PROACTIVE ENVIRONMENTAL STRATEGY DEVELOPMENT: FROM LAGGARD TO ECO-INNOVATIVE FIRMS

Introduction

There is abundant literature regarding strategic diversity in the environmental protection field. In the 1990s some authors established the basis for classifying firm behaviour in different pro-environmental strategic categories (Hart, 1995; Henriques and Sadorsky, 1999; Hunt and Auster, 1990; Roome, 1992). Based on these seminal studies, the subsequent literature shows solid consensus about the idea that the integration of environmental issues in the firm's strategy can take place along a continuum of possibilities between a reactive approach to meet applicable legislation and a proactive approach based on voluntary actions (Albertini, 2013; Buysse and Verbeke, 2003; Hyatt and Berente, 2011; Murillo-Luna et. al, 2008). This literature analyses both the background and implications of different environmental behaviour patterns but it generally provides few details of pro-environmental change processes.

In this study, we attempt to advance in the knowledge of environmental behaviour possibilities, investigating whether evolution towards environmental proactivity is a process that firms systematically follow or whether there are different ways of advancing towards more proactive strategies. Other studies have previously contemplated environmental behaviour strategies as a logical process undergone by firms in the development of environmental proactivity (Post and Altman, 1994). This study aims to learn more by providing a more detailed description of different environmental strategy stages. The proposed objective is to study pro-environmental change processes in firms, focusing on the width and intensity of environmental measures implemented in a three-year period in different areas (productive process, product, management and supply chains).

The introduction of sustainability in the firm has been seen as a challenge that demands important changes in the organization (Millar et al., 2012). Based on the assumption that firms willing to improve their environmental results have to make changes in the organisation, we sustain the idea that such changes not only have to be adopted with some intensity, but also with some breadth, affecting different areas of the organisation. Few authors have jointly examined these two dimensions of environmental strategy. In general, the theoretical and empirical literature that tries to describe the different categories of environmental strategy

consider the intensity with which firms adopt pollution-reducing practices, but pay less attention to the diversity or horizontal scope of such measures.

In our research, following Lee and Rhee (2007), we consider both depth and scope of adoption of environmental practices. However, our approach differs from that of these authors by analysing firms' environmental behaviour focusing on the changes occurring in a given three-year period rather than on the levels reached. In sum, this paper's contribution to the literature lies in the provision of a more detailed description of different stages of pro-environmental change in firms, detecting patterns with significant differences in the diversity and intensity of recent environmental measures adopted.

Four different patterns of pro-environmental change that firms systematically follow can be noticed thanks to the results of this work. From laggard positions with low intensity and reduced scope, to eco-innovative positions characterised by high intensity and scope in the adoption of environmental practices. The study has detected the presence of green patents only in the most advanced stage of pro-environmental change, while environmental certifications are present from the early stages.

The paper is structured as follows. After the introduction, a review of the literature is provided in order to categorise strategic environmental behaviour. The third section describes the empirical study, the sample, the designed variables and the analytical methods. This is followed by a description of the results of the research. The paper ends with the conclusions reached from this study.

Environmental Behaviour Strategies

Several authors agree that there are two methods in the literature to classify environmental strategic behaviour, the progressive approach and the non-progressive approach Ghobadian et al., 1998; González-Benito and González-Benito, 2005; Hass, 1996; Kolk and Mauser, 2002). The progressive approach provides a continuum of strategic possibilities, while the non-progressive approach classifies environmental strategies relative to other factors or characteristics related to the firm and its environment (see Table 1 and Table 2).

Insert Table 1 about here

In the progressive approach, more abundant in the literature, the classifications are based on a similar structure, comprising a continuum of possibilities that range from passive or reactive to environmentally advanced or proactive strategies. The least advanced categories often correspond to firms with very little or no environmental effort. In the next stage is a behaviour pattern that meets the minimal environmental demands of legislation or stakeholders, doing as little as possible without incurring administrative fines and satisfying stakeholder requirements. The next stage presents a significant change in the firm's environmental aspects, in an attempt to reach a win-win situation, which improves environmental performance and increases the firm's competitiveness, by improving income or by reducing costs. This category is often explicitly known in the literature as "environmental proactivity category" (Henriques and Sadorsky, 1999; Hunt and Auster, 1990). In this respect, according to the definition proposed by González-Benito and González-Benito (2006), environmental proactivity consists in the voluntary application of environmental practices and initiatives characterised by the early adoption, anticipating rather than reacting to requirements. Moreover some authors consider environmental innovation as a capacity to be expected in the most advanced or proactive strategic categories (Cramer and Jansen, 1995; Meffert and Kirchgeorg, 1992; Newman and Breeden, 1993; ; Schot, 1992).

