

ECO-INNOVATION IN SMEs AND INTERNATIONALIZATION

Valentina Battista

Caterina Nicolais*

Abstract

Eco-innovation combines several academic and business issues, including a global interest in the significant impact over international economies. SMEs play a critical role because specific actions on their products and services can primarily reduce resource waste. However, the effect of eco-innovation on internationalization has gained insufficient consideration. This paper seeks to fill this gap by investigating the effect of eco-innovation on internationalization of European SMEs. Moreover, the research tries to ascertain whether eco-innovation policies have a positive impact on SMEs internationalization. In order to do so, the Ordinary Least Square (OLS) method has been used and the results show that the eco-innovation drivers (investments in research and development, green patents and expenditure in green technology products) reveals a positive relationship on SMEs internationalization and the role of collaboration on technology appears to positively moderates the hypothesis of the study.

Keywords: eco-innovation; eco-innovation policies; SMEs; green patents

1. Introduction

In recent years, eco-innovation has generated many interests in both the academic and business world. Due to the growing problems concerning the environment, such as the scarcity of primary resources and the increase of the population, the preservation of the quality of the environment has become increasingly crucial, as also emphasized by Govindan et al. (2017). In addition, resource management, pollution control and climate change are all problems, which by their nature go beyond domestic geographical boundaries and take on an increasingly important international dimension. This entails a significant influence on the national and global economy, placing sustainability challenges at the center of the world debate and considering them a priority. According to this perspective, interest in eco-innovation has become one of the priorities in both the academic and business world. According to Fussler

* Valentina Battista, PhD Candidate in international PhD program in Economics and Management of Sustainability and Innovation at LUM University, e-mail: battista.phdstudent@lum.it; Caterina Nicolais, Researcher in Economic and political geography at the University of Naples "Parthenope", Department of Economic and Legal Studies, e-mail: caterina.nicolais@uniparthenope.it

and James (1996), eco-innovation refers to "new products and processes that provide value to the customer and the business, but significantly reduce environmental impacts".

As shown by the data of a recent report drawn up by the OECD (2020), the SMEs are among the greatest exploiters of resources and generators of significant waste, consuming about a third of the world's energy. Therefore, they represent a potential driver for creating an increasingly sustainable society and improving internationalization processes.

The aim of this study is to investigate the effects of eco-innovation on the internationalization of SMEs. Eco-innovation, as Wagner and Lerena (2011) pointed out, is a branch of innovation in economics and is defined as the "production, or exploitation of a good, a service, a production process or a new business, the results of which led to a reduction in environmental risks, deriving from the exploitation of resources compared to other relevant alternatives" (Kemp and Pearsons, 2007). Similarly, the Eco-innovation Observatory has defined eco-innovation as an innovation that reduces natural resources and decreases harmful substances in the life cycle of processes. Eco-innovation is therefore identified as the bearer of solutions that are environmentally friendly compared to alternative innovations. Furthermore, according to various scholars, eco-innovation offers opportunities to open new business channels by providing SMEs with a competitive advantage, leading to a favorable, win-win situation for the environment and SMEs; (Horbach, 2016). To contribute to the literature, the research question is: what is the effect of eco-innovation on SMEs internationalization? Moreover, what are the moderating effects of technological cooperation in the field of eco-innovation? To answer the research question and validate the hypotheses, a quantitative analysis was conducted through an OLS model. The paper data collection was carried out on Eurostat, the national statistical offices and the DIW Econ database on innovation and internationalization of SMEs and the Annual Report on European SMEs 2018/2019; (EC-European Commission (2019)). The analysis was conducted on a dataset containing information about the eco-innovative activities of SMEs belonging to the ten European countries that have distinguished themselves in the field of eco-innovation. This research shows the positive effects of eco-innovation on the internationalization of SMEs, confirming the fundamental role assumed by government policies and the technological cooperation. The paper is organized in an overview from the literature concerning the international theory, the conceptual framework and the methodology description. Next, the econometric model and the results are presented and discussed.

