



Environmental disclosure and Eco-innovation interrelation. The case of Spanish firms

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ABSTRACT

The actual drivers of companies' environmental disclosure have been widely studied and yet with no conclusive results. Most literature looks for the link between environmental performance and environmental disclosure, as reflection of the company instrumental or normative approach to sustainability. However, over the last decade, a growing number of companies are joining the ranks of eco-innovation, focusing their strategy on environmental innovation, and paving the way for new approaches to environmental disclosure.

The main objective of this paper is to assess if eco-innovation in companies can be acting as a non-intended driver to disclosure of environmental reporting, in connection to the Resources Based View theory, and the search for competitive advantage. An extensive research has been undertaken with Spanish eco-innovative companies, evaluating their environmental disclosure standards from a two-fold perspective: managers' perception and public available environmental reporting.

The findings bring in interesting implications about the mismatch between managers' perception of their environmental disclosure and accounting standards, and the actual disclosure of environmental reporting made available to their stakeholders. Within the studied sample, eco-innovation appears to be a driver for environmental disclosure from an inside-out approach encompassed in the RBV theory, where environmental information is primarily meant for managerial purposes and only secondarily to inform stakeholders.

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La divulgación ambiental y la interrelación de la eco-innovación. El caso de Firmas españolas

RESUMEN

Los impulsores reales de la divulgación ambiental de las empresas han sido ampliamente estudiados y, sin embargo, sin resultados concluyentes. La mayoría de la literatura busca el vínculo entre el desempeño ambiental y la divulgación ambiental, como reflejo del enfoque instrumental o normativo de la compañía hacia la sostenibilidad. Sin embargo, durante la última década, un número creciente de compañías se están uniendo a las filas de la ecoinnovación, enfocando su estrategia en la innovación ambiental y allanando el camino para nuevos enfoques para la divulgación ambiental.

El objetivo principal de este documento es evaluar si la ecoinnovación en las empresas puede actuar como un impulsor no intencionado de la divulgación de informes ambientales, en relación con la teoría de la Vista basada en los recursos y la búsqueda de una ventaja competitiva. Se ha llevado a cabo una extensa investigación con empresas ecoinnovadoras españolas, evaluando sus estándares de divulgación ambiental desde una doble perspectiva: la percepción de los administradores y la información ambiental disponible al público.

Los hallazgos traen implicaciones interesantes sobre el desajuste entre la percepción de los gerentes sobre su divulgación ambiental y sus normas contables, y la divulgación real de los informes ambientales puestos a disposición de sus partes interesadas. Dentro de la muestra estudiada, la ecoinnovación parece ser un impulsor para la divulgación ambiental desde un enfoque integral incluido en la teoría de la RBV, donde la información ambiental se destina principalmente a fines administrativos y solo de manera secundaria a informar a los interesados.

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Introduction

The actual drivers for environmental disclosure and reporting have been widely studied and yet with no conclusive results. A review by [Dienes et al \(2016\)](#), suggests that the most important drivers for environmental disclosure are linked to the firm size, media visibility and ownership structure, leaving corporate governance to a mere influential role. Nevertheless, that same review finds no clear tendency to determinants such as profitability, capital structure, firm age or board composition. Most literature looks for the link between environmental performance and environmental reporting, assuming they are the reflection of the company's approach to sustainability, whether from a descriptive, an instrumental or a normative approach ([Donaldson & Preston, 1995](#); [Radu, 2015](#)).

From last decade, a growing number of companies are joining the ranks of green committed business, namely eco-innovation, focusing their strategy on "environmental efficiency". Eco-Innovation (Eco-I) has been defined as the production, assimilation, or exploitation of a product, production process, service, or management or business method that is novel to the organization (developing or adopting it) and that results, throughout its life cycle, in a reduction in environmental risk, pollution, and other negative impacts of resource use (including energy use) compared to relevant alternatives ([Kemp & Pearson, 2007](#)).

Over the years, environmental accounting and reporting has become one the most studied topics of Corporate Social Responsibility (CSR) ([Cho & Patten, 2007](#); [Dye, 1985](#); [Freeman, 1984](#); [Gray et al, 1995](#); [Roberts, 1992](#)). The factors determining the companies approach to environmental reporting, their motivations and objectives have been intensively analyzed through different theoretical frameworks. These frameworks range from the Voluntary Disclosure theory to the Legitimacy theory, including the Stakeholder's theory, the Agency theory and the Institutional theory, among others ([Thomson, 2007](#)). Nevertheless, to date no general conclusions have been reached about a common framework for environmental reporting, and most of the discussion on the determinant factors of voluntary disclosure is still open.

Companies keep on doing business assuming and applying environmental commitment in various ways. Over the last few years, environmental proactivity has become a goal for many companies ([Aragón-Correa & Rubio-López, 2007](#); [Rivera-Torres et al, 2015](#); [Sharma, 2001](#)), with different implementing manners tagged as green economy, circular economy ([Witjes & Lozano, 2016](#)) or eco-innovation ([Garcés Ayerbe et al, 2016](#); [Sarkar, 2013](#); [Valero-Gil et al, 2017](#)), among others.

The academic literature of these business strategies has shown that the main goal of companies so engaged is to improve the company competitiveness and to reduce costs, while improving their environmental performance ([González-Benito & González-Benito, 2005](#); [Porter & van der Linde, 1995](#)). Improving the use of resources and reaching exclusive competitive advantage is, in fact, the basis of the Resources Based View (RBV) theory ([Barney, 1991, 2001](#); [Penrose, 1959](#)), which could therefore be a theoretical framework for eco-innovative companies as those firms that carry out eco-innovation ([Aragón-Correa & Leyva-de la Hiz, 2016](#); [Del Río et al, 2016](#)).