Insert Table 2 about here

Although the progressive approach is dominant in the literature that classifies strategic environmental behaviour, some studies follow a non-progressive or non-sequential classification. This approach contemplates a strategic analysis of firms' environmental behaviour based on different orthogonal dimensions, not always related to degree of environmental effort. They usually classify firms' strategic environmental behaviour using tools such as a matrix formed by axes that measure degree of application of different variables.

As evidenced in Table 2, one of the first studies to classify firms' environmental behaviour using a non-progressive approach is Steger (1993). This author proposes four strategies (offensive, indifferent, innovative and defensive) based on two orthogonal dimensions. The first dimension measures market opportunities through environmental protection, the second

dimension measures corporate environmental risks. Vastag *et al.* (1996) also use a non-sequential approach. They use exogenous and endogenous environmental risk levels to classify different types of business behaviour related to the environment. Klassen and Angell (1998) use business ambition and degree of regulatory institutional motivation related to environmental matters to define four categories of environmental behaviour. Carmona-Moreno *et al.* (2004), in contrast, use the relative importance of environmental management, experience in environmental management and perception of these practices as a strategic ability to develop four environmental behaviour strategies. Finally, others like Cavalcanti (2011) uses degree of development of positive environmental behaviour and degree of environmental pressure in the sector as the basis for the development of another matrix of strategic environmental behaviour.

Considering this scientific literature, which attempts to categorise different environmental behaviour strategies in firms, an exploratory analysis is proposed, aiming to seek environmental behaviour patterns using the methodology described by Lee and Rhee (2007). These authors find four non-progressive environmental behaviour strategies based on the scope and depth of the environmental proactivity measures applied in a firm.

Research Method

In this section the analysed sample is explained, together with the treatment of selection bias, the variables under study and the methodology used.

Sample and bias

The study population comprises firms located in Aragón (in the northeast of Spain) with at least 5 employees, which operate in sectors susceptible to the use of technologies contemplated in the BREFs (Best Available Techniques Reference Documents). A total of 2,996 questionnaires were e-mailed in June 2013, addressed to the person responsible for environmental affairs or, if there was no such person, to the manager. The SABI[1] database was used to collect information about these firms and the contact data were obtained from their websites. The survey was sent again in October 2013 with telephone follow-up, emphasising the sectors (industrial sector) and firm sizes (from 5 to 50 employees) that fit the least with the real structure of the population.

[1] SABI (Iberian Balance Sheet Analysis System) is a database developed by INFORMA D&B in collaboration with Bureau Van Dijk, which includes general information and annual accounts of over 2 million Spanish companies and more than 500,000 Portuguese ones.

After three months of data collection, the final sample obtained consisted of 303 valid observations, representing a response rate of 10.11%.

In order to prevent ex ante selection bias in the sample, the questionnaire was validated by a panel of experts[2], and it provided the opportunity to respond privately and anonymously, guaranteeing full confidentiality and specifically referring to current data protection legislation[3]. The interviewees were also told that the objective of the questionnaires was only for scientific purposes. These ex ante measures are needed, but they are not sufficient (Chang et al., 2010). Therefore, ex post-statistical control strategies were applied to test for selection bias and common method bias.

The firms included in the sample operate in 4 different sectors (primary sector, industrial sector, construction and service sector) and can be divided into 3 size categories (from 5 to 50 employees, from 51 to 250 employees and more than 250 employees), as shown on Table 3. These distributions are not substantially different from those of the population of firms (Table 3). Furthermore, regarding non-response bias, and following Armstrong and Overton (1977), early and late replies received of the questionnaire were compared in our key variables. The associated t-tests were calculated (H0: there are no differences between early and late replies) and all of them were not significant at 0.05. As well, there were no significant differences at 0.05 in terms of firm characteristics (size or sector). To control for common method bias, Harman's single-factor test was used to estimate the extent of the common method bias. All the variables were subjected to principal components analysis. The first un-rotated component explains less than 45% of the variance. Therefore, selection bias and common method variance cannot be expected to be serious problems in our research.

Insert Table 3 about here

Measurement

[2] The panel of experts was made up of 7 people: three representatives of public administrations, two of business associations, one academic expert and the CEO of a firm. They all worked in fields related to the business world and/or the environment. Using a Likert scale from 0 to 10, the experts were asked to assess the comprehension and relevance of each of the items on the survey

[3] See Spanish Data Protection Act (Organic Law 15/1999, of 13 December).

From a series of indicators that measure degree of pro-environmental change in firms over the last three years, a set of variables were designed that synthesis both its intensity and scope. The selection of these indicators started with those used in other studies (Aragón-Correa, 1998; Lee and Rhee, 2007; Murillo-Luna et al., 2008), as well as the assessments provided by the panel of experts. A set of 14 pro-environmental change indicators (Table 4) were used, 4 to measure change in processes, 3 to measure change in products, 4 to measure change in management and 3 to measure change in supply chain. These indicators enable us to quantify the degree of application of regular pro-environmental measures in the last 3 years, using a Likert scale from 0 to 10, where 0 is "no measure has been applied" and 10 means "many measures have been applied". To facilitate the answer, the 11 response categories were explicitly shown, with detailed descriptions. A time window of 3 years was also established in relation to firms' pro-environmental change, following the opinion of the panel of experts that guided the survey's design and the criterion used in previous studies on the topic (De Marchi, 2012; Segarra-Oña et al., 2015). The survey respondents were also asked about the number of green patents (eco-innovation) obtained as a result of said change and about implantation of the ISO 14001 – *Environmental Management System: Requirements with guidance for use* – standard.

