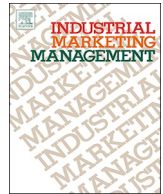




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Research paper

Does a green supply chain improve corporate reputation? Empirical evidence from European manufacturing sectors

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ABSTRACT

Managing supplier relationships in an environmentally responsible way may prevent risk of adverse publicity and reputational damage to the buying firm. Drawing on the stakeholder approach and the environmental management capability framework, the purpose of this paper is to gain further knowledge regarding the impact of strategies oriented to green supply chain management on a firm's corporate reputation. We test a set of hypotheses in a panel data of European manufacturing companies for a period of ten years. Our findings provide strong support for the premise that supplier selection, monitoring and partnership termination based on environmental criteria positively influence corporate reputation. Additionally, evidence suggests that the implementation of those strategies in an integral way as well as progressing towards the adoption of green supply chain management benefit a firm's reputation. This study has implications for theory and practice.

1. Introduction

A strong reputation is a decisive resource to reach and maintain competitive advantage (Bergh, Ketchen, Boyd, & Bergh, 2010; Walker, 2010). This strategic potential is due to its own value-creation capability, and to its intangible nature which are qualities that make it difficult for the competitors to imitate (Martín de Castro, Navas López, & López Sáez, 2006). A firm's reputation is boosted through positive actions, and a suitable management of its resources and capabilities, rather than by increasing advertising or effective corporate communication (Burke, 2011; Hoejmose, Roehrich, & Grosvold, 2014). Environmental sustainability is one of the greatest current challenges that a firm must face to guarantee its legitimacy and good reputation. Governmental legislation and growing environmental concerns among society imply that companies cannot undervalue environmental issues if they want to maintain their competitive advantage. The environmental management comprises responsible use of energy, water, materials, and hazardous substances; emissions reduction, and waste management of water and materials (Porteous, Rammohan, & Lee, 2015).

Reputation is not only built around the focal firm's activities, but is also influenced by the actions developed in B2B partnerships (Money, Hillenbrand, Day, & Magnan, 2010). In this context, a supply chain represents one of the most critical issues facing manufacturing

companies that have to be managed in an environmentally responsible manner. Firms should include environmental issues in the supply chain management activities leading to the approach of green supply chain management (GSCM) (Kannan, Khodaverdi, Olfat, Jafarian, & Diabat, 2013). This approach, also called environmental supply chain management, has been defined from very different points of view. GSCM can be broadly defined as “a buying organization's plans and activities that integrate environmental issues into supply chain management in order to improve environmental performance” (Lee & Klassen, 2008). Since our study focuses on the environmental management of supplier relationships, we adopt the definition that states that GSCM “involves screening suppliers based on their environmental performance and doing business only with those that meet certain environmental regulations or standards” (Hsu & Hu, 2009; Rao, 2002).

Supplier management with environmental criteria may avoid reputational damage to the buying firm. Irresponsible supplier behavior in terms of environmental criteria may be projected to the buying firm, producing adverse publicity or reputation damage (Carter & Jennings, 2004; Foerstl, Reuter, Hartmann, & Blome, 2010).

Despite the significant influence that GSCM may have on corporate reputation, research to date is scant. A few studies explore aspects related to such a relationship in a theoretical approach (Czinkota, Kaufmann, & Basile, 2014), or analyze small samples of proactive firms regarding a sustainable supply chain (thus, presenting selection bias)

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through qualitative methods (e.g. Hojmoose et al., 2014; Pagell & Wu, 2009; Tate, Ellram, & Kirchoff, 2010).

In this article, we explore the effect of the strategies involved in the implementation of an environmental supply chain management on reputation. The stakeholder approach and the environmental management capability framework serve as the foundation for the study. We make four contributions to the extant literature. First, our study takes into consideration a large dataset of public manufacturing firms, which include not only firms engaged proactively in GSCM, therefore it inhibits selection bias that previous works could include (Hojmoose et al., 2014; Tate et al., 2010). Secondly, we contribute to the literature by quantitative research findings. A recent green supply management systematic review highlights that future research needs to utilize actual data from industry practices to extend previous theoretical and qualitative works (Fahimnia, Sarkis, & Davarzani, 2015). Thirdly, we carry out a longitudinal research that involves data from European firms for the period 2008–2017, whereas previously mentioned literature mainly analyzes cross-sectional data. The longitudinal study is particularly useful for evaluating the relationship between GSCM and corporate reputation over time and it allows us to observe the effects of the gradual implementation of the different environmental supply chain strategies. Finally, our study expands on the scarce previous contributions by examining the effect on reputation of each strategy needed for implementing GSCM, namely selection, monitoring and partnership termination, thus taking into consideration the environmental management capability of suppliers (Wong, Lai, Shang, Lu, & Leung, 2012).

The present paper also provides theoretical and managerial insights. We deepen the understanding of the theory of collective reputations by theoretically and empirically exploring the positive impact of GSCM on a buyer's reputation. Previous research has mainly focused on how supplier practices can further harm not enhance a firm's reputation and performance (Kumar, Cantor, & Grimm, 2019). From a managerial perspective, supply chain management is classified in the literature into descriptive and prescriptive research. While descriptive research describes how decisions are actually made, prescriptive research specifies how decisions should be made (Fahimnia et al., 2015; Lienland, Baumgartner, & Knubben, 2013; Manello & Calabrese, 2019). Our research is especially relevant for prescriptive supplier-selection models because these models aim to provide the best supplier recommendations. As we aim to show in this study, a careful GSCM might directly influence a focal firm's own reputation.