2. Theoretical Background: The Internationalization Theory

Over the past decades, man-made pollution, the scarcity of natural resources, the enormous production of waste and its disposal have become subjects widely debated and analyzed at global level. Above all, the emissions of pollutants responsible for the intensification of harmful greenhouse gases, which lead to the consequent increase in global warming, are a source of concern. It has been found that these gases have become more acute with the progress of human activities. The consequences of these phenomena are seen every day in climate change, which

brutally modifies the natural balance of our planet. According to the Organization for Economic Cooperation and Development forecasts, the world population will exceed 9 billion inhabitants by 2050. On the one hand, this will lead to the need to increase the production of necessities and others. Faced with this compromise, various actors, including businesses, governments, and consumers, are called upon to react with a certain urgency. Thus SMEs, aware of the importance of their social responsibility in the face of the problem of pollution as well as of the need to evolve in the face of changes the needs of their customers and stakeholders, must increasingly take into account social and environmental issues when developing new products; therefore, trying to pursue both economic and environmental goals. Within this globalized and increasingly interdependent context, SMEs are increasingly engaged in activities outside their internal markets. The literature and scholars such as Papadopoulos and Martin (2010) have identified these processes with different terms and among them internationalization, degree of internationalization and multinationality. But these reflections have been characterized by a minimum common denominator deriving not only from the possibility of creating value for SMEs but from the great situation of uncertainty that a process such as internationalization entails at the operational level, as underlined by Hitt et al. (2006). According to the theory of internationalization, this allows SMEs to take advantage of more effective use of resources and capacities in research and development and of resources to seize the opportunity to divide into costs with the consequent possibility of growth. Precisely in this context, the SMEs interfaces with what is defined in the literature as being responsible for extraneousness, referring to the expenses concerning non-traditional operations in the context of foreign and unfamiliar markets. The literature has investigated the drivers of the internationalization of SMEs, as underlined by Casson and Buckley (1976). What emerged in the literature is that in order to face the non-domestic market, grow and compete, SMEs must focus on their peculiarities and make them a strategy. These drivers are mainly linked to skills such as that research and development spending, the ability to innovate, SMEs innovations, the ability to collaborate with other SMEs, the size of the company and the governance. Unlike the two great theorists of internationalization, Casson and Buckley (2009), who focus their studies on transaction costs and imperfections on the middle market and the importance of research, Hymer (1968); focuses on the opportunities deriving from monopolies. The position of the two theorists of internationalization is also supported by Cerrato and Piva (2012) when they address in their studies the importance and the competitive advantage deriving from the exploitation of intangible assets beyond national borders with interest in the Uppsala model of Johanson and Vahlne (2017), which underline the importance of experience as a driving force of internationalization processes. According to Porter and van der Linde (1995), the international SMEs that appear to have achieved international success is characterized by a high rate of innovation and high levels of research and development. For these reasons, many scholars have investigated the role and link between internationalization and green innovation, focusing on the fundamental role of research. According to the literature, product and process innovations are distinguished and allow SMEs to be highly competitive in the foreign market. Furthermore, this ability of SMEs; is related to the ability to use not only their internal know-how but also to acquire skills through cooperation, partnerships or licenses. SMEs that have this wealth of external and internal

knowledge generate value in performance in the internal and international market. Therefore, as underlined by Golovko and Cassiman (2011), a company's ability in research and development and its innovative capacity are factors of great success in favoring the decision to enter international markets. For these reasons, the higher the research and development of a company, as Cerrato (2006) points out, the greater the orientation of SMEs to enter the foreign market and start internationalization. From the literature, as also highlighted by Valentini and Golovko (2011), there is a reciprocal influence between innovation and internationalization of SMEs. Still, according to the scholars and confirmed by Filippetti and Archibugi's studies (2010, 2011), SMEs are experimenting with new ways of doing business and an innovative culture that also arises from exchanges with other companies. This is the birth of a virtuous circle that favours great growth opportunities, especially when it comes to environmental innovation or eco-innovation. Chiva et al. (2014) studied its benefits and positive effects on performance.

