Effects of environmental corporate social responsibility on innovativeness of Spanish industrial SMEs

Article *in* Technological Forecasting and Social Change · January 2021

DOI: 10.1016/j.techfore.2020.120355

3 authors:

Francisco Javier Forcadell
King Juan Carlos University

Fernando Ubeda Mellina
Universidad Autónoma de Madrid

Elisa Aracil
Universidad Pontificia Comillas

Effects of environmental corporate social responsibility on innovativeness of Spanish industrial SMEs

Forcadell, Francisco-Javier; **Úbeda**, Fernando; **Aracil**, Elisa;

Accepted version: *Technological Forecasting and Social Change*, January 2021

Highlights

- Environmental corporate social responsibility (ECSR) enhances SMEs' innovativeness.
- Innovativeness embeds technological efforts (R&D) and results (product and process innovation).
- We provide empirical evidence over a large sample of industrial SMEs.
- ECSR promotes sustained innovativeness in already innovative and non-innovative firms.
- This evidence strengthens the business case of pro-environmental strategies.

ABSTRACT

This study analyzes how environmental corporate social responsibility (ECSR) strategies contribute to enhancing innovativeness among small and medium-sized enterprises (SMEs) by developing technological resources. We test our hypotheses over an eight-year period using a panel of 2,405 industrial SMEs in Spain. We empirically find that ECSR drives the building of firms' technological resources, which results in an enhancement of their technological effort or R&D and outcomes in terms of product and process innovation. ECSR intensifies innovation for innovative firms and catalyzes the inception of innovation for previously non-innovating firms, and the resultant effects are sustained over time. We contribute to the literature by analyzing the effects of ECSR in promoting the innovation of firms beyond the well-known influence on green innovation. Further, we examine the neglected research area of the environmental strategies of SMEs. Our findings strengthen the instrumental innovative value of ECSR, specifically for SMEs.

Keywords: Environmental Corporate Social Responsibility; Innovation; Process Innovation; Product Innovation; R&D; SMEs; Sustainability

Declarations of interest: None

Funding: This work was supported by the Spanish Ministry of Science, Innovation and Universities [grant number RTI2018-097447-B-I00]. The funder was not involved in: the study design, the collection, analysis and interpretation of data, the writing of the report, the decision to submit the article for publication.

1. Introduction

Environmental deterioration constitutes the largest externality in history (Stern, 2007). This makes it increasingly critical to internalize companies' environmental externalities in addressing climate change, pollution, depletion of natural resources, and habitat destruction (Babiak and Trendafilova, 2011; Lyon and Maxwell, 2008; Senge et al., 2009; Weyzig, 2009). Thus, environmental protection becomes strategic for firms seeking to convert a major challenge into a business opportunity (Hart, 1995; Porter and van der Linde, 1995; Tang et al., 2018; Sharma and Vredenburg, 1998; Shu et al., 2016; Yang et al., 2015). This implies proactive management of environmental issues (Severo et al., 2017) beyond legal compliance, under the umbrella of environmental business management, environmental protection, or ECSR strategies (Aragón-Correa and Sharma, 2003). Therefore, environmental corporate social responsibility (ECSR)—as a relevant and distinct sub-construct of the corporate social responsibility (CSR) concept (Rahman and Post, 2012)—converts environmental awareness into actions (Chuang and Huang, 2018) to limit adverse environmental impacts (Rahman and Post, 2012) and to promote positive environmental externalities (Wu et al., 2020). In doing so, firms contribute to the development of the Green Growth strategy (2009) of the Organization for Economic Co-operation and Development (OECD), which acknowledges that environmental care can coexist with business performance.