The rest of the paper is structured as follows. We begin by describing the theoretical framework and hypotheses of the effects of GSCM on corporate reputation. Following this, measures, empirical analysis, and results are presented. In the last section, we discuss the contributions, limitations and conclusions of this research.

2. Theory and hypotheses

2.1. Corporate reputation: concept, characteristics and dimensions

Interest in corporate reputation (CR), this is, the collective opinion of an organization, has grown over the past decades from a broad range of fields.

Furthermore, CR's relation with other organizational constructs such as image -how others see us-, identity -how we see ourselves- and legitimation -the cognitive validation of an entity- (Chun, 2005; Rao, 1994), has been extensively treated. In this vein, Wiley and Zald (1968) highlighted that reputation creates a desirable image for organizations, allows to garner resources, and contributes to their survival. According to Bendixen and Abratt (2007), the reputation of an organization is a reflection of its corporate identity. Rao (1994) stated that reputation is an outcome of the process of legitimation.

In addition, there is a lack of consensus regarding its definition due to its intangible nature (Walker, 2010), its proximity to other terms such as the above-mentioned image and identity (Chun, 2005), its

social complexity, tacitness and each firm's unique history, which make CR causally ambiguous (Bergh et al., 2010; Martín de Castro et al., 2006).

The absence of consensus refers especially to its multi-dimensionality. Within the resource-based view literature, Dollinger, Golden, and Saxton (1997) found three independent dimensions that stand for different aspects of CR and its links with different stakeholders: product quality and innovation, management integrity and financial soundness. Similarly, Martín de Castro et al. (2006) proposed and determined empirically, two key components of CR: business reputation and social reputation. The former is related to stakeholders closer to day-by-day business activities, whereas the latter component relates to other stakeholders not so closely tied to the firm activities such as investors and the community.

Likewise, the literature based on the stakeholder approach has contributed to the debate regarding CR dimensionality. Chun (2005) grouped stakeholders as internal and external, and identified three schools of thought whose differences were focused on what stakeholders considered as audiences: evaluative, impressional and relational. Evaluative and impressional schools tend to see reputation as a reflection of the accumulated perception or impressions of a single stakeholder view (investors or managers and employees or customers, respectively). The relational school is based on stakeholder theory, which considers that different stakeholders may have different expectations of a firm. CR is defined as an equal reflection of the internal (managers and employees) and external (mainly customers) views of the organization. Although the school distinguishes between the perceptions of different stakeholders it also supports the idea that internal and external views are related. In a study aimed at proposing an instrument for the measurement of CR, de la Fuente Sabaté and de Quevedo Puente (2003) identified its two-dimensional character. The internal view of CR is related to the perception of the company activity and attitude by employees, managers, shareholders and clients, while the external view is understood as the perception of corporate behavior by external stakeholders, i.e. society in general. Following this approach, CR has been defined as “the evaluation of a firm by its stakeholders in terms of its affect, esteem, and knowledge” (Deephouse, 2000), or as “stakeholders' perceptions about an organization's ability to create value relative to competitors” (Rindova, Williamson, Petkova, & Sever, 2005).

Indeed, the stakeholder approach has been embraced by numerous scholars (Helm, 2007; Martín de Castro, López Sáez, & Emilio Navas López, 2004; Smaiziene & Jucevicius, 2013; Walker, 2010) which argue that corporate reputation differs among stakeholder groups, based on the acknowledgement of stakeholders heterogeneity, since they hold manifold values and expectations towards the firm, its performance and results. The evaluation of stakeholder needs and expectations is a challenging and continuous process as they may vary among stakeholder groups, through time, regions and situations. Besides economic and social expectations, increasing concerns about the natural environment are placing environmental management issues in a prominent position on the corporate agenda (Porter & Kramer, 2011). Since the movement towards sustainable development becomes more evident, building a green reputation may pave the way for a future firm's differentiation gains (Bansal & Clelland, 2004).

The environmental dimension of corporate reputation has received increasing attention in the last few years, when firms began to adopt a variety of environmental practices with low and high visibility to conform to stakeholders' environmental expectations, create and preserve environmentally friendly images and attain legitimacy (Bansal & Clelland, 2004; Porter & Kramer, 2011). A recent study based on a sample of Fortune 500 firms simultaneously listed in the Newsweek Green rankings found a positive relationship between the management of sustainability practices and sustainability reputation which is reflected by reputation and a green score of the company (Sroufe & Gopalakrishna-Remani, 2019). Another research within U.S. firms

supported that environmental practices, enhanced through environmental disclosure, increases environmental reputation (Morales-Raya, Martín-Tapia, & Ortiz-de-Mandojana, 2019). Moreover, Tang, Lai, and Cheng (2012) showed that environmental reputation is positively associated with a firm's general reputation.

In our study we adopt the stakeholder approach to define and measure CR. Above all, CR reflects what stakeholders think and feel about a company. We analyze general CR instead of a specific CR's dimension such as environment, to take into consideration the halo effect, a cognitive bias in which an impression of an entity in one area affects the observer's opinion about the entity in other areas (Crane, 1965). We consider corporate reputation as the aggregated perceptions of all stakeholders and, in particular, the combined perception of both internal and external stakeholders.

2.2. Green supply chain management

In the last three decades, supply chain management and environmental management have received increased attention as strategic organizational practices to obtain competitive advantage (Fahimnia et al., 2015; Seuring & Müller, 2008). However, there is no clear consensus as to the definition of green supply chain management and sustainable supply chain management (SSCM). Ahi and Searcy (2013), in a review paper focusing on definitions for GSCM and SSCM, found a total of 22 definitions for GSCM and 12 definitions for SSCM. They concluded that definitions for SSCM were generally broader than those for GSCM as the latter mainly placed emphasis on environmental concerns. SSCM was an extension of GSCM as it adopted a broader triple bottom line perspective (economic, environmental and social dimensions).