Insert Table 4 about here

Intensity of pro-environmental change. A set of 14 indicators directly measure the intensity with which each of the measures have been applied on a scale from 0 to 10. These indicators are used to construct two types of variables related to intensity of pro-environmental change. On one hand, four variables are constructed to measure partial intensities related to change in each of the four groups of pro-environmental change measures (process, product, management and supply chain). These variables are calculated as the mean values of the items present in each type of measure. On the other hand, the total intensity of pro-environmental change variable is calculated as the mean of the 14 items, and measures the mean intensity of application of pro-environmental change measures in the firm.

Scope of pro-environmental change. The scope evaluates the amplitude or diversity of pro-environmental change measures, according to the different types (process, product, management and supply chain) implanted in the firm. There are also two types of variable here. Four measure the partial scope of each type of measure through the number of different

measures implanted in each of the four types. Two of these variables can take on values from 0 to 4, as four items are considered (related to processes and management). The values of the other two, measuring partial scope in product and supply chain measures, can range from 0 to 3, as three items are considered. Moreover, total scope of pro-environmental change can take on values from 0 to 4, according to whether measures have been implanted in each group (process, product, management and/or supply chain) or not. It was specifically considered that a firm had taken at least one type of measure if intensity was 1 or more in any of the items in the group.

Two additional indicators were used to complete the view of environmental management in the firm:

Eco-innovation. To measure eco-innovation, the questionnaire asked firms about patents registered in the last three years as a result of the pro-environmental change measures described in the previous paragraph. In this case, the variable is designed as a dummy with a value of 1 if the firm registered green patents and zero otherwise.

ISO 14001. This measured the existence of environmental management systems according to the ISO 14001 standard. The variable is designed as a dummy with a value of 1 if the firm has ISO 14001 certification and zero otherwise.

Control variables. Two control variables were considered, the sector variable and the size variable, both quantified as discrete variables. Size was established according to number of employees, comprising three categories (small, medium-sized and large firms). Regarding sector, following their NACE (Nomenclature of Economic Activities) codes, all the firms were classified into four groups (primary sector, industrial sector, construction and service sector). Table 3 shows the distribution of the sample for each control variable.

Data Analysis

An exploratory analysis was performed aimed at characterising the 303 firms in the sample according to degree of pro-environmental change. Analysing the different methodological options followed in studies to date (Table 1 and Table 2), Lee and Rhee (2007) was the most appropriate for best capturing the dimensions of pro-environmental change. Following this methodology, a cluster analysis was performed in which the grouping variables were degree of

application (intensity) and degree of width (scope) of the pro-environmental change measures applied by the firms in their production cycles.

To characterize the different cluster groups obtained, an analysis of variance (equality of mean vector) was performed, using the quantitative variables and the results of the respective Duncan tests (multiple range). With regards to the sector variable, the significance of the Chi square statistic and the standardised residuals associated to each of the crossovers resulting from the contingency table between the sector variable and the strategic pro-environmental change group variable were assessed.

Results

According to the descriptive mean values shown in Table 5, several preliminary conclusions can be reached. First, the companies in the sample have a high scope in the adoption of pro-environmental change measures (average of 3.12 on a scale 0-4). This shows that, in general, the firms adopt pro-environmental change measures in at least three of the four aspects considered. If the partial scope variables for each type of measure are analysed, process (A.1-A.4) and management (A.8-A.11) measures present greater diversity than product (A.5-A.7) and supply chain (A.12-A.14) measures. Regarding degree of intensity, the mean value of the variable shows intensity in the adoption of measures on the lower half of the scale (average of 4.65 on a scale 0-10). The greatest pro-environmental change intensity is found in management.

Insert Table 5 about here

The results of cluster analysis show that there are four significantly different groups. Figure 1 summarises the size of the four groups found and group mean values for the variables total pro-environmental change intensity and scope in the last three years. Table 5 shows the differences between groups based on the intensity of all the items used to describe the firm's environmental proactivity. This table also shows the differences between groups based on the partial and total scope and intensity of the implantation of pro-environmental change measures. Based on the analysis of variance and the Duncan tests, these first results show great significance in the definition of the four clusters, so a high degree of consistency is ensured in the subsequent description of the groups.

