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# Pro-Environmental Change and Short- to Mid-Term Economic Performance: The Mediating Effect of Organisational Design Change

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**Abstract**

The aim of this study is to contribute empirically to the understanding of the economic effects of pro-environmental change in firms. First, we analyse whether pro-environmental changes performed in different sections of firms' value chain (products, processes and supply and distribution channels) generate positive economic returns in the short- to mid-term. Second, we analyse whether measures implemented by firms to improve environmental performance (pro-environmental change) have been complemented with changes in organisational design, and whether these changes help increase short- to mid-term economic performance. Through an analysis of a sample of 303 firms, we have collected empirical evidence that confirms that pro-environmental change improves short- to mid-term business performance both directly and indirectly, through the mediating effect of improvements in organisational design that often go hand in hand with these processes.

**Keywords**

pro-environmental change, short- to mid-term economic performance, efficiency, competitiveness, stakeholders, organisational design change, environmental proactivity

## Introduction

The relationship between environmental proactivity and financial results in firms has been widely studied, and different conclusions have been obtained. Some authors who initially considered that environmental investments can improve economic results are Hart (1995), Porter and Van der Linde (1995a, 1995b), Russo and Fouts (1997), and Shrivastava (1995). These authors argued against the prevailing view that environmental legislation undermines economic performance in the industry. They explained that environmental legislation, far from being an economic burden for firms, generated incentives for innovation in a search for less polluting, less costly and more efficient production systems that were more capable of generating competitive advantages. Over

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the last two decades, these arguments, collected under the so-called "Porter hypothesis," have been supporting the idea that pro-environmental efforts are profitable. Both from a theoretical and an empirical perspective, numerous authors, such as Aragón-Correa, Hurtado-Torres, Sharma, and García-Morales (2008); Bosworth and Clemens (2011); Clarkson, Li, Richardson, and Vasvari (2011); Clemens (2006); Nakamura (2011); and Orlitzky, Schmidt, and Rynes (2003), agree on this idea that "It Pays to be Green." Others authors, however, have come to different conclusions, maintaining that pro-environmental investments are negatively or insignificantly related to economic results (Cañón-de-Francia & Garcés-Ayerbe, 2009; Filbeck & Gorman, 2004; Lanoie, Laurent-Lucchetti, Johnstone, & Ambec, 2011; Telle, 2006; Wilcox, Wilcox, & Jares, 2014).

Given this lack of consensus, the idea that the relationship between environmental and financial performance is not as obvious as it might seem arises. Consistent with this idea, some authors such as González-Benito and González-Benito (2005), King and Lenox (2002), and Klassen and Whybark (1999) obtained mixed results in their studies of the economic performance of different environmental practices. They established that there is no single conclusion regarding this relationship, which needs to be broken down into more specific environmental practices (preventive or corrective practices, for instance). Other authors confirm the complexity of the relationship between pro-environmental measures and financial performance, suggesting that there are certain moderating and mediating variables in this relationship (Dixon-Fowler, Slater, Johnson, Ellstrand, & Romi, 2013, and Orlitzky et al., 2003, conducted meta-analyses in this respect).

Some of the factors affecting the economic results of pro-environmental practices refer to the firms' external conditions, for example, the growth, dynamism and munificence of its industry (Aragón-Correa & Sharma, 2003; Goll & Rasheed, 2004; Russo & Fouts, 1997), the nature of environmental requirements (Filbeck & Gorman, 2004; Wagner & Schaltegger, 2003), the application of green incentives (Clemens, 2006), the complexity and uncertainty of the overall business environment (Aragón-Correa & Sharma, 2003) and market structure and conditions (Wagner & Schaltegger, 2003).

Other moderating or mediating factors refer to the firms' internal characteristics, capacities or key resources, for example, size (Wagner & Schaltegger 2003), innovation intensity (Christmann, 2000), degree of technological knowledge (Cañón-de-Francia, Garcés-Ayerbe, & Ramírez-Alesón, 2007), environmental human resource management (Carmona-Moreno, Céspedes-Lorente, & Martinez-del-Rio, 2012), stakeholder management (Plaza-Úbeda, Burgos-Jiménez, Vazquez, & Liston-Heyes, 2009) and the efforts invested in organisational change (Hottenrott, Rexhauser, & Veugelers, 2012; Huang & Jim Wu, 2010).

This study contributes to the debate by providing empirical evidence of the economic results of pro-environmental practices. The general objective of our research is to analyse the short- to mid-term economic performance of pro-environmental change in private firms. The main contribution of our approach is that our analysis not only takes into consideration the direct economic effects of pro-environmental practices on the firm's efficiency, market position and relationship with stakeholders but also considers indirect effects. Specifically, we examine the possibility of additional indirect effects on economic returns, channelled through the improvement in organisational design that often accompanies pro-environmental change processes.

Since the early 1990s, the academic research generated around the adoption of pro-environmental measures in firms has insisted on the relevance of organisational design (Antonioli, Mancinelli, & Mazzanti, 2013; Lee, 2009; Petruzzelli, Dangelico, Rotolo, & Albino, 2011; Post & Altman, 1994). However, the contribution of this factor to the generation of win-win situations arising from environmental proactivity has seldom been considered from a theoretical viewpoint and has received little empirical support. With the current state of the knowledge, the results are still inconclusive. To date, other strategic factors also related to environmental proactivity have been prioritised in research about the relationship between environmental and economic performance,

such as innovation (Cainelli, Mazzanti, & Zoboli, 2011; Christmann, 2000; Ferreira, Moulang, & Hendro, 2010; Grekova, Bremmers, Trienekens, Kemp, & Omta, 2013; Hall & Wagner, 2012; Singh, Park, Tolmie, & Bartikowski, 2014) or stakeholder management (Nejati, Amran, & Hazlina, 2014; Okoye, Egbunike, & Meduoye, 2013; Plaza-Úbeda et al., 2009; Rodrigue, Magnan, & Boulianne, 2013; Sharma & Vredenburg, 1998; Wagner, 2015). The results of this study will improve the understanding of other internal factors that determine the possibility of achieving additional economic returns through environmental proactivity. Another novelty of this work is our division of green practices into three categories (products, processes and supply and distribution channels measures); we analyse the direct and indirect economic consequences of each category separately.

