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Towards sustainable development: Environmental innovation, cleaner production performance, and reputation

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Abstract

The growing concerns regarding sustainability and a firm's effects on the environment explain the important role that environmental management may play in corporate reputation. Following the premises of the stakeholder approach and dynamic capability theory, we explore how a comprehensive environmental management (environmental innovation [EI] and cleaner production [CP]) impacts a firm's reputation. By analyzing a panel data of European manufacturing firms, we show that EIs benefit corporate reputation. Results also confirm that the higher effectiveness of CP initiatives, the higher a firm's reputation. Both dynamic capabilities improve the firm's legitimacy and stakeholders' perceptions concerning the firm's commitment to environmental sustainability. We offer relevant insights for the academic community as to how EI and CP represent proactive strategies that enhance reputation and provide practical implications for managers in order to respond to stakeholders' demands.

KEYWORDS
dynamic capability, environmental management, manufacturing firms, proactive environmental strategy, reputation, stakeholder theory

1 | INTRODUCTION

The present study explores the influence of the effectiveness of environmental innovation (EI) and cleaner production (CP) on a firm's reputation. Corporate reputation represents an intangible asset, difficult to replicate and a key driver of competitive advantage, attracting superior human resources and providing leverage for managing stakeholders (Khojastehpour & Johns, 2014).

Environmental management is one of the factors that currently has a major impact on reputation. There is a growing awareness of the need for sustainable development and a concern related to the impact of business activity on the environment. After many decades of increasing consumerism and global industrialization, governments, markets and different stakeholders demand an increasing effort to reduce the negative impact of manufacturing operations on climate change. Companies have to respond to this challenge through proactive strategies regarding environmental practices and innovations that allow them to prevent and preserve the natural environment while boosting their image and reputation (de Oliveira et al., 2019; Martín-de Castro et al., 2016).

From a holistic approach, we consider that such proactive environmental strategies are covered by the application of "environmental innovation" and "cleaner production." Both strategies contribute to the development of a comprehensive environmental management.

EI or eco-innovation comprises the development of new ideas, behaviors, technologies, products and processes that contribute to a reduction of environmental burdens or to ecologically specified sustainability targets (Rennings, 2000). EIs help companies to improve

their efficiency, reduce cost, and meet the demands of consumers, internal staff, shareholders, and society which are concerned about the environment, thus benefiting corporate reputation and public image (Amores-Salvadó et al., 2014; Liao & Cheng, 2020).

CP is a strategy aimed at avoiding negative externalities to the environment by systematically reducing waste and emissions. It contributes to the reduction of the consumption of raw materials and power, and minimizes or eliminates the generation of industrial wastes, toxic materials, gas emissions and the residuals from industrial activities (Severo et al., 2018). As it benefits the environment and the organizations, it could have an impact on the perceptions that different stakeholders have about the firm.

Despite the potential influence that the implementation of EI and CP may have on corporate reputation, this relationship remains unexplored. Generally, EI and CP have been examined independently. As for EI, the research analyzing its impact on corporate reputation is scant. There is a study in the manufacturing industry in China, which offers insights into the relationship between EI and the firm's reputation (Liao, 2018). Reputation is measured through four items directly answered by the sample companies included in a self-reporting questionnaire. Focusing on environmental product innovation, an empirical study of the Spanish metal sector explores its relationship with green corporate image (Amores-Salvadó et al., 2014). Regarding CP, its influence on corporate reputation is unexplored in the extant literature. There are a few studies that examine the influence of particular performance measures or actions related to CP on reputation. The majority of these studies are based on case studies or surveys (cross-sectional studies) and the research setting is represented by less developed countries or emerging economies, frequently limited to a specific sector (de Oliveira et al., 2019; de Oliveira Neto et al., 2019; Sousa-Zomer et al., 2018; Yüksel, 2008). Only a few studies examine the relationship between EI and CP to explain different outcomes (financial performance, environmental awareness, and sustainable consumption), and they focus on very specific sectors or regions (Severo et al., 2017; Severo et al., 2018). A recent research exploring the effects of some environmental actions on organizational reputation (Truong et al., 2021) observes only a group of stakeholders and uses the ranking of Fortune's most admired companies as a proxy for organizational reputation, but it suffers from potential bias due to the higher visibility and larger size of firms (Chiu & Sharfman, 2011).