Insert Figure 1 about here

As shown in Figure 1, the first strategic group comprises Laggard Firms (G1), a set of 31 firms with a very low degree of pro-environmental change, in both intensity (0.43/10) and scope (0.97/4). The aggregate characterisation of the groups in Table 5 shows that the few measures adopted by these firms are applied to the production process, so it can be assumed that there is a first type of process measures that are more easily adopted, as they are the first to be applied by firms.

The next group comprises Initiated Firms (G2), a group of 89 firms with a more advanced level of pro-environmental change. As can be seen, there is greater scope (2.97/4) and a substantial increase in intensity (2.67/10) of pro-environmental change relative to the G1 firms. This type of strategic change consists of management and process measures. Based on the comparison between G1 and G2, it is possible to assume that after adopting process measures the next logical stage to increase the degree of the firm's environmental proactivity is to apply measures in management.

The third cluster group is found in Proactive Firms (G3), the largest group with 124 observations, with much greater scope (3.59/4) and particularly intensity (5.40/10). The pro-environmental change in these firms presents the largest number of types of measures, in process, management, supply chain and product. The supply chain and product measures are the last to be applied in firms, and can therefore be assumed to be the most difficult to implement.

Finally, the group of Eco-innovating firms (G4) comprises the 59 firms with the highest degree of environmental proactivity. In this case it is due to a very important increase in the intensity of the measures applied (8.28/10), with their scope (3.51/4) remaining unaltered, as the previous strategic group practically obtained pro-environmental change measures in the 4 fields of action considered.

In the search for significant differences in the endogenous characteristics of the firms in each group, the following results were found. The Chi square statistic (23.134, p-value=0.512) leads us not to reject the hypothesis that "there is no relationship between business sector and belonging to one of another of the analysed groups". We can therefore say that the pattern of

proactivity in pro-environmental change can be generalised to any sector given the analysed sample. The analysis of variance applied to firm size, however, leads to rejection of the hypothesis of joint equality (3.30, p-value<0.02), thus revealing some relationship between firm size and the different strategic groups of pro-environmental change. Despite this, after analysing the Duncan tests, there is no clear pattern that leads to conclusive results.

In addition, an in-depth analysis of whether there are really differences between the groups regarding eco-innovation behaviour was performed. Therefore it was analysed whether the variable that measures the existence of eco-innovation is a distinguishing characteristic in the configuration of the strategic groups. The results of the analysis of variance indicate that there is significant divergence between different strategic pro-environmental change. Table 5 also shows the results of the Duncan tests used to compare means in the likelihood of green patent registration in the four analysed groups of firms. The results are consistent with our idea concerning the characteristic of eco-innovation in the degree of firms' environmental proactivity, and it can be said that eco-innovation is an advanced stage of change towards environmental proactivity. In our case, it is found in the last strategic group (eco-innovative), a set of firms capable of developing specific capabilities for minimising environmental impact through eco-innovation.

Finally, the ISO 14001 variable was used to continue to describe each of the detected behaviour groups. Once again, analysis of variance rejects the null hypothesis of equality between groups in relation to ISO 14001 certifications. However, the Duncan test results, presented in Table 5, were used to show that such certification does not provide considerable environmental differentiation, the opposite of what occurs with eco-innovation. In other words, only laggard firms differ from the other groups in that most of them have no ISO 14001 certification. In the other three groups there are no significant differences in this respect, as ISO 14001 certification is found regularly in most firms.

Discussion

The results of this study are framed in abundant previous literature that empirically classifies strategic behaviour patterns according to progressive levels of environmental proactivity (e.g Aragón-Correa, 1998; Henriques and Sadorsky, 1999; Murillo-Luna et al., 2008; Post and Altman, 1994). This research contributes to knowledge on this topic, providing empirical evidence that firms follow a systematic process in their evolution to environmental proactivity.

The results obtained confirm the idea that there are no different pathways to reaching advanced environmental proactivity conditions, as firms follow similar routes, along which they provide additional resources for environmental protection. Only a few authors, such as Post and Altman (1994), had previously acknowledged the existence of a process of evolution over which companies move similarly. These authors, based on analysis of case studies, establish a transformational change model with three phases of organizational change: Adjustment (compliance-oriented stage), Adaptation/anticipation (beyond compliance stage) and Innovation. We go further, providing empirical evidence, from a sample of 303 firms, that the process of change is similar in firms of different sizes and sectors. This evidence is consistent with that established in previous studies that obtained no clear empirical evidence about the relationship between belonging to different environmental proactivity levels and firm size and/or sector (Aragón-Correa, 1998; Fernández Gago and Nieto Antolín, 2004; Reichert et al., 2000).

The results obtained about the pro-environmental change process confirm our assumption that environmental results will only improve with changes based on the two dimensions of environmental strategy proposed by Lee and Rhee (2007): depth and width.