The article is divided into five sections. The second reviews the literature on environmental proactivity, its impact on business performance and the relevance of changes in organisational design in this process. The third describes the sample, the variables and the methodology used for the empirical analysis. The fourth presents the main results and is followed by a discussion section and a final section that summarises the study's most important conclusions.

## Theoretical Framework

What makes a pro-environmental change attractive for firms is the possibility of generating a win-win situation in which both the environmental and economic performances are improved. This section reviews the relevant literature on the topic and argues that pro-environmental change is often accompanied by changes in the firm's organisational design, which also improves its economic results. The empirical evidence collected reinforces the idea that the relationship between environmental and economic results is determined by a positive function.

### *The Direct Effects of Pro-Environmental Change on Economic Performance*

In the 1990s, the concept of environmental investment started being used in the management literature as a way to improve environmental performance while obtaining better financial results. Based on the so-called "*Porter Hypothesis*," Esty and Porter (1998), Porter (1991), Porter and Van der Linde (1995a, 1995b), and others claimed that environmental regulation is a tool that stimulates innovation towards less polluting and more efficient forms of production capable of generating competitive advantages. Following this line of argument, Hart (1995) links environmental issues to obtaining greater financial performance and argues that competitive advantages should be based on key capabilities and resources that facilitate an environmentally sustainable economic activity. Based on the Natural-Resource-Based view of the firm, this author argues that certain capabilities, such as "pollution prevention," "product stewardship" and "sustainable development," provide competitive advantages by reducing costs, anticipating competitors and improving stakeholder relations. These arguments were supported and supplemented by numerous studies that focused on the capabilities providing competitive advantages on the basis of green practices (Aragón-Correa & Sharma, 2003; Bansal, 2005; Rugman & Verbeke, 1998; Russo, 2009; Russo & Fouts, 1997; Sharma & Vredenburg, 1998; Walls, Phan, & Berrone, 2008).

Later publications provided empirical evidence for some of these competitive advantages. Guenster, Bauer, Derwall, and Koedijk (2011); King and Lenox (2002) and Klassen and Whybark (1999), for instance, find strong evidence that environmental measures based on pollution prevention can improve financial performance. Aragón-Correa et al. (2008) and Burgos-Jimenez, Vázquez-Brust, Plaza-Úbeda, and Dijkshoorn (2013) also conclude that firms with more advanced proactive environmental practices present a greater improvement in financial results. Christmann (2000) empirically shows that environmental management helps reduce cost and that capability for process innovation plays an important role in this relationship. Chen, Lai, and Wen

(2006) complete this empirical evidence by finding a positive relationship between green innovation (applied to both processes and products) and competitive advantages over competitors. According to these authors, such advantages include lower costs, higher quality in products and services, higher returns and an improved corporate image, among others.

The review of the literature highlights two arguments in favour of a positive relationship between environmental investment and financial performance, those based on the competitive differentiation advantages and those based on competitive cost advantages (Ambec & Lanoie, 2008; Christmann, 2000). According to the first of these arguments, pro-environmental practices can be regarded as a way of increasing revenue by improving the firm's image, by improving the quality and differentiation of its products and by providing access to markets. The second argument, which is more widely supported, stresses the ability of pro-environmental practices to increase efficiency and reduce costs through savings in pollution fines, lower energy and raw material consumption and a reduction in logistic, legal, and capital costs.

The first of these arguments has been particularly recurrent in studies focused on the adoption of product-related measures. It is supported, for instance, by Kammerer (2009), who claims that environmental product innovation has a highly differentiating effect, particularly with regard to environmentally aware consumers.

The second argument is supported, among others, by Carrión-Flores and Innes (2010) and Lankoski (2006), who argue that pro-environmental practices are capable of triggering improvements that reduce regulatory costs. Some of these improvements are connected with the reduction of environmental risk, the prevention of natural disasters, the reduction of consumer and governmental claims and the reduction of pollution fines imposed by fiscal systems aimed at fighting climate change.

Other authors, such as Christmann (2000), insist on the possibility of reducing operative costs by means of environmentally friendly practices and innovations that increase efficiency in the consumption of resources and enable the recycling or use of waste and by-products. Some process-related measures, such as life cycle analysis or eco-design, can also result in the generation of cost advantages.

Firms that apply pro-environmental change can also reduce their capital costs. Along these lines, Montel and Debailleul (2004) argue that environment-friendly management can affect a firm's exposure to risk, in the sense that worse environmental management strategies generate greater economic risk and, therefore, greater capital costs.

According to the literature under review, pro-environmental change in the firm, based on the adoption of product, process and supply and distribution channels measures, improves economic short- to mid-term performance through cost savings, increased income, product differentiation and/or improved market position. We therefore present the following hypothesis:

**Hypothesis 1:** Pro-environmental change has a direct positive effect on the short- to mid-term economic performance of a firm.

## *Indirect Effects of Pro-Environmental Change on Economic Performance: The Mediation of Changes in Organisational Design*

The relationship between pro-environmental practices and certain aspects of the internal organisation of firms has already received some attention. Some authors have established that prior organisational design capabilities promote environmental proactivity. In this regard, Petruzzelli et al. (2011) claim that environment-related issues add complexity to organisational processes and present empirical evidence of a positive relationship between inter- or intra-organisational collaboration policies (alliances, inter-firm networks, internal coordination) and green innovations. Vidal-Salazar et al. (2012) also find evidence that suggests that certain human resource management

mechanisms (such as environmental training or organisational learning) prompt companies to develop proactive environmental strategies. Along the same lines, Martínez-del-Río, Céspedes-Lorente, and Carmona-Moreno (2012) consider a large number of high-involvement work-practices (related to internal communication, information-sharing systems and motivation-enhancing practices) and empirically find that their implementation has a positive effect on the development of a proactive environmental strategy. Moreover, Murillo-Luna, Garcés-Ayerbe, and Rivera-Torres (2011); Post and Altman (1994) and Shi, Peng, Liu, and Zhong (2008) have identified internal difficulties related to organisational design (the inappropriate attitude of some employees, poor communications, poor top-management leadership, etc.) as one of the most important obstacles for the implementation of environmental practices within the firm.