Based on the stakeholder approach and the dynamic capability theory, our study makes several contributions. First, this research examines, from a holistic viewpoint, how CP and EI may be key drivers of corporate reputation. A firm's capacity to reduce the use of resources (efficiency) and environmental emissions, and to develop environmental product and process innovation represents a comprehensive approach of environmental practices. Secondly, we explore the impact of both strategies on corporate reputation. This represents a novel research question which has not been studied in the literature despite the fact that a strong reputation is considered a crucial resource to create and maintain a competitive advantage (Sánchez-Torné et al., 2020; Walker, 2010). Additionally, we use an unbiased and reliable measure of corporate reputation that overcomes the bias and financial halo of other measures extensively used in the literature such as the lists of Fortune of the most admired companies. These ratings have received several criticisms regarding their correlation with previous firms' financial performance, the grand aggregation approach in measuring corporate reputation, and the focus on a particular stakeholder group (i.e., other executives in the same industry) (Brown & Perry, 1994; Chiu & Sharfman, 2011). Our measure of corporate reputation is based on a specific score of the ESG database drawn from the Thomson Reuters Eikon. This database is one of the world's largest environmental, social and governance rating databases that uses objective and publically available primary data (Refinitiv, 2019). The calculation of the score regarding corporate reputation is based on a total of 63 indicators that reflect the views of different internal and external stakeholders. Third, our empirical study examines a sample of European manufacturing firms that represent an original research setting since previous studies, especially those related to CP, focus on emerging economies or specific sectors. Fourth, this is a longitudinal study that involves a panel data of the sample firms for the period 2008–2017, whereas previously mentioned works mainly conduct qualitative research (case studies) or cross-sectional studies (surveys). This longitudinal study is particularly useful for evaluating the influence of EI and CP on reputation over time as well as observing the effects of the improvement in the effectiveness of both strategies.

The remainder of this article is structured as follows. The second section offers the theoretical framework and hypotheses. The next sections present the methodology and the results. In the last two sections, we discuss the findings and highlight the contributions, limitations and conclusion of this research.

2 | THEORY AND HYPOTHESIS

More than 25 years ago, Hart argued, through his natural-resource-based view of the firm (NRBV), that "one of the most important drivers of new resource and capability development for firms will be the constraints and challenges posed by the natural (biophysical) environment" (Hart, 1995, p. 989). Convinced that competitive advantage was rooted in capabilities that facilitate environmentally sustainable economic activity, the author proposed three strategic capabilities: pollution prevention, product stewardship, and sustainable development. These three environmental strategies were then theoretically signaled as a source to reinforce and differentiate the firms' position through the positive effects of a good reputation (Hart, 1995).

In our study, we draw on the notion of dynamic capability, introduced a few years later and benefiting the NRBV. This perspective has had a significant impact on the research regarding organizations and the natural environment, as confirmed by Hart and Dowell (2011) when they revisited the NRBV. Teece et al. (1997) defined dynamic capabilities as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments." These are the capabilities that allow firms to reconfigure resources to gain advantages within ambiguous and dynamic markets. Aragón-Correa and Sharma (2003) characterize a proactive environmental strategy as a

dynamic capability in terms of individual elements within Eisenhardt and Martin's (2000) definition. They demonstrate that proactive environmental strategies are dependent upon specific and identifiable processes, are socially complex and specific to organizations, require path-dependent and embedded capabilities, and are nonreplicable or inimitable. Such strategies consist of best practices contributing to proactive investments in pollution prevention. Among these practices, some are linked to cost advantages, such as process-focused practices that increase efficiency and reduce inputs and wastes (Christmann, 2000). Proactive strategies with advanced environmental actions are aimed at preventing and preserving the natural environment while enhancing a firm's image and reputation (Berry & Rondinelli, 1998; Sharma & Vredenburg, 1998). From this perspective, we consider that EI and CP, as proactive environmental strategies, can be understood as dynamic capabilities.

Particularly, we explore how the development of both dynamic capabilities influences corporate reputation, which in turn indicates the stakeholders' recognition of the quality of the firm's capabilities and outputs (Pfarrer et al., 2010). Reputation can be defined as "the collective representation of actions and outcomes of the past and present of the organization, that describe its capability to obtain valuable outcomes for different stakeholders" (Martín-de Castro et al., 2006, p. 362).

Within the reputation paradigm, several schools of thought differentiate which stakeholders are considered as audiences (see Chun, 2005; de la Fuente Sabaté & de Quevedo Puente, 2003). In our study, we follow a multiple stakeholder approach to conceptualize and measure reputation. We state that reputation reflects what all stakeholders perceive about a company and, more specifically, that reputation is compounded of both stakeholder perceptions: internal and external. That is, reputation is an equal reflection of the internal (shareholders, managers, employees, etc.) and external (mainly customers and society in which the firm operates) views of the organization.