On the other side, eco-innovative companies do also implement environmental disclosure policies, which determinants and motivation appear to be partially unclear ([Correa Ruiz et al, 2013](#)). This can be considered as one of the contributions

of this study because, to the best of our knowledge, there are no previous studies that analyze this subject in a similar way, identifying the specific behavior of eco-innovative firms regarding environmental disclosure. It should be taken into account that eco-innovation could be found in the final and more advanced stage of environmental proactivity ([Garcés-Ayerbe et al, 2016](#)), and therefore, previous studies focused on the environmental disclosure in proactive companies represent a different topic that can yield other results than those found in companies carrying out eco-innovation.

From these premises, the research presented in this paper looks to show the determinants of eco-innovative companies' environmental disclosure and the theoretical framework to which they respond, so as to clarify if there is a relationship between being eco-innovative and disclosing environmental reporting. Direct implications in understanding the motivation behind managers' decision to obtain and disclose environmental information, would then pave the way to establishing new criteria to measure and assess disclosure in environmental proactive companies.

To that end, and based on the claims for increasing engagement with managers and stakeholders ([Adams & Larrinaga-González, 2007](#); [Correa-Ruiz & Moneva-Abadía, 2011](#); [Parker, 2005](#)), an extensive research with eco-innovative Spanish firms from various sectors and characteristics has been undertaken, analyzing their environmental reporting standards from a two-fold perspective: from managers' perception and from stakeholders' available information. For the first one, specific questions were posed to the companies' managers looking to understand their own perception about the environmental information disclosed and the inherent importance of environmental reporting as means to inform about the company values, commitment and environmental engagement. For the stakeholders' perspective, a specific research was conducted through accessible sources of information such as Websites and financial databases of 78 Spanish firms.

The paper structure consists in this introductory section which is followed by the theoretical framework in section 2, the methods description and explanation in section 3, the results discussion in section 4, and the conclusions reached in section 5, followed by the references used.

CONCEPTUAL FRAMEWORK

Environmental reporting

Environmental reporting has been widely studied over the last decades, as part of the subject of sustainability, CSR and transparency ([Ballou et al, 2006](#); [Bebbington & Larrinaga, 2014](#); [Gray, 1992, 2010](#)). Researchers have analyzed the environmental disclosure determinants and drivers from a range of economic and sociological theories, looking for its relationship with economic performance, environmental management, companies' engagement with sustainability, or risk management, among others.

The voluntary disclosure theory ([Dye, 1985](#); [Healy & Palepu, 2001](#); [Lang & Lundholm, 1993](#); [Verrecchia, 1983](#)) underlines the incentives of environmental proactive companies to disclose environmental information ([Bewley & Li, 2000](#)), or to remain silent if their environmental performance is questionable ([Clarkson et al, 2008](#)), considering the economic performance as a positive driver for environmental disclosure ([Cho & Patten, 2007](#)). From a normative approach framed within the Stakeholders' theory, environmental disclosure reflects the companies' engagement with sustainabil-

ity (Freeman, 1984), and the will to meet stakeholders' needs (Cormier et al, 2004; Ullmann, 1985). The instrumental perspective, however, the Legitimacy theory (Archel et al, 2009) emphasizes the companies' will to enhance their credibility (Aerts & Cormier, 2009). Similarly, the accountability theory suggests that through disclosure, companies discharge part of their environmental and social responsibility (Fernández et al, 2006).

Indeed, the relationship between environmental performance and environmental disclosure appears to be controversial, and its theoretical framework is still a sum of overlapping and conflicting theories focused on particular aspects (Radu, 2015), and mostly based data from developed countries and homogeneous conditions (Aldrugi & Abdo, 2014). Table 1 presents the most relevant and studied theories for environmental reporting, linked to the drivers and motivation supporting them.

Table 1
Most studied companies motivations to environmental reporting

Motivations to environmental reporting	
Voluntary disclosure theory	Environmental proactivity and economic performance
Stakeholders' theory	Engagement with Stakeholders, commitment to sustainability
Legitimacy theory	Enhancing the company's credibility and reputation
Accountability theory	Discharge of the company's responsibility, legal requirements

A number of different factors have been identified as determinants for environmental disclosure. From stakeholders' power and companies' strategy (Roberts, 1992), to the size, exposure and presence of the company in stock markets (Brammer & Pavelin, 2008; Cormier & Magnan, 1999; Monteiro & Aibar-Guzmán, 2010), a range of interactions have been studied, including local and comparative frameworks (Bouten & Hoozée, 2013; Gamerschlag et al, 2011), and institutional pressure (Larrinaga et al, 2002; Llena et al, 2007). Regulations have increased awareness of environmental management (Claver-Cortés et al, 2007), leading to more environmental disclosure to improve the corporate reputation, but also bringing in changes in managerial practices and environmentally friendly practices. Environmental proactivity in companies and managers' values may lead to a positive impact in environmental disclosure (Marco-Fondevila et al, 2018).

In fact, the significant increase in sustainability reports (KPMG, 2017), as preferred means of environmental disclosure and source of legitimacy for companies (Deegan, 2002; Gray et al, 1995; Laine, 2009; Morsing & Schultz, 2006) has led to growing critics regarding stakeholder accountability (Archel et al, 2009; Perrini & Tencati, 2006) and its appropriateness to address Social and Environmental Accounting (Bebbington, 2009). The sustainability accounting and reporting processes undergone by the companies may respond to other corporate goals besides gaining external legitimacy (Correa-Ruiz & Moneva-Abadía, 2011). In addition, according to the legitimacy theory, entrepreneurs' perception of institutions and structures can exert a profound impact on their eco-innovative activities (Demirel et al, 2017).

Burritt and Schaltegger (2010) studied the different drivers for sustainability accounting and reporting from the perspective of the agent demanding the information, whether internal or external to the company. Sustainability accounting is at once an internal information process required to support management decisions (inside-out manage-

ment perspective), and an information product addressing the company external stakeholders (outside-in stakeholder view). The inside-out approach proposed stresses the use of environmental management accounting as a source of internal information to look for potential benefits and competitive advantage (Burritt et al, 2002). The gathering of environmental management accounting has been proved to be positively related to green innovation in production processes (Ferreira et al, 2010), confirming the relationship with providing advantage to the company and the environment. Similarly, Burritt and Schaltegger (2001) find the inside-out approach to sustainability accounting closely related to the notion of Eco-efficiency, *designed to integrate monetary and physical information to provide monetary and environmental gains* (Schaltegger, 1998).