Other authors assume a similar argument, concluding that the adoption of proactive environmental practices is often complemented with the implementation of certain organisational strategies. Lee (2009), for instance, has provided evidence that supports the idea that firms attempt to redesign their organisational structure as a part of a broader process aimed at establishing an environmentally friendly management system. This notion has also been examined by authors such as Antonioli et al. (2013), who maintain that environmental practices, such as the implementation of green innovations, are connected to changes in organisational structure and human resource management. In this respect, Cherian and Jacob (2012) perform a review of research on how corporations today develop human resource policies for promoting environmental management initiatives. They establish that in order to implement an effective corporate green management system, it is important to promote a great deal of technical and management skills among all the organisation's employees. They refer to recruitment strategies, appraisal and reward systems and training and empowerment programs. Zutshi and Sohal (2004), on the other hand, in their analysis of critical success factors in environmental management systems (EMS) adoption and maintenance, also insist on the importance of organisational factors. Among others, they highlight factors such as top management commitment, providing leadership and motivation to employees, cultural change and organisational vision, internal and external communication, learning and training, and internal analysis.

According to the literature reviewed, pro-environment changes are preceded, accompanied or followed by changes in organisational design. At any rate, they are related processes, and there are reasons to believe that they are, in fact, complementary processes. Some authors have suggested that the combination of both processes (environmental and organisational design change) has a positive effect on the economic returns of firms (Hottenrott et al., 2012; Huang & Jim Wu, 2010). Huang and Jim Wu (2010), for instance, suggested that organisational factors play a relevant role in obtaining results from product-related eco-innovations. These authors consider *cross-functional integration* as "the magnitude of interaction and communication, the level of information sharing, the degree of coordination, and the extent of joint involvement across functions" (Huang & Jim Wu, 2010, p. 1549). They set forth several hypotheses related to *cross-functional integration*: A higher degree of "cross-functional integration" will have a positive impact on both the performance of new green products and financial performance, while the performance of innovation in green products has a positive impact on financial performance. Hottenrott et al. (2012) meanwhile estimated the effect of green technologies on performance, analysing the impact of organisational change. In their study, they find empirical support for the complementarity of green technologies and organisational changes. These organisational changes are related to new organisational practices and/or new methods of organising work responsibilities and decision making. The authors argue that appropriate organisational structures are complementary to the use of new technology, which enables firms to achieve higher gains in productivity from their adoption.

Within this specific line of research, this study first analyses whether the processes of change in environmental proactivity are related to an organisational design change. We define organisational

design in a classic sense, as the set of mechanisms aiming to solve organisational problems regarding coordination and motivation (Milgrom & Roberts, 1992). The organisational design change process is thus interpreted as an effort to improve these two aspects of the organisational problem. This is consistent with authors such as Buckley and Carter (1996), who establish that "business organisation is characterised by their architecture—the allocation of responsibilities among individuals and groups and communication between them for information and coordination—and their incentive structure" (p. 5).

Pro-environmental change and organisational design change are examined for the same time period to guarantee a degree of internal consistency between them. The aforementioned literature suggests that the sign is positive. However, causality direction appears to be a question without consensus, as some authors see organisational design change as coming before pro-environmental change (Martínez-del-Río et al., 2012); others believe that it is a consequence (Huang & Jim Wu, 2010). Measuring both change processes in the same time period, the interpretation of organisational design change as a driver or a result, is a minor issue, as a degree of consistency and mutual adaptation is expected between the two change processes. In this study, the general objective of analysing the economic consequences (and not the background) of pro-environmental change determined an interpretation of organisational design change as a result of pro-environmental change that will in turn improve economic performance, as it will add indirect economic effects to the direct effects of pro-environmental change. Therefore, the improvement in a firm's economic performance that follows change in organisational design is considered to be an indirect effect of environmentally friendly change. Based on this interpretation, we consider the following hypothesis:

**Hypothesis 2:** Pro-environmental change has a positive indirect effect on the short- to mid-term economic performance of the firm, through the mediating effect of change in organisational design.

## Empirical Study

### *Sample*

The population for this study consists of firms located in the region of Aragon (Spain). Given the objective of this research, a questionnaire was designed to obtain information about pro-environmental change and organisational design change in the last 3 years, and about short- to mid-term economic performance in the same period. A total of 2,996 surveys were e-mailed in June 2013.[1] They were to be completed by the person in charge of environmental issues or, failing that, by the firms' managers. In October 2013, a second set of questionnaires were sent to the firms in the population, with telephone follow-up. Both sending the questionnaire and the follow-up aimed to improve the response rate in certain sectors and size strata, according to the population structure in the SABI database. By December 2013, a total of 303 replies were collected, which amounts to a 10.11% response rate.[2]

The firms included in the sample operate in four different group sectors and can be divided into four size categories based on number of employees, as shown in Table 1. These distributions are not substantially different from those of the population of firms in the SABI database. If we compare the percentage distributions between the sample and the population (see Table 1), there is little representation in the sample of the 5 to 10 employees category, although this bias is reduced if the two small firms categories ("from 5 to 10 employees" and "from 11 to 50 employees") are considered together.[3] Regarding the sectoral distribution of the sample firms, there is no significant bias when the two distributions are compared.[4]

**Table 1.** Description of the Sample.

| Variable | Description | Population | Sample |
|---|---|---|---|
| Size: Number of employees | From 5 to 10 employees | 48.1% | 33.7% |
| | From 11 to 50 employees | 36.3% | 45.2% |
| | From 51 to 250 employees | 9.8% | 16.8% |
| | More than 250 employees | 5.8% | 4.3% |
| Activity sector | Primary sector | 7.0% | 8.9% |
| | Industrial sector | 42.2% | 40.6% |
| | Construction | 10.3% | 10.2% |
| | Service sector | 40.5% | 40.3% |

## *Controlling Biases*

Our study adopted ex ante measures in the research design stage to prevent bias associated with the analysis of data obtained from the same respondents in the same measurement context using the same item context and similar item characteristics (Chang, van Witteloostuijn, & Eden, 2010; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Podsakoff & Organ, 1986). First, the survey was validated by a panel of experts. The panel of experts included seven people: three representatives of public agencies, 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-type scale from 0 to 10, the experts were asked to assess the clarity and relevance of each of the items included in the survey. Feedback from these experts was included in a revised version of the questionnaire. Secondly, the focal respondents were the people in charge of environmental issues or, failing that, the firms' managers, and we provided the opportunity to respond privately (not face-to-face with the interviewer) and anonymously (firm identification was optional) and guaranteed complete confidentiality, making specific reference to current data protection legislation. Furthermore, the firms were told that there were no right or wrong answers and that the questionnaire's final objective was academic, and neither commercial nor political.