In the following sections, we develop hypotheses about the effects of EI and CP on reputation.

2.1 | Environmental innovation and corporate reputation

Firms are aware of the relevance of environmental management not only to decrease environmental impacts but also to create competitive advantage. The methodologies of environmental management and the required organizational changes promote EIs (Severo et al., 2017). EI represents an important approach for addressing current environmental problems because it offers double externalities (Pan et al., 2021) since it generates positive economic externalities that are common to all innovations while minimizing the negative impacts on the environment (Rennings, 2000). In addition, EI plays an important role in transforming the traditional linear economy system of production and consumption into a circular economy (Vieira & Radonjič, 2020). EIs refer to products, processes, or management practices established in order to reduce environmental impact (Garcés-Ayerbe et al., 2019).

EI is a dynamic capability that helps firms to reduce the external environmental cost of production or product, allowing them to obtain a better environmental performance than the industry average. It may also represent differentiation factors with respect to competitors (Murillo-Luna et al., 2008). Being an eco-innovative company may improve public image (Vieira & Radonjič, 2020) since it responds to the demands of consumers, employees, shareholders, and society in general, bringing considerable benefits regarding energy conservation, energy consumption reduction, pollution prevention, waste recycling, green product design, and improved health and safety (Liao, 2018).

We can consider EIs as substantive actions since they are usually associated with high research and development investment over a long period of time with the aim of lowering environmental impact of new products. Compared to opportunistic behaviors such as greenwashing, stakeholders tend to confer greater importance on those types of actions because they are clearly linked to performance outcomes. Consequently, substantive environmental actions will be rewarded with reputational gain (Truong et al., 2021). Moreover, EIs signal, in a reliable way, the firm's commitment to social responsibility, which is an important predictor of corporate reputation and of stakeholder intent to engage in supportive behavior towards the firm (Vidaver-Cohen & Brønn, 2015). For instance, conscious customers will pay an additional price for EIs in products, packaging or sustainable forms of business management (Amores-Salvadó et al., 2014).

There is evidence to support these arguments. Focusing on the manufacturing industry in China, a survey shows that companies can improve their reputation through eco-organization innovations regarding processes and products (Liao, 2018). In the context of the Spanish metal sector, there is an investigation showing the positive relationship between green corporate image and environmental product innovation (Amores-Salvadó et al., 2014). As for polluting industries, a study of publicly traded firms confirms the positive influence of substantive environmental actions on organizational reputation (Truong et al., 2021).

Based on the previous arguments and evidence, we pose the following hypothesis related to the broad concept of EI conformed by innovation regarding product, process and management practices:

> **Hypothesis 1.** *The higher the capacity to develop EI, the greater a firm's reputation.*

2.2 | Cleaner production and reputation

CP is also a dynamic capability related to actions that allow firms to make efficient use of raw materials and energy during the production process, increasing their productivity, competitiveness and performance (Severo et al., 2017). The United Nations Environmental Programme (UNEP, 2007, p. 3) defines CP as the "continuous application of an integrated preventive strategy to processes, products and services, to increase overall efficiency and reduce risks to humans and the environment. (…) It is a broad concept that encompasses terms such as eco-efficiency, pollution prevention and green productivity." It should be noted that CP is seen as a proactive environmental strategy, it extends well beyond technical solutions and is more than an

isolated audit (Hens et al., 2018). CP is preventive. In contrast to the end-of-pipe approach, which entails passive practices, it includes active practices that change the structure of the process in order to reduce environmental impact (Muñoz-Villamizar et al., 2018; Yüksel, 2008). It is especially useful for manufacturing companies to gain efficiency by using less energy, water and raw materials as well as to reduce environmental burdens by generating less waste and emissions (Luken et al., 2016). CP is an approach that has positive results in mitigating environmental damages as well as in creating economic and social benefits (Matos et al., 2018). From an analysis of CP practices in large manufacturing firms of Turkey, Yüksel (2008) states that company managers implementing CP identified an enhancement in the image of their products and services by associating them with the environmental concern of the company, a potential link of improvement of organizational image (Matos et al., 2018).

Previous literature highlights the reduction of pollution levels as well as waste and greenhouse gas emissions among the main and most generalized benefits of CP practices. The second largest number of citations regarding CP advantages refers to resource use efficiency, mainly in energy savings, water, materials and other inputs (Matos et al., 2018). Accordingly, in our study, CP effectiveness involves two groups of preventive practices. On the one hand, a company's engagement in reducing environmental emissions during the production and operational processes and on the other hand, a company's resource use efficiency that involves its ability to reduce the use of materials, energy or water, and to find more eco-efficient solutions.

