816	0.6858	NS	0.4933
		5_6_3_Intzshen_Chalng_Tklg_Adv	0.8797	0.865	4.6320	***	0.0000
	Isomorphism	Single Item					
	Global Integration	7_4_3_Industry_Structur_Global	0.3965	0.6809	3.9414	***	0.0001
		5_5_7_Intzshen_Rizens_Survive	0.7856	0.9292	10.6879	***	0.0000
	Regime of Appro.	7_4_4_Industry_Structur_Patent	-0.4225	0.0181	1.3672	NS	0.1725
		7_4_5_Industry_Structur_Appro	0.8748	0.7657	3.4598	***	0.0006
		5_6_9_Intzshen_Chalng_Cpy_Righ	0.6020	0.6361	2.0481	**	0.0414
		5_6_10_Intzshen_Chalng_Cpy_Cop	-0.1913	0.2361	0.5731	NS	0.5670
IE	Scope	5_3_No_Contry_Int_Activ	0.1291	0.3853	1.9412	*	0.0531
	Scale	5_4_Prcntg_Int_TotalSale	0.9558	0.9923	31.1365	***	0.0000
	Speed	5_5_Int_Speed_Medi_Sqrt	-0.0122	-0.1477	0.1694	NS	0.8656

Note: NS=not significant

a. Bootstrapping confidence interval for 10% probability of error (alpha= 0.10)

*$p < .10$. **$p < .05$. *** $p < .01$.*

7.4.2. *Structural model analysis at industry level*

The initial step in analyzing models is checking for the collinearity problem. Here we use latent variable scores to assess the structural model for collinearity. We, therefore, tested collinearity issue for Regime of Appropriability, Isomorphism, Level of Concentration, Knowledge Intensity, Global Integration, and Industry Evolution as the first set of constructs and we added IE to the analysis as the second set of predictors. As it is shown in Table.7.4.2.1, VIF value for all the constructs is less than 5. Thus, we conclude that collinearity among the predictor constructs is not a problem in the path model.

Table7.4.2.1 VIF of constructs

First Set		Second Set	
Constructs	**VIF**	**Constructs**	**VIF**
Regime of Appro.	1.24	IE	1.55
Isomorphism	1.19	Global Integration	1.47
Level of Concentration	1.18	Regime of Appro.	1.26
Knowledge Intensity	1.12	Level of Concentration	1.21
Global Integration	1.10	Isomorphism	1.19
Industry Evolution	1.06	Knowledge Intensity	1.15
		Industry Evolution	1.06
Mean VIF	**1.15**	**Mean VIF**	**1.27**

We examine the R^2 value for the endogenous latent variables and this value for IE is 0.2215 and for International Performance it is 0.3537. Although this value is positive, acceptable R^2 value depends on the field of study and complexity of the model. According to the explorative nature of this study, we think these results can be considered as moderate (Hair et al., 2014).

Path coefficients (β) between different constructs are shown in the following Table 7.4.2.2. As you can see in this table the coefficient of relationship between industrial factors and international performance is not available, while the relationship between IE and international performance is strong. For better analysis of the coefficients, we compare these results with the total effect (Table 7.4.2.3). Total effect table shows that the effect of the industrial factors on International Performance is lower than the effect of the IE on International Performance (0.471).

Table7.4.2.2 Path coefficients (β)

	IE	Int. Performance
Global Integration	0.4867	
IE		0.4710
Industry Evolution	0.0368	
Isomorphism	0.0016	
Knowledge intensity	-0.1158	
Level of concentration	0.1467	
Regime of Appro.	-0.1084	

Table7.4.2.3 The total effect

	IE	Int. Performance
Global Integration	0.4867	0.2292
IE		0.471
Industry Evolution	0.0368	0.0173
Isomorphism	0.0016	0.0008
Knowledge intensity	-0.1158	-0.0545
Level of concentration	0.1467	0.0691
Regime of Appro.	-0.1084	-0.051

Having looked on the outer weight of the industrial factors constructs show that global integration (0.7856), and small domestic market (0. 8936) are positively affect the internationalization of companies in this industry. On the other hand, regime of appropriability (-0.8748) and being close to the technological center (-0.5220) are negatively associated with internationalization of renewable energy companies. In order to check the significance of the path coefficients with low values we run bootstrapping procedure. Path coefficients, t values and significance levels are reported in Table 7.4.2.4 according to the bootstrapping results. We find that all the relationships in the structural model are significant except the relationship for Industrial Evolution and Isomorphism.

Table 7.4.2.4 Bootstrapping of structural model coefficients

	Path Coefficients (Beta)	t Values	Significance levels
Global Integration -> IE	0.4867	11.1568	***
IE -> Int. Performance	0.4710	10.1085	***
Isomorphism -> IE	0.0016	0.0330	NS
Knowledge intensity -> IE	-0.1158	2.2037	**
Level of concentration -> IE	0.1467	2.7951	***
Regime of Appro -> IE	-0.1084	2.0941	**
Industry Evolution -> IE	0.0368	0.7618	NS

Note: NS= non significant
**p< .10. **p < .05. *** p < .01*

The corresponding results for the total effect are reported in the Table 7.4.2.5. The total effect of Global Integration and Regime of Appropriability are significant. While, as we expected, the effect of Isomorphism, Knowledge Intensity, and Industry Evolution on International Performance is not significant and it supports our findings from the qualitative analyses.

Table 7.4.2.5 Total effect

	Total effect	t value	Significance levels
Global Integration -> Int. Performance	0.2292	7.2952	***
IE -> Int. Performance	0.471	10.1085	***
Isomorph -> Int. Performance	0.0008	0.0327	NS
Knowledge intensity -> Int. Performance	-0.0545	1.0967	NS
Level of concentration -> Int. Performance	0.0691	1.2735	NS
Regime of Appro -> Int. Performance	-0.051	1.6522	*
Industry Evolution -> Int. Performance	0.0173	0.7452	NS

Note: NS= non significant
**p< .10. **p < .05. *** p < .01*

To assess the predictive relevance of the path model, we run blindfolding procedure. As it is shows in the following table about the endogenous latent variable, International Performance has Q^2 value larger than 0, which implies that the model exogenous constructs have medium predictive relevance for this construct (Table 7.4.2.6).

Table7.4.2.6. R^2 and Q^2 values

Endogenous latent variable	R^2 Value	Q^2 Value
Int. Performance	0.2218	0.1504

7.4.3. *Control variables*

We controlled the results of our analyses for the effect of level of technological development (Figure 7.4.3.1). This analysis shows if this variable can explain significant variation in the target construct (international performance). The result shows positive influence of level of technological development on the International Performance which is significant at 99% (t value = 3.465).

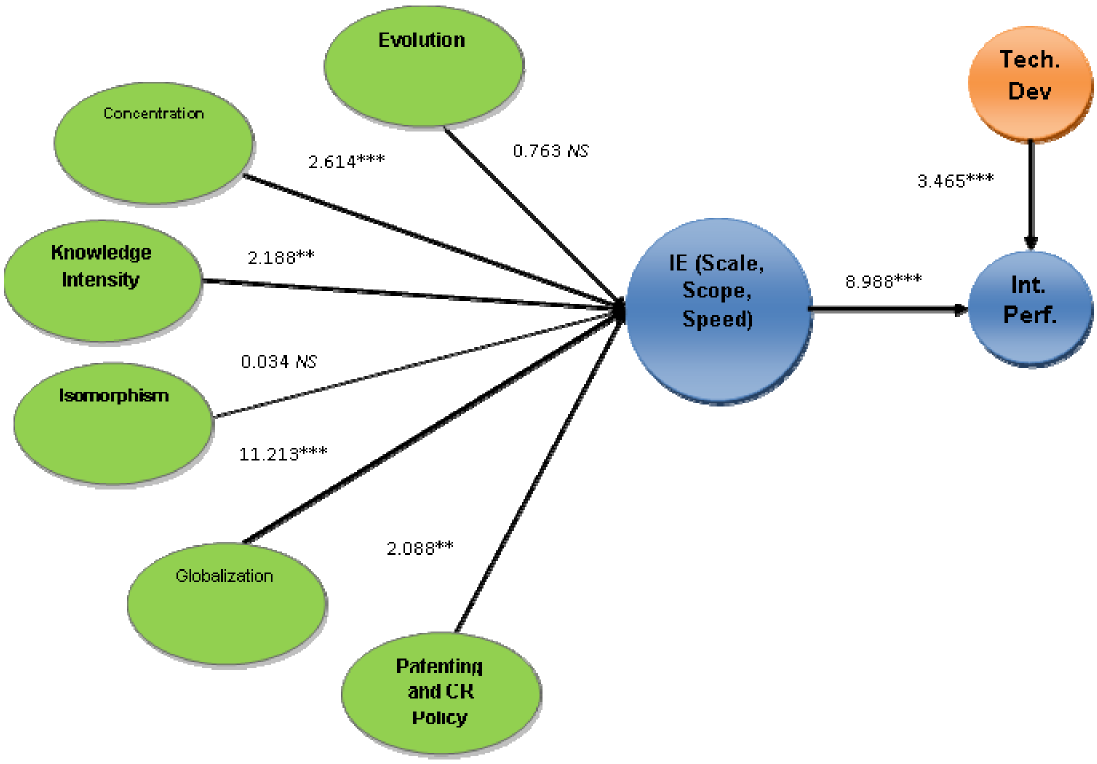

Figure7.4.3.1 Control variable (Level of Technological Development)
(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

7.5. *Entrepreneur level analysis*

The entrepreneur is a new area of research in the IE. Researches in this level of analysis are categorized as "entrepreneurs in the international context" and "opportunity recognition" (Jones et al., 2011). In this part of analysis because of the model parsimony and avoiding complexity of analysis we designed two path models, one for *Philosophical View* and the other one for *Opportunity Recognition*. These two distinct models are designed based on the research questions and hypotheses.

After designing the structural model and the measurement models, we estimated the path model with PLS-SEM algorithm. After applying the algorithm we checked our results for validity and reliability. In this step first we assess the measurement models and, finally we analyze the structural model.

In this path model, there are both reflective and formative measurement models. For assessing the reflective measurement model, which is International Performance, first we check the stop criterion which is 16 and it is lower than 300, the maximum iteration threshold that we defined at the beginning of analysis. The next step is testing this measurement construct for convergent validity. As it is shown in Table 7.5.1 the outer loadings for all the international performance indicators is higher than 0.708 that shows the reliability of the construct. Moreover, average variance extracted (AVE) as a common measure for convergent validity is 0.7089 which is larger than 0.50. Composite reliability in this model is 0.9443 and it is in the range of satisfactory results. Fornell-Larcker criterion allows us to check for discriminant validity. As you can see in Table

7.5.2 the square root of AVE for International Performance (0.8419) is higher than the correlation of this construct with any other constructs in the path model i.e. eco-entrepreneurship (0.0455) and IE (0.4737).

Table 7.5.1 Results summary for reflective measurement model

Latent Variable	Indicator	Outer Loading	Indicator Reliability	Composite Reliability	AVE	Discriminant Validity
International Performance	5_9_1_IntPerform_Vol	0.8660	0.7533	0.9443	0.709	Yes
	5_9_2_IntPerform_MktShare	0.8735	0.7634			
	5_9_3_IntPerform_Profit	0.8452	0.7161			
	5_9_4_IntPerform_Mkt_Acss	0.8624	0.7422			
	5_9_5_IntPerform_Image_Dev	0.7647	0.5829			
	5_9_6_IntPerform_KnowHow_Dev	0.7359	0.5382			
	5_9_7_IntPerform_InGeneral	0.9301	0.8649			

Table.7.5.2 Fornell-Larcker Criterion

	IE	Eco-Entrepreneurship	Int. Performance
IE	1		
Eco-Entrepreneurship	0.0263	1	
Int. Performance	0.4737	0.0455	**0.8419**

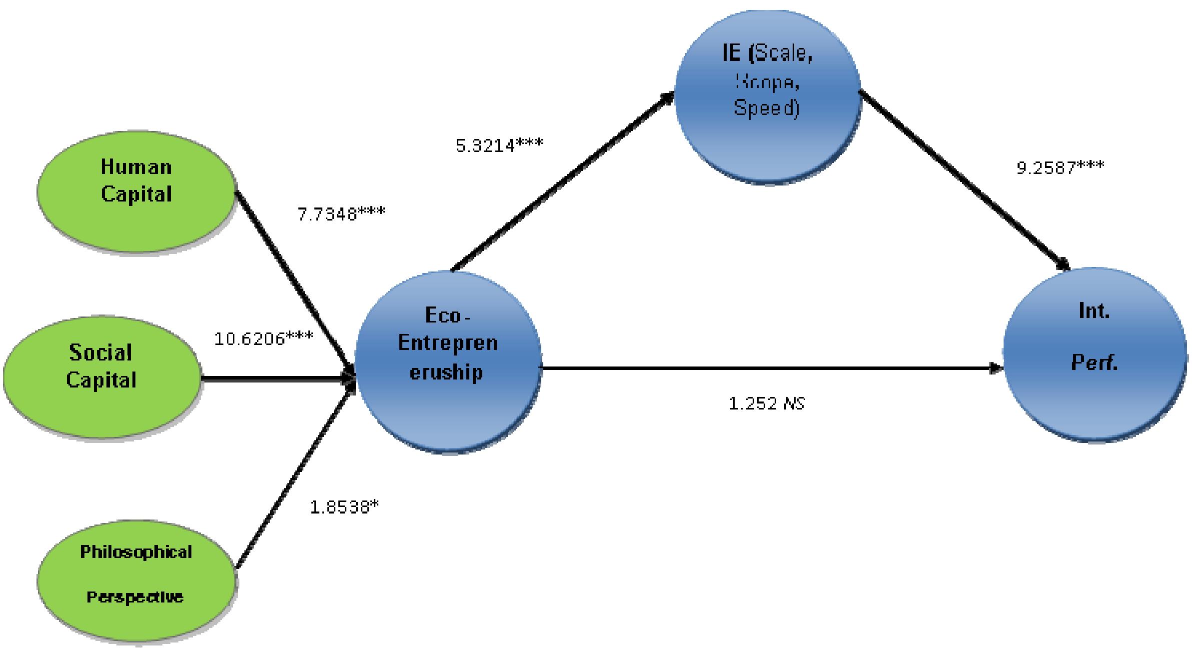

Figure 7.5.1 Entrepreneur-level path model
(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

7.5.1. *Formative measurement model analysis*

Evaluating formative models entail content validity, convergent validity, collinearity, and bootstrapping. Content validity requires that the formative indicators show all major characteristics of the construct. For example, for networking we considered indicators for both formal and informal networks and human capital accounts for two groups of indicators which are entrepreneurs' knowledge and experience. The reason that we considered these measurement constructs as formative is that we cannot use the indicators of these constructs interchangeably (Jarvis et al., 2003) and current IE theoretical frameworks characterize these constructs as formative (Jones & Coviello, 2005; Zahra & George, 2002).

We checked the algorithm convergence first with stop criterion which is 38 and it is less than the threshold of 300. Then the formative measurement models are tested for the collinearity of the indicators. According to the results in Table 7.5.1.1, VIF values for the three constructs are less than the threshold value of 5.

Table7.5.1.1 Variance Inflation Factor (VIF) results

Social Capital		Human capital		Philosophical Perspective	
Indicators	**VIF**	**Indicators**	**VIF**	**Indicators**	**VIF**
3_5_5_Netw_Fair	1.25	3_2_1_Int_Exprns_NoYrz	1.30	3_4_3_EcoEntp_Traits_Sustn	2.32
3_5_6_Netw_Customer	1.20	3_3_1_Mngmnt_Tim_Exp_Int	1.27	3_4_1_EcoEntp_Traits_world	2.12
3_5_1_Netw_Friend	1.15	3_3_3_Mngmnt_Tim_Exp_Enrgy	1.22	3_4_4_EcoEntp_Traits_Both	1.39
3_5_4_Netw_Gov_Agncy	1.14	3_1_1_Int_Edu_NoYrz	1.16	5_5_9_Intzshen_Rizens_help_Pov	1.24
3_3_5_Mngmnt_Tim_Exp_Netw	1.11	3_3_2_Mngmnt_Tim_Exp_Rsrch	1.13	3_4_2_EcoEntp_Traits_Profit	1.13
Mean VIF	**1.17**	**Mean VIF**	**1.17**	**Mean VIF**	**1.64**

The last step in evaluating the formative measurement models is checking the significance of the indicators by analyzing their outer weights. Bootstrapping allow us to check these significance levels through t values. Based on these results we can calculate p values and confidence intervals. The results are summarized in Table 7.5.1.2 for the formatively measured constructs; Human Capital, Social Capital, Philosophical Perspective and IE. The table shows the outer weight, outer loading, *t* values, and *p* values. We found that all formative indicators for Social Capital are significant. Human Capital indicators are significant except for Int_Edu_NoYrz, Int_Exprns_NoYrz, Mngmnt_Tim_Exp_Rsrch. Moreover, the significant indicators for philosophical perspective are EcoEntp_Traits_Both and Intzshen_Rizens_help_Pov.

Table 7.5.1.2 Outer weights significance testing results

Formative construct		Formative Indicator	Outer weight	Outer loading	t Value	Significance Level	p Value
Eco-Entrepreneur	**Human Capital**	3_1_1_Int_Edu_NoYrz	0.1290	0.2762	1.2262	NS	0.2210
		3_2_1_Int_Exprns_NoYrz	0.0845	0.4314	0.8360	NS	0.4038
		3_3_1_Mngmnt_Tim_Exp_Int	0.7443	0.9080	8.7454	***	0.0000
		3_3_2_Mngmnt_Tim_Exp_Rsrch	0.1258	0.2665	1.2332	NS	0.2184
		3_3_3_Mngmnt_Tim_Exp_Enrgy	0.3542	0.6169	3.4970	***	0.0005
	Social Capital	3_3_5_Mngmnt_Tim_Exp_Netw	0.4474	0.6751	4.8614	***	0.0000
		3_5_1_Netw_Friend	0.2434	0.5119	2.9725	***	0.0032
		3_5_4_Netw_Gov_Agncy	0.2455	0.5163	3.1741	***	0.0017
		3_5_5_Netw_Fair	0.3413	0.6865	3.8838	***	0.0001
		3_5_6_Netw_Customer	0.3386	0.6270	3.4929	***	0.0005
	Philosophical Perspective	3_4_1_EcoEntp_Traits_world	0.1466	0.5470	0.3618	NS	0.7177
		3_4_2_EcoEntp_Traits_Profit	0.3227	0.4010	0.8729	NS	0.3834
		3_4_3_EcoEntp_Traits_Sustn	-0.0037	-0.0492	0.5675	NS	0.5708
		3_4_4_EcoEntp_Traits_Both	0.6836	0.8384	2.3713	**	0.0183
		5_5_9_Intzshen_Rizens_help_Pov	0.4529	0.4798	1.7186	*	0.0867
IE		5_3_No_Contry_Int_Activ	0.1655	0.4001	2.0963	**	0.0369
		5_4_Prcntg_Int_TotalSale	0.9055	0.9753	19.7351	***	0.0000
		Int_Speed	-0.1707	-0.2969	1.8942	*	0.0591

Note: NS=not significant

a. Bootstrapping confidence interval for 10% probability of error (alpha= 0.10)

**p< .10. **p < .05. *** p < .01.*

7.5.1.1. *Further analysis*

For designing our structural model, we created an HCM (Hierarchical Component Model) for eco-entrepreneur. This construct consists of three other sub-dimensions: Human Capital, Social Capital and Philosophical Perspective (Lower Order Constructs or LOC). From the theoretical point of view, this model setup helps us to simplify the path model with a single dimension that shows the three other dimensions. Eco-entrepreneur construct also mediate the relationship between the three LOCs and the target constructs which are IE and International Performance. This formative-formative HCM shows that LOCs contribute to explain the eco-entrepreneur construct. The primary results of our analysis about measurement models are similar to the analysis presented in the previous part and Table 7.5.1.2. However, for construct analysis we need to apply two-stage approach. In the first stage, we obtain the latent variables values based on the repeated indicator approach. These latent variables will be used as formative indicators for eco-entrepreneur construct. The results of second order analysis are shown in Figure7.5.1.1. These results indicate significant relationship between the eco-entrepreneur construct and IE (t value = 6.274, significant in 99%). However, the indirect effect of this construct on International Performance is not significant (t value = 1.143).

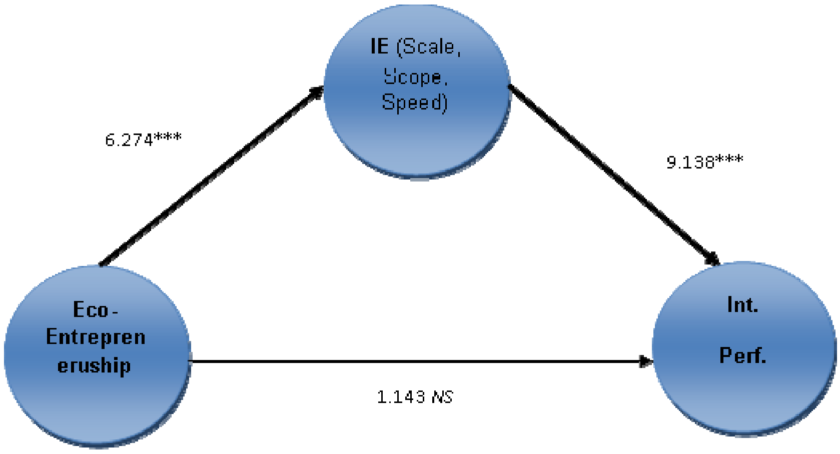

Figure 7.5.1.1 Two-stage approach for HCM analysis
(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

7.5.2. Evaluating structural model

For structural model assessment, the first step is checking the model for collinearity issue. We checked the collinearity for each set of predictor construct separately. As it is shown in the following tables, VIF values are less than 5. Thus, collinearity among the predictor constructs is not a problem in the structural model (Table 7.5.2.1).

Table 7.5.2.1 Collinearity assessment

First Set		Second Set	
Constructs	**VIF**	**Constructs**	**VIF**
Human Capital	1.16	Eco-Entrepreneurship	1.23
Social Capital	1.14	IE	1.23
Philosophical Perspective	1.02	**Mean VIF**	**1.23**
Mean VIF	**1.11**		

To start our analysis, the first step is to examine the R^2 value of the endogenous variables. The R^2 value for IE and International Performance is 0.1181 and 0.2349 respectively. Taking into the account the novelty and explorative nature of this study, we consider these results as moderate (Hair et al., 2014). Path coefficients (β) between different constructs are shown in Table 7.5.2.2. As it is presented in this table, there is positive and strong relationship between eco-entrepreneur construct and IE (0.3437), while this relationship with International Performance is weaker (0.1151). For better understanding of these effects we can examine the total effect (Table 7.5.2.3). Here we can see that the total effect of the eco-entrepreneur is reinforced through IE and its total effect on the International Performance increased to 0.2639. By taking into consideration the outer weights of the constructs' indicator, we identified that management team international experience (0.7443), management team energy sector experience (0.3542), management team networking experience (0.3386), and their philosophical perspective to both taking care of sustainability and making profit (0.6836), and helping poor people in other countries (0.4529) are significant factors that affect internationalization of the firms. However, we could not find high outer weight for some other factors like 3_4_2_EcoEntp_Traits_Profit, 3_5_1_Netw_Friend, 3_1_1_Int_Edu_NoYrz, 3_3_2_Mngmnt_Tim_Exp_Rsrch.

Table 7.5.2.2 Path coefficients (β)

	IE	International Performance
Eco-Entrepreneur	0.3437	0.1151
IE		0.4329

Table 7.5.2.3 The total effect

	IE	International Performance
Eco-Entrepreneur	0.3437	0.2639
IE		0.4329

In order to examine the significance of the path coefficients, especially for the rather low value relationships, we run bootstrapping. Table 7.5.2.4 shows the path coefficients, t values and the significance levels. As it is shown in this table there is no significant relationship between Eco-entrepreneur construct and International Performance but this relationship is mediated by IE. The other constructs show significant relationship with IE and International Performance; however, the relationship between Philosophical View and Eco-entrepreneur is not as strong as the other eco-entrepreneur dimensions i.e. Human Capital and Social Capital.

Table 7.5.2.4 Significance testing results of the structural model path coefficients

	Path Coefficients	t values	Significance Levels
Eco-Entrepreneur -> IE	0.3111	5.3214	***
Eco-Entrepreneur -> Int. Performance	0.0637	1.2520	NS
Human Capital -> Eco-Entrepreneur	0.5268	7.7348	***
IE -> Int. Performance	0.4526	9.2587	***
Philosophical view -> Eco-Entrepreneur	0.1383	1.8538	*
Social Capital -> Eco-Entrepreneur	0.6466	10.6206	***

Note: NS= non significant
**p< .10. **p < .05. *** p < .01*

Corresponding results for the total effects of the exogenous variables are presented in Table 7.5.2.5. These results suggest that IE completely mediate the relationship between Eco-entrepreneur construct and International Performance. Since this model is formative-formative HCM (Hierarchical Component Model), eco-entrepreneur (HOC) expected to fully mediate the relationship between the LOCs (Human capital, Social Capital and Philosophical View) and dependent variables (IE and International Performance). Our findings show the mediating role of eco-entrepreneur construct in the path model, where it mediates significant relationships between eco-entrepreneur's sub-dimensions and IE and International Performance.

Table 7.5.2.5 Significance testing results of the total effects

	Path Coefficients	t values	Significance Levels
Eco-Entrepreneur -> IE	0.3111	5.3214	***
Eco-Entrepreneur -> Int. Performance	0.2045	3.1308	***
Human Capital -> Eco-Entrepreneur	0.5268	7.7348	***
Human Capital -> IE	0.1639	3.9019	***
Human Capital -> Int. Performance	0.1077	2.8544	***
IE -> Int. Performance	0.4526	9.2587	***
Philosophical view -> Eco-Entrepreneur	0.1383	1.8492	**
Philosophical view -> IE	0.0430	1.8458	**
Philosophical view -> Int. Performance	0.0283	1.5615	NS
Social Capital -> Eco-Entrepreneur	0.6466	10.6206	***
Social Capital -> IE	0.2012	5.2670	***
Social Capital -> Int. Performance	0.1322	3.2113	***

Note: NS= non significant
**p< .10. **p < .05. *** p < .01*

The last step in assessing the structural model is to measure the predictive relevance of the path model. By implementing blindfolding procedure, we obtained Q^2 value for the model based on reflective endogenous latent variable which is International Performance. As the results show in Table 7.5.2.6**,** the value more than 0.15 shows medium predictive relevance endogenous constructs.

Table 7.5.2.6 Results of R^2 and Q^2 values

Endogenous latent variable	R^2 Value	Q^2 Value
International Performance	0.227	0.1534

7.5.3. *Mediating and moderating effect*

Based upon Baron and Kenny (1986) mediator effect conditions, we examined our model for mediating effect of IE, between Eco-entrepreneur and International Performance. First we checked the direct effect of the eco-entrepreneur construct on International Performance which is 0.212 and it is significant at 99% (t value = 3.718). After including the mediator variable (IE), we can see that there is significant relationship between eco-entrepreneur and IE (0.311, t value =5.152) and also between IE and International Performance (0.453, t value = 9.103). The indirect effect size is 0.311*0.453 = 0.140 and by dividing this value to Standard Deviation of indirect effect (0.033), the empirical t value of the indirect effect of Eco-entrepreneur and International Performance is 0.140/0.033= 4.24. Thus, we can conclude that this relationship between two constructs through IE mediator is significant (p>0.01). In order to determine the strength of IE as mediator, we apply VAF procedure. VAF is equal to direct effect divided by the total effect. Total effect has a value of 0.212+0.140= 0.352 and VAF value is 0.140/0.352 = 0.40. This result show that 40% of the eco-entrepreneur's effect on International Performance is explained by IE and this situation can be characterized as partial mediation (Table 7.5.3.1).

Table.7.5.3.1 Significance analysis of path coefficients without the mediator

	Path coefficient	t Value	Significance Levels
Eco-entrepreneur -> Int. Performance	0.212	3.718	***

Note: NS= non significant
**p< .10. **p < .05. *** p < .01*

To examine our model for moderating effect of size, we apply continuous moderating effect analysis following Hair et al. (2014) procedure. This analysis determines that whether the relationship between *eco-entrepreneur's philosophical view* and International Performance is moderated by the size of companies. We hypothesized that for the larger firms the effect of philosophical perspective on the internationalization of firms is less important than the smaller firms. Therefore, we expect a negative moderate effect of size between philosophical view and international performance. For our analysis, first we should consider if the moderator variable is reflective or formative. Since we have single item indicator (size), there is no difference between the reflective and formative relationship. After including the moderator variable and interaction terms, we specify size as moderator variable. However, by applying both "product indicator approach" and "the two-stage approach" we could not find any significant moderating effect for the size of company (Figure 7.5.3.1 and 7.5.3.2). Moreover, we repeated the same analysis for the moderating effect of *Level of Technological Development* (Figure 7.5.3.3) and we found the negative effect of the interaction term (-0.111) which is significant at 95% (t value= 1.963). This result shows when the product is in a higher level of technological development the effect of *Philosophical View* on *International Performance* decrease.