The managerial environmental concern appears to be a determinant factor for the environmental innovation strategy (Chang, 2011; Eiadat et al, 2008), highlighting the importance of managers goals, perception and values. Environmental strategies depend on internal resources and capabilities, including top-managers' environmental commitment (Del Río et al, 2012), as the relevance of the managerial proactivity for eco-innovation projects has been demonstrated (Chang & Chen, 2013; Del Río et al, 2016). Thereby, top managers' influence in the degree of green innovation adopted by the company and its communication to stakeholders, appears to be essential (Weng et al, 2015). Whether the role of managers in determining the environmental standards of the company can be primarily linked to an outside-in approach, an inside-out approach (decision making) or a twin-track approach, bringing both inside-out and outside-in together (Schaltegger & Wagner, 2006), strongly depends on how managers envision the company position in society and the market, and the way to communicate achievements (Burritt & Schaltegger, 2010).

Eco-innovation

The term Eco-I is commonly associated with environmental innovation and green innovation (Hojnik & Ruzzier, 2016). Generally speaking, Eco-I is that particular innovation based on pursuing Eco-efficiency (Scarpellini et al, 2012), which derived from the search for an increase in competitiveness through environmental improvement (Cecere et al, 2014; Del Río et al, 2010; Frondel et al, 2007, 2008; Kemp & Oltra, 2011; Pereira & Vence, 2012). As an increasingly relevant field of study, specifically in its relationship with companies' environmental performance, different definitions for Eco-I have been proposed, such as one by the Eco-Innovation Observatory (2016), which states it to be *the introduction of any new or significantly improved product, process, organizational change or marketing solution reducing the use of natural resources and decreasing the release of harmful substances across the whole life-cycle*, or the one from (Kemp & Pontoglio, 2011), associating Eco-I with the development of new ecological products, renewable or more sustainable and the reduction of waste through technological innovation.

The factors driving companies to the adoption of eco-innovative policies have been also widely studied from different perspectives such as the companies' motivation, the internal and external context or the economic theory underneath. Eco-I is observable in both environmental proactive companies introducing product or processes innovation (Garcés-Ayerbe et al, 2016), and in traditional innovative companies introducing environmental criteria to their innovation criteria (Albino et al, 2009; Esty & Winston, 2009).

The most cited drivers for eco-innovation comprise reducing risks, pollution and negative environmental impacts (Kemp & Pearson, 2007), the search for environmental positive effects (Horbach et al, 2012), the better and more efficient use of resources (Eco-Innovation Observatory, 2016), the response to the market pressure (Oltra et al, 2005) and the need to maintain a good reputation (Chen, 2008). As for Eco-I drivers linked to the company engagement with transparency and supplier involvement (Hojnik & Ruzzier, 2016), the integration of innovation and sustainability to better society quality of life (Dangelico & Pujari, 2010), or environmental consumer awareness and social pressure (Bocken et al, 2012) are the most relevant ones.

The theories explaining the adoption of Eco-I by companies, strongly depend on which are the predominant drivers defined by the researcher in every case. Most studies have paid special attention to firm-external factors (Demirel & Kesidou, 2011) within the framework of institutional theory (Aragon-Correa & Leyva-de la Hiz, 2016; Coenen & Díaz López, 2010), or to stakeholders' theory (Paraschiv et al, 2012; Wagner, 2007).

The Resource-based view theory (RBV) brings in another hypothesis to explain the adoption of Eco-I by companies, focused on the competitive advantage. The set of resources and capabilities hardly imitable and costly substitutable, constitutes the competitive advantage of the company under the RBV theory (Barney, 1991, 2001; Hart, 1995), and has been extensively applied and related to Eco-I (Aragon-Correa & Leyva-de la Hiz, 2016; Dangelico & Pujari, 2010; De Marchi, 2012; del Río et al, 2010; Lee & Min, 2015; Sandström & Tingström, 2008).

Cai and Li (2018) state that resource-based view proposes that firms respond to external change, based on their own internal resources and abilities according to Oliver (1997). Thus, it can be considered that Eco-I depends not only on internal drivers but also on many external pressures. Therefore, the Institutional theory can be considered to explain a firm's innovation behavior, consequently applied to the analysis of the influence that Eco-I could have on environmental disclosure.

Environmental reporting and eco-innovation

Assuming the RBV theory as theoretical framework for eco-innovative companies, their environmental reporting standards can therefore reflect a predominant focus on obtaining useful information to maintain the competitive advantage, rather than on informing stakeholders through actual disclosure. From this hypothesis, environmental reporting could be subdued to the company's eco-innovative strategy, implying that informing stakeholders is not the main motivational driver to gather and analyze environmental information.

However, the effects of Eco-I comprise the social, economic and environmental dimensions as long as it seeks sustainable development (Hellström, 2007). According to Schaltegger and Burritt (2005), the more *enlightened* corporations are realizing that corporate economic performance can be improved through engagement with stakeholders. Yet, it is still not clear if environmental sustainability is a contingent consequence of Eco-I or a strategic goal in itself (Baumgartner & Ebner, 2010), even assuming sustainability communication actions are increasing among companies. The success of eco-innovation activities depends on the inclusion of sustainability as an explicit goal (Arnold & Hockerts, 2011).

Studies focusing on eco-innovation drivers stress the additional importance of regulation, environmental policy, insti-

tutional and political drivers (Horbach, 2008). Following the classification proposed by Justine, Doran and Ryan (2012), when the supply and demand eco-innovation drivers are considered, Kesidou & Demirel (2010) find that consumer demand and societal requirements for corporate social responsibility could impact on a firm's likelihood of eco-innovating, although not in all cases (Kesidou & Demirel, 2014). Occasionally, consumer demand, interest group pressures and social corporate responsibility are enough to induce firms to develop/adapt/use more environmentally friendly products, process and management systems (Horte & Halila, 2008). Hence, when considering regulation as an eco-innovation driver, many authors argue that it is the most important (Porter & Van der Linde, 1995). As in the case of disclosure of environmental reporting, Eco-innovation not only helps firms to improve their legitimacy but also to avoid the penalties for poor compliance with regulations (Berrone et al, 2013).