Recent studies have clearly highlighted the dynamics of interactive relationship among the eco-innovation and internationalization: the benefits of eco-innovation are not limited to improving environmental performance, but also allow companies to obtain numerous monetary and economic advantages: the inclusion of eco-innovation in company products and processes, in addition to reducing environmental degradation, promotes satisfaction of current customer needs, and at the same time helps companies gain competitive advantages and increase their market segments. In this way, companies improve and expanded their reputation on the global market, providing a flexible, responsive and responsible organizational image (Juniati et al., 2019). Therefore, eco-innovation strategies are crucial for economic performance, achieve cost savings, respond to market demand, enter new markets, effectively fight fierce competition, build or enhance business reputation, achieving sustainability goals (Hojnik et al., 2018).

Governments' efforts should be directed not only at changing the current eco-regulations, and eco-policies, but also at respective transforming the institutional environment, promoting green education, and shaping citizens as well as businesses commitment to sustainable and, therefore, competitive objectives (Malgorzata et al., 2022).

2.1 Conceptual Framework and Development Hypothesis

Since Fussler and James (1996) first invented the concept, eco-innovation has started to attract the attention of many scholars, and different definitions have been re-proposed over time. The most widely used and accepted definition is that developed by Kemp and Pearson (2007): "Eco-innovation is the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organisation (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives".

As Horbach, et al. (2012) point out, eco-innovations can also result from other economic rationalities such as increasing market share or reducing costs. The literature concerning the taxonomy of eco-innovation is wide and extensive. Many

classifications differ according to the characteristics considered, the purpose of the innovation, the dimension analyzed (for example, social, economic, institutional, etc.) and other aspects. By wanting to give a single classification, it is possible to consider the definition developed by the OECD (2007), which seems to be the most used by experts and scholars in the environmental sector. There are four macro-categories of eco-innovations: 1) Environmental and technological innovations, 2) Organizational innovations for the environment, 3) Product and service innovations offering environmental benefits, and 4) Environmental System innovations (Kemp and Pearson, 2007). Regarding the first category, particular reference is made to environmental process innovations, better known under "eco-innovation process". The eco-innovation process introduces new technologies and methodologies that reduce energy consumption, a more efficient use of resources and, ultimately, a lower production costs for the firms. There are essentially two types of environmental process innovations: end of pipeline technologies and cleaner production technologies (Demirel and Kesidou, 2011). The first type of eco-innovation consists of technological solutions integrated into the final phase of production processes to transform emissions. The second type of eco-innovations concerns organizational innovations for the environment, or the introduction of organizational methods and management systems designed to address environmental issues related to products and processes. These require new infrastructure and systems that go far beyond the adoption of unique technology as prevention programs and environmental management and control systems such as ISO 14001 certifications and can be extended across the entire value chain. In particular, "value chain" management involves the engagement of many actors and cooperation with other SMEs. In the third category of eco-innovations there are new products or products that are significantly improved from an environmental perspective and respectful environment services. In the literature, several studies have focused on the factors that push companies to introduce environmental innovations. The reason lies in the fact that eco-innovations represent one of the main tools through which sustainable development can be achieved. In addition, demand factors include consumers' preference for green products and the need for companies to maintain an environmentally friendly image (Rennings, 1998). However, tracing the determinants of "normal" innovations to those of environmental innovations is not enough because eco-innovations have a particularity that makes them unique. Indeed, according to what the neoclassical school affirms, environmental innovations are characterized by a double externality both in the Research and Development phase "knowledge externalities" and in the innovation diffusion phase "environmental externalities". The first appears to be common to all types of innovation because when a company undertakes R&D activities, it generates positive knowledge spillovers that go beyond its boundaries. On the other hand, the second is linked to the environmental characteristic of the innovation, which, once introduced, produces positive effects on the environment. As far as SMEs are concerned, eco-innovations aim to contribute to a company's goals, such as cost reduction and revenue growth. The lowest common denominator highlighted is that eco-innovations positively affect environmental impacts and are characterized by efficient use of resource. As investigated by the De Marchi (2012), eco-innovations have a double positive effect due to the innovation itself and the positive impact on the environment. Also, important and studied in the

literature are the eco-innovation drivers categorized in demand pull and technology push, affecting SMEs. Unlike normal innovations, eco-innovations, as argued by Rennings (2000), are subject to a double externality and are encouraged by push and pull effects. For these reasons, the scholar states that the policies of governments and the skills in the field of innovation of SMEs that allow the creation of new products and processes are relevant. Moreover, from these peculiarities emerge according to the literature of the opportunities for SMEs, such as greater competitiveness, improved reputation, reduced costs, greater productivity. This also entails an increase in the operations that SMEs can initiate on the foreign market. Hence, this paper proposes the following hypothesis:

- H1: Eco-innovation has a positive impact on SMEs internationalization

The literature on eco-innovation has often highlighted how in recent years government policies have assumed a fundamental and stimulating role as investigated by Porter and van der Linde (1995). Also, according to their studies, environmental policies have the power to “force” or give guidelines to SMEs that want to deal with eco-innovation by stimulating its adoption through favourable economic incentives.

These policies stimulate competitiveness by creating significant growth opportunities. The role of green policies favouring SMEs innovation performance is studied more and more in the literature. The purpose of governments is to support the market and encourage investment in research and innovation, as underlined by the recent creation of the European Innovation Council. It is an instrument in favour of SMEs which has joined the European Research Council. European policies in this regard provide for direct aid, incentives concerning the protection and enhancement of research results and the protection and exploitation of green patents. Therefore, the regulations must be in line with the policies present in the international arena, with the international demand. Furthermore, according to research carried out by Desmarchelier et al. (2013), in a French case study on a company that offers services, a strong sensitivity to green policies, such as eco-taxes or financial incentives that have an impact, was highlighted positive on green investments. Many works in the literature by Horbach (2016) has highlighted the consequences and positive impact of subsidies on activities in eco-innovation by SMEs. The regulations stimulate companies to play an active role in eco-innovation to obtain benefits in terms of performance in the domestic and international market. Of course, not all companies are compliant and adapt minimally by not seeing these entail benefits. The literature has found which those policies give favourable incentives for SMEs to adopt eco-innovation. However, it is necessary to mention how these policies are not always easy to implement as pointed out with a practical case by Eidat (2008). In fact, some scholars have highlighted that the economic and financial incentives and therefore the policy tool are much more fragile on a practical level than what is highlighted in the literature. According to some scholars, the complementarity between innovative and green policies is effective. Therefore, the following hypothesis arises:

- H2: Eco-innovation policies have a positive impact on SMEs internationalization

Sharing knowledge is one of the most studied and investigated issues in the literature, especially in innovation and as regards the performance of companies on the foreign market. According to Bercicchi (2008), to face today's environmental challenges, SMEs must deal with the outside world. This depends, as highlighted in the literature, on the network and on the relationships established with external actors. According to the literature, it is defined as an activity characterized by inter-organizational collaboration based on exchanging know-how or exchange of technology, often governed by an agreement. Cooperation in technology arises from the collaboration between one or more SMEs that share through an agreement part of their activity in research and development. This cooperation is based on a fundamental theory of reference, namely that of the theory of transaction costs, but not only assumes economic advantages but above all represents a medium-long term strategic relationship. There are many actors involved, such as universities, research centres, customers who create an ecosystem of green innovation. This is because green innovations are extremely complex at a systemic and process level, as underlined by De Marchi (2012).

The SMEs, through technological agreements, can share knowledge, increase their know-how in the field of research and development, thus leading to the acquisition of transversal skills that facilitate access to the international market. These agreements based on non-disclosure clauses allow a significant decrease in costs and risks and increase confidence in facing an increasingly difficult market such as the foreign one compared to the domestic one. This leads to a significant increase in efficiency and company organization. This is also the case for eco-innovation, which benefits from the instrument of cooperation in the technological field. Thanks to the cooperation, eco-innovations are improved through increasingly integrated skills that favour diversification between products, reducing their risks. The following hypotheses arise:

- H3: The cooperation on technology directly moderates the relations between eco-innovation and internationalization which is hypothesized in H1
- H4: The cooperation on technology directly moderates the relations between eco-innovation policies and internationalization which is hypothesized in H2