In our study we focus on GSCM and define it as the monitoring of suppliers based on their environmental performance and their collaboration only with green suppliers that satisfy environmental standards (Hsu & Hu, 2009; Rao, 2002). Particularly, we adopt the comprehensive approach of the environmental management capability of suppliers (Wong et al., 2012) that is considered as the suppliers' ability to respond to the environmental concerns of their operations. This ability may be perceived, for instance, through their adoption of environmental management system standards (such as ISO 14000) and the development of any kind of action to mitigate negative environmental impacts in their operations (Klassen & Vachon, 2003). In our study, we explore the impact on reputation of three strategies or processes necessary to implement an environmental supply chain management, which are selection, monitoring and partnership termination.

We define supplier selection as the decision-making process that refers to the evaluation and selection of a new supplier. As for monitoring supplier performance, it refers to how purchasers screen their suppliers and comprises activities such as assessment guides and questionnaires, examination of environmental compliance (e.g. ISO 14000, EMAS, environmental improvement measures, design, eco-labels, etc.), verification of third-party certifications, CSR and/or environmental audits, social impact assessments, and on-site inspections, among others (Morali & Searcy, 2013; Winter & Lasch, 2016). With regard to the process of partnership termination, it comprises a corrective action that focal firms may implement if suppliers do not fulfill environmental criteria.

Greening the different phases of the supply chain not only leads to improved environmental performance (reduces air emissions, effluent waste, and solid waste and decreases hazardous and toxic material consumption). It also meliorates manufacturing organizations' corporate reputation and economic performance, measured as the ability to reduce costs associated with purchased materials, energy consumption, waste treatment and fines for environmental accidents (Green, Zelbst, Meacham, & Bhadauria, 2012).

2.3. Green supply chain management as a booster of corporate reputation

Supplier selection is considered as one of the most important processes in the purchasing and supply chain management function (Wetzstein, Hartmann, Benton Jr., & Hohenstein, 2016). Although supplier selection was traditionally mainly based on issues such as quality, price, and delivery performance (Kannan et al., 2013), manufacturing companies are increasingly incorporating environmental criteria into this process (Agan, Kuzey, Acar, & Açikgöz, 2016).

Environmental supply chain selection is a key strategy that represents a critical activity in GSCM (Luthra, Govindan, Kannan, Mangla, & Garg, 2017). The evaluation and selection of appropriate green suppliers is crucial, not only because they provide the buyer with the right materials, products or solutions with high quality at a competitive cost level, but also because suppliers may improve a purchaser's environmental performance by avoiding hazardous materials or considering solutions that require less materials and/or energy (Igarashi, De Boer, & Fet, 2013). Furthermore, a buyer's environmental sustainability and ecological performance can be demonstrated by its suppliers (Hsu & Hu, 2009).

However, green supplier selection is not straightforward. On the one hand, it is a complex process that comprises several tasks, from identifying a buyer's needs to the final choice (Igarashi et al., 2013). On the other hand, multiple environmental criteria can be considered by the purchaser as a means to ensure that materials and services provided by its suppliers meet environmental standards (e.g., pollution control and prevention, resource consumption, quality and/or environmental management system or certification, among others) (Hashemi, Karimi, & Tavarna, 2015; Hsu & Hu, 2009; Igarashi et al., 2013; Kannan et al., 2013; Winter & Lasch, 2016).

GSCM is relevant for corporate reputation. The management of supplier selection factors and implementation practices support buyer's legitimacy and public image (Luthra et al., 2017). B2B partnerships may result in the development and integration of resources and capabilities such as organizational reputation or brand image (Morali & Searcy, 2013). Lienland et al. (2013) analyzed supplier selection factors within manufacturing industries with complex goods such as automobiles. They showed that the prestige of suppliers significantly influences the end user's perception of the host brand and reputation. Beside their prestige, the overall supplier's behavior enhances the focal firm's image and reputation perceived by its customers (Reuter, Goebel, & Foerstl, 2012). In an empirical study among purchasing managers in Germany, Reuter et al. (2012) found that in firms with a strong public orientation, managers tend to emphasize sustainability criteria in supplier selection, due to their awareness of potential reputational damage. More recently, a research based on a sample of U.S. firms demonstrated that high and low environmental external visibility practices contributed to building a favorable environmental reputation (Morales-Raya et al., 2019). The study considered as high environmental external visibility practices those easily noticed by external stakeholders of the firm. For example, certifications of environmental management systems, as ISO 14001 or the European EMAS. In contrast, low environmental external visibility practices were defined as actions that are difficult for external stakeholders, such as consumers and the general public, to perceive and usually require significant changes in core practices. The study considered the development of beneficial products and services, pollution prevention programs, recycling and clean energy as low environmental external visibility practices. In our study we aim to extend these results to other low environmental external visible practices regarding the supply chain management.

Based on these arguments the following hypothesis can be derived:

Hypothesis 1. Environmental supply chain selection positively influences corporate reputation.

GSCM involves not only selecting green suppliers, but also the evaluation of the performance of the whole supply base (Igarashi et al.,

2013). The existence of a wide variety of supplier monitoring methods and activities, as noted earlier, reflects the complexity of this process as well as the amount of resources consumed (Morali & Searcy, 2013). Effective monitoring requires, for instance, developing an information management system capable of collecting, assessing and incorporating relevant information (Hsu & Hu, 2009).