Kesidou & Demirel (2012) pointed out that the collaboration with environmentally concerned stakeholders play an important role for the generation of eco-innovations in line with the results previously obtained (Wagner, 2007). Indeed, many of the drivers studied for Eco-I are also drivers for environmental disclosure, strengthening the potential correlation among environmental disclosure and Eco-I. Consequently, companies strategically engaged in Eco-I would also have a strategic interest in sustainability and disclosure, as a source of competitiveness and differentiation within the realm of the RBV theory.

Using the literature, Doran & Ryan (2016) identified three key sets of eco-innovation drivers: demand-side drivers, supply-side drivers and regulatory drivers. Commitment of the firm to environmental issues has been considered as one of the drivers of eco-innovation. In the context of eco-innovation, the crucial role of social awareness has been analysed in other studies as a part of sustainability approach of the company. Jasiski & Tunik (2013) pointed out this approach being insufficiently popularised in industry as a potential barrier to eco-innovation. Andersen (2010) considered that eco-innovation is still slightly linked to sustainability because eco-innovation mainly deals with the economic innovation literature while sustainability studies tend to focus on management research. In this sense, this study offers an integrated approach from the business point of view.

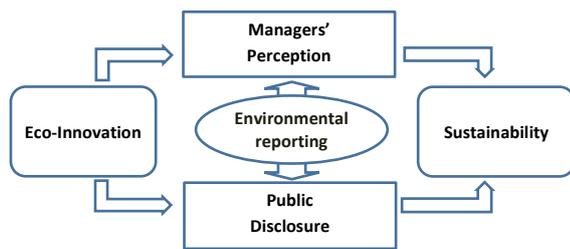
Prior revision of literature points out at significant evidences of causal relationship between environmental disclosure and eco-innovation, and the pivotal role of managers, subject to their strategy, values and level of engagement. The following research looks forward to progress in this line of knowledge, and to determine if Eco-I in companies may be acting as a driver for disclosure of environmental reporting, and what motivational factors define the environmental reporting approach, whether internally oriented (environmental information for decision making), or externally oriented (reporting to stakeholders).

Through a field study with Spanish companies, the interrelations between the quantity and quality of environmental disclosure, the degree of eco-innovation and the managers' perceptions of and engagement with reporting and stakeholders, are assessed as described in figure 1.

Thereby, the research objective presents a two-fold focus, phrased into two research questions, which are analyzed through the empirical study under the framework of RBV theory for competitive advantage:

- *Is eco-innovation a driver for disclosing environmental reporting in companies?*

Figure 1
Research design



- *Is eco-innovative companies' environmental reporting connected to an inside-out approach?*

In summary, the conceptual framework of environmental reporting and Eco-I are duly analyzed to enhance the knowledge in this field through the empirical method described in the following section.

Methods

In response to the first objective of the research, a sample of Spanish companies which can be considered eco-innovative is analyzed in terms of their environmental reporting standards. The second research objective is to determine if environmental reporting in eco-innovative companies is primarily focused on obtaining useful information for the decision making process (linked to the RBV theory), or on informing stakeholders (accountability based theories). Consequently, the research has included qualitative data (those stated by managers) and quantitative data (those observed and collected by researchers), conforming two different perspectives applying to the analysis, the one from managers, which will be tagged as perception, and the one from stakeholders, which will be tagged as observation. While perceptions result directly from managers' answers, observations come from companies' accessible public data available to stakeholders.

The double perspective brings in the possibility to assess the company's actual approach to environmental reporting, since the first question determines if the degree of eco-innovation in companies positively affects the volume of environmental reporting, while the second one establishes the main target of such a reporting, and, consequently, the factors motivating its disclosure. If Eco-I proves to be a determinant factor for environmental reporting under managers' perception further than for stakeholders', a case for RBV theory is then possible.

Managers' participating in the research were asked about their opinions towards the relevance of environmental reporting in their companies. Since the research counts on primary data derived from managers' perceptions as well as data gathered from public accessible sources of information, assessing the potential gap between reporting perceptions and actual disclosure, may support previous results about the actual motivations of managers in disclosing environmental reporting.

The sample

The broad definition of eco-innovation and the novelty of the concept is a common obstacle to define the selection criteria for eco-innovative companies (Bossle et al, 2016). However, this study chose a set of general conditions to determine

which companies could be considered eco-innovative, based on accepted principles and practice for similar cases in Spain.

The population for the study consists of Spanish companies that operate in sectors with great potential for eco-innovation, such as those related to technologies included in the documents known as "BREFs" (European Commission, 2003) of the "Best Available Techniques". Companies with less than 50 employees were discarded so as to avoid lack of environmental reporting due to scarcity of resources or motivation to do so. Besides, considering that size increases the possibilities for undertaking eco-innovation companies with 50 or more employees were selected considering the results demonstrated by other authors in this field (Dong et al, 2014; Rehfeld et al, 2007; Roda-Llorca et al, 2015; Triguero et al, 2015; Wagner, 2007). Specifically, the selected sectors were mining, heavy industry and chemical industries, the manufacturing industry, energy producers & suppliers, water supply, water intensive industry & waste management, and transport, logistics and services. The territorial characteristic of the sample was selected in line with Albino et al (2009) because the strategic approaches for green product developers strongly vary depending on the economic sector, while a more homogeneous behavior is to be found through a territorial perspective (Marco-Fondevila et al, 2018).