Regarding environmental emissions, manufacturers tend to generate hazardous substances that cause environmental pollution and are very harmful to the health of employees and the community at large. Therefore, it is their responsibility to diminish or eliminate this level of industrial pollution using appropriate resources and green technology (Afum et al., 2020). The success of a firm depends on its ability to respond to stakeholder concerns. Pollution prevention approaches provide organizations with opportunities to obtain rare advantages (Hart, 1995). These advantages include cost savings because compared to their competitors they avoid the cost of end-of-pipe pollution control technologies or reduce the costs of implementing regulations. Moreover, these firm's efforts should serve as an important reputation-building factor (Kim et al., 2007). Observable outcomes in terms of environment protection should satisfactorily convince external stakeholder groups.

Focused on one specific stakeholder group, industry peers, a recent study confirms that substantive actions, such as indicators of performance in pollution prevention, enhanced a firm's reputation (Truong et al., 2021). An investigation of US manufacturing companies, belonging to some of the highest emitters of toxic chemicals, measured environmental performance through the volume of hazardous emissions per dollar of sales (Kim et al., 2007). This study demonstrated that the lower the value of hazardous emissions per dollar of sales, the higher the performance reputation. Similarly, examining an unbalanced panel of 58 firms that operated in polluting industries, a study supported the prediction that greater environmental pro-activeness contributed to achieving financial reputation repair (Matozza et al., 2019).

Accordingly, we propose the following hypothesis:

Hypothesis 2. *The higher the effectiveness in reducing environmental emissions, the greater a firm's reputation.*

As far as resource use efficiency is concerned, implementing CP to reduce resource consumption and minimize waste helps firms to achieve a better economy and avoid damage to the natural environment (Afum et al., 2020). Effective allocation of scarce resources can be a source of creating capabilities for sustained competitive advantages. More capable firms retain a higher level of efficiency when using key resources that lead to higher profits and a better image for the firm (Kwon & Lee, 2019). Consumers and other stakeholders agree on the importance of reducing pollution as well as the efficient use of resources. For instance, some customers' environmental concerns are related to reductions in packaging and consumer water and energy use (Khojastehpour & Johns, 2014). Stakeholders' demands related to the adoption of CP initiatives are particularly salient in the manufacturing industries since they are large contributors to waste production coupled with a huge consumption of energy (Baah et al., 2021). Undertaking green production initiatives (such as those oriented to increase resource use efficiency and ensure recycling capabilities), show diverse stakeholder groups that the firm complies with norms and with their demands which lead to higher stakeholder endorsement, trust and loyalty among other benefits (Shashi, Centobelli, et al., 2019).

A recent empirical study of a sample of small and medium enterprises (SMEs) operating in a developing country (Baah et al., 2021) proves that the adoption of green practices presents benefits that positively influence reputation. Some practices analyzed are those aimed at reducing waste and avoiding raw material waste and high-energy consumption among others. The aforementioned study by Matozza et al. (2019), using indicators of resource use reduction, finds that environmental performance increases the financial reputation of firms (Matozza et al., 2019).

Therefore, we hypothesize the following:

Hypothesis 3. *The higher the resource use efficiency, the greater a firm's reputation.*

3 | RESEARCH METHOD

3.1 | Research setting and data

Environmental management is relevant for manufacturing sectors as they are continuously scrutinized by stakeholders, which have a growing concern for the impact on the natural environment (Vachon & Klassen, 2008). Since manufacturing firms generate greater negative environmental impacts compared to other sectors, they are receiving increasing pressure from stakeholders to minimize raw materials usage, reduce waste, reduce greenhouse gasses emissions and reduce energy usage in production (Baah et al., 2021). These industries have contributed significantly towards strengthening the economy of many

countries. Nevertheless, if they do not implement environmental initiatives, their activities will lead to an overuse of resources, overconsumption of energy and high-levels of waste generation (Muñoz-Villamizar et al., 2018).

The research setting for this study is a panel data of European public manufacturing firms for the period 2008–2017. The level of analysis is firm-year. We built our sample using information drawn from two different databases. We collected information regarding the main variables and some control variables in this study from the ESG database of the Thomson Reuters Eikon, which is a world environmental, social and governance rating database. Information regarding the different initiatives that determine the effectiveness of CP and EI began to be more consistent in 2008, while 2017 was the last available year in the database at the time we conducted the search. These facts justify the period of analysis of our empirical study. The ESG database contains objective, auditable, and systematic quantitative and qualitative company-level data of public companies worldwide for several years. This has allowed us to carry out longitudinal studies. The database calculates ESG Scores previously designed by the analysts to objectively measure a company's relative ESG performance, commitment and effectiveness across 10 main themes (Refinitiv, 2019). These include the social pillar score that represents our dependent variable (reputation), and EI, as well as the resource use and emissions scores that constitute the independent variables. Information regarding size was obtained from a second database called DataStream. The validity and reliability of these databases have been established in previous studies (Cheng et al., 2014; Garcia et al., 2017).