These ex ante measures are needed to reduce problems in the comprehension stage of the response process, but they are not sufficient to enable us to correct potential selection bias and common method bias in self-report measures (Chang et al., 2010). We therefore apply ex post statistical control strategies to test for selection bias and common method bias.

Regarding selection bias, and following Armstrong and Overton (1977), we compared early and late respondents of the questionnaire (first wave vs. second wave) in the observed variables. Table 2 shows the descriptive statistics and the statistical tests for differences between means across the waves. All of them were not significant at 0.03. Selection bias was therefore not a serious problem in this research.

To control for common method bias, we first tried to control for the effect of a single unmeasured latent method factor (Chang et al., 2010; Podsakoff et al., 2003). We used Harman's single-factor test to estimate the extent of the common method bias. All the observed variables were subjected to principal components analysis. The first un-rotated component explains less than 45% of the variance. Furthermore, we estimated a single-factor confirmatory model. This model has a bad fit ($\chi^2[179] = 1211.24$, root mean square error of approximation [RMSEA] = 0.134, standardised root mean square residual [SRMR] = 0.110, and comparative fit index [CFI] = 0.692). Consequently, no single factor can explain the data structure.

As noted by Chang et al. (2010, p. 180), "Common method variance is more likely to emerge in models that are overly simple." Our main model include a complex relationship—mediating effect

**Table 2.** Indicators and Descriptive Analysis.

| | | Mean[a] | *SD* | β[b] | *p* Value |
|---|---|---|---|---|---|
| **P-ECh Pro-Environmental Change**—To what extent in the last 3 years . . . | | | | | |
| P-ECh-PRC Pro-environmental chance in processes: | | | | | |
| Prc_1 | Have you installed new low-consumption (water, materials, power, heating, etc.) or low environmental impact equipment/ devices/machinery? | 5.29 | 3.38 | 0.32 | .42 |
| Prc_2 | Have you changed procedures or operative methods to reduce consumption of resources and/or energy or reduce the environmental impact? | 6.00 | 3.05 | 0.02 | .95 |
| Prc_3 | Have you applied new measures to correct generated pollutants (waste purifiers, processors or recycling, filters, storage systems, etc.)? | 5.08 | 3.35 | −0.06 | .89 |
| P-ECh-PRD Pro-environmental chance in products: | | | | | |
| Prd_1 | Have you changed the design of products or components to reduce the use of materials and resources and/or replace them with other less polluting materials and resources (eco-design)? | 4.71 | 3.56 | 0.71 | .11 |
| Prd_2 | Have you changed the design of your products to facilitate their recycling or reutilisation? | 4.07 | 3.54 | 0.45 | .34 |
| Prd_3 | Have you considered new environmental criteria in the design and/or manufacture of containers, packaging, etc. (eco-design)? | 4.01 | 3.55 | 1.26 | .03 |
| P-ECh-SDCH Pro-environmental chance in the supply and distribution channels: | | | | | |
| Sdch_1 | Have you adopted new measures in stock supply and management systems aimed at improving the company's environmental impact? | 4.08 | 3.30 | 0.50 | .23 |
| Sdch_2 | Have you adopted new measures in distribution and marketing systems aimed at improving the company's environmental impact? | 4.16 | 3.42 | 0.55 | .21 |
| Sdch_3 | Have you changed product labelling/instructions to reflect environmental aspects or inform consumers about appropriate waste disposal methods? | 3.45 | 3.50 | 1.01 | .04 |
| **SM-EP Short- to Mid-Term Economic Performance**—As a result of your above referenced pro-environmental change . . . | | | | | |
| Smep_1 | Variable costs have been reduced. | 4.76 | 3.17 | 0.94 | .05 |
| Smep_2 | Your products are differentiated from those of your competitors. | 4.70 | 3.55 | 0.70 | .11 |
| Smep_3 | The company's productivity has improved. | 4.75 | 3.20 | 0.72 | .10 |
| Smep_4 | The company's returns have increased. | 4.62 | 3.21 | 0.56 | .16 |
| Smep_5 | The company's market share has grown (current market). | 3.60 | 3.17 | 0.65 | .10 |
| Smep_6 | The markets targeted by the company have increased (new markets). | 3.92 | 3.51 | 0.68 | .11 |
| Smep_7 | Stakeholder (clients, employees, shareholders, nearby communities, associations, etc.) relations have improved. | 4.69 | 3.39 | 0.69 | .12 |
| **OD-Ch Organisational Design change**—To what extent in the last 3 years . . . | | | | | |
| Odch_1 | Has relationship between employees and executives/owners improved? | 6.41 | 2.50 | 0.51 | .12 |
| Odch_2 | Has the opinion of employees more weight in decision-making processes? | 6.29 | 2.54 | 0.65 | .11 |
| Odch_3 | Has internal communication improved (meetings, IT, information channels, instructions, clarity of instructions, etc.)? | 6.79 | 2.56 | 0.06 | .83 |
| Odch_4 | Has employee motivation improved (incentives, prizes, acknowledgements, privileges in access to products)? | 4.97 | 3.02 | 0.65 | .11 |
| Odch_5 | Has coordination between different jobs positions improved? | 6.38 | 2.38 | 0.04 | .88 |

[a]Likert-type scale from 0 to 10. [b]Effects of a dummy variable; with a code of 0 for early respondents and a code of 1 for late respondents.

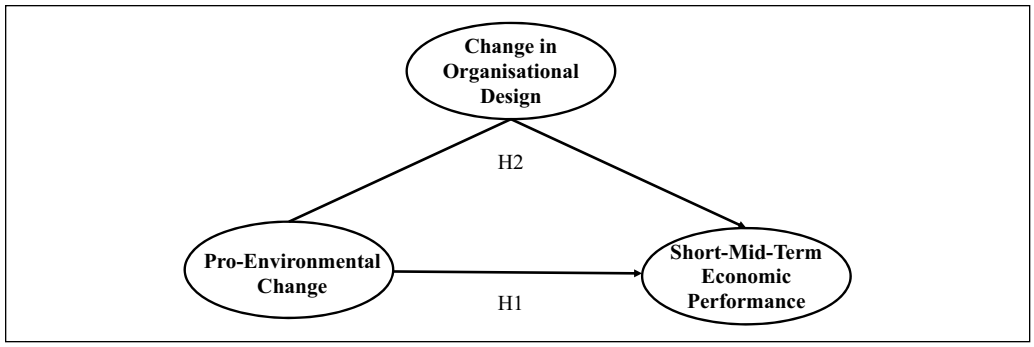


**Figure 1.** Theoretical model.

(Figure 1), so the tests of our hypotheses may not be much affected by common method bias; in other words, our "own theoretical model" was likely to reduce common method variance.