Some purchasers invest considerable resources to monitor their suppliers' performance in order to improve their competitive advantage through higher environmental performance and reduce the so-called supplier sustainability risk across the supply chain (Hajmohammad & Vachon, 2016; Porteous et al., 2015). According to the literature, monitoring encourages suppliers to make environmental investments (Klassen & Vachon, 2003) and to develop their environmental management capabilities (Lee & Klassen, 2008). In an empirical study with managers in the field of purchasing and supply in Spain, Tachizawa, Gimenez, and Sierra (2015) found that monitoring suppliers indirectly improves environmental performance and sustainability, because this process is needed to implement collaborative practices that lead to such improvement. These practices are aimed at encouraging suppliers to increase their green activities and improve their environmental performance (Hashemi et al., 2015).

Monitoring also reduces information asymmetry between the focal firm and the supplier, thus minimizing moral hazard and the risk of a possible opportunistic environmental behavior during the post-selection phase, which could have a negative impact on environmental performance and lead to reputational losses for buyers (Hobbs, 1996; Tachizawa et al., 2015). In fact, supplier sustainability risk assessment mitigates reputational damage (Foerstl et al., 2010; Hajmohammad & Vachon, 2016).

We draw upon the theory of collective reputations, which posits that a firm's reputation is affected by the positive or negative actions and behaviors of other firms that participate in its network because it is derived from the aggregation of the individual reputations of members of the network and it is imperfectly observable (Tirole, 1996). Based on this theory, Kumar et al. (2019) demonstrated that a supplier's environmental managerial problems may negatively influence a focal firm's reputation. Following this theoretical lens, we look into broadening previous research and argue that a focal firm's reputation may be positively affected by a supplier's pro-environmental practices. Environmental monitoring leads to a greener supply chain, more environmentally friendly production processes, improved environmental performance and a higher reputation (Large & Gimenez Thomsen, 2011; Tachizawa et al., 2015).

Accordingly, we formulate the following hypothesis:

Hypothesis 2. Environmental supply chain monitoring positively influences corporate reputation.

Environmental partnership in B2B markets comprises the exchange of technical information and entails the motivation to learn about each other's operations in order to set plans and goals for environmental improvement. Environmental supplier partnerships imply the collaboration to reduce the environmental impact associated with material flows in the supply chain (Vachon & Klassen, 2008). In these collaborations, partners must understand the responsibilities and capabilities of each other in environmental management (Bowen, Cousins, Lamming, & Farukt, 2001). Also, partners should be flexible in the operations that cross organizational boundaries to achieve common goals, since the resulting reputation is built around not only the focal firm, but also the characteristics of the B2B partnership (Money et al., 2010). Supplier relationships are crucial to corporate identity management, and have a direct influence on the process of a buyer's reputation formation in the eyes of stakeholders (Bendixen & Abratt, 2007).

The firm can identify environmental violations made by suppliers through a formal external third-party audit or internally (Awaysheh & Klassen, 2010). Particularly, proactive supplier monitoring is helpful to

identify suppliers that do not fulfill environmental criteria. The monitoring of sustainability standards set apart risky suppliers from less critical and non-critical suppliers. This permits the firm to take corrective actions such as terminating the partnership or phasing-out of non-compliant established suppliers. An empirical study conducted by Porteous et al. (2015) found that terminating a supplier's contract for repeated non-compliances is the most effective corrective action to reduce the risk of future social and environmental violations. Termination is a stronger measure than simply reducing business, and it may enhance a supplier's environmental commitment since eliminated partners become less competitive in order to establish other B2B partnerships. Corrective actions are useful to prevent reputational damage to the buying firm as they reduce the firm's risk of exposure to adverse publicity and guarantee that the supply materials and components from the firm's supply base meet the desired standards (Foerstl et al., 2010) and stakeholders' demand. Moreover, termination represents a low environmental external visible practice, that as suggested by previous research, may enhance the focal firm's reputation (Kumar et al., 2019).

Therefore, we pose the following hypothesis:

Hypothesis 3. The firm's intention of ending a partnership with a supplier based on environmental criteria positively influences corporate reputation.

3. Methodology

3.1. Data and sample

Our research question is especially salient in settings such as manufacturing sectors. Environmental management is a relevant issue for manufacturing firms as they face increasing institutional pressures and intense critical scrutiny from the stakeholders such as end-consumers, industrial customers, financial institutions, activists, etc. To manage this situation, manufacturers have implemented diverse strategies to limit the impact of their activities and operations on the environment such as those related to supply chain management (Vachon & Klassen, 2008; Zhu, Sarkis, & Lai, 2012).

The research setting for this study is a panel dataset of European public manufacturing firms for the period 2008–2017. The USA, Japan, and European countries are among the few countries that have initiated and acknowledged the relevance of environmental protection, although the European countries have been the most dynamic in their environmental concerns (Dhull & Narwal, 2016). Over the past decade, the European environmental policy has become more stringent, including an extensive environmental regulation regarding chemicals, hazardous substances, pollution, etc. New laws, policies and institutions have been created as part of an integral climate policy in European countries (Massey & Huitema, 2016). This policy has generated a growing environmental awareness in companies, especially those belonging to manufacturing sectors.