Thomson Reuters Eikon includes ESG data for close to 10,000 companies representing as high as 80% of the global market cap and covers more than 70 countries. The total number of European firms at the time of the data collection was 1745.

Searches in the ESG database yield a list of 380 European manufacturing companies, which constitute our study population. Data availability constraint (missing data for one or more of the variables) limited the sample to a panel data of 242 unique companies (representing 63.68% of the population) with a total of firm-years observations of 1341. An unbalanced panel reduces sample selection bias and makes the results more representative (Bruno, 2005). Nevertheless, we addressed the potential for selection bias by comparing certain key attributes (such as ESG score, size and sector) of final sample firms to non-sample firms of the population. The results of statistical tests (*t*-test and Kolmogorov–Smirnov two-sample test) suggest that there are no significant differences between both groups.

Our sample includes large firms. The mean number of employees is 47,727.5, the minimum number of employees is 541 and the largest company has 642,292 employees. Our sample consists of firms in 56 manufacturing sectors, the most frequent being: 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 components manufacturers (3.7%). There are 62 high-technology firms. Regarding the geographical location, 21 European countries are represented in our sample, and 86.4% of the companies belong to member countries of the European Union. The most frequent are the United Kingdom (21.95%), Germany (13.49%), Switzerland (10.31%), and Sweden (9%).

3.2 | Measures

3.2.1 | Dependent and independent variables

The measures of the dependent and independent variables are based on specific ESG scores offered by the Thomson Reuters Eikon, which reflect a firm's performance, commitment and effectiveness in different dimensions (Refinitiv, 2019). The values of the ESG scores range from 0 to 100, with 100 being the highest performance in the specific area.

"Corporate reputation" is the dependent variable to test the set of hypotheses. To measure this variable, we use the social pillar score contained in the ESG database (Refinitiv, 2019). This is defined 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 is a measure of reputation used in previous works (Quintana-García et al., 2021), and is consistent with the stakeholder approach considered in this study since the score includes the concerns of internal and external stakeholders. Corporate reputation is a continuous variable in the range 0–100, and is calculated though a percentile rank scoring methodology 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.

"Environmental innovation capacity" is our first independent variable. It is measured through the EI score offered by the ESG database that is defined as "a company's capacity to reduce environmental costs and burdens for its customers, and thereby creating new market opportunities through new environmental technologies and processes or eco-designed products." This is a very suitable measure that covers the broad approach of EI that we adopt in this study as it includes environmental products as well as technological and process innovation (Liao, 2018; Watson et al., 2018). Examples of initiatives observed to estimate this score are related to the development of take-back procedures and recycling programs. It is also linked to the development of products or technologies for use in renewable energy (such as wind, solar, hydro and geo-thermal and biomass power) and the development of products that are designed for the reuse, recycling or the reduction of environmental impacts (eco-design products), and so forth.

CP practices are aimed at increasing the efficiency of resource use and reducing both waste and emissions (de Oliveira et al., 2019; Sousa-Zomer et al., 2018). CP effectiveness is covered in this study through two independent variables: "resource use efficiency" and "emissions reduction effectiveness." Resource use efficiency reflects the value of the resource use score reported by the ESG database, which is defined as "a company's performance and capacity to reduce

TABLE 1 Summary of descriptive statistics

	Variable	Mean	SD	1	2	3	4	5	6	7	8	9
1	Corporate reputation	71.29	16.59	1.00								
2	Environmental innovation capacity	63.55	26.30	0.22***	1.00							
3	Resource use efficiency	77.88	18.22	0.56***	0.19***	1.00						
4	Emission reduction effectiveness	71.05	21.97	0.52***	0.18***	0.64***	1.00					
5	CSR strategy	62.57	26.09	0.45***	0.19***	0.38***	0.31***	1.00				
6	Environmental certification	0.87	0.32	0.20***	0.10***	0.14***	0.17***	0.13***	1.00			
7	Firm size	47,727.5	71,863.67	0.42***	0.17***	0.24***	0.28***	0.28***	0.11***	1.00		
8	High-technology firm	0.27	0.44	−0.06*	−0.03	−0.07	−0.10***	−0.10***	−0.08***	−0.06*	1.00	
9	EU member	0.85	0.34	−0.01	−0.02	0.02	0.05*	−0.10***	0.05*	−0.03	−0.10***	1.00