In short, from the results of Harman's single-factor test, the goodness of fit of the single-factor confirmatory model, and the proposed theoretical model, we can expect common method variance not to be a serious problem in our research.

## *Variables*

The literature was thoroughly examined to design variables capable of measuring pro-environmental change. Different indicators are used in the literature to measure environmental proactivity. Some authors use direct or indirect environmental performance indicators such as greenhouse gas emission quantity and toxic release in water, air and land or pollution indices based on the aggregation of released pollutants and toxic waste (Cañón-de-Francia, Garcés-Ayerbe, & Ramírez-Alesón, 2008; Hamilton, 1995; King & Lenox, 2002) or number of accidents, legal noncompliance and/or environmental fines (Laplante & Lanoi, 1994; Vastag, Kerekes, & Rondinelli, 1996). Other authors consider aspects such as a firm's strategic planning or social strategy, with indicators such as the existence of an environmental plan (Buysse & Verbeke, 2003; Henriques & Sadorsky, 1999; Hunt & Auster, 1990), relevance of environmental objective (Hass, 1996; Murillo-Luna, Garcés-Ayerbe, & Rivera-Torres, 2008), degree of top management involvement in environmental commitments (Hass, 1996; Henriques & Sadorsky, 1999; Hunt & Auster, 1990; Winn & Angell, 2000), degree of environmental disclosure in annual reports (Buysse & Verbeke, 2003), voluntary participation in environmental initiatives (Khanna & Damon, 1999) or environmental certifications such as ISO 14001 or EMAS (Murillo-Luna et al., 2008). Finally, some authors measure environmental proactivity from specific indicators of a firm's functional strategy regarding environmental protection, such as the adoption of energy- and water-saving measures, selective collection of waste, implementation of environmental training programs, modification of products and/or manufacturing processes, use of preventive technologies or life cycle analysis (LCA; Álvarez, Burgos, & Céspedes, 2001; Buysse & Verbeke, 2003; González-Benito & González-Benito, 2005; Melnyck, Sroufe, & Calantone, 2003; Montabon, Sroufe, & Narisimhan, 2007; Murillo-Luna et al., 2008). This article uses the latter indicators that refer to the adoption of specific operative measures for pollution control or prevention. Indeed, we measure environmental proactivity by the degree of adoption of environmental protection measures in three areas: production process, product and supply, and distribution channels. The reasons for this choice are related to our objectives, which require measurement of pro-environmental change effort in a 3-year period. Indicators that measure environmental performance or importance of environmental objectives in strategic planning can result from or lead to a more long-term change, so they are not as appropriate for measuring effort to change over the last 3 years.

Regarding measurement of economic performance, we consider items related to the two types of competitive advantage that have been associated in the literature to environmental proactivity, differentiation-advantages and cost-advantages (Ambec & Lanoie, 2008; Christmann, 2000). Finally, as indicators of organisational change, we consider the use of organisational tools to increase coordination and motivation, thus interpreting organisational design as proposed by Milgrom and Roberts (1992).

*Pro-Environmental Change.* A series of items were used to measure the adoption of environmental practices over the last 3 years. Specifically, we used a set of 9 indicators (Table 2): 3 to measure pro-environmental practices in processes, 3 to measure pro-environmental practices in products and 3 to measure pro-environmental practices in supply and distribution channels. Based on the opinion of the person completing the survey, these variables measure the degree of application of each pro-environmental practice over the last 3 years using a Likert-type scale from 0 to 10, where 0 means "in no case" and 10 means "to a great extent."

*Short- to Mid-Term Economic Performance.* A series of items were used to measure results associated to above referenced pro-environmental change, with consideration of the possibility of attaining cost-related, product-related and image-related advantages for the firm. Specifically, we used a set of 7 items (Table 2): 3 to measure efficiency results, 3 to measure market results and 1 to measure stakeholder relations results. Based on the opinion of the person completing the survey, these results were assessed using a Likert-type scale from 0 to 10, where 0 means "in no case" and 10 means "to a great extent."

*Organisational Design Change.* A series of items were used to measure changes in the organisational design of the firm over the last 3 years. We specifically used a set of 5 items (Table 2), which consider possible improvements in coordination systems and the motivation of employees. These variables respond to the information provided in the survey regarding the implementation of organisational changes that do not directly relate to environmental management over the last 3 years, using a Likert-type scale from 0 to 10, where 0 means "in no case" and 10 means "to a great extent."

## Methodology

Given the objective of this study, we started by carrying out a descriptive analysis of the observed variables in terms of their position measures and used exploratory analysis techniques to evaluate their covariance matrix. We then used confirmatory factor analysis to examine the dimensional structure of the theoretical constructs involved in our hypothesis: Pro-environmental change, Short- to mid-term economic performance and Organisational design change. We subsequently analysed the respective measurement models in terms of reliability and validity (Bagozzi, 1980, 2010; Fornell & Larcker, 1981; McDonald, 1985). Finally, in order to test our hypothesis, we evaluate the results of the structural equation models with latent variables. In these models, we separately analysed the effect of different types of Pro-environmental change on Short- to mid-term economic performance while considering the mediating effect of organisational design change requirements.

The methodological approach is summarised in models of structural equations with latent variables. This statistical approach enabled us to obtain, test and estimate measurement and/or structural models based on robust statistics with missing data and multivariate non-normality (Bentler, 2006; Muthén & Muthén, 1998-2012; Satorra & Bentler, 1994, 2001). This study made use of the MPLUS7.1 software (Muthén & Muthén, 1998-2012). Missing data was managed through the application of the Full Information Maximum Likelihood (FIML) method in combination with the Maximum Likelihood with Robust Standard Errors and the Chi-Square Test Statistic (MLR)

estimation methods (Muthén & Muthén, 1998-2012). At the same time, in order to evaluate the global fit of these models, we present different goodness-of-fit statistics and indices. To be specific, as well as robust statistic $\chi^2$, we used RMSEA, SRMR, and CFI; Bollen, 1998; Browne, Cudeck, Bollen, & Long, 1993; Hu & Bentler, 1999; Jöreskog & Sörbom, 1996). An RMSEA value in the range of 0.05 to 0.10 was considered an indication of fair fit (Hu & Bentler, 1999). Values for the SRMR range from 0 to 1, with well-fitting models obtaining values below 0.05, although values as high as 0.08 are deemed acceptable (Bollen, 1998; Hair, Black, Babin, Anderson, & Tatham, 2006). A value of CFI greater than or equal to 0.90 is currently recognised as indicative of fair fit (Hooper, Coughlan, & Mullen, 2008).