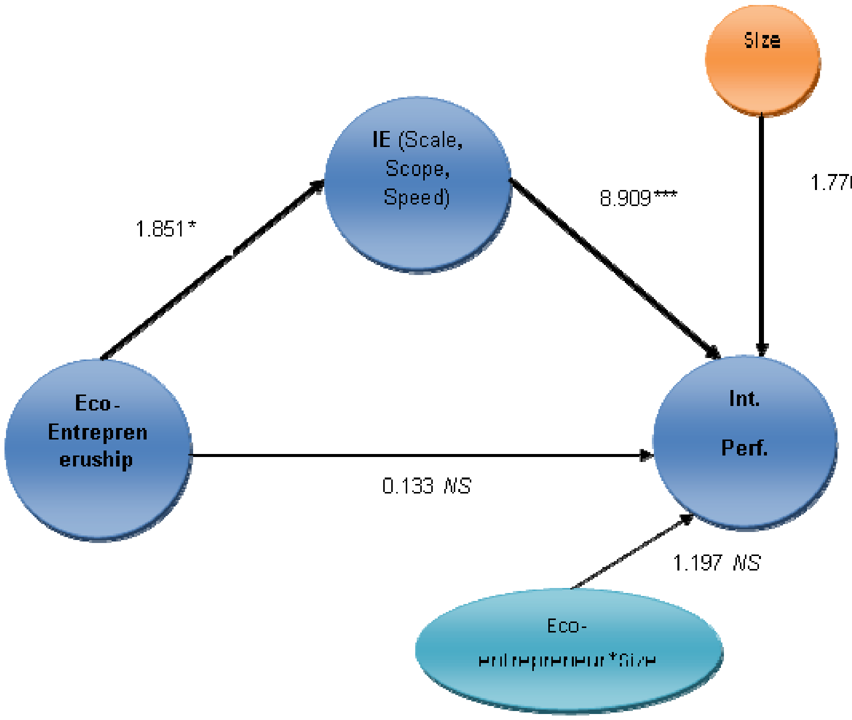

Figure 7.5.3.1 Moderator Model for Size (*The Product Indicator Approach*)

(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

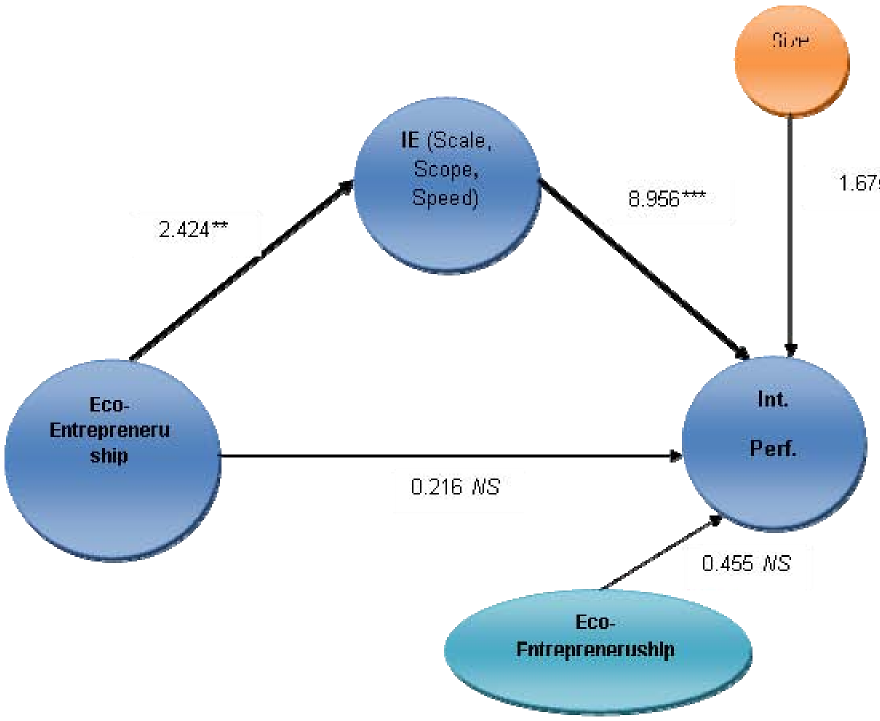

Figure 7.5.3.2 Moderator Model for Size (*The Two-Stage Approach*)
(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

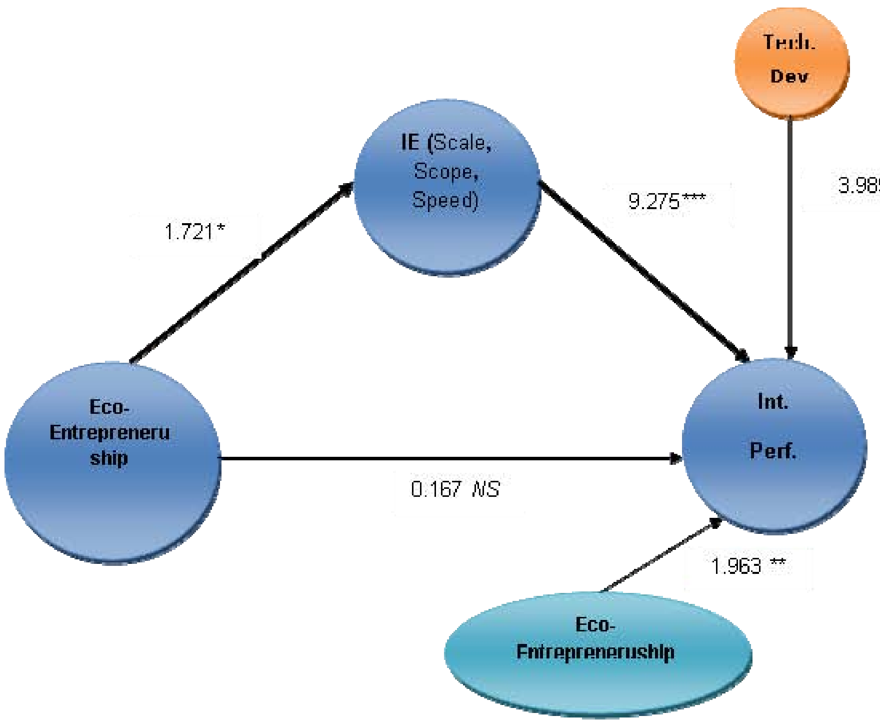

Figure7.5.3.3 Moderator Model for Level of Tech Development (*The Product Indicator Approach*)
(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

7.5.4. *Control variable*

We used both age and size of the firm as control variables to understand if these two variables can explain some variation in the target construct, International Performance (Figure 7.5.4.1). The results show negative influence of the age (-0.013) and positive influence of the size (0.084), but after bootstrapping we find no significant relationship for age (0.377) and size (1.506).

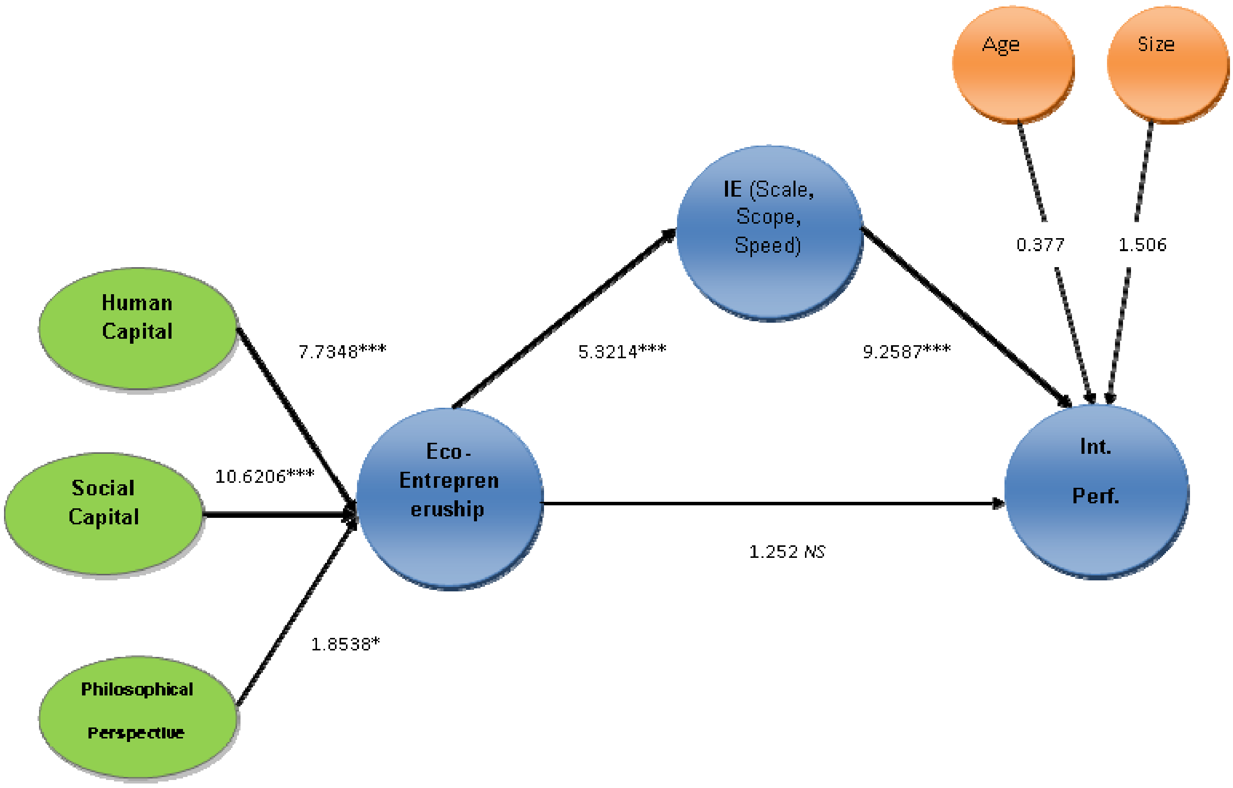

Figure 7.5.4.1 Control variables (Age and Size)
(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

7.6. *Opportunity recognition*

One of the less studied subjects in the IE literature is the process of opportunity recognition (Jones et al., 2011). Moreover, there are few empirical studies that examined this process in the sustainable entrepreneurship studies (Cohen & Winn, 2007; Dean & McMullen, 2007). In this study, with focus on renewable energy industry, we examine the effect of social capital, human capital and environmental factors upon the process of opportunity recognition in the international markets. Moreover, we test the effects of these factors on IE and International Performance. Drawing upon the current theoretical frameworks in IE (Jones et al., 2011; Jones & Coviello, 2005; Zahra & George, 2002), we designed our structural model consist of social capital, human capital, environmental factors, IE and International Performance. For choosing the mode of our measurement models, i.e. whether it is reflective or formative, we applied Jarvis et al. (2003) criterion. Thus, except International Performance the other measurement models are considered as formative because the items are not mutually interchangeable. After specifying our path model, we analyzed it at two steps, first, we analyzed the measurement models and then we implemented structural model analysis.

7.6.1. *Reflective measurement model analysis*

For evaluating the measurement models, initially we assess the reflective measurement model. Internal consistency, indicator reliability, convergent validity and discriminant validity are steps to assess a reflective measurement model. International Performance is the only reflective measurement model in the path model. After running PLS algorithm, we check stop criterion which is 23 and less than maximum number of iteration (300). Therefore, we can conclude that our model is converged. As you can see in Table 7.6.1.1 the outer loading of all the indicators for this reflective measurement model are well above 0.708 that shows the convergent validity. Composite reliability value of 0.9445 demonstrates the reflective construct has high level of consistency reliability. Convergent validity based on AVE is 0.7096 and it is larger than the required minimum level of 0.50. Therefore, this reflective construct has high level of convergent validity. Finally, we applied Fornell-Larcker criterion to assess the discriminant validity. The square root of International Performance's AVE (0.8424) is larger than this construct correlation with the other constructs in the path model i.e. IE (0.4646) and Opportunity Recognition Motivation (0.2012). These results provide evidence for construct's discriminant validity. All the analysis results about this reflective measurement model are summarized in Table 7.6.1.2.

Table 7.6.1.1 Results summary for reflective measurement models

Latent Variable	Indicator	Outer Loading	Indicator Reliability	Composite Reliability	AVE	Discriminant Validity
International Performance	5_9_1_IntPerfom_Vol	0.8616	0.7424	0.9445	0.7096	Yes
	5_9_2_IntPerfom_MktShare	0.8703	0.7574			
	5_9_3_IntPerfom_Profit	0.8419	0.7088			
	5_9_4_IntPerfom_Mkt_Acss	0.8638	0.7462			
	5_9_5_IntPerfom_Image_Dev	0.7695	0.5921			
	5_9_6_IntPerfom_KnowHow_Dev	0.7433	0.5525			
	5_9_7_IntPerfom_InGeneral	0.9316	0.8679			

Table 7.6.1.2 Fornell-Larcker criterion

	IE	Opportunity Recognition Motivation	Int. Perf.
IE	1		
Opportunity Recognition Motivation	0.2046	1	
Int. Performance	0.4646	0.2012	**0.8424**

7.6.2. Formative measurement model analysis

As it is mentioned before (Cf. Section 5.7) we cannot use reflective measurement model evaluation criteria to assess formative measures in PLS-SEM. For evaluating formative models we follow these two steps: (i) checking the formative measurement model for collinearity of indicators, (ii) analyzing the outer weights for their significance and relevance (Hair et al., 2014).

A related measure for the collinearity is VIF (variance inflation factor). VIF value of 5 and higher indicate a potential collinearity problem. As it is shown in Table 7.6.2.1 item 3-5-3 has the highest VIF value (2.57), however all the items in constructs are uniformly below the threshold value of 5. Therefore, we can conclude that collinearity is not an issue for the estimation of PLS path model.

Table 7.6.2.1 Variance Inflation Factor (VIF) results

Human capital		Social Capital		Environmental Factors	
Indicators	**VIF**	**Indicators**	**VIF**	**Indicators**	**VIF**
3_2_1_Int_Exprns_NoYrz	1.30	3_5_3_Netw_Trade_Assc	2.57	5_5_1_Intzshen_Rizens_Finacial	1.11
3_3_1_Mngmnt_Tim_Exp_Int	1.27	3_5_2_Netw_Prof_Assc	2.06	5_5_3_Intzshen_Rizens_Supp_Pol	1.08
3_3_3_Mngmnt_Tim_Exp_Enrgy	1.22	3_5_8_Netw_Distributers	1.88	5_5_10_Intzshen_Rizens_High_Compt	1.03
3_3_4_Mngmnt_Tim_Exp_Entrep	1.16	3_5_7_Netw_Suppliers	1.87	5_5_2_Intzshen_Rizens_Tek_knwl	1.03
3_3_2_Mngmnt_Tim_Exp_Rsrch	1.13	3_5_4_Netw_Gov_Agncy	1.78	**Mean VIF**	**1.07**
3_1_1_Int_Edu_NoYrz	1.12	3_5_6_Netw_Customer	1.59		
Mean VIF	**1.20**	3_5_5_Netw_Fair	1.29		
		3_5_1_Netw_Friend	1.25		
		3_3_5_Mngmnt_Tim_Exp_Netw	1.13		
		Mean VIF	**1.71**		

The final step in evaluating formative measurement models is analyzing the outer weights significance. Bootstrapping in Smart PLS allow us to check the significance and relevance of the constructs through t values. Based on these results we can also calculate p values and confidence intervals. Table 7.6.2.2 shows the results for formatively measured constructs i.e., Human Capital, Social Capital, Environmental Factors, and IE. This table summarizes the results for outer weights estimates, outer loadings, t values, and the significance levels.

Table 7.6.2.2 Outer Weights Significance testing results

Formative constructs		Formative Indicator	Outer weight	Outer loading	*t* Value	Significance Levels	*p* Value
Opportunity Recognition Motivation	Human Capital	3_1_1_Int_Edu_NoYrz	0.1295	0.2607	1.3591	NS	0.1751
		3_2_1_Int_Exprns_No Yrz	0.0091	0.3697	0.0818	NS	0.9349
		3_3_1_Mngmnt_Tim_ Exp_Int	0.7962	0.9211	7.5317	***	0.0000
		3_3_2_Mngmnt_Tim_ Exp_Rsrch	0.1658	0.2993	1.4541	NS	0.1469
		3_3_3_Mngmnt_Tim_ Exp_Enrgy	0.3066	0.5869	2.4380	**	0.0153
	Social Capital	3_5_1_Netw_Friend	0.2847	0.6014	3.7342	***	0.0002
		3_5_2_Netw_Prof_Ass c	0.2107	0.6411	2.3567	**	0.0190
		3_5_3_Netw_Trade_ Assc	0.2445	0.6037	2.7579	***	0.0062
		3_5_5_Netw_Fair	0.4002	0.7031	4.1075	***	0.0001
		3_5_6_Netw_Custom er	0.3972	0.6665	4.7105	***	0.0000
	Environmental Factors	5_5_10_Intzshen_Riz ens_High_Compt	0.3061	0.4249	2.0979	**	0.0367
		5_5_1_Intzshen_Rize ns_Finacial	0.2405	0.5233	1.8820	*	0.0608
		5_5_2_Intzshen_Rize ns_Tek_knwl	0.1997	0.3463	1.5438	NS	0.1236
		5_5_3_Intzshen_Rize ns_Supp_Pol	0.7675	0.8793	6.6015	***	0.0000
IE		5_3_No_Contry_Int_ Activ	0.3266	0.5337	5.3023	***	0.0000
		5_4_Prcntg_Int_Total Sale	0.8118	0.9317	17.913 4	***	0.0000
		5_5_Int_Speed_Medi _Sqrt	-0.2164	- 0.3204	2.4756	**	0.0138

Note: NS=not significant

a. Bootstrapping confidence interval for 10% probability of error (alpha= 0.10)

**p*< .10. ***p* < .05. ****p* < .01.

Looking at the significance levels, we found that all formative indicators except Int_Edu_NoYrz, Int_Exprns_NoYrz, Mngmnt_Tim_Exp_Rsrch, Intzshen_Rizens_Tek_knwl are significant. These indicators remain insignificant even after the alternative sign change options in the bootstrapping (i.e. individual sign change and construct level change). We therefore consider these results as our final results. In addition, we retain these indicators in the formative constructs because prior studies and theories support the relevance of these indicators for capturing *Human Capital* and *Environmental Factors* (Jones et al., 2011; Zahra & George, 2002; Zucchella & Scabini, 2007).

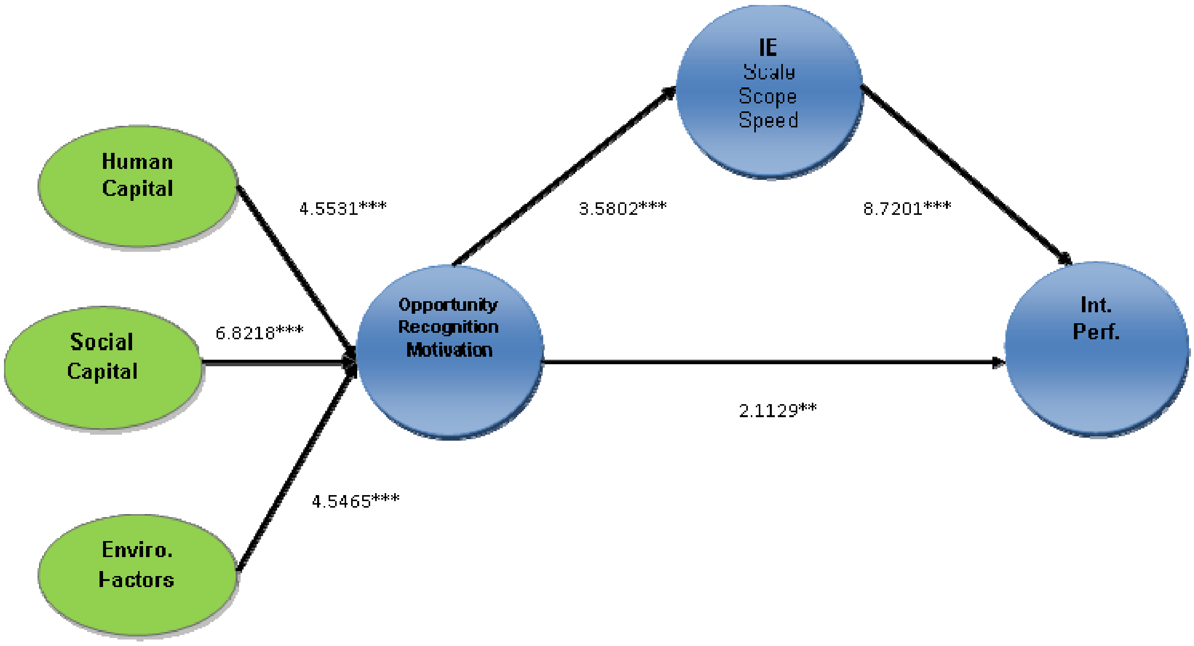

Figure 7.6.2.1 Eco-entrepreneur Level Path Model
(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

7.6.2.1. *Further analysis*

In order to follow parsimony of this structural model and overcome its complexity with many indicators, we also designed our structural model as an HCM (Hierarchical Component Model). In this model we created opportunity recognition motivation construct that consists of three other sub-dimensions: Human Capital, Social Capital and Environmental Factors (Lower Order Constructs or LOC). From the theoretical point of view, HCM setup helps us to simplify the path model with a single dimension that shows the three other dimensions. Moreover, opportunity recognition Motivation construct also mediate the relationship between the three LOCs and the target constructs which are IE and International Performance. This formative-formative HCM shows that LOCs contribute to explain opportunity recognition motivation construct. The primary part of this model analysis is about formative measurement models and it is similar to the analysis presented in the previous part (Table 7.6.2.2). However, for structural model analysis we need to apply two-stage approach. In the first stage, we obtain the latent variables values based on the repeated indicator approach. In the second stage, we use these latent variables as formative indicators for Opportunity Recognition Motivation construct.

7.6.3. Structural model analysis

The first step in structural model evaluation is to examine each set of predictors for collinearity. VIF values for each predictor construct should be lower than 5. In this model we run collinearity test for two sets of constructs in the path model: Opportunity Recognition Motivation constructs and endogenous constructs (i.e. IE and Opportunity Recognition Motivation). Table 7.6.3.1 shows that all VIF values are less than 5 and we can, therefore, conclude that collinearity among the constructs is not an issue in the structural model.

Table 7.6.3.1 Collinearity assessment

First Set		**Second Set**	
Constructs	**VIF**	**Constructs**	**VIF**
Human Capital	1.11	IE	1.07
Social Capital	1.11	Opportunity Recognition Motivation	1.07
Environmental Factors	1.09	**Mean VIF**	**1.07**
Mean VIF	**1.10**		

We continue the structural model analysis with R^2 values of the endogenous latent variables. The results show R^2 value of IE (0.185) and International Performance (0.232) are moderate results according to the explorative nature of the study. Path coefficients (β) between different constructs are shown in Table 7.6.3.2. As it is presented in this table, there is positive relationship between opportunity recognition motivation construct and IE (0.3437), while this relationship with International Performance is weaker (0.1333). For better understanding of these effects we can examine the total effect (Table 7.6.3.3).The results suggest that IE may mediate the relationship between Opportunity Recognition Motivation and International Performance because the total effect increases to 0.2441. Later on we test the mediate effect of IE in this model.

Table 7.6.3.2 Path coefficients (β)

	IE	**Int. Performance**
Opportunity recognition motivation	0.2575	0.1333
IE		0.4301

Note: NS= non significant
**p< .10. **p < .05. *** p < .01*

Table 7.6.3.3 The total effect

	IE	**Int. Performance**
Opportunity recognition motivation	0.2575	0.2441
IE		0.4301

Note: NS= non significant
**p< .10. **p < .05. *** p < .01*

Looking at weights of constructs indicators, we can identify which specific element of opportunity recognition need to be considered. Based on these results we find that items like Supportive Policy in the host country (0.7663), High Competition (0.3051) and Financial Support (0.2426) are the main environmental factors that attract entrepreneurs to entre international markets. Moreover, from network perspective, formal networks such as Professional Association (0.2101), International Fairs (0.4003), Customer Network (0.3976), and informal networks such as Friends Network (0.2850) are significant factors that affect opportunity recognition motivation. Human Capital indicators such as International Experience of Management Team (0.7927) and Experience in the Energy Sector (0.3088) are the most significant items. However, we could not find any high outer weight for Management Team Research Experience (0.1685), International Education (0.1290) and Technological Knowledge (0.2009).

For testing the path correlations with low values, we run bootstrapping procedure to examine the relevance and significance of the model. Table 7.6.3.4 represents path coefficients, t values and significance levels. As it is shown in this table all the relationships between the constructs are significant and there is a strong relationship between Social Capital and Opportunity Recognition Motivation (t value = 6.8218), Environmental Factors and Opportunity Recognition Motivation (t value = 4.5465), and Human Capital and Opportunity Recognition Motivation (t value = 4.5531). However, the direct relationship between Opportunity Recognition Motivation and International Performance is not strong enough and we might find mediating effect of IE. These results suggest the importance of the formal networking in the international opportunity recognition motivation of the firms. Regarding environmental factors our findings put emphasize on the importance of policy level factors in drawing entrepreneur in renewable energy industry to look for international opportunities in the countries with favorable policies.

Table 7.6.3.4 Significance testing results of the structural model path coefficients

	Path Coefficients	t Values	Significance Levels
Environmental Factors -> Opportunity Recognition Motivation	0.3041	4.5465	***
Human Capital -> Opportunity Recognition Motivation	0.4100	4.5531	***
IE -> Int. Performance	0.4301	8.7201	***
Opportunity Recognition Motivation -> IE	0.2570	3.5802	***
Opportunity Recognition Motivation -> Int. Performance	0.1337	2.1129	**
Social Capital -> Opportunity Recognition Motivation	0.6619	6.8218	***

Note: NS= non significant
**p< .10. **p < .05. *** p < .01*

Total effect results are presented in table 7.6.3.5. These results show significant indirect effect of the Environmental Factors, Human Capital and Social Capital on International Performance of the firms. Moreover, it shows strong indirect relationship between Opportunity Recognition Motivation and International Performance (t value = 3.6108).

Based upon this finding we need to assess the mediating effect of IE between these two constructs. Since our model is formative-formative HCM (Hierarchical Structural Model), Opportunity Recognition Motivation (HOC) mediates the relationship between the LOCs (Human Capital, Social Capital, and Environmental Factors) and the target constructs (IE and International Performance).

Table 7.6.3.5 Significance testing results of the total effects

	Path Coefficients	t Values	Significance Levels
Environmental Factors -> IE	0.0782	2.4553	**
Environmental Factors -> Int. Performance	0.0743	2.4719	**
Environmental Factors -> Opportunity Recognition Motivation	0.3041	4.5465	***
Human Capital -> IE	0.1053	2.2296	**
Human Capital -> Int. Performance	0.1001	2.5769	***
Human Capital -> Opportunity Recognition Motivation	0.4100	4.5531	***
IE -> Int. Performance	0.4301	8.7201	***
Opportunity Recognition Motivation -> IE	0.2570	3.5455	***
Opportunity Recognition Motivation -> Int. Performance	0.2442	3.6108	***
Social Capital -> IE	0.1701	4.2542	***
Social Capital -> Int. Performance	0.1616	3.8483	***
Social Capital -> Opportunity Recognition Motivation	0.6619	6.8218	***

Note: NS= non significant
**p< .10. **p < .05. *** p < .01*

The last step in evaluating a structural model is assessing the predictive relevance of the path model by blindfolding procedure. Following this method, we should specify an endogenous construct with reflective measurement model, which is International Performance, and an omission distance between 5 and 10 without integer (Hair et al., 2014). Final results of blindfolding are R^2 and Q^2 values of the path model based on reflective endogenous latent variable (Int. Performance). As it is shown in Table 7.6.3.6, Q^2 value more than 0.15 shows medium predictive relevance endogenous constructs.

Table7.6.3.6 Results of R^2 and Q^2 values

Endogenous latent variable	R^2 Value	Q^2 Value
Int. Performance	0.232	0.1594

7.6.4. *Mediating effect analysis*

In order to understand about the role of IE in our path model, in this part of analysis we examine our model for mediating effect of IE between Opportunity Recognition Motivation and International Performance. According to Baron and Kenny (1986) procedure, we first estimate our model without IE as mediator. The results show positive and significant relationship between Opportunity Recognition Motivation and International Performance (0.247, t value = 3.895). In the next step we include IE as mediator and the model shows significant relationship between Opportunity Recognition Motivation and IE (0.257, t value = 3.446) and also a significant relationship between IE and International Performance (0.430, t value = 8.983). The indirect effect of size is 0.257*0.430 = 0.1105 and we applied bootstrapping to test this result. The empirical t value of the indirect effect is 0.1105/0.035 =3.157, and we can conclude that the relationship between these two constructs via IE is significant at 99% (p>0.01). This significant result shows IE mediate the relationship between Opportunity Recognition Motivation and International Performance. In the last step of the analysis we determine the strength of this mediation by applying VAF procedure. VAF is equal to direct effect divided by the total effect. Total effect has a value of 0.1105+0.247 = 0.3575 and VAF value is 0.1105/0.3575=0.31. This result shows that 31% of the opportunity recognition motivation's effect on International Performance is explained by IE and this situation can be characterized as partial mediation (Table 7.6.4.1).

Table 7.6.4.1 Significance analysis of path coefficients without the mediator

	Path coefficient	**t Value**	**Significance Levels**
Opportunity Recognition Motivation-> Int. Performance	0.247	3.895	***

Note: NS= non significant
**p< .10. **p < .05. *** p < .01*

7.6.5. *Control variables*

We also controlled the results of our analysis for the effects of both age and size (Figure 7.6.5.1). This analysis shows if these two variables can explain significant variation in the target construct (International Performance). The results show negative influence of age (-0.004) and positive effect of size (0.050) on the international performance. But after estimating these effects through bootstrapping, we could not find any significant relationship for age (0.059) and size (0.732).