Note: ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.

the use of materials, energy or water, and to find more eco-efficient solutions by improving supply chain management." The estimation of this score is based on different indicators such as: renewable energy use, energy purchased and produced, electricity purchased and produced, water withdrawal and recycled, and so forth. Emission reduction effectiveness is measured through the emissions reduction score included in the mentioned database that defines it as "a company's commitment and effectiveness towards reducing environmental emission in the production and operational processes." This score is calculated taking into account indicators such as CO_2 equivalent emissions, NOx and SOx emissions reduction, waste total and waste recycled total (total amount of waste produced and total recycled and reused waste produced), water pollutant emissions, staff transportation impact reduction, and so forth.

EI capacity, resource use efficiency, and emission reduction effectiveness are also continuous variables and their values range from 0 to 100, estimated with the same percentile rank scoring methodology explained previously.

3.2.2 | Control variables

We control for several firm attributes that may influence reputation: corporate social responsibility (CSR) strategy, environmental certification, firm size, being a high-technology firm and a European Union member. "CSR strategy" is measured through an ESG score with the same denomination 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. CSR communication may have a positive effect on consumers and other stakeholders' knowledge, trust, and perceptions regarding a firm's reputation (Kim, 2019). It is important that companies adequately communicate their environmental practices and strategies to stakeholders as a response to institutional pressures. Such communicative efforts are a source of positive business results (Amores-Salvadó et al., 2014). A recent study found that good CSR reporting quality increases the intensity of the environmental and social performance effects on corporate reputation (Pérez-Cornejo et al., 2020). "Environmental certification" is a dummy variable that takes value 1 when the firm has implemented an ISO 14000 or environmental management system (EMAS) certification. Such certifications reduce information asymmetries indicating to stakeholders the level of a firm's commitment to the environment as well as the quality of its management (Martín-de Castro et al., 2020). "Firm size" is estimated through the number of employees. Larger firms tend to have a higher number of stakeholders and are of greater public interest, therefore they usually face a higher reputation risk. Likewise, larger firms have more resources to implement a reputation risk management (Heidinger & Gatzert, 2018). Accordingly, firm size may represent a determinant of reputation. We include the dummy variable "EU member" that takes value 1 for the companies located in a country belonging to the European Union. This variable is useful to take into account regional differences that may affect the relationships examined. Over the last decades, European environmental policy has become more

stringent through regulations regarding chemicals, hazardous substances, pollution, and so forth. (Dhull & Narwal, 2016), producing a growing environmental awareness in firms. We also control for being a "high-technology firm." There are high-technology products (e.g., electronic equipment) that rapidly become obsolete which can lead to a high volume of waste and pollution (Widmer et al., 2005). Thus, high-technology companies may be more concerned with implementing proactive environmental initiatives and programs to reduce reputational risks. These high-technology sectors were identified using the definition given by the OECD (2011). Finally, factors that vary over time but affect all firms in the industry, such as financial market conditions, were controlled with dummy variables for each year.

4 | RESULTS

4.1 | Main analyses

Table 1 shows the mean, standard deviations and correlations of the variables used in the analyses.

Table 2 provides the regressions results to test the three hypotheses of this study. We used the generalized estimating equation (GEE) regression method (Liang & Zeger, 1986). This approach facilitates the analysis of data collected in longitudinal designs. The GEE algorithm accounts for correlation between records within the same cluster (data collected about the same company during successive years). GEE uses the generalized linear model to estimate more efficient and unbiased regressions parameters relative to ordinary least squares (Ballinger, 2004). It is less computationally intensive, and hence, often proves less subject to instability and convergence problems. We entered only the control variables in Model 1 in order to provide a baseline. It is noteworthy that adding the independent variables in Model 2 significantly increases goodness-of-fit when compared to Model 1.

Consistent with Hypothesis 1, EI capacity positively impacts corporate reputation ($b = 0.028$; $p < 0.05$). This result confirms that promoting the development of this type of innovation to reduce adverse effects on the environment meets the demands of the different stakeholders, benefiting public image and reputation. The results also provide support for hypotheses 2 and 3 concerning CP. Resource use efficiency ($b = 0.265$; $p < 0.001$) and emissions reduction effectiveness ($b = 0.135$; $p < 0.001$) are found to be positively related with reputation.