The extant literature has extensively proved that by implementing ECSR, firms—including SMEs as discussed by Bos-Brouwers (2010) and Noci and Verganti (1999)—can improve their economic performance (i.e., Chuang and Huang, 2018; Liou and Sharma, 2012), stock performance (Flammer, 2013), international expansion (Xu et al., 2018), customer loyalty (Rashid et al., 2015), or delivery of green innovations (Brunnermeier and Cohen, 2003; Singh et al., 2020). However, an important gap in this literature remains unexplored: the relationship between ECSR and organizational innovativeness beyond green innovation, especially for SMEs. Literature linking ECSR and organizational innovativeness is scarce (Li et al., 2020; Ren et al., 2020; Wu et al., 2020; Yang et al., 2019) and almost absent in the case of SMEs. This literature instead focuses on large companies that have a wider availability of environmental indicators (Bos-Browers, 2010). However, SMEs make a significant contribution to environmental issues (Madueño et al., 2016; Noci and Verganti, 1999). Initiatives such as the European Green Deal or the UN's Sustainable Development Goals (UE, 2019; UN, 2015) underline the importance of SMEs in building a sustainable environment. Additionally, SMEs represent more than 90% of businesses and account for more than 50% of employment worldwide (World Bank, 2020). Thus, it becomes essential to understand the role of ECSR—not only in large companies—in enhancing overall innovativeness in SMEs.

This study explores the effect of ECSR on innovativeness that embeds both the technological effort, by committing resources to R&D, and the results of these efforts, materialized in product and process innovations. We empirically analyze a large non-balanced panel that includes 2,405 industrial Spanish SMEs for the period 2009–2016. We find that ECSR stimulates the development of technological resources in both innovative and non-innovative SMEs. This study contributes to the literature in several ways: first, we extend the analysis of the effect of ECSR beyond green innovation. In particular, we focus on SMEs, which, despite their economic relevance, have been under-researched in the environmental sustainability and innovation literature, although there are exceptions (including Aragón-Correa et al., 2008; del Brio and Junquera, 2003; Bos-Brouwers, 2010; Cuerva et al., 2014; Leonidou et al., 2017). Second, we analyze the influence of ECSR on the inception of innovation in non-innovative SMEs and the enhancement of innovation in already innovative SMEs. Third, we examine the impact of ECSR on innovativeness by considering the technological efforts and the product and process innovation, as opposed to the extant literature that investigates process innovation (Asongu, 2007) or product innovation separately (Frondel et al., 2008; Luo and Du, 2015). Fourth, we perform a longitudinal firm-level empirical analysis that contributes to complete the findings outlined in previous cross-sectional studies (e.g., Kammerer, 2009; Kesidou and Demirel, 2012; Mazzanti and Zoboli, 2009) and sector-level data (del Rio et al., 2011). We thus demonstrate how ECSR contributes to the development of technological resources in SMEs.

This paper is structured as follows. Section 2 presents the theory and hypotheses. Section 3 explains the empirical analysis and describes the sample, variables, and methods developed. Section 4 shows the empirical results. The final section discusses the findings and presents the conclusions.

2. Theory and hypotheses

The extant literature extensively evidences that CSR stimulates both environmental (Halme and Laurila, 2008; Wagner, 2010) and non-environmental innovation (Bocquet et al., 2013; Nidumolu et al., 2009). In contrast, studies on ECSR only highlight its effect on environmental innovation (e.g., Brunnermeier and Cohen, 2003; Cai and Zhou, 2014; Dangelico et al., 2017; Frondel et al., 2008; Guoyou et al., 2013), including SMEs (del Brio and Junquera, 2003). As with CSR, ECSR can constitute an important driver beyond environmental innovation (Bansal, 2005; Ren et al., 2020; Yang et al., 2019). We argue that ECSR generates slack resources susceptible to be complementary to the firm resources, triggering firm innovativeness, especially for SMEs. This contributes to enhancing firms' competitiveness (Hart, 1995; Jaffe and Palmer, 1997; Orlitzky et al, 2003; Porter and van der Linde, 1995; Rahman and Post, 2012; Russo and Fouts 1997; Sharma and Vredenburg, 1998; Shrivastava, 1995) and corporate performance (Aragón-Correa et al, 2008; Dixon-Fowler et al, 2013; González-Benito and González-Benito, 2005; Heras-Saizarbitoria et al, 2011; Link and Naveh, 2006; Russo and Fouts, 1997; Wagner, 2005).