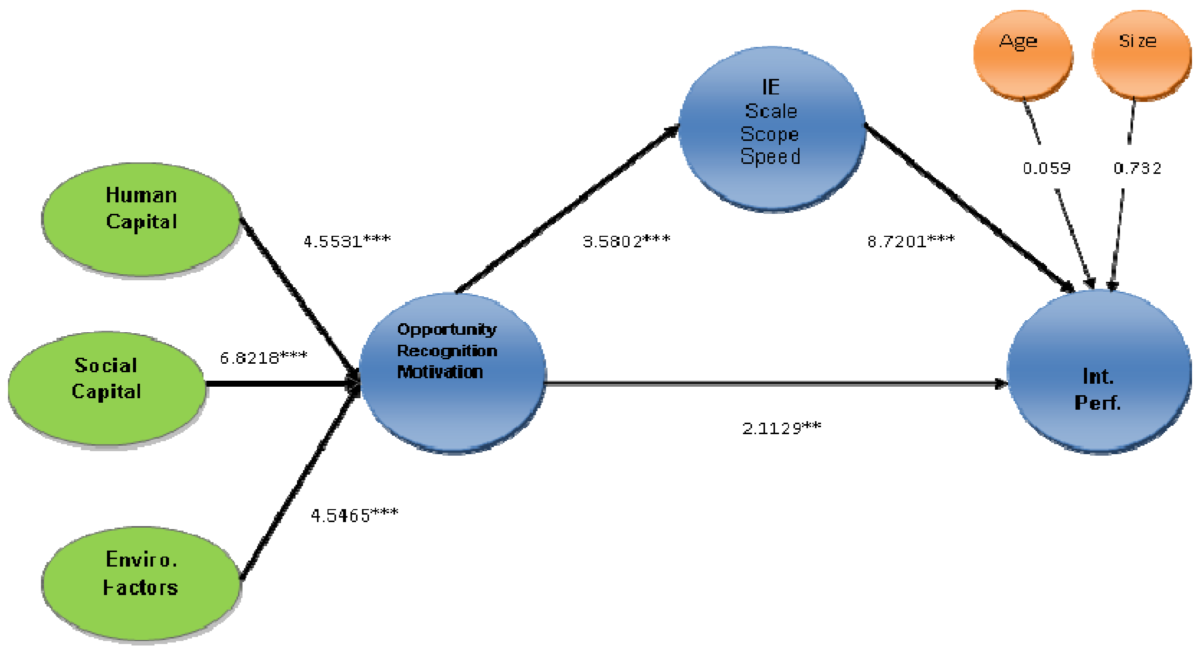

Figure 7.6.5.1 Control variables Size and Age
(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

7.6.6. Higher order model or Hierarchical Component Model (HCM)

The second order analyses are shown in Figure 7.6.6.1. The results of analyses show the R^2 values for endogenous variables IE (0.185) and International Performance (0.233). There is also significant relationship between Opportunity Recognition Motivation construct and IE (0.430, t value = 9.203), and IE has significant effect on International Performance construct (0.403, t value = 7.249). In this model the relationship between Opportunity Recognition Motivation and International Performance is also significant (0.144, t value= 2.379).

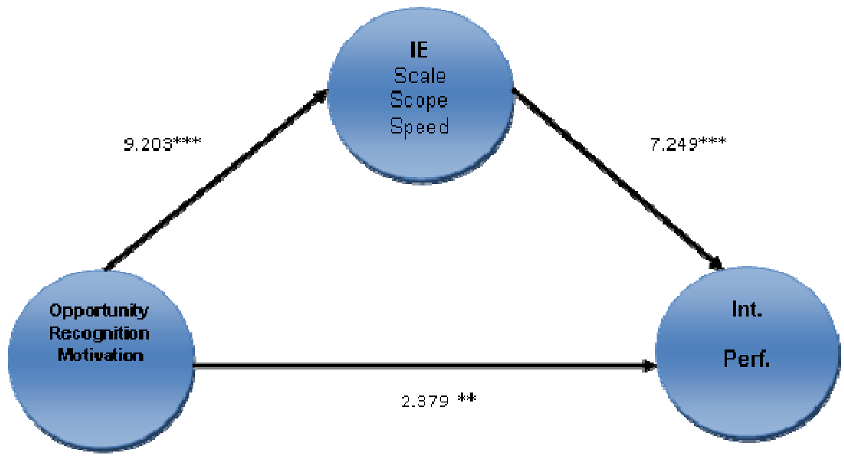

Figure 7.6.6.1 Higher order model or HCM
(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

7.7. *Firm level analysis*

Many firm level factors are involved in entrepreneurial internationalization of the renewable energy companies. In this study we focused on variables that we found significant based on our findings from explorative case studies and also current theoretical frameworks in both international entrepreneurship and sustainable entrepreneurship literature.

An important initial step in application of SEM models is to prepare a diagram that connects variables and constructs based on the theories and logic. For designing our structural model, we designed two path-models one for firms' resources such as financial, technological, knowledge and networks and the second model is designed to examine the commercialization process. Model parsimony and complexity of big model analysis convinced us to consider two distinctive models in this level of analysis.

These path models are designed based on the widely used theoretical frameworks in the IE literature that shows the relationship between the organizational factors, IE and international outcomes (Jones & Coviello, 2005; Zahra & George, 2002). In the following, we discuss about the evaluating measurement models and structural model analysis.

7.7.1. *Evaluating measurement models*

For measurement model assessment we should distinct between formative and reflective models. In this model, we have two reflective models: International Performance and Firm-Level Network.

For evaluating the reflective measurement models, we should consider composite reliability, indicator reliability, convergent reliability, and discriminant validity. The initial step is to check the algorithm convergence with stop criterion which is 15 and it is less than the maximum threshold that we designed at 300. Then, we test the measurement models for convergent validity. As it is shown in Table 7.7.1.1, the outer loadings for all the indicators for International Performance and Firm-Level Network are higher than 0.70 except for item 2_4_3_Small_Big_Resources. However, since this is a newly developed scale and we need this indicator for theoretical reasons (content validity) we keep this item in the Firm-Level Network measurement model. Convergent validity tested through Average Variance Extracted (AVE) of the two measurement models and the results are 0.7089 and 0.6881 for International Performance and Firm-Level Network respectively. An AVE value larger than 0.50 indicates that on average the construct explains more than half of the variance of its indicators. So, for two constructs we have high level of convergent validity. The composite reliabilities are 0.9443 and 0.8113 which are in the satisfactory range of 0.70 and 0.95 (Tables 7.7.1.1 and 7.7.1.2). Finally, we apply discriminant validity to examine the extent of distinction of the reflective construct from the other constructs. Fornell-Larcker criterion shows that square root of the AVEs for International Performance (0.8419) and Firm-Level Network (0.8295) are all higher than the correlation of these reflective constructs with the other latent variables in the path model (Table 7.7.1.3).

Table 7.7.1.1 Results summary for reflective measurement model-Int. Performance

Latent Variable	Indicator	Outer Loading	Indicator Reliability	Composite Reliability	AVE	Discriminant Validity
International Performance	5_9_1_IntPerform_Vol	0.8657	0.7494	0.9443	0.709	Yes
	5_9_2_IntPerform_MktShare	0.8731	0.7623			
	5_9_3_IntPerform_Profit	0.8452	0.7144			
	5_9_4_IntPerform_Mkt_Acss	0.8624	0.7437			
	5_9_5_IntPerform_Image_Dev	0.7644	0.5843			
	5_9_6_IntPerform_KnowHow_Dev	0.7367	0.5427			
	5_9_7_IntPerform_InGeneral	0.9303	0.8655			

Table 7.7.1.2 Results summary for reflective measurement model- Firm Level

Latent Variable	Indicator	Outer Loading	Indicator Reliability	Composite Reliability	AVE	Discriminant Validity
Firm-Level Network	2_4_1_Small_Big_Int	0.9524	0.9071	0.8113	0.6881	Yes
	2_4_2_Small_Big_Teknlgy	0.6839	0.4677			
	2_4_3_Small_Big_Resources	0.5953	0.3544			

Table 7.7.1.3 Fornell-Larcker Criterion

	Financial Resources	Foreign Market Knowledge	IE	Int. Perf.	Firm-level Network	Networking
Financial Resources	**Single item Construct**					
Foreign Market Knowledge	-0.1013	1				
IE	0.0557	0.1984	1			
Int. Performance	0.0705	0.1305	0.4706	**0.8419**		
Firm level Network	-0.018	0.0083	0.1235	0.1836	**0.8295**	
Networking	-0.0202	0.413	0.3353	0.1491	0.0764	1
Technological Resources	-0.1083	0.2368	0.1993	0.2302	0.0996	0.1675

7.7.2. *Formative measurement model analysis*

Formative measurement model assessment includes content validity, convergent validity, collinearity and bootstrapping. Instead of convergent test, the table of indicators and corresponding survey questions can be applied to see if the indicators show the major characteristics of the construct. For example, for networking we applied several indicators to test the importance of the formal and informal networks (Coviello & Munro, 1997, 1995). The other construct also measure the firm level networking from several aspects (resource, technology and resources). We also used four indicators to measure technological resources such as R&D investment, technology growth phase, technological development as reason for internationalization and lack of technological knowledge in the home country (Zahra & George, 2002). Foreign market knowledge also measured in terms of international market knowledge, and language competence (Jones & Coviello, 2005). The only single-item construct is financial resources that address the lack of financial resources as a motive for internationalization of the firms.

First we check the stop criterion to be sure about the algorithm convergence. This criterion value is 15 which is less than the threshold of 300. Then we check the model for the collinearity of the formative measures' indicators. According to results which are shown in Table 7.7.2.1, VIF values for four formative constructs are uniformly below the threshold value of 5. We conclude, therefore, that collinearity is not an issue for our path model.

Table 7.7.2.1 Variance Inflation Factor (VIF) Results

Networking		**Firm-level Network**		**Technological Resources**		**Foreign Market Knowledge**	
Indicators	**VIF**	**Variable**	**VIF**	**Variable**	**VIF**	**Variable**	**VIF**
3_5_3_ne~c	2.56	2_4_3_s m~s	1.67	5_6_3_in~v	1.04	5_6_2_in~_	1.10
3_5_2_ne~c	2.08	2_4_2_s m~y	1.48	5_5_2_in~l	1.04	5_6_6_in~e	1.10
3_5_8_ne~s	1.91	2_4_1_s m~t	1.44	7_2_ur_c~z	1.02		
3_5_7_ne~s	1.88			4_1_rd_i~t	1.02		
3_5_4_ne~y	1.78						
3_5_6_ne~r	1.59						
3_5_5_ne~r	1.26						
3_5_1_ne~d	1.26						
5_6_8_in~a	1.07						
Mean VIF	**1.71**	**Mean VIF**	**1.53**	**Mean VIF**	**1.03**	**Mean VIF**	**1.10**

The last step in evaluating formative measurement models is the analysis of the outer weights for the relevance and significance. We can check the significance and t values of the indicators by means of bootstrapping. Table 7.7.2.2 shows the summary of the results for formative constructs i.e. networking, technological resources, foreign market knowledge and IE. The table shows outer weight, outer loadings, t value, and p value for each indicator. These findings indicate that IE indicators are all significant and

Networking items are significant as well except for 3_5_3_Netw_Trade_Assc, 3_5_4_Netw_Gov_Agncy, 3_5_7_Netw_Suppliers, and 3_5_8_Netw_Distributers. Moreover, we could not find significant results for two Technological Resources indicators i.e., 5_5_2_Intzshen_Rizens_Tek_knwl and 7_2_UR_Co_Tcnlgy_Growth_Faz and we also could not find any significant result for Language and Foreign Market Knowledge.

Table 7.7.2.2 Outer Weights Significance Testing Results

Formative Constructs		Formative Indicator	Outer Weight	Outer loading	t Value	Significance Levels	p Value
Firm	Networking	3_5_1_Netw_Friend	0.1661	0.1994	1.1792	NS	0.2392
		3_5_2_Netw_Prof_Assc	-0.4762	-0.2180	2.3285	**	0.0205
		3_5_3_Netw_Trade_Assc	0.1321	0.0113	0.8571	NS	0.3920
		3_5_4_Netw_Gov_Agncy	-0.0309	0.0384	0.2711	NS	0.7865
		3_5_5_Netw_Fair	0.5055	0.5891	3.3877	***	0.0008
		3_5_6_Netw_Customer	0.2776	0.4496	1.6938	*	0.0913
		3_5_7_Netw_Suppliers	0.1001	0.2012	0.6573	NS	0.5115
		3_5_8_Netw_Distributers	-0.1199	0.2333	0.8312	NS	0.4065
		5_6_8_Intzshen_Chalng_Int_Relation	0.6197	0.7228	4.5031	***	0.0000
	Technological Resources	4_1_RD_Invst	0.3035	0.2276	2.0409	**	0.0421
		5_5_2_Intzshen_Rizens_Tek_knwl	0.0211	-0.1025	0.1367	NS	0.8914
		5_6_3_Intzshen_Chalng_Tklg_Adv	0.8807	0.9046	4.6429	***	0.0000
		7_2_UR_Co_Tcnlgy_Growth_Faz	0.3278	0.4139	1.4850	NS	0.1385
	Foreign Market Knowledge	5_6_2_Intzshen_Chalng_Int_Mkt_	0.9002	0.9739	5.2311	***	0.0000
		5_6_6_Intzshen_Chalng_Languge	0.2387	0.5166	1.0737	NS	0.2838
IE		5_3_No_Contry_Int_Activ	0.2750	0.4898	2.3308	**	0.0204
		5_4_Prcntg_Int_TotalSale	0.8448	0.9492	10.4505	***	0.0000
		Int_Speed	-0.2021	-0.3143	1.7495	*	0.0812

Note: NS=not significant

a. Bootstrapping confidence interval for 10% probability of error (alpha= 0.10)

p* < .10. ***p* < .05. * *p* < .01.

7.7.3. Evaluating PLS-SEM structural model results

The initial step in assessment of the structural model is testing each set of predictor construct separately for collinearity. We, therefore, tested collinearity issue for Networking, Firm-Level Networking, Technological Resources, and Foreign Market Knowledge as the first set of constructs and we added IE to the analysis as the second set of predictors. As it is shown in Table 7.7.3.1, VIF values for all constructs are less than 5. Thus, we can conclude that collinearity among the predictor constructs is not a problem in our path model.

Table 7.7.3.1 Collinearity assessment

First Set		Second Set	
Constructs	**VIF**	**Constructs**	**VIF**
Foreign Market Knowledge	1.26	Networking	1.32
Networking	1.22	Foreign Market Knowledge	1.26
Technological Resources	1.08	IE	1.18
Financial Resources	1.02	Technological Resources	1.11
Firm Level Network	1.02	Financial Resources	1.03
		Firm Level Network	1.03
Mean VIF	**1.12**	**Mean VIF**	**1.15**

The second step is to examine R^2 values of the endogenous constructs. R^2 values for IE and International Performance are 0.15 and 0.2215 respectively. Since this is a novel and explorative study we consider them as moderate results (Hair et al., 2014). As it is shown in Table 7.7.3.2 there is a strong and positive path coefficient (β) between IE and International Performance (0.4706) and Networking and IE (0.2836). Total effect analysis can help us to better understand the effect of exogenous constructs on International Performance. As you can see in Table 7.7.3.3, it shows the total effect of Financial Resources, Technological Resources, Networking, Firm Level Networking and Foreign Market Knowledge on International Performance. In this case, because the analyses of these results are not easy we should take into account the outer weights of indicators. With these values we can identify which specific items of the constructs need to be addressed. These results reveal that interaction between the small and large firms facilitate the internationalization process and firms' access to the new knowledge and technologies. However, we could not find significant results for the other resources such as brand, networks, and distribution channels. Looking at networking indicators also shows that informal networks with friends and formal networks with Customers and Fairs and International Networks contribute positively and significantly to the internationalization of the firms. In contrast formal networks in Professional Associations and Government Agencies cannot help companies in their internationalization. Having knowledge about the international markets and knowing languages positively affect the internationalization of the firms and this relationship is significant for International Market Knowledge. Advancing Technological knowledge (0.8817) and R&D investment (0.3029) outer weights show strong effect on the internationalization of the firms and Knowing About Latest Technology is not the reasons for companies to enter the international markets. Level of Technological Development, however, is strong and positive factor related to the internationalization of firms.

Table 7.7.3.2 Path coefficients (β)

	IE	Int. Performance
Financial Resources	0.0836	
Foreign Market Knowledge	0.0558	
IE		0.4706
Firm Level Network	0.0901	
Networking	0.2836	
Technological Resources	0.1388	

Table 7.7.3.3 The total effect

	IE	Int. Performance
Financial Resources	0.0836	0.0394
Foreign Market Knowledge	0.0558	0.0263
IE		0.4706
Interaction	0.0901	0.0424
Networking	0.2836	0.1335
Technological Resources	0.1388	0.0653

In the next step, we run bootstrapping to test the path coefficients to ensure about the significance of the structural model relationships. Table 7.7.3.4 shows the bootstrapping result as path coefficients, t values and significance levels. As it is shown in this table there is a significant relationship between all the exogenous constructs and IE except for Foreign Market Knowledge (0.0558, t value = 1.1536). Moreover, this table shows significant and positive relationship between IE and International Performance (0.4706, t value = 10.2102). This relationship is strong and positive for Networking, Technological Resources and Firm-Level Network (interaction between small and large firms).

Table 7.7.3.4 Significance testing results of the structural model path coefficients

	Path Coefficients	t values	Significance Levels
Financial Resources -> IE	0.0836	1.6522	*
Foreign Market Knowledge -> IE	0.0558	1.1536	NS
IE -> Int. Performance	0.4706	10.2102	***
Firm Level Network -> IE	0.0901	2.0430	**
Networking -> IE	0.2836	5.1740	***
Technological Resources -> IE	0.1388	2.7043	***

Note: NS= non significant
**p< .10. **p < .05. *** p < .01.*

Corresponding results for the total effect of the exogenous variables are presented in Table 7.7.3.5. These results suggest that the total effect of exogenous variables such as Firm-Level Network (0.118, t value = 2.4120), Networking (0.1335, t value = 2.0128), and Technological Resources (0.0653, t value = 2.1811) on International Performance is significant. The exceptions are Foreign market knowledge (0.0263, t value = 0.6708) and Financial Resources (0.0394, t value= 1.4327).

Table 7.7.3.5 Significance Testing Results of the Total Effects

	Path Coefficients	t values	Significance Levels
Financial Resources -> Int. Performance	0.0394	1.4327	NS
Foreign Market Knowledge -> Int. Performance	0.0263	0.6708	NS
IE -> Int. Performance	0.4706	10.2102	***
Firm Level Network -> Int. Performance	0.118	2.4120	**
Networking -> Int. Performance	0.1335	2.0128	**
Technological Resources -> Int. Performance	0.0653	2.1811	**

Note: NS= non significant
**p< .10. **p < .05. *** p < .01*

Final step in the structural model analysis is predictive relevance of the path model (Figure 7.7.3.1). Following the blindfolding procedure, we define International Performance as endogenous reflective construct and an omission distance between 5 and 10 without integer (Hair et al., 2014). Final results of blindfolding are R^2 and Q^2 values of the path model which are based on reflective endogenous latent variable (Int. Performance). As it is shown in Table 7.7.3.6, Q^2 value more than 0.15 shows medium predictive relevance endogenous constructs.

Table 7.7.3.6 Results of R^2 and Q^2 values

Endogenous latent variable	R^2 Value	Q^2 Value
Int. Performance	0.221	0.1521

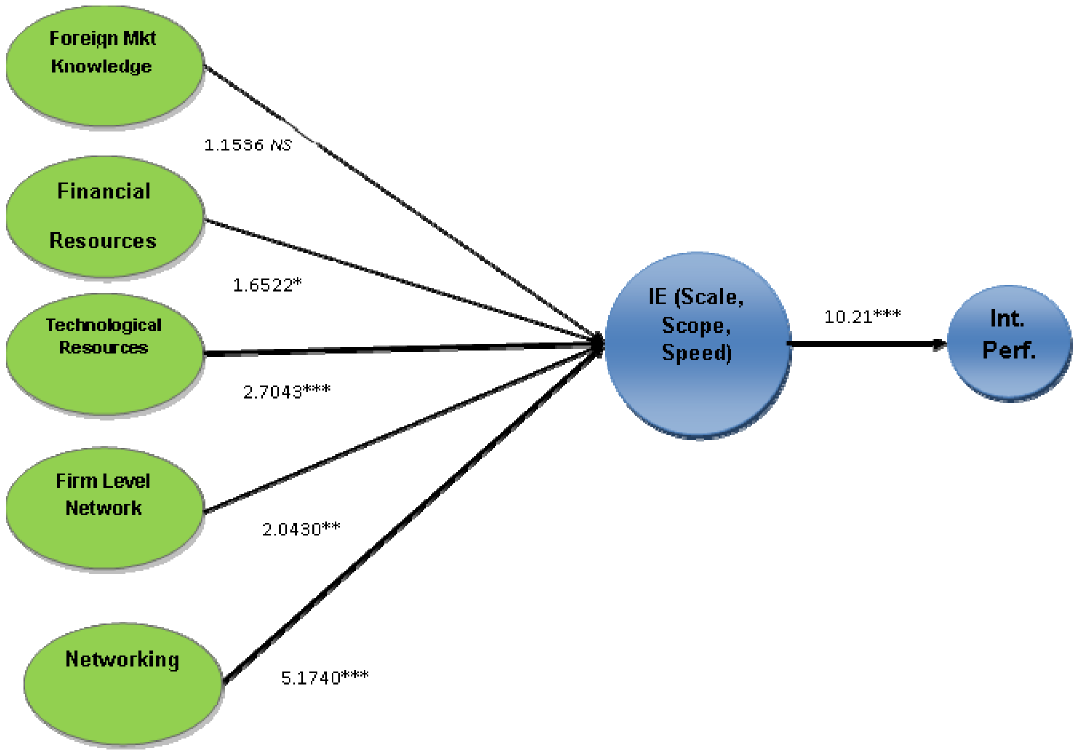

Figure 7.7.3.1 Firm level path model
(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

7.7.4. *Control variables*

We also controlled the results of the analysis for the effect of both age and size (Figure 7.7.4.1). This analysis shows if these two variables can explain significant variation in the target construct (International Performance). The results show negative influence of age (-0.012) and positive effect of size (0.078) on International Performance. However, after estimating these effects through bootstrapping, we could not find any significant relationship for age (0.296), but for size the result is very close to significant (1.414).

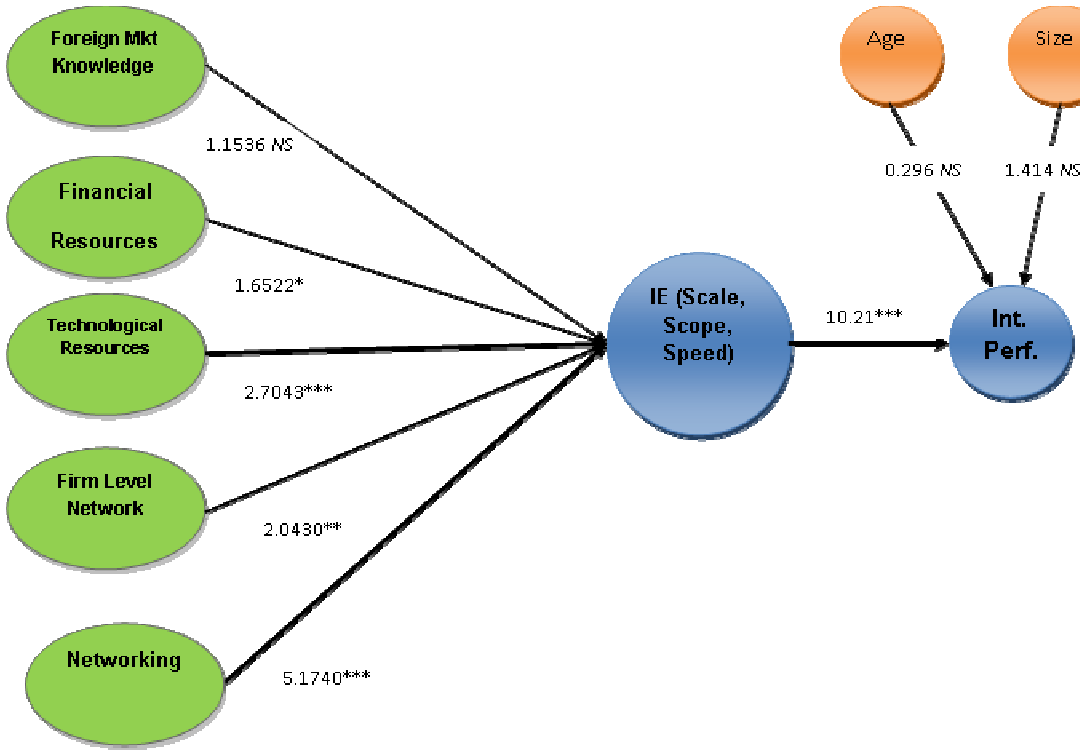

Figure 7.7.4.1 Control Variables Size and Age
(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

7.8. *Commercialization analysis*

One of the main problems in the process of renewable technologies development is slow pace of commercialization and diffusion (Negro et al., 2012). This problem can be risky and hazardous especially for small companies and start-ups with restrict resources. In the following we design a path model to test this construct effect.

7.8.1. *Evaluating measurement models*

For measurement model assessment we should distinct between formative and reflective models. The only reflective measurement model is International Performance. For evaluating the reflective measurement models, we should consider composite reliability, indicator reliability, convergent reliability, and discriminant validity. The initial step is to check the algorithm convergence with stop criterion which is 15 and it is less than the maximum threshold that we designed at 300. Then, we test the measurement model for convergent validity. As it is shown in Table 7.7.8.1, the outer loadings for all the indicators for International Performance is higher than 0.70. Convergent validity tested through Average Variance Extracted (AVE) of the measurement model and the results is 0.7097. An AVE value larger than 0.50 indicates that on average the construct explains more than half of the variance of its indicators. So, for international performance construct we have high level of convergent validity. The composite reliability is 0.9443 which is in the satisfactory range of 0.70 and 0.95 (Table 7.8.1.1). Finally, we apply discriminant validity to examine the extent of distinction of the reflective construct from the other constructs. Fornell-Larcker criterion shows that square root of AVE for International Performance (0.8424) is higher than the correlation of these reflective constructs with other latent variables in the path model (Table 7.8.1.2).

Table 7.8.1.1 Results summary for reflective measurement model-Int. Performance

Latent Variable	Indicator	Outer Loading	Indicator reliability	Composite Reliability	AVE	Discriminant Validity
International Performance	5_9_1_IntPerfom_Vol	0.8611	0.7415	0.9445	0.7097	Yes
	5_9_2_IntPerfom_MktShare	0.8702	0.7572			
	5_9_3_IntPerfom_Profit	0.8407	0.7068			
	5_9_4_IntPerfom_Mkt_Acss	0.8647	0.7477			
	5_9_5_IntPerfom_Image_Dev	0.7723	0.5964			
	5_9_6_IntPerfom_KnowHow_Dev	0.7421	0.5507			
	5_9_7_IntPerfom_InGeneral	0.9314	0.8675			

Table 7.8.1.2 Fornell-Larcker criterion

	Commercialization	IE	Int. Performance
IE	1		
Commercialization	0.3049	1	
Int. Performance	0.2369	0.4710	**0.8424**

7.8.2. *Formative measurement model analysis*

Formative measurement model assessment includes content validity, convergent validity, collinearity and bootstrapping. Instead of convergent test, the table of indicators and corresponding survey questions can be applied to see if the indicators show the major characteristics of the construct. For conducting our analysis, first we checked the stop criterion to be sure about the algorithm convergence. This criterion value is 7 which is less than the threshold of 300. Then we check the model for the collinearity of the formative measures' indicators. According to the results that are shown in Table 7.8.2.1, VIF values for four formative constructs are uniformly below the threshold value of 5. We conclude, therefore, that collinearity is not an issue for our path model.

Table 7.8.2.1 Variance Inflation Factor (VIF) Results

Commercialization		IE	
Indicators	**VIF**	**Indicators**	**VIF**
4_2_2_Comercilz_IntFund	1.43	Scale	1.11
4_2_3_Comercilz_Sup_Policy_Cou	1.35	Scope	1.09
4_2_1_Comercilz_Prtnship	1.2	Speed	1.03
5_5_4_Intzshen_Rizens_Rapid_Co	1.09		
Mean VIF	**1.27**	**Mean VIF**	**1.08**

The final part of our analysis is the analysis of the outer weights for their relevance and significance. We can check the significance and t values of the indicators by means of bootstrapping. Table 7.8.2.2 shows the summary of the results for formative constructs i.e. Commercialization and IE. The table shows outer weight, outer loadings, t values, and p values for each indicator. These findings indicate that Commercialization and IE indicators are all significant except for 4_2_2_Comercilz_IntFund.

Table 7.8.2.2 Outer Weights Significance Testing Results

Formative construct		Formative Indicator	Outer weight	Outer loading	t Value	Significance Levels	p Value
Firm	**Commercialization**	4_2_1_Comercilz_Prtnship	0.7813	0.9210	5.5641	***	0.0000
		4_2_2_Comercilz_IntFund	0.0768	0.5169	0.5899	NS	0.5557
		4_2_3_Comercilz_Sup_Policy_Cou	0.2821	0.5084	1.6527	*	0.0994
		5_5_4_Intzshen_Rizens_Rapid_Co	0.2507	0.4871	1.6217	*	0.1059
IE		5_3_Scope	0.1904	0.4251	2.3870	**	0.0176
		5_4_Scale	0.9017	0.9748	18.8136	***	0.0000
		Speed	-0.1475	-0.2719	1.7036	*	0.0894

Note: NS=not significant
a. Bootstrapping confidence interval for 10% probability of error (alpha= 0.10)
**p< .10. **p < .05. *** p < .01.*

7.8.3. *Evaluating PLS-SEM structural model results*

The initial step in assessment of the structural model is testing each set of predictor construct separately for collinearity. We, therefore, tested collinearity issue for Commercialization and IE. As it is shown in the Table 7.8.3.1 VIF values for all the constructs is 1.1 which is less than 5. Thus, we can conclude that collinearity among the predictor constructs is not a problem in our path model.