Regarding the control variables, only CSR strategy and environmental certification are significant. In line with previous studies (Javed et al., 2020; Pérez-Cornejo et al., 2020), CSR strategy has a positive influence on reputation. This result confirms that communication is relevant to enhance dialog processes between the firms' practices and the expectations of stakeholders which enhance legitimacy and reputation (Kim, 2019). The positive influence of environmental certification suggests that it is a signal of rigor, quality and environmental commitment to a firms' stakeholders (Martín-de Castro et al., 2020).

4.2 | Robustness analyses

We conducted several robustness checks to examine whether our results are stable. We replaced the three independent variables with an alternative holistic specification "Environmental management performance" that represents the performance of the combined strategies regarding EI and CP. This alternative variable is measured through the environmental pillar score of the ESG database that is defined as "a company's impact on living and non-living natural systems, including the air, land and water, as well as complete

TABLE 2 Results of regression analysis for corporate reputation and performance

	Corporate reputation				EBITDA (log)	
	Model 1		Model 2		Model 3	
Corporate reputation					0.036***	(0.001)
Environmental innovation capacity			0.028*	(0.013)		
Resource use efficiency			0.265***	(0.024)		
Emission reduction effectiveness			0.135***	(0.020)		
CSR strategy	0.230***	(0.015)	0.131***	(0.014)		
Environmental certification	5.692***	(1.166)	3.679***	(1.036)		
Firm size	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
High-technology firm	0.210	(0.804)	1.010	(0.749)	0.188**	(0.060)
European Union member	0.246	(1.072)	−0.888	(0.950)	0.179*	(0.076)
Year dummies	Included		Included		Included	
Constant	43.346***	(3.674)	22.059***	(3.440)	17.360	(0.269)
Wald χ^2	639.01***		1197.54***		1711.58***	
Number of firms	242		242		238	
N (firm-year observations)	1341		1341		1285	

Note: *SE*s are in parentheses. ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.

TABLE 3 Regression results on corporate reputation (robustness checks)

	Corporate reputation		Corporate reputation growth, t – (t-1)			
	Model 1		Model 2		Model 3	
Environmental management performance	0.387***	(0.023)				
Growth in environmental management performance					0.651***	(0.025)
Growth in resource use efficiency			0.436***	(0.025)		
Growth in emission reduction effectiveness			0.186***	(0.025)		
Growth in environmental innovation capacity			0.052**	(0.017)		
CSR strategy	0.150***	(0.014)				
Improvement in CSR strategy			0.046*	(0.019)	0.078***	(0.020)
Environmental certification	3.689**	(1.071)	−0.471	(0.764)	−0.700	(0.800)
Firm size	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
High-technology firm	0.879	(0.774)	0.174	(0.554)	0.326	(0.580)
European Union member	−0.377	(0.980)	−0.006	(0.703)	−0.122	(0.736)
Year dummies	Included		Included		Included	
Constant	26.707***	(3.506)	0.550	(1.366)	0.899	(1.430)
Wald χ^2	1032.95***		1305.59***		1069.98***	
Number of firms	242		242		242	
N (firm-year observations)	1341		1323		1323	

Note: *SE*s are in parentheses. ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.

ecosystems. It reflects how well a company uses best management practices to avoid environmental risks and capitalize on environmental opportunities in order to generate long term shareholder value." This score also ranges from 0 to 100, with 100 being the highest score, and its calculation is based on the three scores: EI, resource use, and emissions. We seek to verify that an integral and coherent management of environmental initiatives improves reputation as it demonstrates a high environmental commitment to the firm's stakeholders. Model 1 in Table 3 shows the results of this robustness check. They confirm that achieving a high performance in environmental initiatives related to EI and CP has a positive influence corporate reputation ($b = 0.387$; $p < 0.001$) supporting the main findings of this study.

From a dynamic perspective, and with the aim to reduce concerns regarding unobserved heterogeneity, we used different measures of the dependent and independent variables in terms of growth: corporate reputation growth, growth in EI capacity, growth in resource use efficiency, and growth in emissions reduction effectiveness. Additionally, we created the variable "growth in environmental management performance" based on the integral independent variable used in the previous robustness check. We also considered the growth of the variable CSR strategy named "improvement in CSR strategy" to control for the progress made by the company in its communication practices.

With these alternative specifications, we explore the effects on corporate reputation growth of an increasing commitment in environmental management revealed by greater effectiveness of EI and CP. The growth of such effectiveness may represent a credible signal that improves the expectations regarding a firm's capacity to satisfy the stakeholders' interests. We measured the five variables in terms of growth as the difference between the value of each variable at year t and the previous year (t-1). These variables can take positive and negative values given that the environmental performance of a company can improve or worsen from 1 year to the next. If there is no variation in such performance, the value of the variables is zero. Models 2 and 3 of Table 3 display the results of the regressions using these growth measures, which are also consistent with our main findings. An increasing performance in EI, emissions reduction and resource use signals a growing environmental commitment by the firm which is valued by the stakeholders.