The rarer studies regarding innovation in SMEs (Lee et al., 2010) identify certain particularities that can affect the innovative process. SMEs possess particular advantages derived from their specific resources, but face resource constraints in managing the end-to-end innovation process (Edwards, Delbridge and Munday, 2005), including the manufacture, distribution, commercializing, and financing of innovations (Bos-Brouwers, 2010; del Brio and Junquera, 2003; Lee, Sameen and Cowling, 2015; Leonidou et al., 2017; Zúñiga et al., 2014). These resources are essential for transforming innovation efforts into products or processes (Lee et al., 2010). Moreover, these specificities of SMEs become relevant since they can intensify the value of ECSR as a trigger for innovativeness.

ECSR facilitates the generation of slack resources that are complementary to the resources already possessed by the SME and contribute to building technological resources. Slack resources constitute an important driver of innovation (Greve, 2003) by reinforcing the changes in routines and beliefs required to enhance the innovativeness (Pang et al., 2014). Complementary resources exercise a determinant role in the success of innovation (Helfat, 1997; Teece, 1986) by reducing inherent risk and uncertainty (Teece, Peteraf and Leih, 2016) and are necessary to derive benefits from innovations (Chiu et al., 2008). The main generic resources complementary to technology are capital, distribution, and marketing (Chiu et al., 2008). Nevertheless, cooperation constitutes an efficient approach to access complementary resources (Becker and Dietz, 2004), especially for firms suffering from resource limitations, such as SMEs (Feldman, 1994). Where technological complexity makes it impossible for SMEs to develop technologies alone, networking can provide the essential resources required to enhance innovation (Lee et al., 2010; Rycroft, 2007; Singh, 1997).

ECSR has the potential to generate reputation, which improves stakeholders' trust (Forcadell et al., 2020) and facilitates their networking with the firm (Barnett, 2007; Madueño et al., 2016). Networking constitutes an efficient method to obtain resources not available through other means, thereby reducing risk, shortening innovation time and costs, and improving flexibility (Hagedoorn, 1993). SMEs network more efficiently than large companies (Rothwell and Dodgson, 1994), which is key to their success (Mytelka, 1991). ECSR incorporates the interests of stakeholders into the strategies employed by SMEs to satisfy their expectations. Incorporating stakeholders' expectations into the innovation process thus promotes the conversion of ECSR into innovation (Bos-Brouwers, 2010; Guoyou et al., 2013; Kazadi, Lievens and Mahr, 2016; Massa and Testa, 2008). Stakeholder reciprocation is enhanced in SMEs owing to their mutual proximity (Hammann et al., 2009; Russo and Tencati, 2009; Torugsa et al., 2012). Accordingly, ECSR can strengthen ties with stakeholders whose reciprocation towards SMEs may further contribute to the fostering of corporate innovativeness. Employees positively encourage this reciprocation (Hadj, 2020; Madueño et al., 2016) as enhanced ECSR can improve the retention and attraction of talent (Li et al., 2020) needed to promote innovation. Additionally, the responsiveness of SMEs to stakeholders in the form of ECSR creates a channel for information sharing to satisfy their demands beyond environmental concerns, which may lead to enhanced innovation.

ECSR emerges as a complementary resource to the specific resources of SMEs that are associated with flexible organizational structures and soft skills, thereby stimulating innovativeness. When compared to large firms, SMEs exhibit more flexible and lean organizational structures, less formalized management styles, and informal communication channels, which facilitate ECSR (Aragón-Correa et al., 2008; del Brio and Junquera, 2003; Klewitz & Hansen, 2014; Noci and Verganti, 1999). These structures encourage employees to proactively participate in seeking new solutions that enhance products, processes, or technologies that drive the improvement of specific environmental measures (Shu et al., 2016; Yang et al., 2019) and subsequently enhance overall innovativeness. Moreover, SMEs committed to ECSR tend to develop various organizational soft skills such as an innovative corporate culture (Kesidou and Demirel, 2008) that may become crucial drivers of innovativeness (Martín-de Castro et al., 2013) by fostering employee motivation, creativity, brainstorming, and transformative ideas, that promote the development of innovations (Hurley and Hult, 1998). Thus, flexible structures and a culture that fosters creativity may provide a suitable framework to generate innovativeness arising from ECSR (Shu et al., 2016; Yang et al., 2019).