Table 7.8.3.1 Collinearity assessment

Variable	VIF
Commercialization	1.1
IE	1.1
Mean VIF	**1.1**

The second step is to examine R^2 value of the endogenous constructs. R^2 values for IE and International Performance are 0.0930 and 0.2315 respectively. Since this is a novel and explorative study we consider them as moderate results (Hair et al., 2014). As it is shown in Table 7.8.3.2 there is a strong and positive path coefficient (β) between IE and International Performance (0.4396), and Commercialization and IE (0.3049). Total effect analysis helps us to better understand the effect of exogenous constructs on the International Performance. Table 7.8.3.2 shows the total effect of Commercialization on International Performance (0.2369). Since the analysis of these results is not easy to understand, we should take into account the outer weights of the indicators. With these values we can identify which specific items of the constructs need to be addressed in the final analysis. These results show that rapid commercialization, commercialization partnership and commercializing to the countries with favorable regulatory environment are positively related to IE. Commercializing factors are also related positively to scale, scope and speed of the internationalization.

Table 7.8.3.2 Path coefficients (β)

	IE	Int. Performance
Commercialization	0.3049	0.1029
IE		0.4396

Table 7.8.3.3 The total effect

	IE	Int. Performance
Commercialization	0.3049	0.2369
IE		0.4396

In the next step, we run bootstrapping to check the path coefficients to ensure about the significance of structural model relationships. Table 7.8.3.4 shows the bootstrapping results as path coefficients, t values and significance levels. This table shows significant relationship between commercialization as exogenous construct and IE (0.3049, t value = 6.0811). The effect of commercialization on International Performance is positive and significant (0.1029, t value = 1.6883).

Table 7.8.3.4 Significance testing results of the structural model path coefficients

	Path Coefficients	t values	Significance Levels
Commercialization -> IE	0.3049	6.0811	***
Commercialization -> Int. Performance	0.1029	1.6883	*
IE -> Int. Performance	0.4396	8.4536	***

Note: NS= non significant
**p< .10. **p < .05. *** p < .01.*

Corresponding results for the total effect of the exogenous variables are presented in Table 7.8.3.5. These results suggest the total effect of commercialization on International Performance is positive and significant (0.2369, t value = 3.7774).

Table 7.8.3.5 Significance testing results of the total effects

	Path Coefficients	t values	Significance Levels
Commercialization -> IE	0.3049	6.0811	***
Commercialization -> Int. Performance	0.2369	3.7774	***
IE -> Int. Performance	0.4396	8.4536	***

Note: NS= non significant
**p< .10. **p < .05. *** p < .01.*

Final step in the structural model analysis is predictive relevance of the path model (Figure 7.8.3.1). Following the blindfolding procedure, we define International Performance as endogenous reflective construct and an omission distance between 5 and 10 without integer (Hair et al., 2014). Final results of blindfolding are R^2 and Q^2 values of the path model which is based on reflective endogenous latent variable (Int. Performance). As it is shown in Table 7.8.3.6, Q^2 value more than 0.15 shows medium predictive relevance endogenous constructs.

Table 7.8.3.6 Results of R^2 and Q^2 values

Endogenous latent variable	R^2 Value	Q^2 Value
Int. Performance	0.2315	0.1617

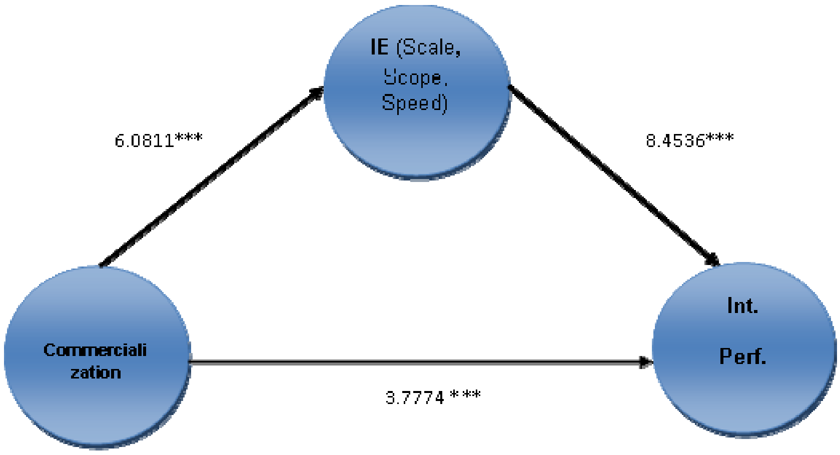

Figure 7.8.3.1 Commercialization Path Model
(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

7.8.4. *Business model analysis*

In order to analyze the effect of the business models on the internationalization of the renewable energy companies, we applied regression analysis about two types of business model. According to the current literature about renewable energy companies two choices of business models exist: utility-side business model and customer-side business model (Richter, 2012).

Table 7.8.4.1 Business model type frequency table

Business Model Type	**Freq.**	**Percent**
Customer-Side	200	**68.26**
Utility-Side	93	**31.74**
Total	293	100

In our analysis we applied confirmatory factor analysis and we created single variable as International Performance from seven variables (Tables 7.8.4.2 and 7.8.4.3).

Factor analysis/correlation — Number of observations = 293
Method: principal-component factors — Retained factors = 1
Rotation: orthogonal varimax (Kaiser off) — Number of parameter = 7

Factor	**Variance**	**Difference**	**Proportion**	**Cumulative**
Factor 1	4.90306	.	0.7004	0.7004

Table 7.8.4.2 factor analysis of international performance

Table 7.8.4.3 factor loading

Variable	Factor1	Uniqueness
5_9_1_IntPerfom_Vol	0.8438	0.2881
5_9_2_IntPerfom_MktShare	0.8553	0.2685
5_9_3_IntPerfom_Profit	0.8258	0.318
5_9_4_IntPerfom_Mkt_Acss	0.8533	0.2718
5_9_5_IntPerfom_Image_Dev	0.7864	0.3816
5_9_6_IntPerfom_KnowHow_Dev	0.7489	0.4392
5_9_7_IntPerfom_InGeneral	0.9329	0.1297

After factor analysis to define a single variable as International Performance, we implemented regression analysis to understand type of business model effect on the international performance. The regression results show that there is a difference between utility-side and customer-side business models which is significant at 99% (0.4127, t value = 3.35) (Table 7.8.4.4).

Table7.8.4.4. Regression result for business model type

Source	SS	df	MS
Model	10.811957	1	10.811957
Residual	281.188038	291	0.96628192
Total	291.999995	292	0.99999998

Number of obs. = 293
F (1, 291) = 11.19
Prob > F = 0.0009
R-squared = 0.0370
Adj R-squared = 0.0337
Root MSE = 0.983

Int_Perf_Fact	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
a_2_3_biz_model_typ	0.4126953	0.1233756	3.35	0.001	0.1698736	0.6555169
_cons	-0.5436873	0.1723826	-3.15	0.002	-0.8829621	-0.2044125

For better interpretation of the result, we graphed observed values that is coded 1/2, 1= customer-side business model and 2= utility-side business model. As it is presented in Figure 7.8.4.1, International Performance scores are significantly different depending on the type of business model. Utility-side business model has significantly higher International Performance than customer side business model. Based on these results we can say that international performance of companies with utility-side business model is 0.4126 points higher than companies with customer-side business model.

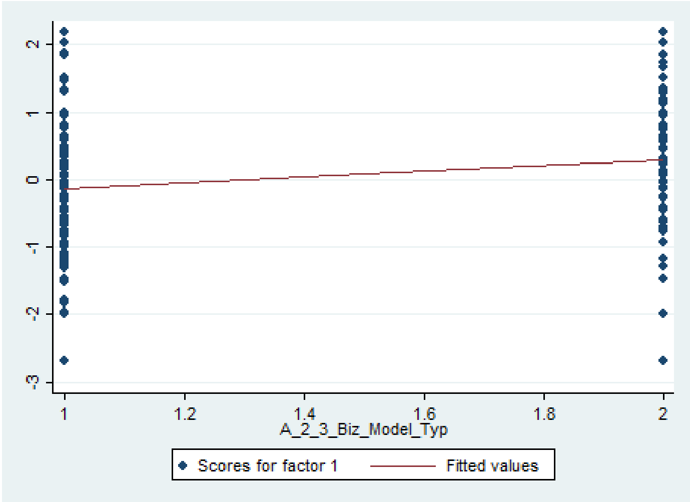

Figure 7.8.4.1 Business model type and international performance

7.9. *Policy level analysis*

The first step in the policy level analysis is defining measurement models. Based on the case studies analyses, we identified the policy level effects at two distinct levels: domestic and international. These two constructs represent the effect of the renewable energy policy in Spain and regulatory environment of the target countries. Moreover, because of the renewable energy policy change, which adversely influenced companies in Spain, we defined a new construct as policy change. All the policy level constructs are considered as formative measurement models.

The path model in this analysis is designed based on widely applied theoretical frameworks in IE (Jones & Coviello, 2005; Zahra & George, 2002). These theoretical models suggest applying contextual factors and environmental dynamism as moderating factor in the internationalization of firms. However, in this specific industry due to the direct influence of the regulatory environment on firms' international behavior, we examined the effect of policy on IE and International Performance in a separate model. In the second stage of the analysis, we included dynamic capability construct in our model to understand how firms reconfigure their current asset base and process to adapt to the new political scheme. In the following, we discuss about the evaluating measurement models and the structural model assessment.

7.9.1. *Evaluating measurement models*

Similar to the prior models in this study, two types of measurement models exist in this path model: reflective and formative. The only reflective model in this path model is International Performance.

The reflective measurement models are commonly assessed based on: composite reliability, indicator reliability, convergent reliability, and discriminant validity. The initial step is to test the algorithm convergence with stop criterion which is 10 and it is less than the maximum threshold that we defined at 300. Then, we test the measurement models for convergent validity. As it is shown in Table 7.9.1.1, the outer loadings for all the indicators for International Performance is higher than 0.70. Convergent validity tested through Average Variance Extracted (AVE) of the measurement model and the results is 0.7087. An AVE value larger than 0.50 indicates that on average the construct explains more than half of the variance of its indicators. So, for this constructs we have high level of convergent validity. The composite reliability is 0.9443 which is in the satisfactory range of 0.70 and 0.95 (Table 7.9.1.1). The indicator reliability shows the extent to which the variation in an item is explained by the construct and it is described as the variation extracted from the item. In this construct, as you can see in 7.9.1.1, the indicator reliability shows that more than 50% of the item is explained by the construct and we can conclude that all the items are reliable. Finally, we apply discriminant validity to examine the extent of distinction of the reflective construct from the other constructs. Fornell-Larcker criterion shows that square root of the AVE for International Performance (0.8419) is higher than the correlation of these reflective constructs with other latent variables in the path model (Table 7.9.1.2).

Table 7.9.1.1 Results summary for reflective measurement model-Int. Performance

Latent Variable	Indicator	Outer Loading	Indicator Reliability	Composite Reliability	AVE	Discriminant Validity
International Performance	5_9_1_IntPerfom_Vol	0.8671	0.7519	0.9443	0.7089	Yes
	5_9_2_IntPerfom_MktShare	0.8741	0.7641			
	5_9_3_IntPerfom_Profit	0.8455	0.7149			
	5_9_4_IntPerfom_Mkt_Acss	0.8621	0.7432			
	5_9_5_IntPerfom_Image_Dev	0.7638	0.5834			
	5_9_6_IntPerfom_KnowHow_Dev	0.7345	0.5395			
	5_9_7_IntPerfom_InGeneral	0.9298	0.8645			

Table 7.9.1.2 Fornell-Larcker criterion

	Domestic Policy	IE	Int. Performance	Int. Policy
Domestic Policy	Single Item Construct			
IE	-0.0403	Formative measurement model		
Int. Performance	0.0374	0.4735	**0.8419**	
Int. Policy	0.1371	0.2459	0.1432	Formative measurement model
Policy Change	-0.1522	-0.2464	-0.1986	-0.2646

7.9.2. Formative measurement model analysis

For assessing formative measurement models we consider content validity, convergent validity, collinearity and bootstrapping. The table of indicators and corresponding survey questions can be applied to see if the indicators show the major characteristics of the construct (convergent validity). For example, for international policy we applied several indicators to test the effect of the target markets policy (Løvdal & Neumann, 2011) and regulatory environment such as copy right rules (Coeurderoy & Murray, 2008) on internationalization and commercialization of the firms. The other single-item construct measure the domestic policy effect (6_1_2_Policy_UnSupp_Dmstik_Pol). Based upon the case studies analyses, we developed three indicators to measure the effect of radical policy change in Spain on international activities of firms, either negative or positive effect.

We start our formative measurement analysis with checking the stop criterion to ensure about the algorithm convergence. This criterion value is 10 which is less than the threshold of 300. Then we check the model for the collinearity of the formative measures' indicators. According to the results which are shown in Table 7.9.2.1, VIF values for four formative constructs are uniformly below the threshold value of 5. We conclude, therefore, that collinearity is not an issue for our path model.

Table 7.9.2.1 Variance Inflation Factor (VIF) results

Int. Policy		IE		Policy Change	
Variable	VIF	Variable	VIF	Variable	VIF
5_5_3_Intzshen_Rizens_Supp_Pol	1.45	Scale	1.11	6_1_3_Policy_Policy_Change_Int	1
5_6_9_Intzshen_Chalng_Cpy_Righ	1.39	Scope	1.09	6_1_5_Policy_Policy_Change_Opp	1
5_6_10_Intzshen_Chalng_Cpy_Cop	1.38	Speed	1.03	6_1_4_Policy_Policy_Change_Dif	1
4_2_3_Comercilz_Sup_Policy_Cou	1.29				
6_1_1_Policy_Int_Policy_Supp	1.21				
Mean VIF	**1.35**	**Mean VIF**	**1.08**	**Mean VIF**	**1**

The final step in assessing formative measurement models is the outer weights analysis. We checked the significance and t values of the indicators by means of bootstrapping procedure. Table 7.9.2.2 shows the summary of the results for formative constructs i.e. international policy, policy change, and IE (domestic Policy is a single item construct). The table shows outer weight, outer loadings, t values, and p values for each individual indicator. These findings indicate that IE indicators are all significant except for Speed. International Policy items are significant as well, except for 5_6_10_Intzshen_Chalng_Cpy_Cop, and 6_1_1_Policy_Int_Policy_Supp. Moreover, we found no significant results for 6_1_5_Policy_Policy_Change_Opp.

Table 7.9.2.2 Outer Weights Significance Testing Results

Formative construct		Formative Indicator	Outer weight	Outer loading	t Value	Significance Level	p Value
Firm	International Policy	5_5_3_Intzshen_Rizens_Supp_Pol	0.3709	0.7263	1.7355	*	0.0836
		5_6_9_Intzshen_Chalng_Cpy_Righ	0.5279	0.4871	2.3529	**	0.0192
		5_6_10_Intzshen_Chalng_Cpy_Cop	0.0376	-0.1888	0.2370	NS	0.8128
		4_2_3_Comercilz_Sup_Policy_Cou	0.4948	0.6865	2.3340	**	0.0202
		6_1_1_Policy_Int_Policy_Supp	0.2581	0.5455	1.3911	NS	0.1652
	Policy Change	6_1_3_Policy_Policy_Change_Int	0.6922	0.6876	4.1464	***	0.0000
		6_1_5_Policy_Policy_Change_Opp	0.1005	0.1173	0.6986	NS	0.4853
		6_1_4_Policy_Policy_Change_Dif	0.7191	0.7124	4.2903	***	0.0000
	Domestic Policy	6_1_2_Policy_UnSupp_Dmstik_Pol	Single Item				
IE		5_3_No_Contry_Int_Activ	0.1884	0.4315	2.2531	**	0.0249
		5_4_Prcntg_Int_TotalSale	0.9195	0.9817	20.2685	***	0.0000
		Int_Speed_Medi_Sqrt	-0.0778	-0.2049	1.1091	NS	0.2682

Note: NS=not significant
a. Bootstrapping confidence interval for 10% probability of error (alpha= 0.10)
p*< .10. ***p* < .05. * *p* < .01.

7.9.3. *Evaluating PLS-SEM structural model results*

The initial step in the assessment of structural model is testing each set of predictor construct for collinearity. Thus, we tested International Policy, Policy Change as the first set of constructs and we added IE to the analysis as the second set of predictors. As it is shown in Table 7.9.3.1, VIF value for all constructs is less than 5. Thus, we can conclude that collinearity among the predictor constructs is not a problem in our path model.

Table 7.9.3.1 Collinearity assessment

First Set		Second Set	
Constructs	**VIF**	**Variable**	**VIF**
Policy Change	1.08	Policy Change	1.12
Int. Policy	1.08	Int. Policy	1.12
		IE	1.11
Mean VIF	**1.08**	**Mean VIF**	**1.11**

The second step is to examine R^2 value of the endogenous constructs. R^2 values for IE and International Performance are 0.1055 and 0.2242 respectively. Since this is a novel and explorative study we consider them as moderate results (Hair et al., 2014). As it is shown in Table 7.9.3.2, there is a strong and positive path coefficient (β) between IE and International Performance (0.4735) and International Policy and IE (0.2048). Moreover, there is negative relationship between IE and Domestic Policy and Policy Change. Total effect analysis can help us to better understand the effect of exogenous constructs on International Performance. Table 7.9.3.3 shows the total effect of International Policy, Domestic Policy, and Policy Change on International Performance. Since the analysis of the results is not easy to understand, we should take into account the outer weights of the indicators. With these values we can identify which specific items of the constructs need to be addressed in the final analysis. These results show that regulatory environment and supportive international policy draw firms to the foreign markets and these factors are positively related to IE. Moreover, threat of infringing copy rights cannot affect the internationalization decision of the firms and unfavorable policy scheme change in Spain is strongly associated with internationalization of the firms. Policy level factors also related positively to scale and scope of the internationalization. However, we could not find strong effect for internationalization speed.

Table 7.9.3.2 Path Coefficients (β)

	IE	Int. Performance
Domestic Policy	-0.0999	
IE		0.4735
Int. Policy	0.2048	
Policy Change	-0.2074	

Table 7.9.3.3 The total effect

	IE	Int. Performance
Domestic Policy	-0.0999	-0.0473
IE		0.4735
Int. Policy	0.2048	0.0970
Policy Change	-0.2074	-0.0982

In the next step, we run bootstrapping to check the path coefficients to ensure about the significance of structural model relationships. Table 7.9.3.4 shows the bootstrapping result as path coefficients, t values and significance levels. As it is shown in this table, there is a significant relationship between all the exogenous constructs and IE. However, the effect International Policy is positive and the effect of the Domestic Policy and Policy Change is negative. Moreover, this table shows significant and positive relationship between IE and International Performance (0.4735, t value = 10.2341).

Table 7.9.3.4 Significance testing results of the structural model path coefficients

	Path Coefficients	t values	Significance Levels
Domestic Policy -> IE	-0.0999	2.1640	**
IE -> Int. Performance	0.4735	10.2341	***
Int. Policy -> IE	0.2048	3.8204	***
Policy Change -> IE	-0.2074	3.9132	***

Note: NS= non significant
**p< .10. **p < .05. *** p < .01.*

Corresponding results for the total effect of the exogenous variables are presented in Table7.9.3.5. These results suggest that the total effect of exogenous variables: Domestic Policy (-0.0473, t value = 2.0452), International Policy (0.0970, t value = 3.1082), and Policy Change (-0.0982, t value = 2.1811) on international performance is significant.

Table 7.9.3.5 Significance Testing Results of the Total Effects

	Path Coefficients	t values	Significance Levels
Domestic Policy -> IE	-0.0999	2.1114	**
Domestic Policy -> Int. Performance	-0.0473	2.0452	**
IE -> Int. Performance	0.4735	10.2341	***
Int. Policy -> IE	0.2048	3.3986	***
Int. Policy -> Int. Performance	0.0970	3.1082	***
Policy Change -> IE	-0.2074	3.4950	***
Policy Change -> Int. Performance	-0.0982	3.2043	***

Note: NS= non significant
**p< .10. **p < .05. *** p < .01*

Final step in the structural model analysis is predictive relevance of the path model (Figure 7.9.3.1). Following the blindfolding procedure, we define International Performance as endogenous reflective construct and an omission distance between 5 and 10 without integer (Hair et al., 2014). Final results of blindfolding are R^2 and Q^2 values of the path model which is based on reflective endogenous latent variable (Int. Performance). As it is shown in Table 7.9.3.6, Q^2 value more than 0.15 shows medium predictive relevance of endogenous constructs.

Table. 7.9.3.6 Results of R^2 and Q^2 values

Endogenous latent variable	R^2 Value	Q^2 Value
Int. Performance	0.2242	0.1511

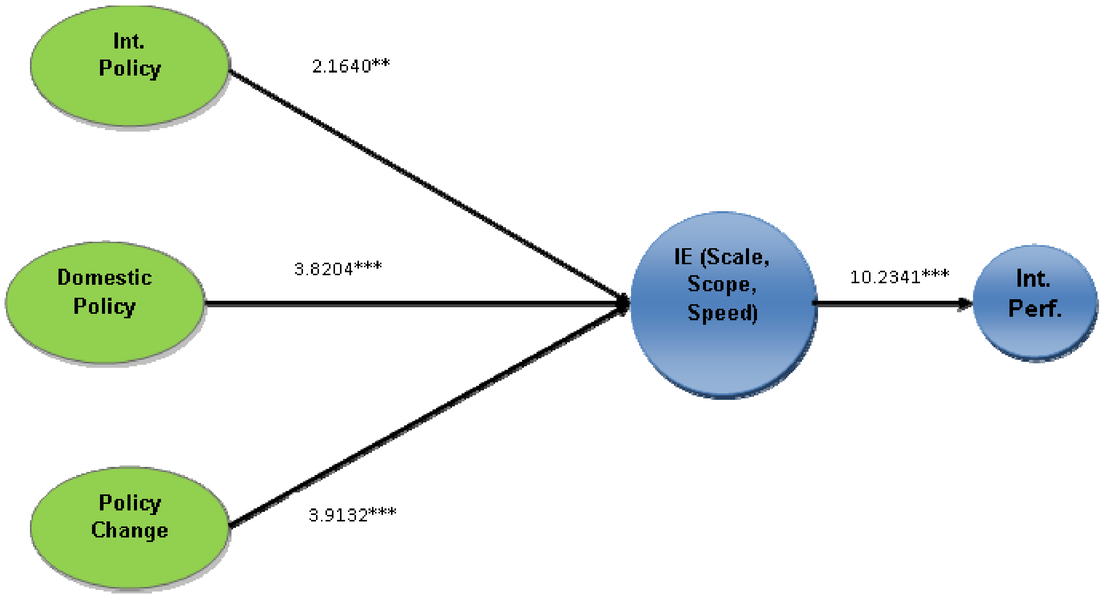

Figure 7.9.3.1 Policy Level Path Model
(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

7.9.4. *Control variables*

We also controlled the results for the effects of both age and size (Figure 7.9.4.1). This analysis shows us if these two variables can explain significant variation in the target construct (International Performance). The results show negative influence of age (-0.047) and positive effect of size (0.095) on International Performance. But after estimating these effects through bootstrapping, we could not find any significant relationship for age (0.823) and size (1.524).

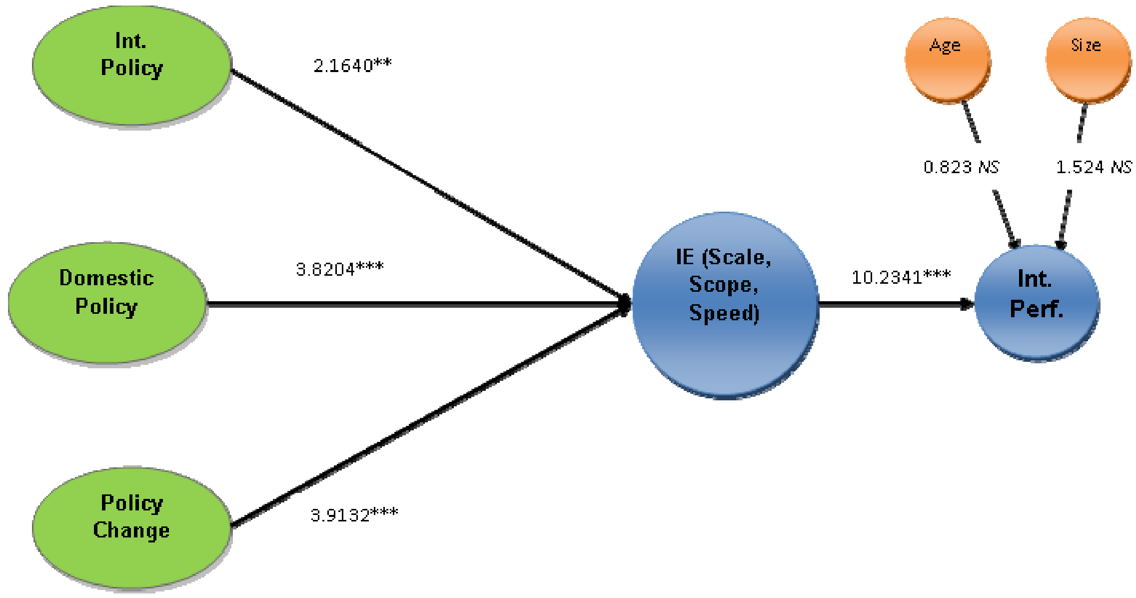

Figure 7.9.4.1 Control variables effect-Size and Age
(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

7.9.4.1. *Further analysis*

In this part we want to understand the effect of the dynamic capability on policy level path model. In other words, we want to explore whether reaction of the firms to the policy level adverse effect can exert significant effect on the relationship between the Policy Change and International Performance. Draw on Jantunen et al. (2005), we used four formative indicators measured on scale 1 to 5. Since this measurement model is formative, we thus used the two-stage approach (Hair et al., 2014). The first step is including the moderator variable as a new construct in our model. In the second step we assign the moderator variable and indicators as formative construct. Then we run the standard PLS-SEM algorithm, to obtain the latent variables scores. We import this new data and we redesign our model with new latent variables (Figure 7.9.4.2). Now we need to specify the interaction term that shows the interaction of dynamic capability and IE. Then, we run the PLS-SEM algorithm that yields the results. Finally, we run bootstrapping to test the significance of the interaction term (Figure 7.9.4.2). As you can see in this model the interaction term of dynamic capability and policy has positive and significant effect on International Performance (0.093, t value =1.722). Thus we can conclude that Dynamic Capability construct moderate the relationship between policy level factor on International Performance of the firm. This positive result shows that increase in Dynamic Capability of firm increase the effect of dependent variable which is International Performance.

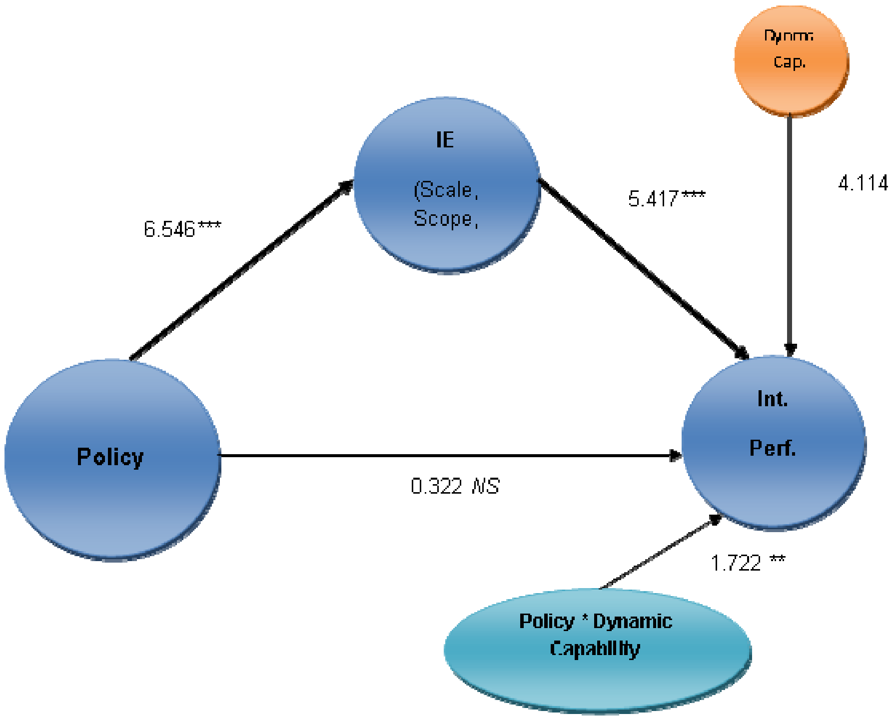

Figure 7.9.4.2 Moderation effect - "Two-stage model"
(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

7.9.5. *Mediating effect analysis*

We also measured the mediating effect of the Dynamic Capability construct between Policy Change and International Performance. To begin the analysis, we first check if there is a significant relationship between Policy Change and International Performance (-0.091, t value= 1.681). Then we include Dynamic Capability in the model (Figure 7.9.5.1). The indirect effect size of Policy Change on International Performance is 0.347 * 0.301 = 0.1044 and its bootstrapping standard deviation is 0.032. The t value of the indirect effect is 0.1044/0.032 = 3.2625, and we can conclude that this relationship through Dynamic Capability is significant at 99% (*p*>0.01). The final step determines the strength of the mediation effect with VAF procedure. The total effect is indirect effect plus direct effect and it is 0.1044 + 0.091 = 0.1954. The VAF equals the indirect effect divided by the total effect and has a value of 0.144/0.1954 = 0.5342. So we can conclude that 53% of the policy change effect on international performance is explained via Dynamic Capability mediator. Because of VAF less than 80%, and more than 20%, it is a partial mediation.