Data from business were obtained through surveys e-mailed during 2015 in the framework of a collaborative R&D project, to a broad sample of 996 firms selected from the SABI economic and financial database. Out of the sample, 110 questionnaires were answered by managers or by environmental managers of companies. Secondly, the 110 companies' financial and economic data were collected from SABI, together with their accounting official record, and their publicly accessible data from Websites and other information platforms. All of it was thoroughly revised and analyzed, highlighting any data related to environmental reporting, disclosure and accounting.

The final sample with sufficient data rose to 78 cases. Although the response rate is low, it should be stressed that the main objective of this study required an exhaustive collection of data from different sources, so as to allow a sound and significant analysis. All companies in the sample were fully identified through their VAT code, so as to permit the collection of all available data and avoid the anonymity of surveys. Given the relatively low number of companies, results may not be sufficiently representative as to extend them directly to the whole population; however, they may still present relevant indications and trends which describe eco-innovative companies' present and future behavior (Table 2).

Table 2
Survey and sample description

Variable	Description	n		%	
		n	%	n	%
Size:	From 50 to 249 employees	690	69,29%	51	65,38%
	From 250 to 450 employees	180	18,10%	16	20,51%
	More than 450 employees	126	12,61%	11	14,10%
		996	100%	78	100%
Sector:	Mining, heavy industry & Chemical	7	0,68%	6	7,69%
	Manufacturing	453	45,48%	41	52,56%
	Energy producers/suppliers	276	27,73%	5	6,41%
	Water supply, water intensive industry & waste	22	2,21%	9	11,54%
	Transport, logistics & services	238	23,94%	17	21,79%
		996	100%	78	100%

Qualitative data

The qualitative data about environmental reporting came from the managers' answers to a set of questions over their environmental reporting standards and procedures, including the type and volume of environmental information reported, the environmental accounting model undertaken, and the presence within their companies of certified Environmental Management Systems (EMS). Seven questions (a.1 to a.7) were posed in three blocks (environmental management, environmental information, and environmental accounting) so as to cover environmental disclosure in a broad way, and get a better view of the companies' practice. These questions conform the Environmental Reporting Perceived block (ERP) (Table 3).

Table 3
ERP survey questions

Environmental Reporting Perceived by Managers (ERP), survey questions (Yes/No)	
a.1	Does your company count with a Certified Environment Management System?
a.2	Does your company inform openly about sustainability matters linked to your activity through accessible and public media?
a.3	Does your company produce reports about the environmental impact addressing the company's stakeholders?
a.4	Does your company count on a specific and public policy about transparency and accountability?
a.5	Does your company record the required expenses to reduce environmental pollution in specific records of you accounting books?
a.6	Does your company record in the accounting books the provisions and contingencies associated to environmental activities and future risks?
a.7	Environmental expenses, provisions & contingencies are specifically detailed in the annual accounting report?

The qualitative data about *Managers' Perception of Environmental Disclosure* came from five questions (b.1 to b.5) addressing the relevance and importance given by managers to environmental proactivity and environmental reporting, based on their policies about transparency and accountability. Such an objective presents a series of difficulties linked to the subjective character of the questions and answers and the different understanding that managers may have about concepts like eco-innovation, environmental proactivity or environmental disclosure. Looking to minimize the risk of misunderstandings and unanswered questions, the later were designed (and endorsed by the panel of experts) with a focus on phrasing them in such a way they would be familiar and close to the managers' own context and concerns. Since the same questions were equally posed to all managers in the sample, they do represent the managers personal view (perception) of the discussed topics. The five questions conform the companies' commitment (through their managers) to the environmental disclosure block (CPED) (Table 4).

Quantitative data

The quantitative data for environmental reporting came from specific research in financial databases and Websites for

Table 4
CPED survey questions

Managers' Perception about Environmental Disclosure (CPED), survey questions (Likert 0 to 5)	
b.1	To what extent including changes to reduce the environmental impact of activities is necessary for the company to be competitive?
b.2	To what extent is there pressure from society towards environment protection?
b.3	To what extent do you consider important and useful informing about the sustainability of the company activities?
b.4	To what extent the information provided to your stakeholders represent the company activity regarding sustainability?
b.5	To what extent is the company aligned with the CSR ¹ model in comparison with the company's sector average?

¹Questions about CSR are based on the sustainability/environmental approach of the company

questions rather similar to those posed to managers (a.1 to a.7), enquiring about the actual environmental information openly reported by companies and available to stakeholders, addressing environmental management, environmental information and environmental accounting (c.1 to c.6). These questions conform the *Environmental Reporting Available Disclosure block (ERAD)* (Table 5).

Table 5
ERAD survey questions

Environmental Reporting Available Disclosure (ERAD) Research questions (Yes/No)	
c.1	The company counts with a Certified Environment Management System?
c.2	The company inform openly about sustainability matters linked to your activity through accessible and public media?
c.3	The company produces reports about the environmental impact addressing the company's stakeholders?
c.4	The company counts on a specific and public environmental policy.
c.5	The company informs about expenses, provisions and/or other economic factors linked to the environment in public media (Websites)
c.6	The company informs about environmental expenses, provisions and/or other economic factors in publicly accessible accounting records (financial database)

All questions in the survey were validated by a panel of experts made up of three representatives of public administrations, two of business associations, one scholar and a firm's CEO in line with other studies on this field (Rivera-Torres et al, 2015).²

The selection of two variables to measure the level of Eco-I entails great difficulty since it could be measured using dif-

²It was decided to include a mixed experts panel with members from different environments, as in previous papers, and, particularly, with members from the public administration since eco-innovation is strongly influenced by public policies.

ferent indicators. From a RBV perspective, capabilities are synthesized using human capital measured by presence or less of specific employees directly or indirectly linked to Eco-I activities (Scarpellini et al, 2017) and resources are measured through the level of investment done by companies in Eco-I, in line with variables selected by other authors (Ding, 2014; Ketata et al, 2014; Lee & Min, 2015; Triguero et al, 2017). Therefore, the degree of companies' eco-innovation (Eco-I degree) was measured and ranked after the sum of two quantitative ratios, which were equally weighted by 50% each: The percentage of human resources devoted to environmental activities, and the percentage of investment devoted to environmental R&D. This information was provided by companies through the questionnaires, and ranked after a Likert scale from 1 to 5, rendering the following results:

Table 6
ECO-I degree of companies

ECO-I degree of sample	% Companies
From 4 to 5,0	5,1%
From 3 to 3,9	41,0%
From 2 to 2,9	32,1%
From 1 to 2,9	21,8%
ECO-I mean	2,57
ECO-I median	2,50

The following table presents the companies' Eco-I degree per sector and average number of employees:

Table 7
Companies size and Eco-I degree

Sectors	Size (mean)	Eco-I (mean)	Eco-I (median)
Energy producers	2.260,5	3,0	3,0
Manufacturing	869,3	2,5	2,5
Transport, logistics & services	226,2	2,6	2,5
Water supply, water intensive industry & waste	225,3	2,7	2,5
Mining, heavy industry & Chemical	161,7	2,7	2,5
Total	663,5	2,6	

The observed differences among sectors are not very significant, being the energy sector the most eco-innovative one, and the manufacturing industries the least eco-innovative. Nevertheless, the manufacturing sector includes rather diverse sub-sectors which level of eco-innovation is subject to important variability. The in-depth study undertaken by Valero-Gil et al (2017), presents more detailed results, confirming the significant differences within the manufacturing sector, as well as the relevance of other factors such as technology level and size of the company.

As for the companies' size in number of employees, and its relationship with the companies' degree of Eco-I, the energy sector shows a connection between larger number of employees and higher degree of Eco-I which, nevertheless, cannot be extended to the other sectors. No conclusions shall be observed about this relationship, likely due to the size of the sample and the mentioned diversity of companies included in every sector.

In any case, analyzing the level of Eco-I per sector and size, or trying to infer the situation of Spanish companies through the results obtained with the research sample, is not

the primary object of the paper, and falls outside the scope of analysis.

Analysis

The analysis of data was performed at two levels: firstly, with statistical discrete analysis for each and every variable, as well as for groups of questions:

- By variable (a.1-7; b.1-5; c.1-6)
- By block, an aggregated index was created, assigning an equal weight to every variable with each cluster (ERP: 0-7, CPED: 0-5 and ERAD: 0-6). The range of results for the three blocks were then transposed into a 0 – 5 scale, so as to allow the comparison among them.

Secondly, a correlation study between Eco-I and environmental disclosure was performed, analyzing the potential linkage among Eco-I and ERP, ERAD & CPED, so as to determine if Eco-I may be acting as a driver or motivational factor to environmental reporting and companies' sustainability reporting model.

Additionally, the potential relationship between the 3 clusters was analyzed, so as to assess if relationship or collinearity conditions are present within the 3 distributions.

As for the outcomes and implications of the analysis related to the size of the companies and the different sectors of activity, the limited size of the sample (specially in number of companies representing sectors such as mining or water supply), advises a careful approach to results so as to avoid jumping up to conclusions which may not be significant or representative of reality.

RESULTS AND DISCUSSION

Environmental Reporting Perceived by Managers (ERP)

The first set of results relate to the perception managers have about environmental reporting in their companies. As shown by the percentages in table 8, around two thirds of the sample count with a certified environmental management system, and inform about the environmental activity of the company. The questions related to environmental accounting, however, show a lower percentage of compliance, slightly below 50%, which could be also attributable to lack of information about the matter. In the whole, around half of the sample states a significant degree of environmental reporting.

Environmental Reporting Available Disclosure in databases and Websites (ERAD)

The second set of results comes from direct observation of the companies' Websites, reports and communications openly available to stakeholders. In this case, around two thirds of the sample openly states counting with a certified EMS and having environmental commitments or policies. Informing about the company's environmental activity happens only in 39% of the sample, while just 27% of companies offer a report including environmental information. As for transparency of environmental expenses, provisions and contingencies, the figures are very low, with 8% of the companies presenting economic data about their environmental activity, and none of them providing specific accounting information related to their environmental activity in the largest financial database used by researchers and practitioners.

Table 8
ERP results

Vb.	ERP	%
a.1	Does the company count with a EMS (ISO 14000 and/or EMAS)	67,95%
Environmental information questions		63,89 %
a.2	Does the company inform about sustainability and environmental activity	69,23%
a.3	Does the company produce and disseminate Sustainability reports	62,18%
a.4	Does the company count with a transparency and/or accountability policy	60,26%
Environmental accounting questions		48,71%
a.5	Does the company account environmental expenses in specific accounts	43,59%
a.6	Does the company account environment related provisions	56,41%
a.7	Does the company give detail of environmental provisions in accounting records	46,15%

Table 9
ERAD results

Vb.	ERAD	%
c.1	Openly states having implemented an EMS (ISO 14000 and/or EMAS)	62,82%
Environmental information available		44,23%
c.2	Openly states environmental commitment and/or policy	66,67%
c.3	Openly shows details about the company's environmentally related activity	39,10%
c.4	Openly delivers a Sustainability/environmental/CSR report	26,92%
Environmental accounting available		4,17%
c.5	Openly presents environmentally related economic data (expenses, provisions, etc.)	8,33%
c.6	Provides detailed information about environmental accounting in largest accessible financial database (SABI)	0,00%

The two sets of results highlight the relevant differences existing in environmental reporting as perceived by managers and as actually disclosed to stakeholders. The most notorious ones are show in the Table 10:

In all three cases, the difference between perception from managers and actual availability of information by stakeholders is large and relevant, suggesting a mismatch with different potential origins. The possible hypothesis to explain such a gap would be the following:

- Considering the possibility of managers being partly untrue. However, since the managers were explained the data would only be used anonymously and as part of a large sample, there are no reasonable incentives to embellish the answers.
- A lack of accurate information by managers could also explain the gap, assuming they answered positively without actually being certain of the answer. However, the difference is probably too large to accept this hypothesis, at least as the only relevant factor.
- A third hypothesis would be that managers' answers are based on the fact that they have the information requested, and therefore, they state it exists, downplaying the matter of it being openly available or not. The actual

Table 10
ERP vs. ERAD

Does the company produce and disseminate Sustainability reports	62,18%	Openly delivers a Sustainability /environmental/ CSR report	26,92%
Does the company inform about sustainability and environmental activity	69,23%	Openly shows details about the company's environmentally related activity	39,10%
Environmental accounting perception (managers)	48,71%	Environmental accounting available to stakeholders	4,17%

phrasing of the questions posed to managers does not specify who the company is informing to, leaving the door opened to two viewpoints, informing *internally* or informing *externally*.