Slack resources generated by ECSR can contribute by compensating for financial resource constraints and thereby prompt investments in innovation (Klewitz and Hansen, 2014). Slack financial resources can be invested in research and development (R&D), which in turn can produce both process and product innovations (McWilliams and Siegel, 2001; Zúñiga et al., 2014). These financial resources liberated by ECSR activities may contribute to turning a non-innovative firm into an innovative one. We identify three potential sources of financial resources generated by ECSR activities: first, cost savings from ECSR implementations can liberate financial resources (Aragón-Correa, 1998; Judge and Douglas, 1998; Russo and Fouts, 1997; Shrivastava, 1995; Winston, 2009), whereby eco-friendly products tend to use less inputs, leading to cost advantages (Corsini et al., 2019); second, firms that anticipate and eliminate the negative environmental impacts of their products may profit from regulatory incentive schemes such as tax deductions or subsidies, thereby generating sources of capital that may be invested in R&D; third, enhanced reputation levels associated with ECSR can improve investors' trust, assisting SMEs in gaining access to additional funding under more favorable conditions (Dhaliwal et al., 2014; Harjoto and Jo, 2015); and fourth, the reputation for being responsible through commitment to ECSR reflects an SME's customer orientation (Li et al., 2020) and is likely to attract new customers (Choi and La, 2013), which may further facilitate the identification of market needs and the development of ideas and solutions to satisfy them (Hurley and Hult, 1998; Wu et al., 2020). Satisfying customer demands increases loyalty and the willingness to purchase (Bhattacharya and Sen, 2003), while the excess funds generated through these mechanisms can be assigned to innovation.

In summary, ECSR generates slack resources that are complementary to the resource portfolio of SMEs. This contributes to overcoming resource constraints and complements certain SME-specific resources. As a result, ECSR has the potential to generate technological resources and fuel innovativeness in already innovative and non-innovative SMEs. Accordingly, we propose the following hypotheses:

H1. ECSR stimulates SMEs' innovativeness, in terms of *technological effort, product innovation, and process innovation.*

H2. ECSR stimulates innovativeness in already innovative and non-innovative SMEs.

3. Data and methods

3.1. Data and Sample

For all variables, we have used data from the Survey on Business Strategies (SBS) for the period from 2009 to 2016. The reference population includes Spanish manufacturing firms with 10 or more employees. This is a well-known database as it has been previously used by multiple studies in the analysis of firms' strategies (e.g., Esteve-Pérez and Rodríguez, 2013; García, Avella and Fernández, 2012; Golovko and Valentini, 2011, 2014; Salomon, 2006; Salomon and

Jin, 2008; Shaver, 2011). Our sample is a non-balanced panel that includes 2,405 firms and 9,853 observations.

3.2. Variables

3.2.1. *Dependent Variables*

We use three variables as proxies of innovativeness. Technological effort (TE_{it}) is measured as the ratio of R&D expenditures over total sales (Horbach, 2008; Jaffe and Palmer, 1997), divided by the average sector R&D expenditure. Based on the Oslo-Manual of the OECD/Eurostat (2005), we have distinguished between product and process innovations. Therefore, we have used two variables: the variable for product innovation ($ProdInn_{it}$) is assigned the value of one if the firm has achieved at least one product innovation in the period and zero otherwise (Rehfeld, Rennings and Ziegler, 2007); the variable for process innovation ($ProcInn_{it}$) is assigned the value of one if the firm has achieved at least one process innovation in the period and zero otherwise (Rennings, Ziegler, Ankele and Hoffmann, 2006).