Information regarding strategies oriented to GSCM began to be more consistent in 2008, while 2017 is the last available year in the database. These facts justify the period considered in our longitudinal study. This panel was drawn from the ESG (environmental, social and government) database of the Thomson Reuters Eikon, the world's largest environmental, social and governance rating database. ESG database comprises objective, relevant, auditable, and systematic quantitative and qualitative company-level data on public companies worldwide for a number of years. This makes it an excellent data resource for carrying out longitudinal studies. Specially trained research analysts manually collect and process over 400 ESG metrics and controversies per firm using objective and publically available primary data. The database provides ESG signals from 75,000 sources (global media, indexes, annual reports, ESG disclosure, etc.), for portfolio construction and company monitoring in partnership with Truvalue Labs. After collecting the ESG data (which lack worldwide fully

accepted reporting standards) every year, analysts transform them into consistent units to enable quantitative analysis of these qualitative data. Based on this information, the database calculate ESG Scores previously designed by analysts to transparently and objectively measure a company's relative ESG performance, commitment and effectiveness across ten main themes (Refinitiv, 2019), such as the social pillar score that constitutes our dependent variable. The validity and reliability of this ESG database have been established in previous studies (Cheng, Ioannou, & Serafeim, 2014; Garcia, Mendes-Da-Silva, & Orsato, 2017).

We identified a population of 380 European manufacturing companies in the database, which represent a 30.13% of the total European companies belonging to all sectors. 242 firms out of them (63.68%) have available information on the state of their implementation of environmental supply chain strategies and their reputation which are the main variables in this study. We also collected information to control for several firm's strategic dimensions and attributes. Considering data availability constraints, our final sample includes an unbalanced panel of 242 unique European public manufacturing firms, and the total number observations is 1341. The sample includes companies from a total of 21 European countries. The countries most represented in the sample are the United Kingdom (21.95% of firms in the sample), Germany (13.49%), Switzerland (10.31%) and Sweden (9%). Our sample firms cover 56 different manufacturing sectors. The most frequent industries are pharmaceutical and medicine manufacturers (10.58%), navigational, measuring, electromedical, and control instruments manufacturers (6.08%), motor vehicle and vehicle parts manufacturers (6.08%), beverage manufacturers (3.9%) and semiconductor and other electronic component manufacturers (3.7%).

3.2. Measures

3.2.1. Dependent variable

Our dependent variable “corporate reputation” is measured through the social pillar score reported by the ESG database. Each ESG score is calculated through a percentile rank scoring methodology (in the range 0–100), based on three factors: companies that are worse than the current one, companies that have the same value and companies that have a value at all (Refinitiv, 2019). The calculation of this score is based on a total of 63 indicators related to workforce, human rights, community and product responsibility. The social pillar score is defined by the database as “a company's capacity to generate trust and loyalty with its workforce, customers and society, through its use of best management practices. It is a reflection of the company's reputation and the health of its license to operate, which are key factors in determining its ability to generate long term shareholder value”. This score contains the internal and external views of different stakeholders. Hence, it covers the definition of reputation assumed in this study which is based on the stakeholder approach (Chun, 2005; de la Fuente Sabaté & de Quevedo Puente, 2003).

Table 1
Summary of descriptive statistics.

Variable	Mean	Std. Dev.	1	2	3	4	5	6	7
1 Corporate reputation	61.86	20.38	1.00						
2 Environmental supply chain selection	0.73	0.43	0.50***	1.00					
3 Environmental supply chain monitoring	0.99	0.08	0.11***	0.04	1.00				
4 Environmental supply chain partnership termination	0.33	0.47	0.48***	0.41***	0.06	1.00			
5 Environmental certification	0.79	0.40	0.33***	0.32***	0.04	0.12***	1.00		
6 CSR strategy	52.78	28.60	0.58***	0.38***	−0.00	0.29***	0.31***	1.00	
7 Firm size	30,216.9	55,194.7	0.39***	0.18***	0.30***	0.30***	0.14***	0.32***	1.00

*** $p < .001$.

* $p < .05$.

3.2.2. Independent variables

Our independent variables relate to three strategies that are involved in the implementation of green supply chain management, and are measured using data points reported by the ESG database. The first independent variable is “environmental supply chain selection”. It is dichotomous and reported as 1 if the company uses environmental criteria (ISO 14000, energy consumption, etc.) in the selection process of its suppliers or sourcing partners. “Environmental supply chain monitoring” is our second independent variable measured by a dummy variable that assumes value 1 if the company conducts surveys of the environmental performance of its suppliers. Finally, we include in the models the third independent variable called “environmental supply chain partnership termination”. This variable is coded as a dummy variable, taking value 1 when the company reports or shows it is ready to end a partnership with a sourcing partner, if environmental criteria are not met.

3.2.3. Control variables

We control for several variables regarding environmental management, corporate social responsibility (CSR) strategy and firm attributes that may influence corporate reputation. We included the dummy variable “environmental certification” coded as 1 when the company claims to have an ISO 14000 or environmental management system (EMAS) certification. Environmental certification can be observed as a signal of the firm's environmental commitment to support the implementation of green supply chain management. It also allows a firm to gain legitimation from its multiple stakeholders by reconciling pro-environmental behavior and strategic choices (Martín-de Castro, Amores-Salvadó, Navas-López, & Balarezo-Nuñez, 2017). A second control variable is “CSR strategy”, a score reported by the ESG database that reflects a company's practices to communicate that it integrates the economic (financial), social and environmental dimensions into its day-to-day decision-making processes. Disclosure information about corporate social responsibility practices is part of the dialogue between a firm and its stakeholders that help legitimize corporate behavior and positively influences corporate reputation (Michelon, 2011; Pérez, 2015). We use the number of employees to control for “firm size”. Size and visibility are considered key drivers of environmental awareness (Martín-de Castro et al., 2017; Solomon & Mihelcic, 2001). Larger companies are more visible and any negative action regarding environmental responsibility may seriously damage their reputation. Finally, a dummy variable for each year was included to control for factors that are the same for all cross-sectional units but vary over time (e.g. economic magnitudes).

4. Results

4.1. Descriptive statistics and regression results

Table 1 reports descriptive statistics (mean, standard deviations, and correlations) for the variables used in our study.