In fact, all three hypotheses could be combined, and results could still be reasonable. Managers may be exaggerating or overplaying some of their actions, while not been aware of other and not knowing accurately to what extent environmental information is disclosed to stakeholders.

Table 11
CPED results

Vb.	CPED	Average	Median
b.1	To what extent is it necessary to introduce changes reducing the environmental impact of the company to make it more competitive?	3,19/5	3
b.2	To what extent is there pressure from society towards more environmental protection?	2,94/5	3
b.3	To what extent informing about the sustainability aspects of the company activities is important and useful to your company?	3,65/5	4
b.4	To what extent the information transmitted to the company's stakeholders represents the company activity in sustainability terms?	3,21/5	3
b.5	To what extent is your company aligned with the CSR model in relation to the average of your sector?	3,41/5	4

Managers were asked 5 questions to assess their perception about environmental reporting relevance for their companies. The only question presenting a slightly lower average is the one related to the pressure exerted by society towards more environmental protection. All other four are quite high, especially for b.3 and b.5, which state the importance and usefulness of informing about sustainability matters, and the alignment with CSR/sustainability compared to the sector average. Once again, the results are consistent with the answers provided by managers about their companies' environmental reporting, but not with the environmental information actually available to stakeholders. Of special attention is the mismatch between b.5 and actual disclosure, since it could lead to one of the following conclusions:

- a. the average alignment with CSR/sustainability in their sector is pretty low, or

- b. managers do not see informing stakeholders as an essential part of CSR.

Whatever the case, the direct implication suggested is that eco-innovative companies score rather low in CSR standards, whether as a sectorial inherent condition (case a), or due to a serious misunderstanding of what environment represents in terms of informing stakeholders. This scenario is congruent with the idea that eco-innovative companies get involved in environmental reporting as an indirect consequence of their environmentally proactive behavior, and not due to an actual commitment towards transparency and stakeholders' engagement.

Correlation between environmental reporting and degree of eco-innovation

The correlation between the environmental reporting of the company (both perceived and openly available), and the degree of Eco-I for every company, required the categorization of companies after the sum of two ratios linked to Eco-I and focused on human resources (*Staff devoted to environment and R&D/ Total staff*) and investment (*Investment devoted to environment/ total investment*).

The categorization of the companies' degree of Eco-I, together with the three clusters developed previously (ERP, ERAD & CPED), were analyzed, assessing the potential correlation among the four statistical distributions.

The consequent correlation matrix obtained presents the following results (table 12), which show the statistical significance of the three blocks as drivers for Eco-I, especially in ERP's case:

Table 12
Eco- I Correlation with blocks

		ERP	ERAD	CPED	ECO-I
ERP	Pearson	1	0,576*	0,683*	0,831*
	Correlation				
	Sig. (2-tailed)		0,000	0,000	0,000
ERAD	Pearson		1	0,396*	0,484*
	Correlation				
	Sig. (2-tailed)			0,000	0,000
CPED	Pearson			1	0,593*
	Correlation				
	Sig. (2-tailed)				0,000

The following two tables show in more detail the different degree of correlation between the four distributions, through the statistical model for linear regression and the ANOVA test. The first table (table 13), confirms the interrelation of ERP, CPED and, to a lower extent, ERAD, while the second table studies the correlation between ERP and ERAD, CPED, so as to test the possibility of collinearity between these three distributions.

Table 13
Correlation between Eco-I (independent) and ERP, CPED & ERAD.*

Independent variable: Eco-I	R	R ²	Estimate Std. error	Sum of squares	Mean square	F	Sig.
Predictor: ERP	0,831	0,690	0,47955	38,885	38,885	169,088	0,000
Predictor: CPED	0,593	0,352	,69348	19,812	19,812	41,196	0,000
Predictor: ERAD	0,484	0,234	0,75363	13,197	13,197	23,236	0,000

The strong correlation between Eco-I and ERP suggests that eco-innovative companies are positively linked to environmental reporting from managers' perspective. Although positive, the correlation between Eco-I and ERAD is much lower, indicating that Eco-I is not that clearly engendering actual disclosure of environmental reporting to stakeholders. This lower relationship with Eco-I confirms the previous discrete results, enforcing the idea of a gap between what managers do state/think and what actually happens. The fact that CPED is also correlated to Eco-I – less than ERP but more than ERAD – points at the idea that to a certain extent, the more eco-innovative a company is, the more prone to environmental disclosure. However, ERAD lower correlation suggests that companies may still be in the process of turning that inclination in real observable facts.

Table 14
Correlation between ERP (independent) and CPED & ERAD

Independent variable: Eco-I	R	R ²	Estimate Std. error	Sum of squares	Mean square	F	Sig.
Predictor: CPED	0,683	0,466	1,35693	122,054	122,054	66,288	0,000
Predictor: ERAD	0,576	0,332	1,51721	87,004	87,044	37,814	0,000

Managers' perception of how important environment reporting are for their companies is positively correlated to the perception of the reporting they do, and to a lower extent, to the actual reporting observable.

Finally, the perception of managers about the importance of transparency, although statistically significant, it is barely related to the actual disclosure of environmental reporting available to their stakeholders with a Pearson R² below 0,16. Again, the gap between managers' perceptions and actual disclosure is remarkable.