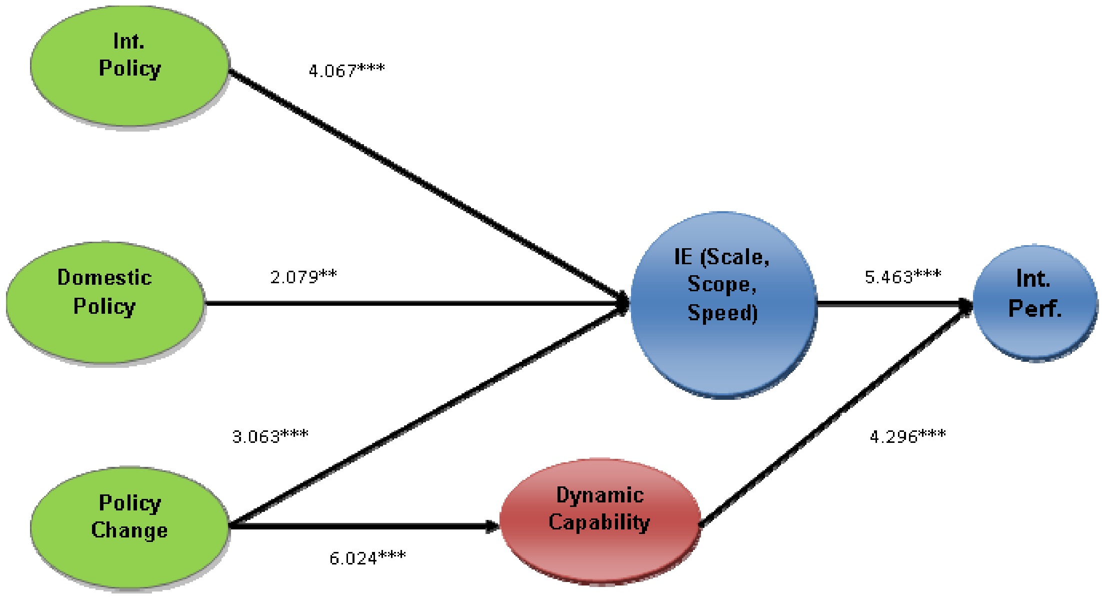

Figure 7.9.5.1 Mediator Model (Dynamic Capability)
(NS= Not Significant, *p< .10, **p < .05, *** p < .01)

7.10. *Testing the proposed research hypotheses*

In this section we test our research hypotheses as they were developed in the previous chapter. As we mentioned before (Cf. Table 6.8.1), these hypotheses are synthesize of the current literature in the field and the exploratory case studies findings. The results of the hypotheses testing are summarized in Table 7.10.1.

- **Eco-Entrepreneur level**

(Hypotheses 1-5b)

Based on the results of PLS-SEM analyses, we identified the effect of Philosophical View, Social Capital and Human Capital on IE and International Performance. IE define scale, scope and speed of internationalization. International Performance consists of financial and non-financial performance indicators and is related to the total performance of the firms in the international markets. Regarding the effect of Philosophical View on IE, we found positive and significant relationship between these two constructs. Although the effect of Philosophical View on international performance is positive, it is borderline non-significant (t value = 1.5615). Thus, we can conclude that the positive effect of Philosophical View on internationalization of firms (Hypothesis1) is *partly supported*. For further analysis, we examined the moderating effect of size and the level of technological development on the model. We could not find significant moderating effect of size on the relationship between Philosophical View and International Performance (Hypothesis 2a), but Hypothesis 2b was *supported* due to the significant effect of the level of technological development as moderator on this relationship (t value=1.963). International experience and energy industry experience are two factors that compose Human Capital construct. Results of our analysis show positive and significant effect of Human Capital on IE and International Performance. Hence, Hypothesis 3 was *supported*. Furthermore, Hypothesis 4 *supported*, since there is highly positive correlation between Social Capital and IE (0.2012, t value = 5.260) and International Performance (0.1322, t value= 3.2113). In the second model, we examined the effect of Social Capital, Human Capital, and Environmental Factors on international Opportunity Recognition Motivation. Results of path model analyses show positive and significant effects of Human Capital on IE (0.1053, t value = 2.2296) and International Performance (0.1001, t value = 2.5769). Thus Hypothesis 5a *supported* in our analysis and we found the similar results for Social Capital and IE (0.1701, t value= 4.2542) and International Performance (0.1616, t value = 3.8483) and these results *support* Hypothesis 5b. Our key finding here is about the significant and positive effect of the Environmental Factors on Opportunity Recognition Motivation and internationalization (IE and International Performance), and these results *support* Hypothesis 5c.

In summary, at this level of analysis we examined the effect of various entrepreneurs' level constructs on the internationalization of firms. These results show that eco-entrepreneurs' mindset for sustainability, international knowledge, experience in the energy field, social capital and formal networking affect IE and firms' International Performance. Moreover, these findings show the positive effect of knowledge and experience of entrepreneur, networking and environmental uncertainty on opportunity recognition motivation and internationalization of companies. Our results, however, suggest that age and size cannot moderate the relationship between the entrepreneurs' motives and internationalization but level of technological development is significant moderator on the effect of Philosophical View on companies' internationalization.

- **Firm Level**

(Hypotheses 6a-12)

  - **Resources**

Since this industry is high-tech and knowledge intensive, results of PLS-SEM analyses show a positive and significant effect of technological resources on IE and International Performance. Hence, Hypothesis9a is *fully supported*. Yet, Foreign Market Knowledge effect on the internationalization is non-significant. Therefore, our findings *could not support* Hypothesis9b. The other key resource in the internationalization of firms in renewable energy industry is financial resources. This industry is capital intensive with high level R&D expenditure. Since Spain adversely affected by financial crisis, we expected that having access to the financial resources present major challenge for companies. Results of our analysis show positive and significant effect of financial resources on IE. But the effect of this factor on international performance is positive and borderline non-significant (t value= 1.4327). Thus, our results *support* Hypothesis8 *partly*.

  - **Networking**

We defined the effect of networking at individual level and firm level. Our results show the positive effect of both types of networking on the internationalization of firms. At individual level PLS-SEM analyses results show significant and positive effect of Networking on IE (t value = 5.1740) and International Performance (t value = 2.0128). Moreover, Firm-Level Network influence on IE (t value = 2.0430) and International Performance (t value = 2.4120) is positive and significant. Therefore, Hypothesis7 and Hypothesis11 are *fully supported*.

- **Commercialization**

Results of PLS-SEM analyses, show positive and significant effect of Commercialization on IE (0.3049, t value = 6.0811). This factor also related positively and significantly to firms' internationalization speed (0.1475, t value = 1.7036). Moreover, Commercialization impacts on International Performance is borderline significant and positive (0.1029, t value= 1.6883). These results, thus, *support* Hypothesis10 about the effect of commercialization on rapid internationalization of firms in this industry. This result explains the rapid internationalization of companies in this specific industry.

- **Business model**

We applied regression analysis to examine the effect of the two types of business models on the international performance of the companies. The results of our analysis show significant difference between customer-side and utility-side business models. The International Performance of companies with utility-side business model is 0.4126 points higher than the customer-side business model. This difference between the two business models is significant at 99% (t value = 3.35). Therefore, we can conclude that Hypothesis12 is *fully supported*. In contrast with our expectation, the effect of utility-side business model on the international performance is positive because it incorporates lower level of risks.

To sum up, at the firm level we could support Hypotheses related to Networking, Firm Level Networking, Technological Resources and Business Model. However, our results could not fully support the effect of Financial Resources on the internationalization of firms. Finally, we checked our model for the effect of the age and size on the internationalization of firms as control variable. Since many companies are established after 2007, this variable cannot show the variation of final results. Although age effect on the internationalization of firms is negative, it is not significant (-0.012, t value = 0.296). We also tested the effect of the firm's size on the international performance and we obtained a positive and almost borderline non-significant result (0.078, t value = 1.414). Therefore, Hypotheses 6a and 6b are *not supported*.

- **Industry level**

(Hypotheses 13a-18)

According to the results of PLS-SEM analyses that were discussed above, different industrial factors affect internationalization of firms in this emerging and high-tech industry. Global Integration and High Level of Concentration in this industry positively influence IE and International Performance. This result is significant for Global

Integration at 99% (t value = 7.2952) and *fully support* Hypothesis17. However, the effect of Level of Concentration on International Performance is not significant (t value = 1.2735), thus we can say that Hypothesis14 is *partly supported*. Knowledge Intensity and Regime of Appropriability are two key constructs that affect negatively IE and International Performance. Although the total effect of Knowledge Intensity is not significant (t value =1.0967), this result *support* Hypothesis15. The negative effect of Regime of Appropriability on the internationalization of firms is significant (t value= 1.6522) and it *supports* Hypothesis18. As we expected, we could not find any significant effect for Isomorphism and Industry Evolution on firms' internationalization and these results *support* Hypothesis13a and Hypothesis16. Finally, according to Hypothesis13b we tested the effect of Level of Technological Development on firms' internationalization and we found significant and positive effect of this factor, as a control variable, on International Performance (t value=3.465). Finally, we could not find the Isomorphism effect significant. Thus, this result *supports* Hypothesis 16.

In sum, following our findings from qualitative analysis and the model suggested by Fernhaber, McDougall, and Oviatt (2007) we tested the effect of industrial level factors on the internationalization of entrepreneurial renewable energy companies. Our findings support the hypotheses as we expected. Since this industry is high-tech industry, the theory has acknowledged that knowledge intensity in this industry is one of the main reasons that draw firms to the foreign markets. However, Spain is one of the leading countries in renewable energy technologies and this factor cannot be a driving force for companies' internationalization. Moreover, in contrary to the current literature, we could not find any significant effect of industry maturity on the internationalization of firms. We expected this result based on the case studies analysis. Thus, as we hypothesized, we found a significant and positive relationship between the level of technological development and international performance. Taking into account that this is an emerging industry, there are many small companies around the world that are collaborating for technological development and for companies it is necessary to be part of this global chain, therefore, we could find positive and strong effect on global integration on the internationalization. Moreover, because of the large number of small companies and intense competition in the small domestic market the level of concentration in this industry is high and this issue is one of the key forces that drive firms to the international markets. However, we could not find significant effect of level of concentration on international performance of firms. In this industry, as high-tech industry, we found a significant and negative effect of Regime of Appropriability on the internationalization of firms. Risk of infringing copy rights and strict patent policies in other countries are significant factor that affects negatively the firms' internationalization. The reason for not finding Isomorphism effective might be related to the characteristic of this industry as emerging and fast changing. Therefore, firms can not follow other companies in the foreign markets.

- **Policy**

(Hypotheses 19-22)

The last PLS-SEM path model examined the effect of Domestic Policy, International Policy and Policy Change on internationalization of firms. International Policy (favorable policy of host country) is one of the key driving forces for internationalization of firms. This factor is related positively and significantly to IE

(0.2048, t value = 3.8204) and International Performance (0.0970, t value = 3.1082). Thus, Hypothesis20 is *fully supported*. However, we found negative effect for Domestic Policy on internationalization of firms. Its effect on *IE* (-0.0999, t value = 2.1114) and International Performance (-0.0473, t value= 2.0452) is significant and *support* Hypothesis 19. According to the context of study and radical renewable energy policy change in Spain, we examined the effect of Policy Change on firms' internationalization. The results show Policy Change impacted the internationalization of firms negatively. This result is significant for both IE (-0.2074, t value= 3.4950) and International Performance (-0.0982, 3.2043) at 99%. Therefore, Hypothesis 21 is *supported* by PLS-SEM results.

For further analysis, we tested the effect of Dynamic Capability on Internationalization of firms (Jantunen et al., 2005). We tested the effect of this construct as both moderator and mediating variable. Moderator analysis shows positive and significant effect of interaction term (0.093, t value =1.722). We also examined the mediating effect of Dynamic Capability between Policy Change and International Performance. Results of mediating analysis show that the indirect effect of Policy Change on International Performance through Dynamic Capability is positive and significant (0.1044, t value = 3.2625). These results *fully support* Hypothesis22.

In a nutshell, PLS-SEM analyses results support our hypotheses about the effect of domestic and international energy policy scheme on the internationalization of firms. Although favorable policy scheme in international markets draw firm to the foreign markets, unfavorable policy scheme affect firms' international behavior negatively. Renewable energy policy change in Spain and terminating all supportive policies is one of the main challenges in this industry and the analysis result shows the negative effect of policy change on the internationalization of companies. Our finding shows significant mediating effect of dynamic capability on the international performance. Applying Size and Age as control variables although show positive effect for Size (0.095) and negative effect for Age (-0.047), the final result is non-significant for age (t = 0.823) and borderline non-significant for size (t = 1.524).

Table 7.10.1 Summary of the Research Results				
Level of analysis	**Constructs**	**Hypotheses**	**Description**	**Results**
Eco-Entrepreneur	**Values and Motivations**	**Hypothesis 1**	Mix of non-financial motives (internal commitment to make the world a better place to live and contribution to the global market) and financial motives will affect positively internationalization of firms.	**Partly Supported**
		Hypothesis 2a	The effect of eco-entrepreneurs' philosophical perspective on the internationalization of firms will be higher for smaller firms than larger firms.	**Not Supported**
		Hypothesis 2b	The effect of eco-entrepreneurs' philosophical view on the internationalization of firms is higher for firms with lower level of marketability of their products (or technological development) than firms with higher level of marketability.	**Supported**
	Human Capital	**Hypothesis 3**	Eco-entrepreneurs' foreign work and experience in energy sector positively affect the internationalization of firms.	**Supported**
	Social Capital and Network	**Hypothesis 4**	Eco-entrepreneurs' networking capability positively affects internationalization of the firms.	**Supported**
	Opportunity recognition motivation	**Hypothesis 5a**	Eco-entrepreneurs' international skills and experience positively affect the international opportunity recognition and exploitation.	**Supported**
		Hypothesis 5b	Eco-entrepreneurs' formal and informal network positively affects international opportunity recognition and exploitation.	**Supported**
		Hypothesis 5c	Environmental uncertainties will positively affect the international opportunity recognition and exploitation.	**Supported**

Table 7.10.1 Summary of the Research Results				
Level of analysis	**Constructs**	**Hypotheses**	**Description**	**Results**
Firm	**Age and Size**	**Hypothesis 6a**	Higher age of the renewable energy companies is negatively associated with their international performance.	**Not Supported**
		Hypothesis 6b	Higher size of the renewable energy companies is positively associated with their international performance.	**Not Supported**
	Interaction between large and small firms	**Hypothesis 7**	Collaboration between the large and small companies facilitates the internationalization of the firms and positively affects their internationalization.	**Supported**
	Financial Resources	**Hypothesis 8**	Need for financial resources and funding encourage renewable energy firms to internationalize.	**Partly Supported**
	Technological Knowledge	**Hypothesis 9a**	Technological resources are positively associated with internationalization of renewable energy companies.	**Supported**
		Hypothesis 9b	Foreign market knowledge positively affects internationalization of renewable energy companies.	**Not Supported**
	Commercialization	**Hypothesis 10**	Need for commercialization of products positively affect renewable energy firms' internationalization.	**Supported**
	Networks	**Hypothesis 11**	Networking (formal and informal) affects positively internationalization of renewable energy companies.	**Supported**
	Business Model*	**Hypothesis 12**	The utility-side business model impacts positively/negatively the international performance of renewable energy companies.	**Supported**

Table 7.10.1 Summary of the Research Results

Level of analysis	Constructs	Hypotheses	Description	Results
Industry	Technological Evolution	Hypothesis 13a	There is no significant relationship between the level of industry evolution and internationalization of the renewable energy companies.	Supported
		Hypothesis 13b	In renewable energy industry companies with more mature technologies are more willing to internationalize.	Supported
	Level of concentration of the industry	Hypothesis 14	High level of industry concentration and existence of many new small ventures affect positively the internationalization of the firms in this industry for finding new foreign markets.	Partly Supported
	Knowledge intensity	Hypothesis 15	Knowledge-intensity of renewable energy industry cannot be positively related to the internationalization of firms.	Supported
	Isomorphism	Hypothesis 16	Local renewable energy industry internationalization cannot positively affects the internationalization of other firms in renewable energy industry.	Supported
	Global integration	Hypothesis 17	Global integration of the renewable energy industry affects positively the internationalization of the renewable energy companies.	Supported
	Patent and Copy (Regime of Appropriability)	Hypothesis 18	The strong regime of appropriability in the target markets affects negatively the internationalization of renewable energy companies.	Supported
Policy	Supportive Domestic Political Scheme	Hypothesis 19	Unsupportive renewable energy scheme in the domestic market, affect negatively the internationalization of companies.	Supported

Table 7.10.1 Summary of the Research Results				
Level of analysis	**Constructs**	**Hypotheses**	**Description**	**Results**
	International Policy	**Hypothesis 20**	Supportive renewable energy policy framework in the host country, affects positively the outward internationalization of the renewable energy companies.	**Supported**
	Policy Change	**Hypothesis 21**	Renewable energy policy change has affected the internationalization of the renewable energy companies positively/or negatively.	**Supported**
	Dynamic Capability	**Hypothesis 22**	Dynamic capability of firms positively mediates the relationship between policy change effect and international performance.	**Supported**

*The effect of business model on the internationalization of firms is tested through regression with categorical predictors

-How to play music may be known. At the commencement of the piece, all the parts should sound together. As it proceeds, they should be in harmony while severally distinct and flowing without break, and thus on to the conclusion. "Confucius"

8. *Discussion and Conclusion*

8.1. *Introduction*

This study explores and examines the new topic of *international energy entrepreneurship* (IEE) at the intersection of two important lines of research: international entrepreneurship (IE) (Oviatt & McDougall, 2005) and sustainable entrepreneurship (Dean & McMullen, 2007; Wüstenhagen & Wuebker, 2011b). The focus of this thesis is on the entrepreneurial internationalization of renewable energy companies, and it discusses the driving forces for and barriers to internationalization at four levels of analysis: eco-entrepreneur, firm, industry, and policy.

This chapter mainly deals with the objectives of our study as described in the first chapter. Thus, the aim of this study was to answer the following questions:

> *How and why do renewable energy companies enter international markets? How do IE and sustainable entrepreneurship contribute to the international development of renewable technologies?*

However, we need to narrow down these main research questions. By concentrating on renewable energies, we aim to explore to what extent and how firms operate internationally as an act of entrepreneurship in this industry. Thus, we summarize the research questions as follows:

- *Why is the internationalization of renewable energy companies important?*

- *What are the most important factors that drive and/or hinder the development of renewable technologies in international markets?*

- *How and why do these factors influence renewable energy companies' international development?*

- *To what extent do companies within the renewable energy industry use internationalization as a strategy to overcome barriers?*

- *How and why do renewable energy companies enter foreign markets?*

- *What factors differentiate the process of entrepreneurial internationalization in renewable energy companies and why?*

In this chapter, first we discuss the notion of IEE, and then we turn to the current gaps in the literature and show how this study is designed to address the lack of knowledge in both the IE and sustainable entrepreneurship literature. Finally, we discuss the key contributions of the study and future lines of research.

8.2. *International Energy Entrepreneurship*

Environmental degradation and market imperfections provide significant entrepreneurial opportunities for entrepreneurs to achieve profitability through the development of renewable energies (Cohen & Winn, 2007; Dean & McMullen, 2007). This issue represents a new interesting line of research, defined as *energy entrepreneurship* (EE) (Wüstenhagen & Wuebker, 2011). As the role of entrepreneurs in this process has remained relatively unexplored, it is therefore important to consider the role of entrepreneurial activity in the development of breakthrough energy technologies in both start-up and established firms (Moore & Wüstenhagen, 2004; Wüstenhagen & Teppo, 2006; Wüstenhagen & Wuebker, 2011).

However, here the initial question is why we need to study the entrepreneurial internationalization of renewable energy companies. In the globalized world, which is characterized by environmental challenges that adversely affect the lives of billions people, we need renewable energy technologies to develop further and thrive in the worldwide markets. By taking advantage of the IE literature, we want to understand how companies and entrepreneurs can successfully develop their entrepreneurial activities across borders to tackle these global environmental challenges. However, the extant literature on IE in the clean energies sector is still narrow, and further development is needed to support EE as a promising field and establish a new research subject: *international energy entrepreneurship* (IEE).

This study was designed to investigate intensively the internationalization of renewable energy companies by taking advantage of IE and sustainable entrepreneurship theories. Although studies on IE have mainly concentrated on high-tech and knowledge-based industries, such as IT (Buckley & Hashai, 2005; Etemad, Wilkinson, & Dana, 2010; Gabrielsson & Gabrielsson, 2004; Kuivalainen et al., 2012; Loane, Bell, & McNaughton, 2006; Reuber & Fischer, 2011) and biotechnology (Jones, Wheeler, & Dimitratos, 2011), studies of clean and sustainable industries are still lacking. Without doubt, we think that the distinctive characteristics of this industry need further attention regarding eco-entrepreneurs' incentives, technology-based firms, and policy sensitivity.

8.3. *International entrepreneurship and sustainable entrepreneurship; key gaps in the literature*

To develop the notion of IEE, we have drawn on the IE and sustainable entrepreneurship literature at four levels of analysis: *eco-entrepreneur*, *firm*, *industry*, and *policy*. In what follows, we present the gaps identified in knowledge in both fields and the contributions our findings make in addressing them.

- **Eco-entrepreneurs**

At the eco-entrepreneur level, except for some conceptual research on different types of eco-entrepreneurs (Linnanen, 2002; Post & Altman, 1994; Schaltegger, 2002; Schaltegger & Wagner, 2011; Taylor & Walley, 2004; Walley & Taylor, 2002), no study has yet empirically examined eco-entrepreneurs' motivations and value systems driving them to engage in sustainability-related businesses. Although the IE literature emphasizes the importance of the philosophical standpoints of entrepreneurs in the internationalization of firms (Cavusgil, 1984; Covin & Slevin, 1991; Leonidou et al., 1997), this subject has been under-investigated; indeed, only 4.5% of studies on IE are at the entrepreneur level and there are few empirical studies that have examined this field (Jones et al., 2011). This research has employed case studies and a survey to explore and examine the motivating factors for eco-entrepreneurs and the effect on the internationalization of firms. Moreover, the concept of opportunity recognition is quite new to the IE (Jones et al., 2011) and sustainable entrepreneurship literature (Dean & McMullen, 2007; Pacheco et al., 2010). This relatively unexplored field is tested for the impact of human capital, social capital, and environmental factors (Ruzzier et al., 2007) on opportunity recognition.

Moreover, in the literature there are no empirical studies that analyze the effect of changes in entrepreneurs' incentives on firms' internationalization decisions. Size and level of technological development are two key factors that are applied to investigate the effect of firms' expansion and the marketability of the final product on the firms' internationalization behavior.

- **Firm**

Several firm-level factors affect the internationalization process in the renewable energy industry. In this study, we have mainly focused on age, size, resources, commercialization, networks, and the business model.

  - **Age and Size**

In the business sustainability literature, the results of studies are contradictory in terms of the importance of age and size in adopting green strategies (Dibrell, Craig, & Hansen, 2011b). The initial body of knowledge regarding environmental and green strategies developed in relation to the incumbent and large firms (Ambec & Lanoie, 2008; Porter & Linde, 1995; Porter, 1991; Senge, Carstedt, & Porter, 2001; Sharma & Verdenburg, 1998), and predominantly discussed the positive influence of green and environmental strategies on incumbent firms' performance and competitiveness. However, being early in the organizational life cycle makes it more probable that greening strategy will be to accepted as positive, leading to a competitive advantage (Dibrell et al., 2011b; Gibbs, 2009). As a result, in this study we have focused on both new entrants and established firms to understand how these two types of firms differ.

Moreover, IE research has mainly focused on new ventures and small companies in relation to the rapid pace of internationalization (Oviatt & McDougall, 2005). Some studies have also discussed entrepreneurial internationalization in the subsidiaries of MNEs (Prashantham & Birkinshaw, 2008; Zahra & Garvis, 2000). Although it seems that incumbents react to new trends in the market and are restricted by their existing assets (Ketola, 2007), Hockerts and Wüstenhagen (2010) assert that established firms

(Greening Goliath) as well as new entrants (Emergent Davids) play significant roles in the sustainable transforming of green industries. Thus, in this study we have addressed both start-ups and incumbents' roles in the transformation toward sustainability of the renewable energy industry and their co-evolution in international development. Furthermore, we have examined interactions and partnerships between small firms and large companies aimed at effective internationalization.

- **Business Model**

One of the less studied subjects in sustainable entrepreneurship and IE is the business model. Business models are critically important in explaining how a company makes money and meets the expectations of stakeholders. In particular, for sustainability purposes, hybrid business models are needed to deal with both economic and sustainability objectives. The current sustainability literature shows that the role of sustainability in a firm's business model and its application in real business is under-studied and needs further investigation (Belz & Binder, 2015; Kolk & van de Buuse, 2012; Lüdeke-Freund, 2010; Richter, 2012). We have addressed this gap in the literature by taking advantage of the EE literature in terms of different types of business models in the renewable energy industry. One study in Switzerland, which assessed what business models might succeed in the global market, revealed that among three generic business models, the service-driven business model is much more preferred by investors than business models that suggest the lowest price or best technology (Loock, 2012). In another study, two types of business models were discussed: the utility-side business model and the customer-side business model. Utility-side business models are based on fewer large projects, developed for commercial purposes. In contrast, customer-side business models are based on a large number of small projects and are still in the early stages of development. Although studies show the advantages of the utility-side business model, such as the potential for higher revenue and lower risk, the customer-side business model needs further attention for a more sustainable future (Richter, 2012). Moreover, there is a lack of research concerning eco-entrepreneurs' preference for each type of business model and the effect of this on the internationalization of firms (Loock, 2012; Richter, 2012). In addition, the IE literature has not discussed the importance of business models for the internationalization of firms although this issue is particularly important in the renewable energy industry, in which companies need to address both sustainability and economic objectives for internationalization. In this study, we have explored the effect of business models on the internationalization behavior of several case study firms. We have also empirically tested how different types of business model may affect firms' internationalization and international performance.

- **Knowledge**

Existing IE studies generally admit the importance of technological knowledge (Bell, Crick, & Young, 2004; Clercq, Hessels, & Stel, 2008; Kuemmerle, 2002; Helena Yli-Renko et al., 2001) and foreign market knowledge (Eriksson, 2003; Musteen & Datta, 2011; Tolstoy, 2009; Zhou, 2007) for the internationalization of firms. Although renewable energy is a knowledge-intensive industry, there is a gap in the literature concerning understanding of the impact of technological knowledge and market knowledge on firms' performance in clean and sustainable industries. In addition, the extant literature in sustainable entrepreneurship needs to address the effect of technological knowledge on the development of this industry. In this study, drawing on the IE literature, we have studied and tested the impact of technological and market knowledge on the international development of firms. This issue is particularly important in the context of Spain, as one of the leading countries in renewable energy technologies. The outcomes of this research can help us understand how and why knowledge acquisition and exploitation attract the interest of renewable energy companies toward foreign markets.

- **Commercialization**

The commercialization of new energy technologies is a slow and complex process (Negro et al., 2012) with various determinants at different stages of technological diffusion. In this study, we have focused on the commercialization of renewable energy technologies because this topic is underrepresented in the existing literature. Thus, in this study, first we have addressed this gap by exploring renewable energy diffusion and commercialization to identify systemic problems in the diffusion and commercialization of these technologies. Then, we have looked at the possible solution to tackle the constraints and limitations, and thus accelerate the commercialization process in this industry. Drawing upon the IE literature and previous studies in this industry (Bjørgum et al., 2013; Løvdal & Moen, 2013), we have examined the effect of commercialization on the internationalization of firms.

- **Social and financial resources**

The effect of networking and financing on the internationalization of firms has been thoroughly studied in the IE literature. The existing literature underscores the importance of formal and informal networks in the internationalization of firms (Buciuni & Mola, 2013; Che Senik, Scott-Ladd, Entrekin, & Adham, 2011; Coviello & Cox, 2006; Etemad & Lee, 2003). However, the effect of such networks on opportunity recognition in international markets needs further investigation.

Moreover, the renewable energy industry, as a high-tech industry, is capital intensive. Limited access to financial resources is one of the main reasons that firms may be attracted to international activities (Løvdal & Aspelund, 2011; Løvdal & Moen, 2013). This issue is more critical in Spain as the country has been adversely affected by the financial crisis. This study inspects the effect of financial and social resources on the internationalization decision of firms to fill the knowledge gap concerning the implication of these two resources in the IE and sustainable entrepreneurship literature.

- **Industry**

Sustainable entrepreneurship is a new line of research in entrepreneurship and there is a lack of empirical research in this field. In this literature, there is a knowledge gap concerning the effects of industrial factors on entrepreneurial activities. The IE literature has widely considered entrepreneurial activities in high-tech industries, such as IT (Gabrielsson & Gabrielsson, 2004; Kuivalainen et al., 2012; Majumdar et al., 2010b; Nummela, Puumalainen, & Saarenketo, 2005) and bioscience (Jones et al., 2011). There are also some studies on IE in low-tech industries (Andersson et al., 2006; Evers, 2010). However, there is a lack of research in emerging industries, such as renewable energy. Furthermore, the current studies in IE discuss firms in a certain industry, but not the effect of industrial factors on the internationalization of firms. This study concentrates on the effect of six industrial factors on the internationalization of firms in the renewable energy industry to address the topical knowledge gaps.

- **Policy**

The international business (IB) literature shows the impact of hard institutional factors on firms' internationalization in general terms and from a macro perspective. These studies mainly concern the effect of supportive policy in the host countries on the international activity of firms (Czinkota & Ronkainen, 2005). In the IE field , except for some conceptual papers (Acs et al., 1997; Wright, Westhead, & Ucbasaran, 2007), there are few studies that have empirically tested the effect of policy on international expansion at the firm level of analysis (Korhonen et al., 1996).