## Results

In view of the descriptive results shown on Table 2, we can reach several preliminary conclusions. In the first place, we can see that the firms adopt pro-environmental change in the three senses considered, with the mean values of the items being close to or more than 5 on a scale from 0 to 10. With regard to the mean values of the items, it appears that the most common pro-environmental changes are related to processes. As for short- to mid-term economic performance, the mean values show that they improve efficiency, enable product differentiation, increase market share and improve stakeholder relations. Efficiency-related results have a higher mean level. The mean values of the variables that measure changes in organisational design over the last 3 years show that the firms did require considerable change. In 4 out of 5 indicators the mean values was in excess of 6.

The first step involved using principal components analysis of the covariance matrix of the observed variables. The results of the first analysis suggest the presence of five dimensions. The implantation of pro-environmental change can thus be defined on the basis of three dimensions that correspond to our previous classification (Table 2): P-ECh-PRC, "Pro-environmental practices in processes (Prc_1-Prc_3)"; P-ECh-PRD, "Pro-environmental practices in products (Prd_1-Prd_3)"; and P-ECh-SDCH, "Pro-environmental practices in the supply and distribution channels (Sdch_1-Sdch_3)." This analysis reveals the existence of two additional dimensions: SM-EP, "Short- to mid-term economic performance (Smep_1-Smep_7)"; and OD-Ch, "Organisational design change (Odch_1-Odch_5)."

After these first exploratory tests, the next step was to define confirmatory factorial analysis models (measurement model) in order to evaluate the suitability of the described structures. Four models of confirmatory factor analysis are specified, three partial and one global measurement models. The first model tests the dimensional structure of "P-ECh-PRC, P-ECh-PRD and P-ECh-SDCH," the second that of "SM-EP," the third that of "OD-Ch" and the last tests the complete multidimensional structure: "P-ECh-PRC, P-ECh-PRD, P-ECh-SDCH, SM-EP and OD-Ch."

The statistics and goodness-of-fit indices of these models (Table 3) led us not to reject these structures; all the models exhibit a fair fit (P-ECh: $\chi^2[24] = 27.71$, RMSEA = 0.023, SRMR = 0.028, and CFI = 0.996; OD-Ch: $\chi^2[5] = 21.43$, RMSEA = 0.070, SRMR = 0.030, and CFI = 0.956; SM-EP: $\chi^2[14] = 135.77$, RMSEA = 0.072, SRMR = 0.053, and CFI = 0.903; and Global Model: $\chi^2[179] = 438.22$, RMSEA = 0.069, SRMR = 0.045, and CFI = 0.922).

Having not rejected the dimensional structures of the measurements models, the estimated parameters are analysed in the global model. Regarding the estimated parameters, both the factorial loads ($\lambda > 0.70$) and the percentages of explained variance ($R^2 > 0.50$) present appropriate values (Table 3). Furthermore, the coefficients of reliability and converging validity (AVE and CRC) of the latent variables considerably exceed what are deemed to be acceptable values (AVE > 0.50 and CRC > 0.70).

Having tested the dimensional structure of the variables, we performed three analyses of the effect of each of the three types of Pro-environmental change (Pro-environmental practices in

**Table 3.** Results of Confirmatory Factor Models.

| | P-ECh[a]—Pro-environmental change | | | SM-EP[b]—Short- to mid-term economic performance | OD-Ch[c]—Organisational design change | $R^2$ |
|---|---|---|---|---|---|---|
| | P-ECh-PRC—Processes | P-ECh-PRD—Products | P-ECh-SDCH—Supply/distribution channels | | | |
| Prc_1 | 0.83 | | | | | 0.69 |
| Prc_2 | 0.88 | | | | | 0.77 |
| Prc_3 | 0.75 | | | | | 0.56 |
| Prd_1 | | 0.88 | | | | 0.77 |
| Prd_2 | | 0.88 | | | | 0.77 |
| Prd_3 | | 0.84 | | | | 0.71 |
| Sdch_1 | | | 0.87 | | | 0.76 |
| Sdch_2 | | | 0.88 | | | 0.77 |
| Sdch_3 | | | 0.77 | | | 0.59 |
| Smep_1 | | | | 0.81 | | 0.66 |
| Smep_2 | | | | 0.88 | | 0.77 |
| Smep_3 | | | | 0.89 | | 0.79 |
| Smep_4 | | | | 0.87 | | 0.76 |
| Smep_5 | | | | 0.90 | | 0.81 |
| Smep_6 | | | | 0.84 | | 0.71 |
| Smep_7 | | | | 0.89 | | 0.79 |
| Odch_1 | | | | | 0.85 | 0.72 |
| Odch_2 | | | | | 0.86 | 0.74 |
| Odch_3 | | | | | 0.78 | 0.61 |
| Odch_4 | | | | | 0.72 | 0.52 |
| Odch_5 | | | | | 0.77 | 0.59 |
| AVE[d] | 0.68 | 0.75 | 0.71 | 0.76 | 0.64 | |
| CRC[e] | 0.82 | 0.87 | 0.84 | 0.87 | 0.80 | |

*Note*. All factorial loads are significant at 1%. RMSEA = root mean square error of approximation; SRMR = standardised root mean square residual; CFI = comparative fit index.
[a]Partial model of P-ECh: $\chi^2(24) = 27.71$, RMSEA = 0.023, SRMR = 0.028 and CFI = 0.996.
[b]Partial model of SM-EP: $\chi^2(14) = 135.77$, RMSEA = 0.072, SRMR = 0.053 and CFI = 0.903.
[c]Partial model of OD-Ch: $\chi^2(5) = 21.43$, RMSEA = 0.070, SRMR = 0.030 and CFI = 0.956.
[d]AVE = Fornell and Larcker coefficient.
[e]CRC = Macdonald's Omega coefficient.