As supplementary information, observing the development of supply chain management based on environmental criteria, companies exhibit an increasing implementation over time. In 2008, only 10 companies (4%) had adopted the combination of the three strategies related to environmental supply chain selection, monitoring and partnership termination. Nevertheless, in 2017, 146 out of the 242 firms included in our sample (60%) had developed an integral approach of green supply chain management based on the implementation of the three strategies. This favorable trend in environmental awareness is also reflected in the number of environmental certified companies that increased from 16 in 2008 to 202 in 2017.

This evidence confirms that the proactivity in the context of responsible supply chain management is a recent phenomenon (Hoejmose et al., 2014). Our sample includes mainly large firms. The mean number of employees is 30,217. Only 9 firms have < 250 employees. There are growing concerns regarding sustainability in high-technology sectors as they are characterized by short life-cycle products and volatile demand (Chuang, Wang, & Zhao, 2014). In our sample, there are 62 high technology companies. The high-technology sectors were identified using the definition given by the OECD (2011).

Table 2 offers the results of the ordinary least squares (OLS) regressions with fixed-effects examining how the implementation of each environmental supply chain management strategy influences corporate reputation. Estimating a fixed-effects model is equivalent to adding a dummy variable for each firm (Greene, 2002), and controls for all constant, unmeasured differences across firms that may explain differences in the dependent variables. For instance, sector (e.g. high-technology) is considered a relevant control variable in organizational studies. We entered the control variables in the first step (Model 1). In the second step, the independent variables were added to the equation (Model 2) providing the variance accounted for the three strategies.

Consistent with hypothesis 1, environmental supply chain selection positively impacts on corporate reputation ($b = 6.510, p < .001$). This result confirms that the selection of suppliers that provide materials and services based on environmental standards responds to stakeholders' concerns and benefits reputation. The results provide support for hypothesis 2. Monitoring suppliers to evaluate their environmental performance has a positive and significant impact on corporate reputation ($b = 9.927, p < .01$). The estimates also confirm Hypothesis 3. The coefficient of the variable environmental supply chain partnership termination is positive and significant ($b = 4.942, p < .001$). Those firms willing to terminate the relationship with suppliers that do not fulfill the environmental standards gain reputation. Overall, to ensure a sustainable supply chain management through the collaboration with

green suppliers is a strategic decision to respond to the stakeholders' environmental concerns and reduce the risk of reputational damage.

In examining the effect of control variables, the main finding is the significance of both environmental certification and CSR strategy in the models shown in Table 2. The findings are consistent with the claim that environmental certification helps companies build an environmental image and reputation. The ISO 14001 or EMAS certification can be used as a proper way to communicate clear signals that the firm meets stakeholders' environmental expectations (Aravind & Christmann, 2011; Martín-de Castro et al., 2017). Complementary, findings are consistent with previous studies based on different theoretical approaches (e.g. institutional/legitimacy theory or agency theory) that confirm that CSR reporting and corporate reputation are positively correlated (see Pérez, 2015). The firm's ability to communicate how it integrates the economic, social and environmental dimensions in its operations enables it to establish a transparent dialogue with stakeholders that positively reinforces corporate reputation.

4.2. Robustness checks

To see whether our results are stable, we applied various robustness checks. We explored how the results might vary using three alternative specifications of the independent variables:

“Bundles of environmental supply chain strategies”. This variable was created based on the assumption that environmental practices regarding the supply chain work best in combination. It was annually estimated using the count of environmental supply chain strategies; the variable can take from value 0, when the firm does not implement any strategy, up to value 3, when the firm implements environmental supply chain selection, monitoring and partnership termination, that is, the firm develops a green supply chain management.

“Green supply chain management”. This is a dichotomous variable that assumes value 1 if the company implements the three environmental supply chain strategies and 0 otherwise. It represents the development of the environmental management capability of suppliers and a comprehensive management to ensure that suppliers meet environmental standards. Moreover, it demonstrates a high environmental commitment to the firm's stakeholders.

“Evolution towards green supply chain management”. From a dynamic point of view, we ran an additional analysis to explore how the evolution towards the adoption of GSCM influences a firm's reputation. This alternative measure is a dummy variable that takes value 1 when the firm progresses towards the implementation of GSCM. That is, this measure assumes value 1 if the variable bundles of environmental supply chain strategies increase from one year to the next.

The results from this sensitivity test are shown in Table 3. Model 1 includes bundles of environmental supply chain strategies as the independent variable, Model 2 considers green supply chain management and Model 3 incorporates the third alternative independent variable. These robustness checks confirm the link between environmental supply chain management and reputation, supporting the main findings of this study and of previous evidence based on case studies (Hoejmose et al., 2014). Regarding the first alternative independent variable, Model 1 confirms that in addition to the individual effect of particular environmental supply chain strategies, there is greater potential for an impact when such strategies come in a bundle. This is reinforced by the results offered in Model 2 that reveal the positive and significant influence of the implementation of GSCM on reputation. Creating a whole system of integrated strategies to ensure the collaboration with green suppliers, benefits the firm's legitimation. The results shown in Model 3 are also consistent with our main findings. Corporate reputation improves when firms provide signals to its stakeholders that they are

Table 2
OLS Regression Results on Corporate Reputation.

	Corporate reputation			
	Model 1		Model 2	
Environmental supply chain selection			6.510***	(1.852)
Environmental supply chain monitoring			9.927**	(3.024)
Environmental supply chain partnership termination			4.942***	(0.845)
Environmental certification	6.281***	(1.386)	5.664***	(1.372)
CSR strategy	0.055**	(0.184)	0.050**	(0.017)
Firm size	-0.000	(0.000)	-0.000	(0.000)
Year dummies	Included		Included	
Constant	55.990***	(2.757)	39.697***	(1.873)
R ²	0.074		0.147	
F	15.42***		17.17***	
N (firm-year observations)	1341		1341	

Standard errors are in parentheses.