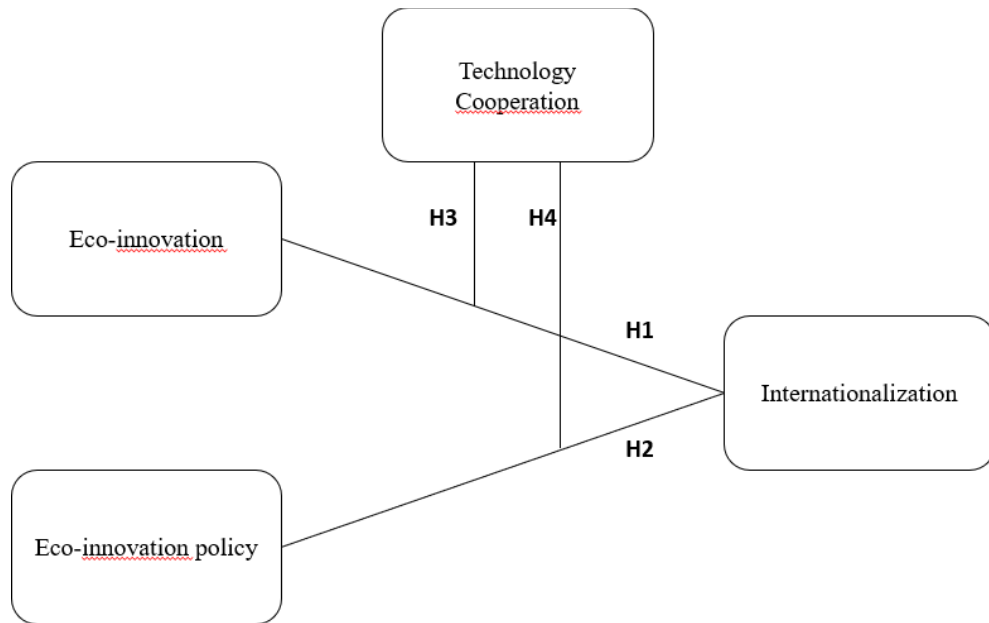


Figure 1: theoretical framework

2.2 Methodology

The literature analysis was carried out on EBSCO and Google Scholar, and in particular by inserting on the string the word eco-innovation in reference to the internationalization of SMEs. The analysis was conducted over a period of time ranging from 2011 to 2019. The unit of analysis considered are the SMEs of the ten European countries active in the field of eco-innovation: France, Germany, Sweden, Italy, Netherlands, Finland, Denmark, United Kingdom, Spain, Austria. To answer the research question and validate the hypotheses, a quantitative analysis was conducted through an OLS model. The paper data collection was carried out on Eurostat, the national statistical offices and the DIW Econ database on innovation and internationalization of SMEs and the Annual Report on European SMEs 2018/2019 (2019). In this paper, one of the independent variables used is the level of eco-innovation. According to the literature, many studies have measured this variable with R&D expenditure and green patents. In this study both measures were analyzed as highlighted by Demirel and Kesidou (2011). The dependent variable is represented by SMEs internationalization and according to the literature is very complex as a dimension and is multifactorial due to its complexity. For this, according to Cerrato and Piva (2012), it is defined as the relationship between foreign sales to total sales. In this context, foreign sales are defined as sales generated outside Europe and not in the European Union, given that in the analysis it is the UK was also involved. In this paper, one of the independent variables used is the level of eco-innovation. To validate the second hypothesis and measure the impact of the second

independent variable, i.e. the policies in the field of eco-innovation on internationalization, are measured. In this paper, technological collaboration between SMEs is considered a moderating variable. Multiple linear regression has been used to study the effects of the independent variables, the degree of eco-innovation on SMEs internationalization, and the moderating effect of cooperation on technology.