processes [P-ECh-PRC], Pro-environmental practices in products [P-ECh-PRD], and Pro-environmental practices in the supply and distribution channels [P-ECh-SDCH]) on Short- to mid-term economic performance (SM-EP), with the mediating effect of Organisational design change (OD-Ch). These models were intended to test the two hypotheses considered. We therefore estimated a total of three structural equation models with the results shown on Table 4. The goodness-of-fit statistics of these models provide evidence of reasonable fit (Model_P-ECh-PRC: $\chi^2[87] = 300.203$, RMSEA = 0.080, SRMR = 0.048, and CFI = 0.905; Model_P-ECh-PRD: $\chi^2[87] = 282.153$, RMSEA = 0.080, SRMR = 0.046, and CFI = 0.912; Model_ P-ECh-SDCH: $\chi^2[87] = 281.556$, RMSEA = 0.080, SRMR = 0.043, and CFI = 0.912).

Table 4 shows the estimated parameters of these structural models with mediating effects. The coefficients that measure the effect of pro-environmental change on short- to mid-term economic performance are positive and significant in all the estimated models, showing that pro-environmental change improves economic performance. Hypothesis 1 is therefore not rejected for any type of eco-innovation practices. In all types, pro-environmental practices in processes (0.489, $p$ value < .00),

**Table 4.** Results of the Structural Models.

| Processes | P-ECh-PRC | OD-Ch | $R^2$ | Goodness-of-fit index |
|---|---|---|---|---|
| Direct effects | | | | $\chi^2(87) = 300.203$; |
| Organisational design change (OD-Ch) | 0.488*** | | 0.24 | RMSEA = 0.080; |
| Short- to mid-term economic performance (SM-EP) | 0.489*** | 0.266*** | 0.44 | SRMR = 0.048; CFI = 0.905 |
| Indirect effect | | | | |
| Short- to mid-term economic performance (SM-EP) | 0.130*** | | | |
| **Product** | **P-ECh-PRD** | **OD-Ch** | $R^2$ | **Goodness-of-fit index** |
| Direct effects | | | | $\chi^2(87) = 282.153$; |
| Organisational design change (OD-Ch) | 0.579*** | | 0.34 | RMSEA = 0.080; |
| Short- to mid-term economic performance (SM-EP) | 0.674*** | 0.114* | 0.56 | SRMR = 0.046; CFI = 0.912 |
| Indirect effect | | | | |
| Short- to mid-term economic performance (SM-EP) | 0.054 | | | |
| **Supply/distribution channels** | **P-ECh-SDCH** | **OD-Ch** | $R^2$ | **Goodness-of-fit index** |
| Direct effects | | | | $\chi^2(87) = 281.556$; |
| Organisational design change (OD-Ch) | 0.490*** | | 0.24 | RMSEA = 0.080; |
| Short- to mid-term economic performance (SM-EP) | 0.777*** | 0.122** | 0.71 | SRMR = 0.043; CFI = 0.912 |
| Indirect effect | | | | |
| Short- to mid-term economic performance (SM-EP) | 0.060** | | | |

*Note.* RMSEA = root mean square error of approximation; SRMR = standardised root mean square residual; CFI = comparative fit index.
*Significant at 10%. **Significant at 5%. ***Significant at 1%.

pro-environmental practices in products (0.674, $p$ value < .00) and pro-environmental practices in the supply and distribution channels (0.777, $p$ value < .00), there is strong evidence of improved short- to mid-term economic performance.

If we consider the indirect effects of pro-environmental change on short- to mid-term economic performance (Table 4), through the mediating variable change in organisational design, it can be observed that estimated coefficients differ significantly in some of the three models. Hypothesis 2 receives weaker support from the evidence. The coefficients that measure the effect of mediating variables are not significant in one of the models. These coefficients lead us not to completely reject Hypothesis 2. Specifically, Hypothesis 2 is rejected for pro-environmental practices in products, but not for pro-environmental practices in processes (0.130, $p$ value < .00) and pro-environmental practices in supply and distribution channels (0.060, $p$ value < .05).

## Discussion

The empirical evidence obtained in this study shows that environmental protection measures are adopted in different forms throughout the life cycle of products, from changing the raw materials

used in manufacture to guidance for disposal by consumers. Pro-environmental change processes comprise measures in three areas: in the productive process area (by installing new low-consumption or low environmental impact equipment and by changing procedures or operative methods to prevent or to correct pollution), in the product area (by changing their design or components both in the product and in the packaging) and in the supply and distribution channels area (by adopting measures in stock management and distribution and marketing systems and by informing consumers about waste disposal methods). According to the results obtained in this research, the three types of measure are adopted by firms, although there is some preference for process and supply and distribution areas rather than product area. These results support the idea found in the literature that environmental measures can be applied in different areas, with a significant distinction between product-related and process-related measures (González-Benito & González-Benito, 2005; Sarkis, 1995).

These pro-environmental change processes improve the economic performance of firms in the short to medium term. In this respect, our results are also consistent with the previous literature, confirming the idea that environmental measures can improve firms' results in at least two respects, through cost-advantages and differentiation-advantages (Christmann, 2000; González-Benito & González-Benito, 2005). Our results confirm three types of short- to mid-term benefits derived from pro-environmental change. First, pro-environmental change improves efficiency, by reducing costs and increasing income and/or productivity. Secondly, pro-environmental change helps differentiate the firm's products from those of competitors, increasing the firm's market share. Finally, pro-environmental change helps improve stakeholder relations. Our results show that the greatest benefit of pro-environmental change is the reduction of costs, and the smallest is growth in market share. This is consistent with the relatively smaller adoption of product measures, which are usually associated to differentiation and market share advantages (Christmann, 2000; González-Benito & González-Benito, 2005; Huang & Jim Wu, 2010).

On the other hand, the results of our research are empirically consistent with the literature that claims that pro-environmental change is associated with changes in organisational design (Antonioli et al., 2013; Hottenrott et al., 2012; Huang & Jim Wu, 2010; Lee, 2009; Zutshi & Sohal, 2004). There is such an association in the three types of pro-environmental change, as shown by the regression analyses. This shows that any pro-environmental change requires a degree of organisational design change. These results empirically confirm the significance of organisational factors in environmental management systems and practices, established in the literature by authors such as Antonioli et al. (2003) and Zutshi and Sohal (2004). Pro-environmental change creates additional needs for coordination and motivation as well as demanding a general improvement of the firm's operation, which promotes more efficient internal information services, coordination between employees or departments and participation of employees in decision-making processes.