The renewable energy industry is a policy-driven industry; therefore, deliberate and effective policies foster the development of renewable energies across borders. Current studies of this industry have primarily discussed the effectiveness of various policies in the development of renewable technologies (Bürer & Wüstenhagen, 2009; de Alegría Mancisidor, Díaz de Basurto Uraga, Martínez de Alegría Mancisidor, & Ruiz de Arbulo López, 2009; Lewis & Wiser, 2007). However, these studies are limited to a focus on technological development and mainly concentrate on certain policy schemes in a specific country. The development of this industry across borders not only depends on the policy scheme in the domestic market but also in the target markets (Korhonen et al., 1996; Liu & Goldstein, 2013). In this study, the effect of both domestic and foreign energy policy schemes on the internationalization decision of firms has been assessed to address the knowledge gap in both IE and sustainable entrepreneurship.

Finally, we have tested how companies can align themselves with the current renewable energy policy change in Spain. To understand how companies adapt to the new environmental situation, we have applied the dynamic capabilities perspective (Teece, Pisano, & Shuen, 2016). In the IE literature there is lack of knowledge regarding the contribution of dynamic capabilities theory to the entrepreneurial internationalization of firms (Jantunen et al., 2005; Zucchella & Scabini, 2007).Thus, in this study we have explored and analyzed the effect of the policy change on the companies' internationalization by applying this novel theoretical framework. All the aforementioned gaps in the literature are summarized in Table 8.3.1.

Table 8.3.1 Key Gaps in the literature	
Gap Identified	**Need Addressed**
Lack of study about the importance of sustainability issues in the internationalization of entrepreneurial firms.	Drawing upon sustainable entrepreneurship literature we discussed about internationalization of companies in the renewable energy industry.
Eco-entrepreneur	
No empirical studies about the eco-entrepreneurs' values and motivations.	Our empirical results shows the importance of eco-entrepreneurs' motivation and its effect on the internationalization of firms.
Lack of literature on dynamism of eco-entrepreneurs' values change.	Investigating about the effect of firms' age and size on their value system and motivation.

Table 8.3.1 Key Gaps in the literature	
Gap Identified	**Need Addressed**
Lack of empirical studies to examine entrepreneurs' philosophical stand point effect on the internationalization of firms.	Examining the effect of financial and non-financial incentives on entrepreneurial internationalization of the renewable energy companies.
Process of opportunity recognition is relatively unexplored in both IE and sustainable entrepreneurship literature.	Exploring and empirically testing the role of human capital, social capital, and environmental factors in the opportunity recognition.
Firm	
Contradictory results in the literature about the effect of size and age of the companies in adopting sustainable strategy and its effect on their success in international markets.	This study examine the relationship between age, size and eco-entrepreneurs' incentives and internationalization behavior.
In the literature there is no empirical study to shows the relationship between the MNCs and small firms can partner effectively in order to develop internationally.	Assessing the extent of effective partnership between small and large companies for developing over the borders. This result can explain *co-opetition* theory.
Sustainable entrepreneurship literature and IE presume about the key role of business models in the international development of renewable energies, however, there is no empirical studies to shows how choosing business models may affect internationalization of the firms.	Need to examine the effect of choosing the business model on the internationalization and international performance of renewable energy companies.
Knowledge gap in sustainable entrepreneurship literature about the technological and market knowledge effect on the firms' performance.	This study provides empirically tested answer about the impact of technological and market knowledge on firms' performance.
Lack of empirical study about the effect of formal and informal networking on the opportunity recognition in international markets.	Based upon IE literature, the effect of networking on the internationalization of renewable energy companies is examined.
Investigating about the effect of financial resources on the internationalization behavior of renewable energy companies.	The extent to which need for capital encourages renewable energy companies to internationalize.
Lack of study about commercialization process and its drawbacks in renewable energy industry.	Need for looking at commercialization process in this specific industry and how and why firms overcome their limitations.
Industry	
Limited number of studies about the role of the environmental factors and industry on the internationalization of entrepreneurial companies.	We empirically tested the effect of industrial factors on the entrepreneurial internationalization of companies in the renewable energy industry.
Policy	

Table 8.3.1 Key Gaps in the literature	
Gap Identified	**Need Addressed**
Need for empirical study to assess the effect of policy scheme on the development of renewable energy companies. Moreover, there is a knowledge gap in the current IE literature about the effect of favorable policy in the host and target markets on the internationalization of firms.	This study explores and tests the relationship between domestic and foreign policy and the internationalization decision of firms.
Lack of empirical study in IE and sustainable entrepreneurship about how and why change of policy affect the development of firms particularly in international markets and what is the companies' reaction to the change.	We addressed the need in the literature to analyze the effect of policy change on the internationalization of firms and how dynamic capabilities framework can justify companies' alignment to the new policy scheme.

8.4. *Findings of the study at the entrepreneur, firm, industry and, policy levels*

This section compiles the results of our study from both the qualitative and quantitative analyses. To gain a proper understanding of the reasons for internationalization in the renewable energy industry, we contrast the international operations of the case study and surveyed firms, drawing on IE and sustainable entrepreneurship theories. We also discuss the supporting and contradictory results from the qualitative and SEM analyses in terms of eco-entrepreneurs, institutional settings, industry structural factors, and firm-level variables. A summary of the final results and key findings is provided in Table 8.5.1.

- **Eco-entrepreneur**

The comparative results of the cases show both non-financial and financial incentives motivate the eco-entrepreneurs. They follow their inner values to improve sustainability and help people at the base of the pyramid by providing renewable sources of energy.

Eco-entrepreneurs' philosophical perspective is not necessarily restricted to their home country's boundaries. They are deeply preoccupied with finding a universal solution to prevent global warming and environmental degradation. They consider humankind all over the world, such as people who do not have access to inexpensive and reliable sources of energy. Moreover, eco-entrepreneurs believe that the impact of developing sustainable energies in a certain country could influence all the citizens of the world. For example, producing lower levels of CO_2 in Spain also has a positive impact on the global level of greenhouse gas emissions. Thus, we can conclude that eco-entrepreneurs' motivation and incentives constitute a global value for making this world a better place in which to live and we can consider this a global inner value. This result is exactly in line with Gibbs's (2009) and Isaak's (2002) view that eco-entrepreneurs demonstrate internal commitment to improving the world. However, we can identify different levels of internationalization in these companies based on their incentives, size, and technological maturity.

Based on the case study findings, we examined the effect of eco-entrepreneurs' incentives on the internationalization and international performance of firms. Single financial incentives, such as *making a profit*, and non-financial incentives, such as *sustainability* and *making the world a better place to live in*, appear to have no significant impact on the firms' internationalization. In contrast, a mix of both financial and non-financial motives is positively related to the internationalization of firms (IE). However, we are unable to find a strong significant relationship between *philosophical view* and the international performance of firms. Thus, non-financial motives and financial incentives together significantly affect firms' internationalization. According to this result, we can observe that eco-entrepreneurs in the renewable energy industry are not similar to typical entrepreneurs, and their sustainability concerns affect their (international) entrepreneurial orientation (Kuckertz & Wagner, 2010). Moreover, it seems that eco-entrepreneurs' global inner value encourages them to enter international markets. With this result, we can connect two streams of literature – sustainable entrepreneurship and IE – and describe how and why eco-entrepreneurs' sustainability values influence their perceptions of internationalization. This finding follows prior IE studies that underscore the effects of entrepreneurs' philosophical standpoint on the internationalization of firms (Cavusgil, 1984; Covin & Slevin, 1991; Leonidou et al., 1997).

Despite the non-significant moderating effect of size on the internationalization of firms, the level of technological development negatively and significantly moderates the relationship between philosophical perspective and international performance. This means that when the level of the marketability of a technology increases, the effect of philosophical perspective decreases. This result provides support for the model recommended by Schaltegger (2002, 2011). This model shows the priority of sustainability objectives of eco-entrepreneurs, the organizational effects of which can shift in the course of firm growth, which increases the market effect. In other words, after the entry of a sustainable technology to a mass market, financial issues are more important than non-financial objectives, such as sustainability, environmental, and social issues. This is in line with the findings from the qualitative analysis that sustainability issues are more important for firms in the initial stage of technological development, such as wave energy, than for firms with mature technologies, such as wind energy.

Apart from the subjective attributes of eco-entrepreneurs, such as internal commitment and inner values, we have tested the effect of general traits of entrepreneurs, such as internationalization knowledge, professional experience, and education, on firms' internationalization. Evidence from the cross-case analysis illustrates that eco-entrepreneurs' international education and experience influence the international activity of companies. As we observed in our cases, international education develops the international skills of eco-entrepreneurs to confront cultural differences. It also helps them improve their skills for making contact with people over their country's borders. In some cases, such international experience and skills helps them find future business partners or customers. The results of the quantitative analysis show that energy industry experience and international experience mainly define the human capital construct. The result for the total effect shows the significant effect of human capital on IE and the international performance of firms. Surprisingly, in contrast to our expectations and prior studies (Chetty & Campbell-Hunt, 2003; Eriksson, 2003; Kuemmerle, 2002; Reuber & Fischer, 1997), international education is not a significant indicator for the human capital construct. However, we find a significant result for the energy experience indicator. This result shows the importance of knowledge and the capability of entrepreneurs and the management team in the energy sector for the international development of companies.

The effect of social capital on the internationalization of firms has been widely studied in the IE literature (Coviello & Cox, 2006; Coviello & Munro, 1997, 1995; Fuller-Love, 2009; Mort & Weerawardena, 2006; Rasmussan et al., 2001a; Lianxi Zhou et al., 2007). As the renewable energy industry is a highly institutionalized industry, and its development is more dependent on formal networks and institutional relationships, we expected formal networks, in comparison to informal networks, to have a much more significant effect on the internationalization of firms. The results from the case studies reveal that both types of networks, formal and informal, positively influence the internationalization process. However, as some case firms are related to certain institutions, such as *Kic InnoEnergy* or the *Repsol Foundation*, the results are tentative and cannot assure us about the significance of formal networks in the internationalization of firms. The survey results demonstrate the effects of both formal and informal networking on the internationalization of firms. Personal contacts, for example friends and family, and formal networking with government agencies, at fairs, and with customers are significant factors forming the social capital construct. Finally, the quantitative results show that in this particular industry both formal and informal networking influence the internationalization of firms and social capital positively, and are strongly associated with IE and international performance.

Opportunity recognition is also one of the less studied subjects in relation to IE (Coviello, 2015; Jones et al., 2011), and in the sustainable entrepreneurship literature, no practical research has studied how and why eco-entrepreneurs take advantage of opportunities provided by environmentally relevant market imperfections in clean industries (Cohen & Winn, 2007; Dean & McMullen, 2007; Pacheco et al., 2010). The results of the qualitative analysis suggest that human capital and social capital facilitate the process of opportunity recognition. International education and professional experience, personal and informal networks, and also formal contacts with government agencies and institutions are the factors identified that affect the process of international opportunity exploration and exploitation. Path model analysis shows that international experience and energy industry experience are significant indicators for the *human capital* construct. It also shows that formal and informal networking and environmental issues (except technological factors) are significant indicators that define the constructs *social capital* and *environmental factors* respectively. The direct and indirect effects of the aforementioned constructs on IE and international performance are positive and significant. In contrast to the outcome of qualitative analysis, we do not find any significant result for international education. These findings call for further attention to be paid to the importance of environmental factors and context in the process of opportunity development. Here, international uncertainties in different contexts are not so much barriers to be overcome, but rather create a context for the development of new opportunities. This might explain how the energy policy setting in which the international opportunity is embedded affects the behaviors of eco-entrepreneurs. This result is in line with previous studies on national context (Mainela & Puhakka, 2008), such as the social setting as a driver of international opportunities and value creation (Baker & Nelson, 2005).

- **Firm**
    - **Age and Size**

There are contradictory results concerning the link between the size and age of companies and their internationalization. Evidence from the small and large case study firms shows that although smaller firms are more agile and flexible in adopting an internationalization strategy and they enter the foreign markets more rapidly, larger firms are more successful in foreign markets and they perform better internationally. To investigate the effects of these two factors on the internationalization of firms further, we have examined the effects of size and age on *international performance*. The results of the quantitative analyses indicate that despite the negative effect of age on international performance, its impact is not significant. However, there is a positive effect of size on the international performance of firms, which is weakly significant. We can thus conclude that larger firms' international performance is higher because of their access to a wider range of resources and capabilities, such as financial and technological resources.

- **Interaction between large and small firms**

Interaction between large and small firms seems to be unavoidable in the renewable energy industry as large firms face an inherent challenge in terms of radical innovation (Christensen, 1997), and small firms suffer from a lack of resources, knowledge, and capability to survive (Peña, 2002b). The results from the case studies suggest that interaction between large and small companies not only contributes to the transformation of the renewable energy industry (Hockerts & Wüstenhagen, 2010), but can also facilitate and accelerate the process of internationalization. Large companies in international markets need reliable sub-suppliers that follow them over national borders to participate in international projects. On the other hand, small companies are engines of innovation and variations in technology. These companies are the sources of new technologies and partnering with them helps larger firms to adopt disruptive and radical technologies. Conversely, interaction between small and established firms helps the international progress of small companies as the large companies provide them with requisite knowledge and capabilities, such as market knowledge, reputation, and networks, assisting them to enter foreign markets. We can call this *passive internationalization* as it might be possible that small companies only wish to be active in the domestic market, but are in some way obliged to follow large companies into international markets to maintain their partnerships with these large firms. In summary, the results of the case studies show that in the renewable energy industry, interaction between large and small companies is essential for the further development of this industry in international markets. We have examined the link between the *interaction of large and small firms* (firm-level network) and *internationalization* in the path model. The results support the positive and significant effect of this construct on IE and international performance. This outcome is particularly important in the renewable energy industry, which is mainly dominated by large utility companies. Thus, small high-tech firms need to interact with them for further international development. However, the findings of the qualitative analysis suggest that this collaboration is challenging, especially for small firms, due to their lack of resources, competition with large companies, the (lack of) willingness of large companies to collaborate, and lack of flexibility and speed.

This phenomenon can be explained by the notion of the *coopetition strategy* (Bengtsson & Kock, 2014; Ritala & Tidström, 2014; Ritala, Golnam, & Wegmann, 2014). This new line of research justifies the collaboration between competing firms in the quest for improved performance and innovation results. This strategy can be attributed to the interaction between small and large firms. Following topical studies in this field (Ritala, 2012), the results of our study provide new evidence concerning the positive effect of a coopetition strategy on the innovation and international market performance of the renewable energy companies. This implies that the success of firms' coopetition strategy depends strongly on the industrial context. In the renewable energy industry, because of global integration and technological novelty, a higher level of risk is incorporated that can create a unique industrial context.

- **Resources and capabilities**

The resource-based perspective (Barney, 1991, 2001; Barney & Clark, 2007) suggests that firms' tangible and intangible resources contribute widely to the survival and growth of entrepreneurial firms (Cooper et al., 1994). Drawing on this theory and the IE literature, the results from the multiple case studies show that financial resources are one of the primary constraints for renewable energy companies. Evidence from the case studies suggests that that accessing international markets is a well-accepted solution for companies in gaining access to funding and financial support. We empirically tested whether the need for financial support encourages firms to enter foreign markets. Our findings indicate that the relationship between financial needs and the internationalization of firms (IE) is positive and significant; however, its effect on international performance, although also positive, is almost non-significant (t=1.4327). This result follows prior studies of marine and wave energy in Norway, showing that internationalization is a common strategy for overcoming the need for financial support (Bjørgum et al., 2013; Løvdal & Aspelund, 2011; Løvdal & Neumann, 2011). This result implies that the need for capital is one of the key drivers for the internationalization of firms. This issue is particularly important in the context of Spain, where the economy is still struggling with the effects of the financial crisis and budget deficit.

As the renewable energy industry is a high-tech industry, in this study we investigated the effect of technological knowledge on the internationalization of firms. The multiple case studies show inconsistent results concerning the importance of technological knowledge for the internationalization of firms. Although the case study managers and entrepreneurs claim that access to the latest technology is not the main reason for entering foreign markets, in the vast majority of cases, they already collaborate with international partners on technological development. Further analysis of the cases suggests that we should differentiate between technological knowledge and technological development. Therefore, in the empirical analysis we first examined the effect of technological knowledge, such as R&D expenditure, on the internationalization of firms, and then at the industry level of analysis we asked companies if technological development draws them to international markets. The results show that technological resources are positively and significantly associated with internationalization (IE) and international performance. However, the effect of technological development on the internationalization of firms is negative and significant, and we find no significant effect for international performance. We can therefore conclude that as this industry is high-tech, technological knowledge is a key resource that determines the internationalization of firms. This result is in line with previous studies in the IE literature concerning knowledge-intensive industries (Autio et al., 2000; Jones et al., 2011; Nummela et al., 2005; Reuber & Fischer, 2011; Spence, 2003). Our exploration of the effect of knowledge development on the internationalization of firms is based on Fernhaber, McDougall, and Oviatt's (2007) model, which examines the effect of industrial factors on the internationalization of firms. The negative and significant result suggests that looking for the latest technologies and being close to technological centers are not factors that draw firms to the international markets as Spain is one of the leading countries in this field and companies do not need to seek the latest technologies over the border.

Commercialization is another significant capability. In accordance with the literature on clean energies, the case studies show that the slow pace of the commercialization process is a critical problem (Negro et al., 2012). The comparative multi-case study analyses suggest that financing and patenting are key factors that decelerate the commercialization. Internationalization is an accepted strategy in the case study firms to speed up the entry of final products to markets. We empirically examined this hypothesis in the final part of our analysis. The end result confirms that the need for commercialization is positively and significantly associated with IE and international performance. These results demonstrate that internationalization is a common practice for clean energy companies in accelerating their commercialization. However, in relation to the commercialization construct, we find no significant effect for funding as a driver of internationalization, the significant indicators being “having partnerships with companies in other countries” and “entering markets with a supportive policy.” This result suggests that mere financial challenges do not encourage firms to engage in internationalization, whereas having partnerships with international players and going to countries with favorable policies are the driving forces. This is perhaps due to the potential for *mitigating the risks of new product development* and the *liabilities of foreignness* (Arenius, Sasi, & Gabrielsson, 2006; Chorev & Anderson, 2006).

We also considered networking in terms of firms’ intangible resource. The results of the case studies highlight that both formal and informal networking facilitates the internationalization of firms. We therefore investigated the link between these two types of networks and the internationalization of firms. The empirical analysis shows that formal networking indicators significantly contribute to the networking construct, whereas we could not find any significant effect for the informal networking factor. The ultimate outcome of the model indicates that networking affects the speed, scope, and scale of internationalization, and that it is positively and significantly associated with international performance. These results are in line with the previous IE literature indicating the significance of networking in the internationalization of firms (Chetty & Wilson, 2003; Coviello & Munro, 1997, 1995; Etemad & Lee, 2003; Loane & Bell, 2006; Mort & Weerawardena, 2006; Sharma & Blomstermo, 2003). Even though the sustainable entrepreneurship literature has not discussed the role of networking in the entrepreneurial activities of firms, this result implies that as the clean energy industry is policy driven, formal networks are more significant factors in terms of defining the entrepreneurial internationalization of firms in this specific industry.

Business models, either utility-side or customer-side, define how firms would like to create value for their stakeholders. The case firms, except for *Watly*, mostly adopted the utility-side business model, no matter whether they were large (e.g., *Alstom*) or small (e.g., *Tecnoturbine*, *Smalle Technologies*). In this model, similar to large utility companies, firms are looking to make money by applying the traditional model of utility companies and a centralized energy system. To analyze the impact of the business model on the internationalization of companies, we applied regression analysis for the two types of business model. The regression results show that there is a difference between utility-side and customer-side business models, which is significant at 99% (t-value = 3.35). Although we expected that customer-side business models might contribute more positively to the internationalization of firms, the final result reveals that utility-side business models are related positively and significantly to the international performance of the firms. As this business model creates more revenue and incurs lower risk (Richter, 2012), it has a more positive effect on the international operations of firms. However, for sustainable future, the development of the customer-side business model is necessary.

The choice of business model, however, in an institutionalized sector such as renewable energy is based less on firm decision making and is related more to external forces from national innovation systems and the political structure, local socio-technological conditions, and the cognitive abilities of the entrepreneur and corresponding stakeholders (Provance et al., 2011).

- **Industry**

Based on Fernhaber et al.'s (2007) theoretical framework, we have explored and examined the effect of industry structural factors on the internationalization of firms. These factors include: (i) industry evolution, (ii) level of concentration of the industry, (iii) knowledge intensity, (iv) isomorphism, (v) global integration, and (vi) regime of appropriability.

The cross-case analysis shows that although this industry is in the emergent stage, many companies have already started to engage in international activities, even in the pre-commercialization phase. At the industry level, we found that rather than level of industry evolution, the level of technological development better explains the different extent of internationalization between the cases. Based on these results, we investigated whether the level of industrial development or technological development better explains the internationalization of firms in this industry. Testing the results from the case studies confirms that the level of technological development is positively and significantly related to the internationalization of firms. In contrast to Fernhaber et al.'s (2007) suggestion, we find no significant result for the level of industry evolution. This result implies that although the renewable energy industry is in it emerging phase of evolution, internationalization is a common practice for companies’ growth. Moreover, only considering the level of industry maturity is not sufficient to understand the internationalization process in this industry, in which companies with more mature technologies are more willing to enter to the foreign markets.

It was also expected that the level of industry concentration would positively affect the internationalization of firms. The case study analysis suggests that in this industry, either a higher concentration of large firms or a prevalence of numerous small firms has led to a limited internal market. This market restriction could be a major force for the internationalization of companies. Testing this result shows that a higher number of small firms, a small domestic market, and intense competition are key indicators that define the level of the concentration construct. Following the current literature, this factor influences the speed, scope, and extent of internationalization positively and significantly, but its effect on international performance is insignificant. Thus, we can conclude that the effect of this factor on the internationalization of firms is partly supported. This result indicates that a limited domestic market and a high number of small firms together lead to a high level of concentration, and large firms still do not dominate the market.

As the renewable energy industry is a knowledge-intensive industry, Fernhaber et al. (2007) suggest that this factor will affect internationalization of firms positively. However, the case study results suggest that as Spain has always been a hot-spot for renewable energy technologies, being close to technological centers is not a driving factor that draws firms to international markets. We tested these roughly contradictory propositions and the result shows that knowledge intensity is negatively and significantly associated with the internationalization of firms. We can interpret this result according to the context. As Spain is one of the pioneering countries in renewable energy technologies, this factor does not attract Spanish firms to other strategic locations to foster the knowledge creation process.

Despite the non-significant effect of isomorphism on the internationalization of firms, global integration is one of the critical structural factors in the internationalization of firms in the renewable energy industry. Cross-case analysis shows that the specific characteristics of this industry, such as standard end products and knowledge intensity, make this industry global, and companies need internationalization to grow and survive. Testing these results shows that global integration is strongly and positively related to the scope, speed, and extent of internationalization and international performance. This result shows that in this industry it is essential to be international in order to grow and survive. This result is in line with prior studies on tidal and wave energy, indicating that this industry is *born global* (Bjørgum et al., 2013; Løvdal & Aspelund, 2012).

According to our cases and renewable energy industry experts' perspectives, the renewable energy industry is not tightly protected, unlike the pharmaceutical industry; indeed, this industry is closer to the other end of the spectrum, and in many cases companies can replicate other companies' ideas and technological products. Therefore, instead of investing money and time in patenting a technology that can be copied by competitors, firms prefer to develop their technology and market. Based on these results, we can conclude that although patenting is important in this industry and many companies apply for patents, or it may be required by venture capitalists, it is not a determining factor in the success and survival of the firms, in particular for small firms. However, the risk of infringing copyright and strict patenting policy in the target market is significant indicator that defines the *regime of appropriability* construct. Path model analysis confirms that patenting barriers in the target markets negatively and significantly affect the internationalization of firms in the renewable energy industry. Thus, we enhance the current proposition by Fernhaber et al. (2007) regarding the *regime of appropriability* effect.

- **Policy**

The exploratory cross-case analysis shows that development and growth in the renewable energy industry, as a policy-sensitive industry, is highly related to policy support. Examples of countries that have successfully developed industrial clusters of clean energy technologies, for example Denmark and Germany (Wüstenhagen & Bilharz, 2006; Wüstenhagen, 2003), indicate that the initial step for achievement in international markets is a strong industrial cluster supported by favorable policy. Our model findings suggest that the unfavorable domestic policy in Spain is negatively and significantly related to the internationalization and international performance of firms. This result is in line with theoretical recommendations and the finding of the cross-case analyses that the successful growth of firms in international markets entails an advanced industrial cluster and a strong domestic market. Thus, we cannot support the assumption that an unsupportive domestic policy may encourage firms to enter international markets.

In addition, in this study we have explored the link between supportive policies in the host country and the internationalization of firms. The cross-case analysis suggests that the policy scheme in the host country is the first criterion that companies consider before entering a market. We examined the effect of this factor in our model and the results show a positive and significant effect of the international policy scheme on internationalization and international performance. This result indicates that the mere presence of a favorable policy in the domestic market is not enough to encourage firms to enter international markets; rather it requires an attractive support scheme in the foreign countries.

One of the curious phenomena that occurred during the course of this study was a radical change of renewable energy policy in Spain. The new policy introduced in late 2012 terminated all the financial incentives for the development of clean energy technologies, even for previously running projects. In this study, we have explored and examined the effect of the policy change on the internationalization of firms, and we have also investigated the mediating effect of dynamic capability factors to identify how companies adapted to the new circumstances in this industry. Evidence from the case studies suggests that the effect of the policy change has not been equal, and it has affected more developed technologies such as wind and solar technologies to a greater extent than emerging technologies such as biomass, wave and tidal, and micro-hydro energies. Surprisingly, some cases, such as energy efficiency firms, perceived the policy change as an opportunity for developing their activities. Therefore, we conclude that the level of the effects of the policy change on the firms' development and international expansion has been mixed. Testing the impact of the policy change on firms' internationalization revealed that this phenomenon had a negative and significant effect on the firms' internationalization and international performance. Following the same justification as for the negative effect of domestic policy, the possible explanation could be that a stable domestic market condition determines the successful internationalization of firms. Thus, we cannot simply conclude that changing the domestic energy policy will encourage firms to enter international markets. As a result, we can state that the impact of the policy change has not been limited to the firms' domestic market; rather its consequence goes beyond the national borders because it can simultaneously affect the firms' international activities.

Finally, we have investigated how firms can adjust to the new market conditions after such a radical policy change. In other words, we have explored whether the reaction of the firms to the adverse effect at the policy level could exert a significant effect on the relationship between the *policy change* and international performance. In doing so, we applied a dynamic capability construct in the path model as a mediating variable between the policy change and firms' internationalization. The result shows that the *t*-value for the indirect effect of dynamic capability is 3.2625, and we can thus conclude that this relationship, through *dynamic capability*, is significant at 99% ($p > 0.01$). The strength of the mediation effect is 53%, and we can therefore conclude that this construct partially mediates the relationship between the policy level factor and international performance. Moreover, testing the moderating effect of the dynamic capability construct presents a positive and significant result. This positive result shows that an increase in the *dynamic capability* of firms increases the effect of the dependent variable, which is international performance.

8.5. *Theoretical and empirical implications*

This study has several implications for entrepreneurs, business owners, managers, and policymakers. In this section we discuss the theoretical and practical implications of this study for managers, entrepreneurs, and policymakers at the four levels of analysis. A summary of the results and the implications is shown in Table 8.5.1.

- **Eco-Entrepreneur**

From the theoretical point of view, this is the first empirical study to show how eco-entrepreneurs differ from typical entrepreneurs in terms of motivation. The results of this study show that eco-entrepreneurs are motivated by non-financial incentives as well as financial ones, and a mix of these two motivations encourages them to engage in international development. The global inner value of the eco-entrepreneurs is a focal point that can connect two theoretical frameworks in the entrepreneurship literature, i.e., sustainable entrepreneurship (Dean & McMullen, 2007; Gibbs, 2009) and IE (Oviatt & McDougall, 2005). Moreover, the effect of technological development on the philosophical standpoint of eco-entrepreneurs empirically demonstrates the dynamism and change in the eco-entrepreneurs' motivation as the marketability of the product increases (Schaltegger & Wagner, 2011; Schaltegger, 2002). The analysis of networking analysis also highlights the importance of formal networking in the renewable energy industry; because this industry is deeply institutionalized, interaction between firms and institutions is equally important for eco-entrepreneurs and managers. Moreover, this study is one of the few to have examined the *context embeddedness approach* to explain the process of opportunity recognition in IE. In this research, we identify how the policy scheme in different countries affects the process of new international opportunity development in various contexts (Mainela et al., 2014), while contextual factors are defined in terms of the policy scheme, domestic market situation, and technological change. From the methodological point of view, this study is one of the few to test empirically the effect of entrepreneurs' value systems following a mixed methods approach. In this study, we employed the results of exploratory case study research and survey research to extrapolate the final results.

The findings of this research have multiple implications for managers, entrepreneurs, and policymakers. Entrepreneurs should consider the distinctive characteristics that differentiate them from typical entrepreneurs and put more emphasis on non-financial incentives than financial. Moreover, this study shows how and why entrepreneurs are motivated to enter international markets. This finding could be of help to eco-entrepreneurs in terms of how they perceive themselves in the international context, and in understanding how they can successfully expand their foreign market activities to generate a balance between sustainability and profitability objectives. This issue is also important for the managers of large companies to encourage their subsidiaries' managers to engage in international growth.

Moreover, the empirical results of this study suggest that managers and entrepreneurs should build their teams according to their international market experience and energy field experience. These two key characteristics are required to build a winning team for the companies' international development. In addition, in the renewable energy industry, formal networking with government agencies and institutions, participating in international fairs, and networking with customers are as important as informal personal contacts for foreign market entry.