*** $p < .001$.

** $p < .01$.

Table 3
OLS Regression Results on Corporate Reputation. Robustness checks.

	Corporate reputation					
	Model 1		Model 2		Model 3	
Bundles of environmental supply chain strategies	5.537***	(0.716)				
Green supply chain management			5.535***	(0.832)		
Evolution towards green supply chain management					1.987***	(0.602)
Environmental certification	6.016***	(1.351)	6.699**	(1.361)	6.367***	(1.398)
CSR strategy	0.050**	(0.017)	0.052**	(0.018)	0.059**	(0.018)
Firm size	−0.000	(0.000)	−0.000	(0.000)	−0.000	(0.000)
Year dummies	Included		Included		Included	
Constant	44.402***	(3.076)	54.050***	(2.720)	58.08***	(2.139)
R ²	0.139		0.124		0.055	
F	19.59***		18.21***		16.18***	
N (firm-year observations)	1341		1341		1323	

Standard errors are in parentheses.

*** $p < .001$.

** $p < .01$.

* $p < .05$.

continuously increasing their environmental commitment and take steps to secure the environmental management capability of their suppliers.

In an additional analysis (available upon request), we used a different estimation method. We checked the robustness of the results offered in Table 2 applying the generalized estimating equation (GEE) regression method instead of the OLS regression. The GEE algorithm accounts for correlation between records within the same cluster (data collected about the same firm during successive periods of time). It is less computationally intensive than either fixed effects or random effects. Therefore, it often proves less subject to instability and convergence problems (Zorn, 2001). Since this approach differs from fixed effects, we could include the constant feature “high-technology firms” in the model as a control variable. However, the statistical software employed (Stata) omitted this variable because of collinearity. The results indicate that the three strategies regarding environmental supplier chain selection ($b = 5.957$, $p < .05$), environmental supply chain monitoring ($b = 17.332$, $p < .001$) and environmental supply chain partnership termination ($b = 8.363$, $p < .001$) significantly enhance corporate reputation. Therefore, the alternative estimation strategy confirms our earlier results that validate all the hypotheses stated in this study.

We also implemented a robustness test (available upon request) whose objective was to explore whether the variables “environmental certification” and “CSR strategy” could play an antecedent role on corporate reputation or even the implementation of GSCM. We estimated Model 2 in Table 2 using these control variables lagged one period. The main results remain similar and CSR strategy (t-1) appears to have a positive and significant effect on reputation ($b = 0.044$, $p < .001$). Moreover, we used probit regression analysis to examine the effect of “environmental certification (t-1)” and “CSR strategy (t-1)” on “green supply chain management” (dummy), considering firm size as a control variable. Of the two independent variables, only CSR strategy (t-1) is significant ($b = 0.001$, $p < .01$). These insights suggest that companies benefit from engaging in CSR initiatives, which increase favorable valuation from the stakeholders in the long term. The results also confirm that CSR strategy supports the implementation of GSCM.

Finally, we conducted another sensitivity test with the aim of exploring the existence of a “financial halo” behind corporate reputation (results available upon request). Such financial halo or bias appears when “the assessments of the different elements of corporate reputation are interpreted taking into account the economic and financial performance of the firm” (Martín de Castro et al., 2006). We included, in the models shown in Tables 2 and 3, two one-period-lagged control variables regarding economic and financial performance: ROA (return on

assets) and EBITDA (earnings before interest, taxes, depreciation and amortization). The results from this sensitivity test consistently supported the main findings of the study. However, none of those control variables were significant. Therefore, we kept the original analyses in order not to reduce the number of observations due to the lagged additional control variables. From the results of this sensitivity analysis test, we can interpret that there is no financial halo effect. These results confirm the validity of our dependent variable as a measure of reputation that contains the views of different stakeholders and not just the concerns of managers, industry experts and those agents mainly concerned with economic and financial performance.

5. Discussion and conclusion

Firms managing the supply chain with environmental criteria may enhance reputation. Yet little attention has been paid in research to the relationship between strategies oriented to GSCM and corporate reputation. Prior work has explored this relationship through cross-sectional studies, focusing only on firms proactive to responsible supply chain management (which implies selection bias) and analyzing anecdotal evidence or using case studies (Hoejmose et al., 2014). This article expands on the scarce previous contributions by examining the effect on reputation of each strategy involved in the implementation of environmental supply chain management through a longitudinal and quantitative research.

By studying a panel data of European manufacturing companies, we find that the selection of suppliers based on their environmental performance benefits corporate reputation. Supplier selection is considered to be one of the most critical and complex processes within supply chain management (Hashemi et al., 2015) where environmental issues are increasingly taken into account. There are multiple environmental criteria that can support decision-making regarding supplier selection. Hsu and Hu (2009) proposed incorporating environmental criteria into five main dimensions in the supplier selection process: procurement management (green purchasing), R&D management (green design), process management (management for hazardous substances), incoming quality control, and management systems such as environmental management system certification. We also find that post-selection supply chain monitoring and partnership termination based on environmental performance positively influence corporate reputation. Collecting reports and documents, auditing, and establishing a database for information received from suppliers to determine their compliance with the environmental requirements (e.g. reducing packaging and waste, recycling, remediation, etc.) are essential for effectively managing the green supply chain. This monitoring approach encourages