Although our results do not show such detail, it would appear to be logical to assume that each type of pro-environmental change requires different types of organisational change. It would be reasonable, for instance, to expect pro-environmental change in process and distribution channels to basically require tools that improve job coordination and design. Pro-environmental change in product, however, can require greater motivation and employee involvement in decision making. These differences could explain why the organisational change derived from our three types of pro-environmental change has different effects on short- to mid-term economic results. The effect is positive in all three cases, but more so in organisational change associated to process. Less intense is the effect on economic results of organisational change associated to the other two types of pro-environmental change, especially in relation to product measures.

The aforementioned results suggest the existence of positive indirect effects derived from pro-environmental change. Pro-environmental change not only directly but also indirectly improves results, by requiring organisational improvements that will ultimately improve economic performance. The evidence obtained here enables us to associate these indirect effects to at least two of

the three types of pro-environmental change considered, pro-environmental change in process and pro-environmental change in supply and distribution channels. These results suggest that organisational design change is an asset complementary to pro-environmental change, which enables additional indirect benefits from implementing environmental practices. The existence of complementary assets associated to the implementation of environmental management practices was previously considered by Christmann (2000) in reference to innovation processes and by Hottenrott et al. (2012), Huang and Jim Wu (2010), and Martínez-del-Río et al. (2012) in reference to internal organisational factors. Our results suggest conclusions similar to those established by Hottenrott et al. (2012) and Huang and Jim Wu (2010), who empirically show that green practices, technologies and innovations jointly adopted with changes in firms' organisational structure enable better returns. Our results are also consistent with those obtained by some of the authors who analyse organisational change as a determinant and not as a result of environmental proactivity, but who also find that the joint implementation of the two aspects generates additional benefits. Martínez-del-Río et al. (2012), for instance, find that the implementation of high-involvement work practices, as well as generating direct economic benefits, also favours the development of a proactive environmental strategy that produces further indirect benefits.

The results, however, do not confirm the hypothesis that there are indirect benefits of pro-environmental change in the product area through organisational change. Pro-environmental change in product directly improves short- to mid-term economic results and, like the other types, requires a degree of organisational change. But this organisational change only responds to the objective of facilitating pro-environmental change in product, without generating other benefits. However, organisational change associated with pro-environmental change in process and distribution channels generates additional profits that can be seen as an indirect benefit of pro-environmental change. This can be explained by considering that organisational change related to environmental measures in processes and in the distribution and supply chain are more under the firm's control and therefore more easily adapted to make the most of complementarities. Organisational change related to environmental measures in product depends more on external market variables. Less flexibility when implementing organisational measures that facilitate pro-environmental change in products reduces the likelihood of complementarities.

## Conclusions

This research adds empirical evidence of the idea that "It Pays to be Green" by analysing the relationship between pro-environmental change and economic performance, and how changes in organisational design have a mediating effect on this relationship. The results show that firms that implant pro-environmental practices are capable of improving their short- to mid-term economic performance. This improvement reflects on the firm's results on different levels—in efficiency, product quality or stakeholder relations—and confirms a win-win situation in which both the environment and the firm gain. Therefore, firms can profit from pro-environmental change in different ways: by replacing equipment with new low-emission or low-consumption machinery, by changing product design, by providing specialist training for employees or by adopting new strategies with regard to distribution channels to make them more environment-friendly, among others.

According to the results of our research, win-win situations achieved through the implementation of pro-environmental change are in some cases enhanced even further by a number of positive indirect effects. We have shown that pro-environmental change tends to promote further changes, which have an additional positive effect on the firm's economic performance. This argument has often been used with reference to innovation (Christmann, 2000; Grekova et al., 2013; Hall & Wagner, 2012) but has seldom been invoked with regard to organisational design.

Regarding changes in organisational design, they affect all three categories of change contemplated here: product, process and supply and distribution channel-related measures. However, indirect positive effects derived from changes in organisational design are only relevant in the case of process and supply and distribution channel-related pro-environmental practices.

This study has important implications for management. In the first place, it regards pro-environmental strategies as tools that improve a firm's image, differentiates the firm's product, facilitates access to new markets and reduces costs. Secondly, it shows that changes in organisational design, when required for pro-environmental change, can have an additional positive impact on performance. Finally, the study shows that pro-environmental change can be used to pursue a win-win situation, achieving a better environmental performance without incurring in poor economic performance.

The results of this study should be interpreted with caution, as it has some limitations, which should be taken into consideration with future avenues of research. On the one hand, there is a significant constraint in the source of the data: all firms examined are located in a single geographical region. On the other, the measurement of economic results is based on the subjective perception of the executives that completed our questionnaire. Although the results are consistent with what has been hitherto published, only an objective measurement of the firms' results could provide confirmation.

Secondly, although certain steps were taken in the questionnaire's design and the data collection process, the absence of selection bias cannot be fully guaranteed. In this respect, the sample used in the research presents some bias towards large firms. On the other hand, there could be some bias towards firms with advanced pro-environmental change strategies. Finally, the mediating effect of other internal processes associated to pro-environmental change should be investigated in order to complete the analysis of the economic impact of environmental proactivity. There is certainly a great deal still to be done along this avenue of research.

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## Notes

1. The Sistemas de Análisis de Balances Ibéricos (SABI) database was used to gather information about these firms. Contact details were collected from their websites and via telephone.
2. Previous studies on environmental strategies in Spanish firms obtain similar response rates (Brío, Fernández, & Junquera, 2002; Brío & Junquera, 2001; Carmona-Moreno, Cespedes-Lorente, & De Burgos-Jiménez, 2004; Garcés-Ayerbe, Rivera-Torres, & Murillo-Luna, 2012; López-Gamero, Molina-Azorín, & Claver-Cortés, 2009; Murillo-Luna et al., 2011).
3. The results obtained in the chi-square test show that there are no significant differences between the distribution in the sample and in the population if the two small firms categories are considered together ($\chi^2_{(2)} = 2.37$, $p = .31$).
4. The results obtained in the chi-square test show that there are no significant differences between the sectorial distribution in the sample and in the population ($\chi^2_{(3)} = 0.91$, $p = .92$).

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