Policymakers seeking the development of renewable technologies at the national and international levels need to understand that unlike with typical entrepreneurs, only providing financial incentives is not enough to motivate eco-entrepreneurs. A mix of stimuli is involved in eco-entrepreneurs' value systems and they should design effective policy by considering both types of incentives. In addition, policymakers should support renewable energies based on the level of technological development (instead of the size of firms). As eco-entrepreneurs' philosophical perspectives are less important at a higher level of technological development, technologies in the early stage of development need greater support than mature technologies. In addition, the major implications of formal networking in terms of opportunity recognition and the international expansion of companies call for policymakers' attention to establishing and developing networking facilities to inform and support firms and eco-entrepreneurs.

- **Firm**
    - **Age and Size**

Regarding age and size, although we cannot claim that our findings fully respond to the contradictory results in the previous literature, they do address the effect of size and age on international performance. These findings imply that larger firms perform better in international markets. Managers and entrepreneurs, accordingly, need to develop their business to sustain their presence in the market and survive. Policymakers should also design favorable policies to support growth and the international expansion of renewable energy companies.

- **Interaction between large and small firms**

The provision of the results concerning interaction and networking between small and large firms and the positive influence on the internationalization of firms is one of the key contributions of this study. Based on the qualitative analysis, we suggest that interaction between small and large firms is an essential factor facilitating the further development of renewable energy technologies in international markets. At first glance, one might question why large companies should collaborate with small firms. However, our findings show that small firms are sources of innovation and new technologies, and large companies need to interact with them to overcome their challenges with radical innovation. On the other hand, small companies, due to their lack of networks, markets, and industrial knowledge, collaborate with large companies to enable entry to foreign markets. This finding is a focal point that connects sustainable entrepreneurship to the IE literature. This result supports the potential for the international development of renewable energy companies and the co-evolution of this industry through interaction between new entrants and established firms (Hockerts & Wüstenhagen, 2010). Moreover, we observe interaction between small and large firms from the very start of their activity. This is in contrast to Hockerts and Wüstenhagen's (2010) suggestion that small and large firms co-evolve in separate spheres and they simply interact based on the evolutionary perspective, i.e., a high degree of variation on the side of small companies' side, and after reaching dominance, it is the turn for large firms to select among new entrants.

The positive effect of the interaction between small and large firms on the internationalization of firms implies that managers of established firms and entrepreneurs should consider further collaboration to speed up product development and the growth of their business. Policymakers can facilitate interaction between firms, and reward such affiliations, for example in terms of networking skills. The links developed might yield relevant foreign contacts and customers.

We have also explained collaboration between small and large firms based on the *coopetition strategy* (Bengtsson & Kock, 2014; Ritala et al., 2014; Ritala & Tidström, 2014). The results from the renewable energy industry provide advanced empirical evidence concerning the effect of the industrial context on the successful adoption of this strategy. Specific structural factors in the energy sector indicate why this strategy is successfully employed by firms in the renewable energy industry. This issue can be considered one of the key theoretical implications of this study.

- **Need for financial support**

From the methodological perspective, in this study we have examined the effect of financial support on the internationalization of firms. The results of this study empirically demonstrate that the need for capital attracts entrepreneurial companies to international markets. Similar results from the surveyed firms confirm the results of prior research based on case studies (Bjørgum et al., 2013; Løvdal & Neumann, 2011). This result implies that entrepreneurs and managers should look for international partners in countries with financial support for the development of renewable energy technologies. Moreover, policymakers interested in the development of these technologies need to design effective policies to attract foreign projects and companies.

- **Technological development and commercialization**

The results concerning technological knowledge suggest that managers' and entrepreneurs' investment in R&D and technological knowledge will pay off through growth and better performance. Therefore, it is essential for firms, especially small companies, to keep investing in technological development to survive. Moreover, this result for technological development implies that policymakers in Spain should pay more attention to technological centers and energy research centers to maintain the position of the country as a focal point for the latest renewable energy technologies and innovation. Otherwise, they will lose their competitive advantage in the global market and they will miss many opportunities in the future. In terms of being close to hot-spots for renewable energy technologies, the results of this study provide policymakers and practitioners with additional insights for facilitating the presence of international companies in Spain, and fostering investment in these technologies.

In addition, based on the renewable energies literature, in this study we have explored for the first time the link between the commercialization and internationalization of firms. Prior studies have suggested that the insemination of new technologies in this industry is slow, but no study has yet examined the link between commercialization challenges and the internationalization of firms. The results indicate that the link between sustainable entrepreneurship and IE in the literature needs to be explored precisely in further studies to explain the internationalization of firms in the pre-commercialization phase.

- o **Networking and the business model**

No study in the sustainable entrepreneurship literature has previously discussed the effects of networking on clean technology industries. As the energy sector is policy driven, in this study we have found the effect of formal networks to be more important than social networks, especially in the internationalization process. The implications of this result include the need for the promotion of formal networking by policymakers in national and international contexts in order to foster the international presence of companies. Moreover, entrepreneurs should not see membership of agencies and associations as an extra cost; they can gain mutual benefits from international fairs and networking events to expand their presence in domestic and international markets.

Furthermore, in this study we have examined for the first time the effect of the business model on the internationalization of firms. This is one of the main contributions of this study to both the IE and sustainable entrepreneurship literature. Our results convey to entrepreneurs and managers that to outperform competitors in the market, they should choose the utility-side business model. However, as there is a greater need for customer-side business models for sustainability in the future (Richter, 2012), policymakers can play a role in introducing supportive policies to make this type of business model more attractive for entrepreneurs and managers.

- **Industry**

For the first time in this study we have empirically examined the effect of structural factors of an emerging industry on the internationalization of firms. There has been no prior study in clean and sustainable energy that has examined the effect of industry-level factors on the internationalization of entrepreneurial companies. Therefore, in this study, we draw on Fernhaber et al.'s (2007) theoretical model, and test the effect of industrial factors on the entrepreneurial internationalization of firms.

In contrast with suggestions in theory, the effect of *level of industry maturity* on the internationalization of firms is insignificant. Instead, our result suggests that the *level of technological development* is a better factor in terms of determining the international performance of firms. This result suggests that entrepreneurs and managers should formulate the company internationalization strategy according to the technological level of development of their product. Moreover, policymakers should take this factor into consideration in supporting the expansion of companies according to technological advancement. A high *level of concentration* in the renewable energy industry also implies that the growth of small companies should not be limited to domestic markets. Managers and entrepreneurs should plan their business expansion in foreign markets and policymakers need to consider both policy options for expanding internal markets and facilitating firms' growth internationally.

Contrary to Fernhaber et al.'s (2007) proposition, the findings of this study suggest that Spain is one of the leading countries in renewable energy development. As a result, companies prefer to exploit their inimitable resources and capabilities within the country, close to their main partners and customers, to advance the knowledge creation process. Policymakers engaged in stimulating new technologies can take advantage of this to promote technological centers in Spain for further international collaboration and investment in R&D. In addition, managers and entrepreneurs should know that being close to the centers of technological knowledge provides them with competitive advantage in the market because it can reduce the internationalization risk.

Following the current IE literature (Fernhaber et al., 2007) and prior studies in the same industry (Bjørgum et al., 2013; Løvdal & Aspelund, 2012), this is the first study to have empirically tested the effect of the global integration of an industry on the internationalization and international performance of companies. As previously mentioned, these results suggest that this industry is global and it is vital for firms to be in international markets. Therefore, it is essential for entrepreneurs and managers to revise and develop their strategy to encompass an international presence, even in the pre-commercialization phase. In addition, governments, agencies and policymakers should not overlook the effect of a favorable context on firms' internationalization.

We have also improved on the previous proposition made by Fernhaber et al., (2007) concerning the effect of the appropriability regime. Based on both the quantitative and qualitative results, we suggest that the patenting system significantly influences firms' internationalization. This theoretical contribution has important practical implications for entrepreneurs and policymakers in reconsidering the internationalization decision based on the patenting regime in each country. Finally, from the methodological aspect, this study, by incorporating both quantitative and qualitative data, makes a considerable contribution to both the IE and sustainable entrepreneurship literature.

- **Policy**

There are no previous empirical studies on the effect of policy schemes on the international performance of firms (Acs et al., 1997). This gap in the literature has been addressed by studying the effect of political support on entrepreneurial internationalization and international performance. Our results suggest that this industry is excessively sensitive to the policy regime and policymakers should cautiously employ support schemes for these technologies. Geographical, institutional, technological, and economic factors should be considered prior to offering a deliberate policy (Cohen & Ernesto Amorós, 2014). Furthermore, policymakers should avoid "*stop and go policies*" and "*attention shifts*" in effective policy design (Negro et al., 2012). In addition, policymakers should also take into account the consequences of a policy for international companies, as well as for domestic firms. They need to consider the international effectiveness of a policy and facilitate foreign companies' presence in the market. In this way, they can increase competitiveness between firms. In Spain, the government needs to introduce new policies to support the internationalization of Spanish firms, for example specific incentives for exporting these technologies. The best example of this is the success of Chinese green energy companies in international markets due to the conscious policy encouraging exportation (de la Tour et al., 2011; Liu & Goldstein, 2013). Finally, policies need to be revised and benchmarked frequently to control for fulfillment of their intended objectives.

Moreover, the outcomes of policy-level analyses have practical implications for entrepreneurs and managers. Market assessments and the foreign market entry decision in this industry should be based on policy incentives. Moreover, managers and entrepreneurs should always be ready for flux in the market and the environment. Being prepared for hard situations, and applying the measures and changes required as soon as possible, positively affects the performance and survival of firms.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
Eco-Entrepreneur	**Values and Motivations**	**Hypothesis 1**	• Eco-entrepreneurs believe in values for making the world a better place to live. •Internal commitment of eco-entrepreneurs to improve the world. •Eco-entrepreneurs contribution to global market.	Mix of non-financial motives (internal commitment to make the world a better place to live and contribution to the global market) and financial motives will affect positively internationalization of firms.	**• IE= + • International Performance = NS**	**Partly Supported**	• Eco-entrepreneurs have mix of financial and non-financial incentives that affect significantly internationalization of firms.
		Hypothesis 2a	• Eco-entrepreneurs have mix motivations of green, ethical, social and economic motives that are inseparable. •There is interaction between the financial and non-financial motives for eco-entrepreneurs. •The intensity and priority of these incentives for every entrepreneur is different. Based on these differences of incentives we can categorize the eco-	The effect of eco-entrepreneurs' philosophical perspective on the internationalization of firms will be higher for smaller firms than larger firms.	**• IE= NS • International Performance = NS**	**Not Supported**	• Based upon the qualitative analysis results, we proposed that the effect of philosophical standpoint of eco-entrepreneurs on the internationalization of firms may decrease as the size of the firms decrease. But we could not find any significant moderating effect of size on the

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
			entrepreneurs. • Firm size and marketability of the product determine the priority of eco-entrepreneurs motivation and type of eco entrepreneurs				internationalization of firms.
		Hypothesis 2b		The effect of eco-entrepreneurs' philosophical view on the internationalization of firms is higher for firms with lower level of marketability of their products (or technological development) than firms with higher level of marketability.	**• Size= NS** **• Higher level of technological development (or Marketability of product) on International performance= -**	**Supported**	• To explore more the previous hypothesis, based on the qualitative analysis findings we proposed that besides size, level of marketability of product (or technological development), may moderate the relationship between

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
							philosophical standpoint and internationalization of firms. Quant analysis result supports this hypothesis.
	Human Capital	**Hypothesis 3**	• Eco-entrepreneurs previous international professional experience and education helped them to find international partner, to gain skills for international business for communication and negotiation	Eco-entrepreneurs' foreign work and experience in energy sector positively affect entrepreneurial internationalization of firms in renewable energy industry.	**• IE= +** **• International Performance =** +	**Supported**	• International experience and having knowledge about energy industry are the two significant factors that influence internationalization of renewable energy companies. Despite of positive effect of international education, we could not find it significant.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
	Social Capital and Network	**Hypothesis 4**	• Formal networks have helped companies to develop their activity in the international context • Informal and personal networks influenced the internationalization of the firms.	Eco-entrepreneurs' networking capability positively affects entrepreneurial internationalization of the firms in renewable energy industry.	• **IE**= + • **International Performance** = +	**Supported**	•Although qualitative results about the importance of formal networking were tentative, the empirical results acknowledge the positive influence of formal networking on the internationalization of firms. This outcome is in line with our expectation about the major implication of formal networking in this specific industry.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
	Opportunity recognition motivation	**Hypothesis 5a**	• Human capital such as international skills, experiences positively affect entrepreneurial opportunity recognition and exploitation in the global context • Social Capital positively affect the process of opportunity recognition and exploitation in international market	Eco-entrepreneurs' international skills and experience positively affect the international opportunity recognition and exploitation.	• **IE**= + • **International Performance** = +	**Supported**	• Human capital factors such as experience in energy industry and international experience are significant factors that affect opportunity recognition and development. However, in contrary with our expectations, quantitative result could not support that the positive effect of international education is significant.
		Hypothesis 5b		Eco-entrepreneurs' formal and informal network positively affects international opportunity recognition and exploitation.	• **IE**= + • **International Performance** = +	**Supported**	• Both quantitative and qualitative analysis results confirm the importance of formal and informal networks in

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
							opportunity recognition.
		Hypothesis 5c		Environmental uncertainties will positively affect the international opportunity recognition and exploitation.	**• IE= +** **• International Performance =** +	**Supported**	• Case studies results imply that environmental factors affect significantly the internationalization of firms. Based upon *Context Embeddedness* approach we examined the effect of national setting (ex. policy scheme, domestic market,...) on international opportunity recognition and development, which is positive and significant.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
Firm	**Age and Size**	**Hypothesis 6a**	•Although large companies' internationalization because of their access to wider range of resources and capabilities is easier than small firms, most of the small companies are born global or INVs and they entered to the international markets from the inception. •Small firms are more flexible to adapt to international context and their internationalization is faster •Some companies in this industry start their international activities in the pre-commercial period and before establishment	Higher age of the renewable energy companies is negatively associated with their international performance.	**• International Performance = NS**	**Not Supported**	•Despite of our findings from the case studies, we could not support the hypothesis that age of the firms negatively related to their internationalization and international performance.
		Hypothesis 6b		Higher size of the renewable energy companies is positively associated with their international performance.	**• International Performance = +/NS**	**Weakly Supported**	•Large firms perform more efficiently in international markets and their chance to survive due to easy and wide access to resources is higher, although the effect of size barely supported in the study.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
	Interaction between large and small firms	**Hypothesis 7**	•Collaboration between the small and large firms is essential •Large firms needs small firms in international market as sub-supplier and provider of the high-tech and innovative technology •Small firms take advantage of large firms resources like networks, market channels to accelerate and facilitate internationalization • Moderating effect of level of technology maturity on the interaction between the large and small firms	Collaboration between the large and small companies facilitates the internationalization of the firms and positively affects their internationalization.	**• IE= +** **• International Performance =** +	**Supported**	• Interaction between large and small firms (Firm-Level Network) is a significant factor that affects internationalization and International Performance of firms. Small and large firms should consider collaboration with both small and large firms for further progress of their business in the international context. • Passive internationalization when small companies obliged to follow the (larger) partner companies in international markets.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
	Financial Resources	**Hypothesis 8**	•Financial problem is the primary barrier for development and internationalization of renewable energy companies in Spain especially after the general financial crisis and Feed-in Tariff cuts. • Many companies looked for funding from outside of Spain and EU supporting projects.	Need for financial resources and funding encourage renewable energy firms to internationalize.	**• IE= +** **• International Performance = NS**	**Partly Supported**	• Financial resources are important factors that affect internationalization of firms, though we could not find a significant effect for international performance. • Entrepreneurs and managers should find partners in countries with supportive financial policies. • Policy makers should design effective policies and practices to attract international companies.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
	Knowledge	**Hypothesis 9a**	• Having access to the latest knowledge and technology is not an strong motive for renewable energy companies to enter international markets because Spain is already a hot-spot of knowledge about renewable technologies particularly in solar and wind energy •However, many companies established	Technological resources are positively associated with internationalization of renewable energy companies.	• **IE**= + • **International Performance** = +	**Supported**	• This industry is knowledge intensive and investing on technological knowledge development and R&D will be paid off by better performance and survival in the market. • This hypothesis result can be justified in accordance with technological

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
		Hypothesis 9b	international collaboration with foreign partners. This international partnership is maybe related to mitigating the risk of investment in new technologies. •Mira-Energia is the only company states that they need internationalization to have access to the latest knowledge because Spain is not leading country in Solar HVAC.	Foreign market knowledge positively affects internationalization of renewable energy companies.	**• IE= NS** **• International Performance = NS**	**Not Supported**	development at the industry level.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
	Commercialization	**Hypothesis 10**	• Commercialization of renewable energy technology in Spain is slow • Other factors can slow down the process of commercialization of renewable energy companies like Policy support, financing, market demand • Internationalization could be a possible solution to overcome technological development difficulties. • Because of these problems in product commercialization, many companies started internationalization in pre-commercial phase •Type of the technology could be moderating factor on the speed of commercialization of renewable energy companies	Need for commercialization of products positively affect renewable energy firms' internationalization.	**• IE= +** **• International Performance =** +	**Supported**	• To overcome commercialization challenges, companies draw to the international markets. In order to mitigate the risks of new product commercialization and liabilities of newness companies choose their global partners in the countries with favorable renewable energy policy. In contrast, we could not find a significant effect for financial support and funding.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
	Networks	**Hypothesis 11**	•Networking has been used as a means and facilitator to overcome resources constraints and limitations, particularly in international market. •Companies take advantage of their formal and informal networks to enter to the international market.	Networking (formal and informal) affects positively internationalization of renewable energy companies.	**• IE= +** **• International Performance =** +	**Supported**	Based on the case studies analysis we conclude that both formal and informal networks are key factors in the internationalization of firms, but quantitative analysis outcomes recommend that formal networks are determinant factors that define entrepreneurial internationalization of firms. Policy makers and entrepreneurs should consider the importance of membership in associations, institutions and international agencies.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
	Business Model*	**Hypothesis 12**	• More companies adopted the traditional business model like conventional utility companies • Only Watly adopted customer-side business model • For customer side business model companies are more incline to be international •The degree and speed of internationalization in customer-side business model companies is higher than utility-side business model companies.	The utility-side business model impacts positively/negatively the international performance of renewable energy companies.	**• International Performance** = +	**Supported**	At the beginning we expected that customer-side business models positively related to the internationalization of firms, but the quantitative analysis results reveal that firms with utility-side business models perform better in the international markets because it incurs less risk and creates more revenues.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
Industry	**Technological Evolution**	**Hypothesis 13a**	•Although this industry is emerging industry and many technologies are still in the introduction phase, companies they have started their internationalization activities even in the pre-commercial phase. Therefore, the stage of the development of the	There is no significant relationship between the level of industry evolution and internationalization of the renewable energy companies.	**• IE= NS** **• International Performance = NS**	**Supported**	• In contrast with theory, the relationship between the level of industry development and internationalization of firms is insignificant. However, both qualitative and quantitative results confirm that level of technological development is a better

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
		Hypothesis 13b	technology may not be a significant factor in the internationalization of the firms in this industry. •Companies in this industry still need to practice internationalization for growth and survival. •We can conclude level of maturity of the industry is not a significant factor in the internationalization of the firms and the technology can be a better factor that explain the inter nationalization of firms.	In renewable energy industry companies with more mature technologies are more willing to internationalize.	**• International Performance =** +	**Supported**	determinant factor for firms' internationalization.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
	Level of concentration of the industry	**Hypothesis 14**	• In renewable energy industry in general there are mix of large and small companies • Companies internationalize to have access to a wider market and this is particularly true about small companies in the niche market • The level of concentration depend on the technology, for ex. wind energy is highly concentrated, in contrast solar and tidal are less concentrated	High level of industry concentration and existence of many new small ventures affect positively the internationalization of the firms in this industry for finding new markets.	**• IE= +** **• International Performance =NS**	**Partly Supported**	• High level of concentration arises from numerous small firms, small domestic market and competition intensity. The effect of this factor on IE is strong and positive but it cannot impact performance of the firms in international markets.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
	Knowledge intensity	**Hypothesis 15**	•Spain has been always a hot spot for renewable energy technology and knowledge •Being close to the technological hub is not the main reason for the internationalization of the renewable energy companies from Spain. • This factor was only important for Mira-Enrgia and Smalle Technologies, with less level of these technology development in Spain	Knowledge-intensity of renewable energy industry cannot be positively related to the internationalization of firms.	**• IE= -**	**Supported**	• Final result of this study, in contrary to the theory recommendation, suggests that internationalization of companies in not related to being close to the technological centers. This result is related to the effect of contextual factors because Spain is one of the pioneer countries in clean energy technologies.
	Isomorphism	**Hypothesis 16**	•We could not find any evidence that support this idea that mimetic isomorphism is the reason for the internationalization of the renewable energy companies	Local renewable energy industry internationalization cannot positively affects the internationalization of other firms in renewable energy industry.	**• IE= NS** **• International Performance = NS**	**Supported**	• Both qualitative and quantitative results show that isomorphism is not a significant driving factor for internationalization.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
	Global integration	**Hypothesis 17**	• By considering the market, competitiveness, cost and also environmental factors this industry is truly a global market. •This industry is globally integrated (born global industry) • Internationalization for companies in this industry is essential.	Global integration of the renewable energy industry affects positively the internationalization of the renewable energy companies.	**• IE= +** **• International Performance =** +	**Supported**	• In accordance with the theory, both cross case analysis and path model analysis confirm that renewable energy industry is a globally integrated industry. Firms should consider internationalization to grow and survive, even from the very beginning. Thus, we may call it "born global" industry.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
	Patent and Copy (Regime of Appropriability)	**Hypothesis 18**	•Evidences from the cross case analysis do not support the idea that in renewable energy industry because of the low level of patenting protection companies prefer to enter international market to take the most advantage of their idea. • High level of protection can make barrier for entry to that market. (such as entry to US wind energy market)	The strong regime of appropriability in the target markets affects negatively the internationalization of renewable energy companies.	**• IE= +** **• International Performance =** +	**Supported**	• In contrast with the theory, despite of loose protection of ideas in this industry, this factor cannot be a significant factor in the internationalization of firms. Case studies analysis results suggest that patenting system in the target market determine the internationalization decision of firms. The empirical results confirm the negative and significant effect of this factor on the internationalization and international performance.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
Policy	**Supportive Domestic Political Scheme**	**Hypothesis 19**	• In the past years supportive political scheme has helped to the development and international expansions of renewable energy industry particularly wind energy. • Although this policy was more and less successful for development of the wind energy (especially in the Basque country region) , it could not lead to the development of the renewable industry cluster related to other technologies like solar and photovoltaic, because of the fast policy change. • Since the policy support for renewable energy in Spain was very generous, many international companies came to Spain.	Unsupportive renewable energy scheme in the domestic market, affect negatively the internationalization of companies.	**• IE= -** **• International Performance = -**	**Supported**	• Grounding on qualitative analysis we proposed that unsupportive policies may impact internationalization of firms positively or negatively. The final quantitative result shows that initial condition for successful internationalization of firms is an advanced industrial cluster and then a strong domestic market. Moreover, this is not an unsupportive policy that attracts firms to the international markets, while it is favorable policies in the other markets that draw firms to the foreign markets.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
	International Policy	**Hypothesis 20**		Supportive renewable energy policy framework in the host country, affects positively the outward internationalization of renewable energy companies.	• **IE=** + • **International Performance =** +	**Supported**	• Consequences of renewable energy policy in a country are not limited to its borders; international companies are also affected by energy policy in other countries. The primary criterion of companies for choosing a potential market is favorable policy scheme in that market.

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Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
	International Policy	**Hypothesis 20**		Supportive renewable energy policy framework in the host country, affects positively the outward internationalization of renewable energy companies.	• **IE**= + • **International Performance** = +	**Supported**	• Consequences of renewable energy policy in a country are not limited to its border. International companies are also affected by energy policy in the other countries. The primary criterion of companies for choosing a potential market is favorable policy scheme in that market.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
	Policy Change	**Hypothesis 21**		Renewable energy policy change has affected the internationalization of the renewable energy companies positively/or negatively.	• **IE= -** • **International Performance = -**	**Supported**	• Despite of contradictory results from the case studies, empirical analysis results confirm that policy change impacted the internationalization and international performance of firms negatively.

Table 8.5.1 Summary of Key Findings and Implications							
Level of analysis	**Constructs**	**Hypotheses**	**Qualitative interview findings**	**Hypotheses Description**	**Quantitative survey results**	**Results**	**Summary**
	Dynamic Capability	**Hypothesis 22**		Dynamic capability of firms positively mediates the relationship between policy change effect and international performance.	**International Performance =** +	**Supported**	• Mediating effect of Dynamic Capability between policy change and International Performance is significant and it is a partial mediation. Moreover, dynamic capability can positively moderate the relationship between policy change and internationalization of firms.

8.6. *Limitations of the study and directions of future research*

As in many other studies, there are some limitations to be acknowledged in this particular study at multiple levels of analysis. At the eco-entrepreneur level, the scope of this study is limited to the contribution of IE to sustainable entrepreneurship. Next, studies can investigate the effect of entrepreneurs' philosophical perspective on the survival of firms. Moreover, drawing on the *context embeddedness approach* (Mainela et al., 2014), new studies at multiple levels of analysis (e.g., entrepreneur, policy, and social context) can explore the effect of the social and political setting on opportunity recognition. This issue is critically important in this industry, in which policy and the social acceptance of new technologies play significant roles in the development of the industry (Sine & Lee, 2009). In addition, future studies should define certain indicators to measure opportunity recognition.

A second limitation of this study is at the firm level in that many companies were established after 2007, when the Spanish government introduced the new renewable energy policy. This reduced the variance in age among the firms. Therefore, we could not properly examine the significance of firms' age and internationalization speed in the internationalization process. Results from other contexts with different political and regulation schemes could address this drawback in our research. Moreover, future studies may empirically compare the different roles of large and small firms in the co-evolution of renewable energy. The outcomes of this study will help provide a better understanding of the interaction between the firms in the progress of the renewable energy industry (Hockerts & Wüstenhagen, 2010). A new line of research could also help us to understand the interaction between large and small firms. The *coopetition strategy* indicates the reasons for collaboration and interaction between competing firms (Bengtsson & Kock, 2014; Ritala, 2012; Ritala & Tidström, 2014). In addition, the notion of internationalization in the pre-commercialization phase should be explored further based on the inward and outward internationalization concept (Korhonen et al., 1996; Welch & Luostarinen, 1993). Our results are of significance in explaining how and why renewable energy companies start their international activities, even in the pre-commercialization phase. Future academic works should also examine the role of formal and informal networks in different industrial contexts. It would be interesting to understand how different types of networking contribute to the internationalization of firms in various industrial settings. Researchers also need to pay more attention to the importance of business models. This is the first study that has examined the effect of the business model in the internationalization of firms. However, our knowledge of this field is still limited, and in the future we need to know why more risk is involved in customer-side business models and how policymakers can address this limitation to promote this type of business model.

Another limitation of this study is related to the fact that we only focused on the renewable energy industry as an emerging industry. We could compare the results of this industry to those of other emerging industries, such as the biomedical industry, to learn how and why different industrial contexts affect the internationalization of firms. The different effects of technological advancement on the international development of firms need further inquiry in the future to compare empirically the extent of internationalization between industries at different levels of evolution and technological development. Future studies can also compare the effect of knowledge intensity to understand how contextual differences affect the internationalization behavior of companies. Moreover, in this study we have not considered the role of venture capitalists in the internationalization of firms. According to Fernhaber et al. (2007), they play a significant role in the internationalization of firms by providing financial support for certain technologies. This issue needs additional consideration in future studies. Finally, although in this study we have not found a significant effect for isomorphism and the level of patenting protection in the industry, future studies need to address these concepts in other industries.

It would be interesting for new investigations in this field to explore the effectiveness of different policies in the development of new energy technologies in longitudinal study and in different contexts. Future studies can also examine how companies systematically assess different markets based on favorable policy schemes. We would like to know if only financial support or the general context of the market form the criteria for choosing the entry market. An additional restriction in this study is the cross-sectional nature of the design. Future studies can take advantage of longitudinal data to assess the impact of policy changes on firms' internationalization behavior more precisely. Moreover, the effect of *dynamic capability* can be considered through longitudinal analysis to track the change in dynamism and the reaction of firms.

Apart from the limitations attributed to the levels of analysis, some theoretical, technical, and general limitations are associated with this research. First, this research concerns renewable energy companies from Spain. It is important to apply similar frameworks to compare our results to those of other countries to enhance the generalizability of these findings. This issue is particularly significant in understanding how policy change may affect the structure of an industry and also the international development of firms.

An additional limitation of this study is related to the market factors. In particular, in this research we chose to focus on four levels of analysis, and we could not cover the impact of market-level factors. Future lines of research can cover this subject, in addition to discussing different modes of market entry. Theoretically, future studies can shift attention to the demand-side approach, i.e., customers. There is a lack of knowledge of customers' perceptions and preferences in adopting renewable sources of energy. This means that market studies are lacking in this sector (Bird, Wüstenhagen, & Abakken, 2002; Kaenzig & Wüstenhagen, 2008; Wüstenhagen et al., 2007). Moreover, we believe that other theoretical frameworks can be employed to assess this industry. One of the new frameworks that can provide a holistic picture of new industries is the *innovation system* or the *technological-specific innovation system* approach (Staffan Jacobsson, & Bergek, 2004). There are few available studies that have applied this theoretical framework to assess this specific industry (Foxon et al., 2005; Smit, Junginger, & Smits, 2007).

From the methodological point of view, forthcoming studies can apply covariance-based structural models, such as LISREL or AMOS. In this study, because of the exploratory nature of the study, the sample size, and the use of formative/reflective constructs, we decided to apply PLS-SEM; however, other methods can provide greater strength in other respects, especially in terms of model fit. The other practical limitation of this study was that we only collected data regarding subjective international performance measures because of the entrepreneurial nature of the companies. More robust results could be obtained by assessing internationalization based on objective measures. Finally, the results of this study are limited to cross-sectional data, whereas future studies could apply panel data at different times, for example before and after a renewable energy policy change, to analyze how firms react to such changes and the survival rate of companies after the changes.