5 | DISCUSSION AND CONCLUSION

Framed under the stakeholder approach and the dynamic capability theory, we explore how EI and CP influence corporate reputation. By studying a panel data of European manufacturing companies, our findings reveal that EI related to products, processes and management practices benefit corporate reputation. We also provide evidence that the higher effectiveness of CP initiatives the higher a firm's reputation. Both dynamic capabilities improve the firm's legitimacy and stakeholders' perceptions concerning the firm's commitment to sustainability.

Our insights are consistent with previous works that support the notion that substantive environmental actions reduce information asymmetry between firms and stakeholders concerning the company's environmental commitment, enhancing corporate reputation as a result of that (Pérez-Cornejo et al., 2020; Truong et al., 2021; Vidaver-Cohen & Brønn, 2015). In coherence with the scarce empirical previous literature (e.g., Baah et al., 2021; Kim et al., 2007;

Liao, 2018), we argue that if enterprises adopt EI and invest in CP initiatives, they can meet the environmental protection needs of different stakeholders, improving public image and reputation.

Reputation allows companies to differentiate themselves from competitors and attracts customers and the loyalty of other stakeholder groups. Our evidence highlights the need to explore the antecedents of corporate reputation such as environmental dynamic capabilities.

This research has implications for theory and practice. Considering the dynamic capabilities approach, it offers relevant insights on how EI and CP represent complementary proactive strategies that enhance reputation. Literature to date has only loosely connected these strategies to explore their impact on different performance outputs. Both strategies consist of best practices linked to cost advantages, such as process-focused practices that increase efficiency and reduce inputs and wastes (Christmann, 2000), and to differentiation, such as changes in product design aimed at reducing the product's environmental impact through production, use and disposal at the end of the product's life (Martín-de Castro et al., 2017). Moreover, this research contributes to the stakeholder theory, since it adopts its multiple approach to examine the influence of the aggregated perceptions of internal and external stakeholder groups on reputation.

Our study also offers practical implications for managers. To respond to stakeholder pressures, companies should actively carry out substantive environmental actions, that is, formulate strategies and induce changes in daily activities to lower the environmental footprint (Truong et al., 2021). This study confirms the relevance of implementing green proactive practices in a holistic approach, which represent a strategic approach to respond to stakeholders' demands in addition to obtaining operational benefits. Investors, customers, suppliers, employees and the rest of the stakeholders are increasingly environmentally conscious, and companies must provide clear signals of the proactive strategies they are adopting to prevent and preserve the natural environment (Martín-de Castro et al., 2017). Meeting environmental regulatory requirements and stakeholder concerns translates into legitimacy and reputation. EI and CP involve low and high visibility practices. Managers should develop and implement such practices even those less visible since they help to achieve a favorable perceived assessment by external and internal stakeholders. From a dynamic perspective, this study also demonstrates that increasing efforts in promoting proactive environmental strategies drives corporate reputation growth. Furthermore, to gain legitimation, this study supports the premise that managers should disclose information and communicate social responsibility practices as part of the dialog with different stakeholder groups. Disclosure will help to enhance and protect a firm's reputation from competitors with low environmental investment or that show environmental or corporate social irresponsibility.

This work has some limitations that can be overcome in future research. We explore how the effectiveness of the environmental strategies implemented by an enterprise impacts on stakeholders' perceptions. However, from a collective reputation approach (Tirole, 1996), a firm's corporate reputation is also affected by the positive or negative actions of other companies that participate in its network (suppliers, partners, customers, etc.). Future research might analyze how the environmental management implemented by partners influences a focal firm's reputation. Our sample includes European manufacturing companies, and all of them are publicly traded firms. Further research would benefit from expanding this investigation to the service industry. Likewise, the inclusion of private companies and other countries would contribute to the acquisition of generalizable conclusions. It is possible that other unmeasured variables may account for our results such as other relevant attributes of the company (e.g., location of its manufacturing plants, other sustainability strategies) or the effectiveness of the communication channels accessible to stakeholders. It would be interesting to carry out qualitative research and use primary sources of information to obtain knowledge about these dimensions and deepen the understanding of the relationships analyzed in this study.

Our research advances in the knowledge of the relationship between proactive environmental strategies and corporate reputation. Findings induce us to continue the study of some unexplored issues regarding the adoption of a collective reputation approach and the variety and effectiveness of the forms used by firms to communicate with stakeholders among others, which all together constitute promising areas of research.

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