Discussion

The results obtained by Kesidou & Demirel (2010), pointed out that societal requirements could impact on a firm's likelihood of eco-innovating, although not in all cases (Kesidou & Demirel, 2014), and, to the best of our knowledge, the reverse analysis is understudied. In this paper the eco-innovation is considered to be a determinant factor for disclosure of environmental reporting, implying that the more eco-innovative a firm is, the more prone it is to improve its reporting standards. Doran and Ryan (2016) also considered the commitment of the firm to environmental issues as a driver of eco-innovation. From another side, Jasiski and Tunik (2013) pointed out insufficiently popularized approach to sustainability in industry as a potential barrier to eco-innovation, but the impact of eco-innovation on environmental disclosure was not analyzed in detail. Thus, the discussion on this field is still open since determinants and motivation for eco-innovative companies implementing environmental disclosure appear to be unclear, given the theory driving their environmental performance (Correa Ruiz et al, 2013).

In response to Andersen (2010), who considered that Eco-I and social responsibility are still slightly linked, in this study an integrated approach from the business point of view that combines the Eco-I literature and the environmental disclosure research is presented. In line with Berrone et al (2013), it can be stated that Eco-I goes beyond helping companies to improve their legitimacy.

Eco-I, as other current trends such as green economy or circular economy, has systemic conditions and is generally de-

veloped in a fast changing environment, basing its corporate strategy on gaining competitiveness and market value while improving its environmental performance. In this context, assuming companies do change over time as does society, and that factors and context affecting the companies have an influence on their approach to environmental disclosure, it is pertinent to consider RBV from a non-biased perspective setting the focus on what the eco-innovative companies actually do.

The research undertaken has analyzed in detail the environmental reporting approach of a significant sample of eco-innovative Spanish companies from a two-fold perspective: the managers' perception about their reporting standards, and the actual environmental disclosure publicly available to their stakeholders. Additionally, a third construct of data was created after the managers' perception of environmental reporting importance and usefulness to their companies.

CONCLUSIONS

Through eco-innovation, companies may gain competitive advantage and better use of resources. Environmental information could be required primarily to help managers with their decisions, and only secondarily to inform stakeholders. The Resource Based View theory fits in with this behavior, and could consequently be considered a potential theoretical framework to environmental reporting determinants for eco-innovative firms.

The two hypotheses tested within the current research have brought positive results in establishing eco-innovation as a driver for environmental disclosure from an instrumental inside-out approach, with the RBV theory as the framework for eco-innovative companies' environmental disclosure behavior. However, these results are subject to the specificity of the sample used, as well as to its size and characteristics.

The results confirm the first research question of the paper, suggesting that eco-innovation is likely to be a relevant factor for disclosure of environmental reporting, implying that the more eco-innovative a firm is, the more prone it is to improve its reporting standards. Furthermore, the mismatch encountered between managers' reporting perception and reporting publicly available to stakeholders, brings in a different theoretical framework than those usually discussed. Managers declare producing far more environmental information than the one objectively disclosed to their stakeholders. Whether it is a conscious or an unconscious gap, it implies that their primal motivation would not be to inform their stakeholders or to establish a close relationship with them under normative values.

Moreover, results show that in most aspects, the companies' actual disclosure of environmental reporting goes no further than what is strictly required by Law, and, in some cases, even not that much. Given that managers declare having more and better information than the one publicly disclosed, and that most of them consider it important and useful to inform about environmental activities, it appears they could be downplaying the chance to legitimize their business and to respond to society pressure. The companies' behavior within the sample focuses on producing and using environmental reporting rather than on disclosing it to their stakeholders. This fact speaks of an instrumental approach, not based on the objective of gaining reputation or market image, but rather on being more competitive and efficient. This strategy responds to the inside-out approach to sustainability accounting, based on the search for eco-efficiency as described by [Burritt and](#)

[Schaltegger \(2001\)](#), confirming the paper second research question.

The present paper provides practitioners with relevant data for decision-making processes towards successfully communicate eco-innovations. Our findings directly translate into practices to understand behaviors and to provide information on factors that have an influence on the relationship with stakeholders adopted by eco-innovative companies. In addition, this study addresses the gap between academics and practitioners by examining eco-innovation and environmental disclosure within the conceptual framework of the resource-based view. The main results can be applied by managers to define and measure the specific firms' capabilities for application to eco-innovative processes, to focus either on compliance (limiting their exposure to stakeholders) or on close stakeholder engagement, and its impact in defining their relationship with stakeholders.

The research, as happens with restricted samples from a specific geographical context, has tried to cope with the subsequent limitations by including a heterogeneous group of companies in the sample, from different sectors, activities and locations within Spain. Besides, the main source of primary information, which was considered essential in order to incorporate the managers' perception, is also subject to limitations, since surveys suffer from potential bias and subjectivity. This particular limitation was minimized by contacting the companies' managers and explaining in detail the purpose and method of the research, and the anonymity of data.

The conclusions reached should therefore be considered as a likely explanation for other cases, whether in other sectors or territories, paving the way to larger studies which could establish inference models. The difference between managers' perception and actual reporting supporting the paper findings, opens a wide field of analysis, looking to identify where the gap is larger and why. An in-depth study of Eco-I interrelation with environmental disclosure linked to the different sectors of activity and the size of the company would be very interesting provided the sample is larger, and remains a potential line of research. The results showing low number of companies producing sustainability reports or presenting economic data linked to environmental activities paves the way to the study of results per question addressed to managers, aiming at explore the behavior of Eco-I companies in specific topics. Thereby, the future lines of research opened by this paper are diverse and appealing. Exploring the environmental disclosure behavior of other environmental proactive companies, such as those engaged in circular economy, or within other geographical scopes, brings in the possibility to revise some of the most renowned hypothesis for reporting determinants. Other future line of inquire could derive from a complementary research approach through the application of dynamic capabilities for this field of study instead of the RBV. Furthermore, the mismatch found between what managers' perceived as environmental disclosure and what they actually report to stakeholders opens the door to investigate to what point businesses share the normative concept of stakeholders and social accountability.

Conflict of interests

The authors declare no conflict of interests.

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