8.7. *Overall conclusion*

The final questions are why we studied IE in the renewable energy industry (IEE), and what differentiates this industry from others. This industry differs from others in several respects: first, eco-entrepreneurially driven firms enter foreign markets earlier in time related to their different philosophical standpoint and original non-financial motivations, compared to traditional entrepreneurs. In particular, their desire *to make the world a better place to live in* is a very distinctive characteristic in this industry. This finding interconnects two rather separate streams of literature: sustainable entrepreneurship and international entrepreneurship. Moreover, the *context embeddedness approach* (Mainela et al., 2014) suggests that environmental uncertainty in this industry has led to further international opportunity recognition and exploitation.

At the industry level, our findings describe the renewable energy industry as a globally integrated industry in which technological maturity is a key factor that determines the international activity of firms. Moreover, in this industry, knowledge intensity, isomorphism, and loose copyright policies do not draw firms to international markets. Knowledge intensity is not the key driver for the internationalization of firms in Spain as it is one of the major knowledge centers, with cutting edge renewable energy technologies. The weak regime of appropriability in this industry suggests that protecting an idea through patenting is not an effective approach for gaining competitive advantage in the market, at least for small companies. However, a tight patenting regime in the host country is a significant factor that prevents such firms from engaging in internationalization.

What differentiates the internationalization of firms in the renewable energy industry is first that the phenomenon of internationalization is in its pre-commercial phase. As the commercialization of renewable energy technologies is somewhat slow (Negro et al., 2012), internationalization is a common strategy for renewable energy companies to adopt to speed up this process, and also to mitigate the commercial risk of new technology development (Walsh, 2012). Moreover, networking between small and large companies is especially different in this industry. Interaction between large and small players not only contributes to the transformation of the renewable energy industry itself (Hockerts & Wüstenhagen, 2010), but also can facilitate and accelerate the process of internationalization for different sizes of firms. In addition, coopetition is a common strategy between new entrants and incumbent firms, which justify collaboration between competing firms to enhance international market performance and reduce the associated risks of new technologies and innovation (Ritala, 2012; Ritala & Tidström, 2014).

Our findings also suggest that in this industry, the level of maturity of the technology determines the scope and scale of internationalization. In more relatively mature technologies, such as wind, the level of internationalization is higher than in the case of technologies that are in the initial phase, such as tidal and wave technology, or the growth phase, such as solar energies. In addition, due to the fact that this is an institutionalized and policy-driven industry, formal networking more effectively determines the internationalization of firms in this industry. The other distinctive feature at the firm level is the business model. The empirical results show that companies with a utility-side business model exhibit better international performance than firms with customer-side business models, because the former model incurs less risk and leads to more profit.

More importantly, this industry is policy driven and a supportive policy scheme is regarded as a decisive factor in the entrepreneurial internationalization of renewable energy companies. This issue is particularly important in Spain, where access to funding and capital is the primary challenge for companies, and the support of a favorable policy can be a strong motive for engaging in international activities. Finally, what differentiates this industry in the context of Spain is that internationalization is an indispensable way to mitigate risks and survive!

9. References

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10. *Appendix*

10.1. *Interview invitation letter*

Invitation Letter for Research Participation

Date: 15. July.2014

Dear Mr.*,**

My name is *Meysam Zolfaghari*, and I am PhD student and researcher in the Business Department at the University Autònoma de Barcelona (UAB). I am currently conducting research about internationalization of renewable energy companies in Catalonia and Spain as part of requirements of my doctorate degree in Entrepreneurship and Management. This study, called "*International Entrepreneurship in Renewable Energy Industry*, aims to improve not only our understanding about the challenges and barriers of renewable energy companies in international market, but also to see more clearly the incentives and the success factors related to entrepreneurs/managers, companies and industry and policies in this field.

Because of this, I would like to invite you to become part of this research by taking part in a personal interview, which should take about one hour of your time at your convenience. **Details about the process and content of the interview are attached.** UAB guarantees that all the information will be fully confidential, anonymous, and used exclusively for the sake of this academic research.

By participating, you will have free access to reports and consultancy during this research, for example: **General Report**, which offers information about the current situation of renewable energy industry and the main challenges and barriers of renewable energy internationalization. An **Assessment Report,** which offers customized feedback on your company' s internationalization, as well as *Best Practices* and opportunities for the future in this sector. For policy makers working on the internationalization of renewable energy, these reports will serve as valuable resources for policy development.

I am looking forward to knowing your interest in participating in this research. Please contact me with any questions you may have at my contact information below. Thank you very much for your time considering helping to make this study on renewable energy possible.

Yours sincerely,

Meysam Zolfaghari
(Principal investigator)
Doctoral student
Department of Business
University Autonoma de Barcelona
Phone: +34-677112259
Email: meysam.zolfaghari@uab.cat

Dr. Alex Rialp
(Supervisor)
Associate Professor
Department of Business
University Autonoma de Barcelona
Phone: +34-935812268
Email: alex.rialp@uab.cat

Prof.Dr. Joaquim Vergés
(Supervisor)
Professor
Department of Business
University Autonoma de Barcelona
Phone: Phone: +34- 935811210
Email: Joaquim.Verges@uab.es

10.2. *Interview process and logistic*

Interview Process and Logistics

- **Ethics/privacy:** Research involved in this interview conforms to the fundamental ethics principles, including those reflected in the Charter of Fundamental Rights of the European Union.
- **Main content**
  - A. Entrepreneur
  - B. Companies
  - C. Technology
  - D. Renewable Energy Industry
  - E. Policy
- **Format:** face to face interview and recorded, with possibly one or two persons
- **Where:** This is flexible, we can arrange that either at your office or UAB (quite place for better quality of voice recording)
- **Duration:** About 1 hour
- **Calendar:** This is flexible, we schedule a time in your convenience through telephone, email, Doodle[1] or Scheduleonce[2]

Benefits for Participating

General Report: This report will provide information about the current situation of renewable energy industry, particularly in Spain. In this report, we will show the main challenges and barriers of renewable energy internationalization, according to the results of our study.

Assessment Report: In the assessment part, we will analyze the main strengths and weaknesses of the company in implementing its process of internationalization. In the benchmarking part, we will look at how leading companies succeed in internationalization and collect the best practices of how they meet challenges in the sector and overcome obstacles. In the last part, we will present opportunities for taking clear and highly-feasible actions to improve a company's process towards internationalization. This Report will be customized to address the needs of the company, above all in regards the assessment.

For institutions active in policy making and working on the internationalization of renewable energy, this report will offer a more general and comprehensive view about how to achieve their respective objectives more effectively, through improved supports and policy schemes.

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[1] https://doodle.com

[2] http://www.scheduleonce.com/Home.aspx

10.3. *Questionnaire*

Bienvenido!

"Encuesta sobre la Internacionalización de las Empresas de Energías Renovables de España"

Pulse El Botón Siguiente Para Empezarezar

Sobre la encuesta

Encuesta sobre la Internacionalización de las Empresas de Energías Renovables de España

Estimado señor o señora,

Desde la Universidad Autónoma de Barcelona (UAB) estamos llevando a cabo una encuesta que examina el proceso de internacionalización de empresas de energías renovables de España. Los objetivos de la investigación son:

- **La evaluación de la internacionalización empresarial de las empresas de energías renovables.**
- **La evaluación de los retos y limitaciones para el crecimiento y desarrollo internacional de la industria de energías renovables.**

¿Podemos por favor tener alrededor de 15 minutos de su tiempo para completar el cuestionario adjunto?

- **Esta encuesta es completamente para fines académicos y no hay ganancias financieras que participan en esta investigación.**

- **Las empresas de esta encuesta son seleccionados al azar y sus respuestas serán estrictamente confidenciales. Ninguna empresa que participe será nombrada en futuras publicaciones que se deriven del análisis de los datos recogidos**

- **Si usted desea recibir un resumen de las conclusiones del estudio y los resultados, estaremos encantados de enviárselo cuando esté listo.**

- **Para cualquier duda o pregunta sobre esta encuesta, puede ponerse en contacto con el Prof. Alex Rialp o Prof.Joaquim Vergès como los supervisores de este estudio. También puede ponerse en contacto con el Meysam Zolfaghari como investigador principal. La información de contacto se proporciona en el pie de página de esta carta.**

MUCHAS GRACIAS POR SU TIEMPO Y SU COOPERACIÓN!

1. Perfil de la Empresa

1.1 ¿Cuál es su posición en la empresa?*

- Fundador
- Director general/gerente
- Director técnico
- Director ejecutivo
- Otro (especifique):

1.2 ¿En qué país está ubicada la sede principal de la empresa? *

1.3 Número total de empleados (a tiempo completo y a tiempo parcial):

1.4 ¿Cuál de estas categorías describen mejor el tipo de tecnología que su empresa está desarrollando? *

- Eólica
- Solar
- Biomasa
- Olas y Mareas
- Eficiencia Energética
- Biocombustibles
- Geotérmica
- La potencia hidráulica
- Hidrógeno
- Servicio de Energía
- Otros: especifique:

1.5 Por favor, indique cuál de las siguientes opciones describe mejor la actividad que añade más valor a su empresa:

- [ ] Investigación y desarrollo
- [ ] Las operaciones de producción
- [ ] Servicio al cliente
- [ ] El diseño del producto
- [ ] La distribución del producto
- [ ] Compra de materiales
- [ ] Las actividades de marketing y ventas
- [ ] Otros: especifique: ____________

1.7 El nivel de desarrollo técnico del producto:

- [ ] Conceptual
- [ ] Modelo numérico, laboratorio
- [ ] Modelo físico
- [ ] Prototipo
- [ ] Demonstración
- [ ] Producto final

1.8 ¿Quién es/quienes son el(los) propietario(s) de la empresa?

- [ ] Fundador
- [ ] Universidad
- [ ] Empresa de capital riesgo
- [ ] Gobierno
- [ ] Compañía de petróleo y gas
- [ ] Empresa de servicios públicos
- [ ] Otros inversores privados

2. Empresa

2.1 Fecha de constitución de la sociedad:

2.2 Primer año de la venta del producto:

2.3 ¿Cuál es su modelo de negocios? Por favor seleccione uno:

☐ Vendemos nuestro producto o tecnología a los usuarios finales (Sistema descentralizado de energía renovable)

☐ Vendemos nuestra tecnología de productos para empresas de servicios públicos (Sistema centralizado de energía renovable)

☐ Otro...: [ ]

2.4 Por favor, valore las siguientes declaraciones. La interacción entre las pequeñas y grandes empresas nos proporcionan....

	Totalmente en desacuerdo	**....**	**Neutral**	**....**	**Totalmente de acuerdo**
...entrada más fácil a los mercados internacionales	☐	☐	☐	☐	☐
...acceso al conocimiento y a nuevas tecnologías	☐	☐	☐	☐	☐
...acceso a más recursos (marca, red, canales de distribución	☐	☐	☐	☐	☐

3.Emprendedor

Logic: Show/hide trigger exists.

3.1 ¿Ha realizado estudios en el extranjero? *****

- ☐ Sí
- ☐ No

Logic: Hidden unless: Question "3.1 ¿Ha realizado estudios en el extranjero? " #13 is one of the following answers ("Sí")

Duración de los estudios:

Cuántos años...

Logic: Show/hide trigger exists.

3.2 ¿Tiene usted alguna experiencia laboral en el extranjero?*****

- ☐ Sí
- ☐ No

Logic: Hidden unless: Question "3.2 ¿Tiene usted alguna experiencia laboral en el extranjero?" #15 is one of the following answers ("Sí")

Duración de la experiencia:

Cuántos años...

3.3 Qué tipo de experiencia tiene usted en equipos de gestión:

	Poca	....	....	....	Mucha
•Experiencias de negocios internacionales	☐	☐	☐	☐	☐
•Experiencias de investigación	☐	☐	☐	☐	☐
•Energía y servicios públicos	☐	☐	☐	☐	☐
•Emprendedor	☐	☐	☐	☐	☐
•Networking	☐	☐	☐	☐	☐

3.4 Por favor, valore los factores que motivan a los eco-emprendedores para iniciar su negocio en el sector de las energías renovables:

	Totalmente en desacuerdo	....	Neutral	....	Totalmente de acuerdo
•Para conseguir un mundo mejor con la energía sostenible	☐	☐	☐	☐	☐
•Ganar dinero y obtener beneficiost	☐	☐	☐	☐	☐
•Sostenibilidad y protección del medio ambiente	☐	☐	☐	☐	☐
•Igualmente obtener beneficios y conseguir un mundo más sostenible	☐	☐	☐	☐	☐

3.5 Por favor, indique en qué medida han ayudado las siguientes actividades de networking y cooperación a la internacionalización de su empresa:

	Nada	....	Algo	....	Mucho
•Amigos y colegas profesionales	◘	◘	◘	◘	◘
•Asociaciones profesionales	◘	◘	◘	◘	◘
•Asociaciones de Comercio	◘	◘	◘	◘	◘
•Agencias gubernamentales	◘	◘	◘	◘	◘
•Participación en conferencias o exposiciones internacionales	◘	◘	◘	◘	◘
•Clientes	◘	◘	◘	◘	◘
•Proveedores	◘	◘	◘	◘	◘
•Distribuidores	◘	◘	◘	◘	◘

---

4. Tecnología

4.1 Por favor, indique aproximadamente el importe total gastado en I + D en concepto o producto hasta ahora:

4.2 Por favor, valore las soluciones que su empresa utiliza para superar los problemas de comercialización:

	Totalmente en desacuerdo	**....**	**Neutral**	**....**	**Totalmente de acuerdo**
•A través de la colaboración/alianza internacional					
•La financiación internacional					
•Operando en países con políticas de apoyo					
•Encontrar a un socio internacional antes de la comercialización del producto					

4.3 Por favor, valore los factores que afectan la comercialización de las empresas de energías renovables:

	Sin importancía	**....**	**....**	**....**	**Muy importante**
•Falta de recursos (ex.Financiación)					
•Falta de demanda del mercado					
•Falta de políticas de apoyo					
•Falta de conocimiento tecnológico					

5. Internationalización

5.1 Por favor, indique el año de la primera actividad internacional con empresas o instituciones extranjeras:

El año...

5.2 ¿Podría indicar en qué fase la empresa comenzó su actividad internacional:

- ☐ Antes de crear la empresa
- ☐ Después de crear la empresa
- ☐ En proceso de comercialización

5.3 ¿Con cuántos países ha desarrollado usted una actividad internacional?

5.4 Qué porcentaje de sus ventas totales (aproximadamente) proviene de ventas internacionales:

0 ________________________[__]_____________________________ 100

5.5 Por favor, valore los factores que atraen a su empresa a los mercados internacionales:

	Totalmente en desacuerdo	**....**	**Neutral**	**....**	**Totalmente de acuerdo**
•La falta de recursos financieros en el mercado interno	☐	☐	☐	☐	☐
•Conocimiento sobre la última tecnología	☐	☐	☐	☐	☐
•Políticas de apoyo en el país de destino	☐	☐	☐	☐	☐
•Rápida comercialización de nuestra tecnología	☐	☐	☐	☐	☐

•Reducir el riesgo de tener mercado único en España	◘	◘	◘	◘	◘
•La falta de mercado nacional	◘	◘	◘	◘	◘
•La internacionalización es la única manera de sobrevivir	◘	◘	◘	◘	◘
•Localización geográfica idónea de la tecnología (ej. los países soleados o países que tienen acceso a las olas del mar)	◘	◘	◘	◘	◘
•Dar acceso a la energía a personas de países pobres o en vías de desarrollo	◘	◘	◘	◘	◘
•La intensidad de la competencia con las empresas nacionales	◘	◘	◘	◘	◘

5.6 Por favor, califique los retos para la internacionalización de su empresa:

	Totalmente en desacuerdo	**....**	**Neutral**	**....**	**Totalmente de acuerdo**
•La falta de apoyo financiero	◘	◘	◘	◘	◘
•La falta de conocimiento sobre el mercado internacional	◘	◘	◘	◘	◘
•Nuestra tecnología no es lo suficientemente avanzada	◘	◘	◘	◘	◘
•Nuestra empresa no es lo suficientemente grande	◘	◘	◘	◘	◘

•El riesgo de internacionalizarse es demasiado grande	☐	☐	☐	☐	☐
•El idioma	☐	☐	☐	☐	☐
•Problemas de distancia	☐	☐	☐	☐	☐
•Pocas relaciones internacionales	☐	☐	☐	☐	☐
•El riesgo de infringir algún derecho de propiedad en otros países	☐	☐	☐	☐	☐
•El riesgo de que otras empresas copien nuestra idea y tecnología	☐	☐	☐	☐	☐

5.7 ¿Cuál ha sido el modo de entrada de su empresa en el mercado internacional?

	Sí	No
•Fuimos comprados por una empresa extranjera	☐	☐
•Sucursal de su empresa en otro país	☐	☐
•Joint venture con la empresa extranjera	☐	☐
•Fusión con empresa extranjera	☐	☐

•Compramos una empresa extranjera	◘	◘
•Exportación	◘	◘
•Contrato de Agencia	◘	◘
•Otros	◘	◘

Logic: Hidden unless: Question "•Otros " is one of the following answers ("Sí")

Por favor especifica:

5.9 Cómo de satisfecho ha estado en relación con sus actividades internacionales durante los últimos tres años:

	Nada satisfecho	Poco satisfecho	Algo satisfecho	Muy satisfecho	Totalmente satisfecho
•El volumen de ventas	◘	◘	◘	◘	◘
•Cuota de mercado	◘	◘	◘	◘	◘
•Rentabilidad	◘	◘	◘	◘	◘
•Acceso al mercado	◘	◘	◘	◘	◘
•Desarrollo de imagen	◘	◘	◘	◘	◘
•Desarrollo del know-how (conocimientos)	◘	◘	◘	◘	◘
•En general	◘	◘	◘	◘	◘

6. Políticas

6.1 Por favor, valore las siguientes afirmaciones sobre políticas de energías renovables:

	Totalmente en desacuerdo	....	Neutral	....	Totalmente de acuerdo
•Las políticas de apoyo en los demás países nos motivan a internacionalizar la empresa.	◯	◯	◯	◯	◯
•La falta de políticas de apoyo en España nos animan a entrar en el mercado internacional.	◯	◯	◯	◯	◯
•Los cambios en las políticas de energía renovable en España nos motivan a internacionalizar la empresa.	◯	◯	◯	◯	◯
•Los cambios en las políticas de energía renovable impide la internacionalización de nuestra empresa.	◯	◯	◯	◯	◯
•Los cambios de política fue una oportunidad para nuestra empresa a fin de promover nuestros productos .	◯	◯	◯	◯	◯

6.2 Después del cambio de la política de energías renovables en España hemos conseguido los siguientes cambios en la empresa:

	Sin éxito	Poco éxito	Aceptable	Cierto Éxito	Éxito
•La implementación de la nueva estrategia de internacionalización	☐	☐	☐	☐	☐
•Modificación o renovación de la estructura de la organización para facilitar la internacionalización	☐	☐	☐	☐	☐
•Modificación o renovación del método de comercialización para los mercados extranjeros	☐	☐	☐	☐	☐
•No se han desarrollado cambios hasta el momento el la empresa	☐	☐	☐	☐	☐

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7. Industria

7.1 ¿Cuál de las siguientes fases describiría mejor el nivel actual de crecimiento en la industria de las energías renovables?

☐ Fase inicial

☐ Fase de crecimiento

☐ Fase de madurez

7.2 ¿Cuál de las siguientes fases describiría mejor el nivel actual de crecimiento tecnológico de su empresa?

- Fase inicial
- Fase de crecimiento
- Fase de madurez

7.3 Por favor, valore las siguientes afirmaciones sobre el número de empresas grandes y pequeñas en la industria de energía renovables:

	Totalmente en desacuerdo	**....**	**Neutral**	**....**	**Totalmente de acuerdo**
•En esta industria hay más empresas pequeñas que empresas grandes.					
•Esta industria está dominada por las grandes empresas.					
•Debido al pequeño mercado interno, las empresas pequeñas tienen que ir a los mercados internacionales.					
•Debido a la intensa competencia en el mercado interno, las empresas pequeñas tienen que ir a los mercados internacionales.					

7.4 Por favor, valore las siguientes afirmaciones sobre la estructura del sector de las energías renovables:

	Totalmente en desacuerdo	....	Neutral	....	Totalmente de acuerdo
•La posibilidad saber acerca de la última tecnología nos anima a ir a otros países .	◌	◌	◌	◌	◌
•Entramos al mercado internacional debido a que otras grandes empresas de nuestro sector entraron al mismo mercado internacional .	◌	◌	◌	◌	◌
•En esta industria es esencial que empresas sean internacionales .	◌	◌	◌	◌	◌
•En esta industria para ser los primeros en el mercado es más importante estar bien protegido por patentes.	◌	◌	◌	◌	◌
•La estricta política de patentes en el país de destino no nos permite	◌	◌	◌	◌	◌

entrar en ese mercado .					

Muchas Grasias!

Logic: Show/hide trigger exists.

Muchas gracias por el tiempo dedicado a responder este cuestionario. Sus respuestas son muy importantes para este estudio. Por favor seleccione:

(le informaremos acerca de los resultados de la lotería hasta Octubre 2015)

- Quiero recibir el resultado del estudio
- Quiero participar en la lotería
- Ambos
- Nada

Muchas Gracias!

UAB
Universitat Autònoma
de Barcelona

10.4. *Technological level of development analysis*

Level of technological development and International Entrepreneurship:

> **Hypothesis13a:** There is no significant relationship between the level of industry evolution and internationalization of the renewable energy companies.
>
> **Hypothesis13b:** In renewable energy industry companies with more mature technologies are more willing to internationalize.

According to our analysis we analyzed the differences between the different technological development levels. Since here we have several dependent variables and then categorical independent variable we selected MANOVA to compare the differences between the companies at various levels of technological development. The primary results from MANOVA show that there is significance different between companies at different levels of technological development.

A MANOVA was run on a sample of 270 participants to examine the effect of different levels of technological development on entrepreneurial internationalization of the firms.

There was a significance difference between the companies' levels of technological development at initial phase, growth phase and, maturity phase when considered jointly on the variables internationalization scale, scope and scale (IE) , Wilk's Lambada = .906, F(6, 508) = 4.26, p= .0003. To find where the difference lie we will follow up with several post-hoc tests. We will begin by comparing the treatment group (initial phase) with the average of the control groups i.e. growth phase group and maturity group. These results indicate that companies in the initial phase of the technological development are statistically significantly different from the average of the firms in growth and maturity phases, Wilki's Lambda =.937, F (3, 253) =5.69, p=0.001. In contrast the difference between the firms in the growth phase and maturity phase in not significant, Wilki's Lambda = 0.980, F (3, 253) = 1.81, p=0.146. Then we compared the results based on the differences in the means for each of the dependent variables (scale, scope, speed of internationalization) for each of the control groups (growth and Maturity phase) compared to the firms in the initial phase of the technological development.

W = Wilks' lambda L = Lawley-Hotelling trace

P = Pillai's trace R = Roy's largest root

Source	Statistic		df	F (df1,	df2) =	F	Prob>F
Level of Technological Development	W	0.9066	2	6.0	508.0	4.26	0.0003 e
	P	0.0940		6.0	510.0	4.19	0.0004 a
	L	0.1024		6.0	506.0	4.32	0.0003 a
	R	0.0951		3.0	255.0	8.09	0.0000 u
Residual			256				
Total			258				

e = exact, a = approximate, u = upper bound on F

Respecting to the dependent variable percentage of international sales (scale), the difference between the means for firms in initial phase versus the firms in growth phase and maturity phases groups are approximately 10 and 15 which is not significant between the firms at the Initial phase and Growth phase (p= 0.118), in contrast this difference is significant between the firms in Initial phase and Maturity phase (p= 0.037).

	Int. Scale
1.Initial Phase	0
	(.)
2.Growth Phase	9.966
	(1.57)
3.Maturity Phase	14.98*
	(2.10)
N	259

t statistics in parentheses
+ p<0.1, * p<0.05, **p<0.01, *** p<0.001

The other dependent variable is number of countries that firms have international activity with (scope). The difference between the means for firms in Initial Phase versus the firms in Growth Phase and Maturity Phases groups are approximately .562 and .941 which are statistically significant with respectively p= 0 .006 and p=0.000.

	Int. Scope
1.Initial Phase	0
	(.)
2.Growth Phase	0.562**
	(2.78)
3.Maturity Phase	0.941***
	(4.15)
N	259

t statistics in parentheses
+ p<0.1, * p<0.05, **p<0.01, *** p<0.001

Internationalization speed or number of years took that companies enter to the international market increase when the companies are in the Growth and Maturity phase than in the initial phase. The difference between the means for firms in Initial Phase versus the firms in Growth Phase and Maturity Phases groups are approximately 0.835 and 0.885 which are statistically significant with respectively p= 0 .005 and p=0.009.

	Int. Speed
1.Initial Phase	0
	(.)
2.Growth Phase	0.835**
	(2.81)
3.Maturity Phase	0.885**
	(2.65)
N	259

t statistics in parentheses
+ p<0.1, * p<0.05, **p<0.01, *** p<0.001

A separate ANOVA was conducted for each dependent variable, the results show that there is a significance difference between firms at Initial, Growth and Maturity levels on number of countries they have international activities with, F(2,265)= 7.57, p=0.0006, partial SS = 17.80. Nevertheless, internationalization speed is significant at lower level F (2,275) = 3.52, p=0.03, partial SS = 17.69. Almost same results are obtained for internationalization scale as dependent variable, F (2,267) = 2.67, p=0.07, partial SS = 6291.82. The last result show that firms percentage of international sale is related to their level of technological development but the impact of level of technological development on this variable is not as large as its effect on the number of international markets or speed of entry to foreign markets. The following tables report the ANOVA tables. (need the table numbers!)

Number of obs = 270				R-squared = 0.0196	
Root MSE = 34.3092				Adj R-squared = 0.0123	
Source	Partial SS	df	MS	F	Prob> F
Model	6291.82783	2	3145.91.391	2.67	0.0709
Level of Technological Development	6291.82783	2	3145.91391	2.67	0.0709
Residual	314290.972	267	1177.11975		
Total	320582.8	269	1191.75762		

(ANOVA Internationalization Scale)

Number of obs = 268				R-squared = 0.0540	
Root MSE = 1.08462				Adj R-squared = 0.0469	
Source	Partial SS	df	MS	F	Prob> F
Model	17.8098051	2	8.90490254	7.57	0.0006
Level of Technological Development	17.8098051	2	8.90490254	7.57	0.0006
Residual	311.744668	265	1.17639497		
Total	329.554473	267	1.23428641		

(ANOVA Internationalization Scope)

Number of obs = 278				R-squared = 0.0250	
Root MSE = 1.58469				Adj R-squared = 0.0179	
Source	Partial SS	df	MS	F	Prob> F
Model	17.6929423	2	8.84647114	3.52	0.0309
Level of Technological Development	17.6929423	2	8.84647114	3.52	0.0309
Residual	690.593208	275	2.51124803		
Total	708.28615	277	2.55698971		

(ANOVA Internationalization Speed)

When we compare MANOVA at industry and company level about level of maturity, we found that the effect of the level of industry development on the internationalization scale is more significant than two other internationalization factors i.e. internationalization scope and speed. However, when we compared the difference between these variables internationalization scope is better significant variable in defining the internationalization of the firms.

10.5. *Feedback from managers and entrepreneurs*

Reply all | Delete Junk ...

Investigación académica de la Universitat Autónoma de Barcelona

JF Javi Font | Alusin Solar <javi.font@alusinsolar.com>

To: Alejandro Rialp Criado; Joaquim Vergés Jaime; Meysam Zolfaghar Ejlal;

Reply all

Thu 7/16/2015 11:55

From: Javi Font | Alusin Solar <javi.font@alusinsolar.com>
Sent: Thu 7/16/2015 11:55
To: Alejandro Rialp Criado; Joaquim Vergés Jaime; Meysam Zolfaghar Ejlal;

Survey Gizmo

- The message sender has requested a read receipt. To send a receipt, click here.

Buenos días a todos:
Soy Javier Fdez-Font Perez, gerente y propietario de Alusin Solar.

Acabo de cumplimentar con sumo gusto la encuesta que nos han hecho llegar. Me ha parecido de mucho interés y me gustaría me tuvieran en cuenta a la hora de entregar los resultados de la misma.

Aprovecho para comentarles muy por encima. Los cambios regulatorios en España estuvieron a punto de hacernos cerrar la empresa hace 2 años. Hoy, más del 90% de nuestros clientes son internacionales y la situación de la empresa, lejos de estar para echar cohetes, no permite mantener los puestos de trabajo ser modernamente optimistas.

Desde la asociación de jóvenes empresario del Principado de Asturias (AJE Asturias) me han pedido en algunas ocasiones que les cuente nuestra historia para animar a los asociados a la exportación. Sobre todo, nuestros errores de gestión y planificación en la misma, que de esos tenemos unos cuantos...

Si aprovechando la presentación de los resultados de su encuesta les puede interesar hacer algo parecido, con sumo gusto, estoy a su entere disposición.

http://sialapymelevabien.com/la-exportacion-el-salvavidas-de-alusin-solar/
http://www.elcomercio.es/v/20131113/aviles/alusin-solar-destaca-necesidad-20131113.html

En la firma del correo tiene todos mis datos de contacto.

Atentamente · Best Regards · Cumprimentos · Cordialement

Javier Fernandez-Font Pérez
General Manager

Mob. ESP +34 687 720 587 | Calls with whatsapp available
Skype: javi.font.alusinsolar | javi.font@alusinsolar.com

alusínsolar