In our aim to analyse the pro-environmental change process focusing on the width (diversity) and depth (intensity) of environmental measures implemented in a three-year period, we found four phases or stages through which firms evolve. In the first stage of the pro-environmental change process, firms focus on altering and improving processes, with low or moderate intensity. After those first steps, firms advance with greater intensity but also include changes in management practices. Completion of the process and management modification process with changes in products and supply chain is the next step on the environmental proactivity scale. In the final and more advanced stage of environmental proactivity, firms can continue to improve with more intense efforts aimed at the four types of environmental practice: process, management, product and supply chain. It is here where eco-innovation can be found. As far as we can see in the literature on the topic, there are no previous studies that analyse the pro-environmental change process in a similar way, identifying the sequence followed by firms in their adoption of measures related to process, product, management and supply chain.

Another of the findings of this research shows that eco-innovation, defined by “green patents”, is not yet a widespread practice in Spain. Only firms with change processes of great scope and intensity present eco-innovative behaviour. This confirms the generally accepted idea that

environmental innovation is a capability that can only be found in the most advanced environmental strategies (Cramer and Jansen, 1995; Meffert and Kirchgeorg, 1992; Newman and Breeden, 1993; Schot, 1992). Huppes and Ishikawa (2005) had previously referred to the reduced development of eco-innovation in the European context. About the comparison between European countries, in some settings, more advanced processes in terms of eco-efficiency (eco-innovation) are rare in the dynamic behaviour of firms in environmental protection matters (Huppes and Ishikawa, 2005). The policy adopted by every state in the European Union towards developing eco-innovation has resulted in different effects from countries with a very high penetration of eco-innovation and countries with low performances in this field (Álvarez et al., 2014; Davidescu et al., 2015). Indeed, in general terms, there is much more literature about environmental proactivity of firms (e.g. Aragón-Correa, 1998; Hyatt and Berente, 2011; Murillo-Luna et al., 2008) and less about eco-innovative business behaviour (e.g. Blum-Kusterer and Hussain, 2001; del Río et al., 2012; Scarpellini et al., 2016), probably due to the small number of firms with advanced behaviour in this field.

Finally, this research agrees with the idea previously established in the literature that ISO 14001 certification is not unique to the most advanced or proactive environmental strategies (Cañón-de-Francia and Garcés-Ayerbe, 2009; Lannelongue and González-Benito, 2012). On the contrary, it is a tool that firms voluntarily used nearly from the first step in the environmental change process and therefore does not, it itself, guarantee a high degree of environmental proactivity.

Conclusions

This study considered the strategic pro-environmental change of firms to detect homogeneous patterns according to scope and intensity of adopted measures in a three-years period. The empirical evidence showed four well-differentiated patterns of change with significantly different characteristics. Companies evolve in a similar way along these patterns extending the range of pro- environmental measures taken and increasing the intensity of adoption.

The findings of this study contribute to the research trying to answer questions without a clear solution in the previous literature. Do companies follow similar patterns in the scale towards environmental proactivity? What measures are taken mainly? Is there a logical evolution to adopt pro-environmental measures? Is this evolution different between sectors? To what extent is eco-innovation part of the environmental change? This study's empirical evidence provides

the following answers to these questions. Firms follow similar patterns in the scale towards environmental proactivity. Moreover, there is a logical evolution when adopting pro-environmental measures, irrespective of firm size or sector. Regarding the measures adopted, this paper concludes that in all sectors the most widespread pro-environmental measures taken by companies are process measures and management measures, both in intensity and diversity of actions. The implementation of measures of product and supply chain is less frequent and less intense in companies.

The results also indicate that there is often a logical order of adoption of these measures. Four pro-environmental change patterns can be considered as a continuum that firms follow, irrespective of the sector to which they belong. The characterisation of the patterns leads to conclude that the first pro-environmental change effort focuses on process measures. After process, measures firms usually deploy management measures, as well as Environmental Management System certification according to the ISO 14001 standard. Firms that advance to the next level increase their scope in the adoption of measures, also applying the other two types of environmental proactivity measures (in product and supply chain). The next stage in proactive pro-environmental change consists of apply the four types of measure more intensively than on the previous level. Only in this last and most advanced pro-environmental change strategy was found in firms that apply eco-innovation measures.

The evolution along which companies expand and intensify its environmental efforts is similar in the different sectors considered. What distinguishes the pro-environmental change of companies of any industry is the intensive adoption of product measures and supply chain measures, and specially the eco-innovation. Companies do not reach levels of environmental proactivity only through process measures like the correction of pollutants or the reduction of energy consumption, or through management measures such as ISO 14001 certification. These measures are visible throughout the whole process of pro-environmental change, but according to the data analysis presented here, their implementation does not generate significant differences between each other.

The results of this study are interesting from an academic perspective. The main contribution of this paper regarding previous literature is a more detailed vision of the strategic possibilities in environmental protection, providing information about the process of change and about how firms evolve to more advanced environmental strategy stages. Knowledge of this evolution

process, little studied in the previous literature, helps academics to understand the complexity and strategic significance of adopting environmental protection measures.