suppliers to have environmentally friendly production processes, and hence, buying firms will be able to mitigate environmental risks and improve their reputation (Tachizawa et al., 2015). Conversely, the information obtained from this evaluation process may lead to terminate the partnership in the case that suppliers do not fulfill the environmental standards. When supplier dependence on the buyer is high, the threat to terminate the relationship will ensure that suppliers act according to environmental expectations (Hajmohammad & Vachon, 2016). Our study reveals that the intention to terminate the relationship with suppliers that do not present appropriate environmental performance has positive consequences on corporate reputation. The additional analysis reveals that designing a whole system of integrated strategies to ensure the environmental management capability of suppliers, benefits the firm's legitimation. Our findings are consistent with previous evidence from case studies that reveal that supplier sustainability risk assessment capabilities reduce corporate reputational damage, since they improve supplier selection decisions and allow the phasing-out of non-compliant established suppliers (Foerstl et al., 2010; Hojmosse et al., 2014). Also, this study supports previous work exhibiting that environmental supplier development, positively influences environmental reputation (Ehrgott, Reimann, Kaufmann, & Carter, 2013).

This research has implications for theory and practice. It contributes to the literature on green supply chains. In spite of the importance of ensuring a sustainable supply chain management to boost corporate reputation, literature to date has only loosely connected these two research streams, with a few exceptions (e.g. Hojmosse et al., 2014; Pagell & Wu, 2009; Tate et al., 2010). This study has explored the relationship between such research areas, demonstrating that environmental supply chain management is a relevant antecedent of reputation. Furthermore, this research contributes to the stakeholder theory, since it considers the aggregate perception of both internal and external stakeholders in the study on reputation. Additionally, we extend the collective reputations theory to examine the reputation from a buyer-supplier perspective. This perspective is relevant because suppliers' behaviors have a low visibility to external stakeholders such as consumers, media, investors or nongovernmental organizations thus making it difficult to capture the impact of a supplier's proactive environmental practices on a focal buyer's reputation. Our results demonstrate how the collective reputations theory represents a significant theoretical foundation to investigate how suppliers are an important external group that influences a focal buyer's reputation. We also illustrate how the collective reputations theory can explain up to what extent supplier environmental proactivity boosts a focal buyer's reputation, thus extending previous literature mainly orientated to analyzing the negative effects of a supplier's environmental managerial problems (Kumar, Teichman, & Timpernagel, 2012). Complementary, this work contributes to the literature on strategies for environmental sustainability in B2B markets in a sequential way, examining the effect of suppliers-focal firm relationships on focal firm-stakeholders' valuation.

Our study also provides valuable insights for managerial decision makers. Implementing a more sustainable green approach to a supply chain helps firms not only gain efficiency but also improve competitive advantage through an increased reputation. The findings prove that it is necessary to implement an integral sustainable management of the supply chain to meet stakeholders' expectations, since each strategy involved in such management has a direct impact on corporate reputation. Results are especially relevant for prescriptive supplier-selection models whose purpose is to identify the most significant factors in developing strategic partnerships with suppliers. Managers need to consider environmental factors in supplier selection decisions beyond conventional criteria such as price, quality, delivery, etc. (Hashemi et al., 2015). The interest in the literature regarding environmental and green criteria for supplier selection is growing, however, there is little empirical evidence of the transfer of these applications into the real

world (Genovese, Lenny Koh, Bruno, & Esposito, 2013). Our findings might contribute to reducing this dichotomy between theory and practice. After the selection process, firms should continuously monitor its suppliers to verify and assess the extent to which they are acting in an environmentally responsible manner. Moreover, this research reveals that when the environmental strategy of the firm no longer fits into the suppliers' actions, terminating the partnership is an appropriate decision to mitigate reputational risks.

This work has some limitations. We explore the consequences of using environmental criteria in the management of supplier partnerships (selection, monitoring and termination). The use of dummy variables to measure strategies involved in GSCM provides information about whether firms develop each practice or not and how the evolution in the adoption of such strategies has an impact on corporate reputation. As actions involved in each strategy are complex and firms may implement them in different degrees, future studies might deepen the understanding of the relationships analyzed, through direct questionnaires to firms, with the purpose of analyzing how the different levels of adoption concerning each strategy affect corporate reputation. Additionally, future research might analyze how considering the combination of economic, social and environmental criteria influences decisions concerning supply chain management and how these decisions influence corporate reputation. We study a panel data of European manufacturing firms. Including companies from different manufacturing sectors and countries contributes to the generalization of the results. Nevertheless, future research would benefit from expanding this investigation to the service industry and to other non-European countries. Service supply chains are often characterized by higher customer involvement, less structured processing, and intangible products that may not be standardized or stored (Hussain, Khan, & Al-Aomar, 2016). Thus, although the main elements of supply chains are common in both manufacturing and service industries, it is necessary to examine the particular features of sustainability practices in service supply chains more in depth. It is possible that other unmeasured variables may account for our results such as suppliers' characteristics (e.g. location in emerging economies), environmental performance, and other firms' sustainability strategies that can mediate or moderate the causal relation analyzed in this study. Moreover, it would be interesting to examine the causal relationships considered in this study focusing on green reputation. In this research line, we could explore if variables such as environmental certification and CSR strategy are antecedents of a green reputation. Future research using questionnaires or other sources of information containing data on these variables would help address these issues.

Our research further develops the understanding of the relationship between environmental supply chain management and corporate reputation, and has theoretical and managerial implications. The results provide the motivation to continue the study of some unexplored issues. For instance, it would be interesting to study how reputation is affected by the integral consideration of economic, social and environmental criteria in the selection, monitoring and partnership termination of suppliers as well as the specific dynamics of the relationship between GSCM and reputation in the service industry. These constitute promising streams for future research.

Declaration of Competing Interest

None.

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