2. Model with the moderation effect of cooperation on technology

Model 1: OLS, with observations 2-90 (n = 89)

Dependent variable: v8

Robust standard errors with respect to heteroskedasticity, variant HC1

	Coefficien t	Standard deviation	t ratio	p- value
Constant variable	92833,1	6969,07	13,32	<0,000 1 ***
V1 ISO certification	0,105098	0,138658	0,7580	0,4506
V2 R&D expenditure	16638,4	3189,74	5,216	<0,000 1 **
V3 Green patents	1,13849	5,52951	0,2059	0,8374
V4 Eco- innovation policies	0,0189967	0,00752725	2,524	0,0135 **
V5 Scientific co- publications	-19,3285	3,76788	-5,130	<0,000 1 ***
V6 Cooperation on technology	39,3656	353,119	0,1115	0,9115

The table shows R², sum of squares, Log-likelihood and β -value.

Mean dependent variable	40669,75	SQM dependent var.	29737,21
Sum of squares	3,51e+10	E.S. of the regression	20691,45
R-squared	0,548859	R-squared	0,515849
F(6, 82)	40,00941	P-value(F)	2,23e-22
Log-likelihood	-1007,076	Akaike Criterion	2028,151
Schwarz Criterion	2045,572	Hannan- Quinn	2035,173

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Inflation Factors of Variance (VIF) Minimum possible value = 1.0
 Values above 10.0 indicate a collinearity problem

v1	1,255
v2	2,018
v3	1,925
v4	1,191
v5	1,843
v6	1,969

Table 1: Model with the moderation effect of cooperation on technology.

4. Findings and Discussion

The OLS model with dependent variable Y, the SMEs internationalization, and the moderation effect of cooperation on technology, is quite robust, and the p-values are also good. The variables used in the model are significant and $R^2_{adj} = 0,515849$. As shown in the model at a unit increase of the variable V1 (ISO certification), the variables Y (SMEs internationalization) increase of 0,105098 keeping still the other variables. Considering the variable V2 (R&D expenditure), keeping still the other variables, at unit increase of V2(R&D expenditure) there is the same trend of Y of 16638,4. The same trend for V3 (green patents) and V4 (Eco-innovation policies) where at a unit increase of the variables V3 and V4, the dependent variable increases respectively of 1,13849 and 0,0189967. The hypothesis 1 and 2 of the study according to the results of the model have confirmed the importance of the level of eco-innovation and the strategic role of eco-innovation policies on SMEs internationalization. If we consider the variables V5 (scientific co-publications) we find an inverse trend, in fact our dependent variable Y decrease of -19,3285. The results also confirm the fundamental importance of the moderating role of cooperation between SMEs in the field of technology

In addition, according to the variance inflation factor, the variables do not have multicollinearity problems.

5. Conclusions

The paper results confirm Porter's hypotheses according to which strict policies in the field of eco-innovation and development of eco-innovation contribute to improving the internationalization of SMEs. Although much literature agrees,

many scholars have analyzed the contrasting effects, especially in policies that are not always easy to implement. The study also confirms the fundamental role of collaboration in the field of technology. These collaborations bring great benefits and involve SMEs and the whole world, which revolves around the enhancement of innovation and research results, favouring the entry of SMEs on the international market and creating favourable conditions for development, not only economic. However, the results are not yet particularly evident, and today the academy discusses the potential of eco-innovation on the internationalization processes of SMEs. According to scholars, eco-innovation can give greater competitiveness, improve reputation, and start a process of diversification of the products offered. Unlike the existing literature which highlighted the problems that SMEs had to solve when interfacing with a foreign market, this study highlights how eco-innovations can be fundamental and assume a strategic role for SMEs who want to enter a foreign market. The moderating effect presented in this research concerning technological cooperation in the context of the report between environmental innovation, environmental policies and internationalization is significant. This demonstrates how the SMEs that initiate technological cooperation processes are able to exploit the advantages of eco-innovation compared to those that do not cooperate.

In addition, public policies in the field of eco-innovation are of practical importance. We are witnessing more and more a growing concern about the environment. For these reasons, increasingly stringent environmental regulations must be disseminated. The policy should encourage the development of eco-innovation, and this study has shown, with many limitations, the positive effect. Once again, what is evident is the confirmation of Porter's hypotheses through the creation of a win-win situation both for the SMEs and the environment. According to some scholars, it is not a question of activating only financial incentives, but as Antonietti et al. (2015) highlighted in their studies, activating mechanisms to spread a shared culture that looks at the sustainable development of businesses and the territory.

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