This study contains practical implications for management and policy makers. The results can help business managers to understand the process of change towards advanced environmental positions. This knowledge is useful for managers responsible for designing, planning and developing environmental strategies. The conclusions obtained are also interesting for those responsible for public policies related to the environment. Knowledge of the process of environmental change in firms could facilitate the design of appropriate support incentives and policies for businesses. The results of our research should be analysed with caution due to the limitations associated to the regional sample. Although the results could be extrapolated to areas with similar industrial characteristics as the autonomous region of Aragon, they should be confirmed with samples from more regions. This leads to the need for future research to replicate our analysis with alternative samples from other geographic areas and with different characteristics.

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Acknowldgements

This work was supported by the Spanish Ministry of Economy and Competitiveness under Grants ECO2013-45599-R, ECO2012-36290 and ECO2013-48496-C4-3-R; and DGA-FSE under CREVALOR and "Socioeconomía de la energía y la sostenibilidad – S128" research groups.

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Table 1: Environmental Behaviour Progressive Strategy Classification.

AUTHORS	CLASSIFICATION
Hunt & Auster 1990	Beginner—Fire fighter—Concerned citizen—Pragmatist—Proactivist
Winsemius & Guntram 1992	Reactive—Receptive—Constructive—Proactive
Stikker 1992	End-of-pipe—Environmental care systems—Environmental auditing—Cradle-to-grave approach—Sustainable business
Roome 1992	Non-compliance—Compliance—Compliance plus—Commercial and environmental excellence—Leading edge
Müller & Koechlin 1992	Inactive—Reactive—Proactive—Hyperactive
Schot 1992	Dependent—Defensive—Offensive—Innovative—Niche
Meffert & Kirchgeorg 1993	Opposition—Passivity—Retreat—Adaptation—Innovation
Greeno 1993	Problem solving—Compliance—Assurance
Newman & Breeden 1993	Reactive—Proactive—Innovative
Azzone & Bertelè 1994	Stable—Reactive—Anticipatory—Proactive—Creative
Post & Altman 1994	Adjustment—Adaptation/anticipation—Innovation
Cramer & Jansen 1995	Optimization production and products—Further renewal production technology—Function-oriented innovations
Welford 1995	Resistance—Observe & Comply—Accommodate—Seize & Preempt—Transcend
Hart 1995	Pollution Prevention—Product Stewardship—Sustainable Development
Buitelaar 1995	Passive/defensive—Offensive—Innovative—Critical sustainable
Crosbie & Knight 1996	Do nothing—Defensive posture—Social responsibility—Strategic opportunity—Sustainable business
Rondinelli & Vastag 1996	Reactive—Proactive—Crisis preventive—Strategic
Berry & Rondinelli 1998	Noncompliance with regulations—Compliance with regulations—EMS (beyond compliance)
Reed, 1998	Franchise protection—Process changes—Product changes—New market development
Henriques & Sadorsky 1999	Reactive—Defensive—Accommodative—Proactive
Alvarez Gil *et al.* 2001	Reactive—Intermediate—Proactive
Buysse & Verbeke 2003	Reactive strategy—Pollution prevention—Environmental leadership
Murillo-Luna *et al.* 2008	Passive—Attention to legislation—Attention to stakeholders—Total environmental quality
Peiro-Signes *et al.* 2012	Low environmental proactivity—Medium environmental proactivity—High environmental proactivity
Albertini 2013	Newly concerned—Compliance—Opportunistic—Proactive

Table 2: Environmental Behaviour Non-Progressive Strategy Classification.

AUTHORS	STRATEGY CLASSIFICATION
Steger, 1993	Offensive—Innovative—Indifferent—Defensive
Vastag *et al.* 1996	Reactive—Proactive—Strategic—Crisis Preventive
Ehrenfeld 1998	Business as usual—Compliance—Prevention—Sustainability
Klassen & Angell 1998	Reactive posture—Opportunistic posture—Proactive posture—Compliance posture
Brockhoff *et al.* 1999	Defenders—Escapists—Dormant—Activists
Winn & Angell 2000	Deliberate reactive—Unrealized—Emergent active—Deliberate proactive
Carmona-Moreno *et al.* 2004	Experienced—Hopeful—Indifferent—Incipient
Lee & Rhee 2007	Reactive—Focused—Opportunistic—Proactive
Cavalcanti 2011	Defender—Reactor—Sleeper—Innovator

Table 3: Sample Characteristics.

Variable	Description	Population		Sample	
		N	%	N	%
Size: Number of employees	From 5 to 50 employees	2,529	84.4%	239	78.9%
	From 51 to 250 employees	293	9.8%	51	16.8%
	More than 250 employees	174	5.8%	13	4.3%
Activity Sector	Primary Sector	210	7.0%	27	8.9%
	Industrial Sector	1,264	42.2%	123	40.6%
	Construction	309	10.3%	31	10.2%
	Service Sector	1,213	40.5%	122	40.3%

Table 4. Pro-environmental Change Indicators.

The following has occurred in your firm over the last THREE YEARS:	
PROCESS	
A.1	New low-consumption or low environmental impact equipment/machinery (water, materials, electric power, heating, etc.) has been installed.
A.2	Operative procedures or methods have been changed to reduce the consumption of resources and/or energy or reduce our environmental impact.
A.3	New action has been taken to correct pollutants (water purifiers, waste processing or recycling, filters, storage systems, etc.).
A.4	New systems have been installed to use and/or generate renewable sources of energy (solar panels, photovoltaic panels, wind turbines, biomass, etc.).
PRODUCT	
A.5	The design of products or components has been changed to reduce the use of materials or recourses and/or to replace them with other less polluting materials (eco-design).
A.6	The design of products has been changed to facilitate recycling or reuse.
A.7	New environmental criteria have been considered in the design and/or manufacture of packaging, etc. (eco-design).
MANAGEMENT	
A.8	New resources have been spent on training employees in or increasing their awareness of environmental issues and/or innovation.
A.9	Jobs have been re-designed to improve the firm's environmental impact.
A.10	People have been appointed to be responsible for environmental affairs in the firm.
A.11	Investments have been made in R&D to improve the firm's environmental impact.
SUPPLY CHAIN	
A.12	New measures have been applied in supply and stock management systems aimed at improving the firm's environmental impact.
A.13	New measures have been applied in distribution and marketing systems aimed at improving the firm's environmental impact.
A.14	Product labelling/instructions have been changed to show environmental aspects or inform consumers of appropriate means of disposal.

Table 5. Description of Strategic Groups.

PRO-ENVIRONMENTAL CHANGE	Laggard		Initiated		Proactive		Eco-Innovative				Duncan test
	$\bar{x}_1$	% R.	$\bar{x}_2$	% R	$\bar{x}_3$	% R	$\bar{x}_4$	% R	$\bar{x}$.	ANOVA	
SCOPE (1-4)	0.97†		2.97†		3.59		3.51		3.12	98.16*	$\bar{x}_3 = \bar{x}_4$
INTENSITY	0.43		2.67		5.40		8.28		4.65	783.64*	†
PROCESS											
A.1 New equipment	1.26	35%	3.98	78%	5.80	92%	8.86	100%	5.29	64.29*	†
A.2 Change methods	1.29	42%	4.80	90%	6.68	99%	9.02	100%	6.00	97.64*	†
A.3 Correct pollutants	0.77	20%	3.67	79%	5.85	94%	8.39	100%	5.08	69.13*	†
A.4 Renewable energy	0.23	3%	1.08	20%	2.84†	53%	5.91†	79%	2.48	27.92*	$\bar{x}_1 = \bar{x}_2$
% completion		64%		95%		99%		100%			
SCOPE (1-4)	1.00		2.57		3.19		3.19		2.78	43.70*	$\bar{x}_3 = \bar{x}_4$
INTENSITY	0.89		3.40		5.32		8.18		4.83	162.03*	†
PRODUCT											
A.5 Reduce materials	0.04	4%	2.26	56%	5.78	94%	8.93	100%	4.71	123.90*	†
A.6 Recycling/ Reusing	0.04	4%	1.56	46%	4.96	90%	8.63	100%	4.07	122.92*	†
A.7 Packaging	0.00	0%	1.61	45%	5.14	89%	8.16	95%	4.01	89.22*	†
% completion		4%		64%		97%		100%			
SCOPE (1-3)	0.06†		1.12†		1.99		2.02		1.54	28.37*	$\bar{x}_3 = \bar{x}_4$
INTENSITY	0.03		1.90		5.31		8.54		4.38	174.41*	†
MANAGEMENT											
A.8 Training employees	0.59	21%	4.61	91%	6.50	98%	8.87	100%	5.78	104.79*	†
A.9 Change jobs	0.07	3%	1.96	54%	5.02	92%	7.98	96%	4.05	101.12*	†
A.10 Responsible	0.29	11%	3.68	64%	6.56	95%	8.91	98%	5.51	72.36*	†
A.11 R&D	0.00	0%	1.73	48%	4.74	83%	7.78	96%	3.85	72.03*	†
% completion		20%		98%		100%		100%			
SCOPE (1-4)	0.32†		2.42†		3.34		3.32		2.76	72.78*	$\bar{x}_3 = \bar{x}_4$
INTENSITY	0.22		3.12		5.72		8.44		4.89	219.13*	†
SUPPLY CHAIN											
A.12 Supply/Stock	0.00	0%	1.74	55%	5.28	94%	7.71	98%	4.08	116.03*	†
A.13 Distribution	0.15	8%	1.62	52%	5.24	93%	7.94	98%	4.16	112.09*	†
A.14 Labelling	0.16	4%	1.30	39%	4.18	78%	7.72	100%	3.45	72.22*	†
% completion		11%		63%		97%		100%			
SCOPE (1-3)	0.10†		1.21†		2.16		2.19		1.68	41.39*	$\bar{x}_3 = \bar{x}_4$
INTENSITY	0.10		1.58		4.93		7.91		4.01	178.46*	†
SIZE	1.61		1.85		2.08		1.86		1.92	3.30+	$\bar{x}_1 = \bar{x}_2 = \bar{x}_4$ $\bar{x}_2 = \bar{x}_3 = \bar{x}_4$
ECO-INNOVATION	0.03		0.01		0.04		0.14†		0.05	4.28*	$\bar{x}_1 = \bar{x}_2 = \bar{x}_3$
ISO 14001	0.06†		0.26		0.34		0.37		0.29	3.88*	$\bar{x}_2 = \bar{x}_3 = \bar{x}_4$

ANOVA: Rejection of H0 "$\bar{x}_1 = \bar{x}_2 = \bar{x}_3 = \bar{x}_4$" if p<0.00 * and p<0.02 +.

Duncan test: Rejection of H0 "$\bar{x}_I = \bar{x}_J$", for all i≠ j, † p<0.00.

% R: Percentage of firms in group that perform activity.

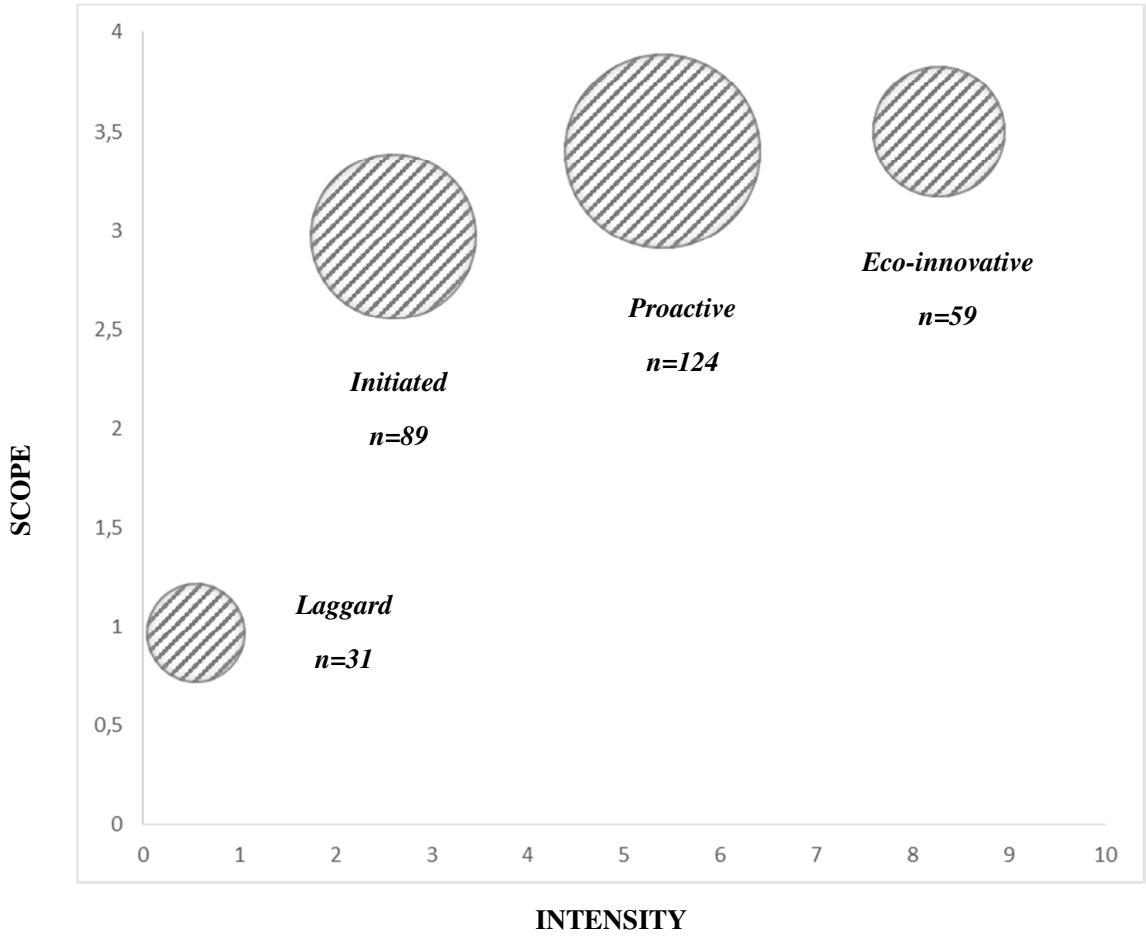

Figure 1. Strategic Environmental Behaviour.