R&D investment is the common measure of technological efforts (Lai et al., 2015; Lioui and Sharma, 2012; Luo and Du, 2015; Hull and Rothenberg, 2008; McWilliams and Siegel, 2000; Mithami, 2016; Padget and Galan, 2010; del Río et al., 2011; Scott, 2005; Shen et al., 2016). However, these efforts do not necessarily guarantee an improvement in products or processes (Anton et al., 2004; Frondel et al., 2008). Therefore, we analyze the impact of ECSR on innovation from two perspectives: first, the technological effort committed to innovating; and second, its results or appropriability in terms of both product and process innovation (Arundel and Kabla, 1998; Boer and During, 2001).

3.2.2. *Independent Variables*

We measure ECSR based on SMEs' expenditures on environmental protection. In particular, the variable $ECSR_{it}$ takes the value 1 when the firm has incurred expenditures related to outsourced or in-house environmental protection, maintenance of or investments in environmental protection equipment, and installations related to environmental pollution control (Frondel et al., 2008). We use the contemporaneous $ECSR_{it}$ and the variable lagged one period $ECSR_{it-1}$.

3.2.3. *Control Variables*

To reduce the risk of omitted variable bias, we incorporate a set of control variables: *Export intensity* is defined as the ratio of export sales to total sales (EXP_{it}) (Rennings, et al., 2006); *Age*

(A_{it}) is computed as the difference between the current year and the firm's year of foundation (Berrone, et al., 2010, Horbach, 2008; Rehfeld, et al., 2007); *Size* is defined as the logarithm of the total number of a firm's employees ($Size_{it}$) (Horbach, 2008; Rehfeld, et al., 2007; Rennings, et al., 2006); *Group membership* (GM_{it}) is a dummy variable that takes the value of one if the firm is independent and zero otherwise (i.e., the firm is a subsidiary, or it is integrated into a corporate group); *Advertising* (AD_{it}) is defined as advertising and public relations expenses over sales; *Slack* (SL_{it}) is measured as the firm's ratio of assets to liabilities (Baysinger and Hoskisson, 1989, Gómez-Mejia et al., 2014); and *ROA* is defined as the EBIT over total assets (Horbach, 2008; Rennings, et al., 2006), which is standardized by the sectoral ROA. We control for industry membership at the two-digit SIC code level using dummy variables (Horbach, 2008; Jaffe and Palmer, 1997; Rennings, et al., 2006). The inclusion of time effects (year dummies) allows us to control the time-dependent determinants of innovation (Jaffe and Palmer, 1997). We have lagged the control variables by one period to mitigate potential endogeneity bias.

3.3. Empirical model

We apply two different methods given the different nature of our three dependent variables. The technological effort (TE_{ijt}) is a limited and censored dependant variable since it does not take negative values and contains numerous observations with values equal to zero. Hence, a Tobit panel data method is the most appropriate to test our hypotheses. Additionally, as product and process innovation are binary variables, we use the Probit panel data model, which accounts for the probability of a firm implementing each of the decisions. Since the fixed effects model is an inconsistent estimator of the unobserved effect over a short time panel (Cameron and Trivedi, 2005), we use a random effect maximum likelihood (Gómez-Mejia et al., 2014).

The assumptions of normality and homoskedasticity are key for the validity of the Tobit model. The test by Cameron and Trivedi (2005) rejects the null hypothesis of homoscedasticity, and the test by Skeels and Vella (1999) rejects the null hypothesis of normality. This poses serious implications for a censored-data regression[1], which we solve by applying a type-2 Tobit model that has been estimated by the two-step method. This approach decomposes the technical effort (TE_{ijt}) into two different decisions. The first is the decision to perform technological activity, defined as a binary variable, taking the value of 1 if the R&D expenditure is greater than zero, and taking the value 0 if the firm does not make any technological effort over the

[1] The maximum likelihood estimator is inconsistent if the errors are not normally distributed or if they are heteroskedastic (Cameron and Trivedi, 2005).

period *(TE–Binary)*. We have applied a Probit model to identify the determinants of this decision. The second decision determines the R&D expenditure of innovative firms. Accordingly, we define a truncated variable that is valued only when R&D expenditure is greater than zero (*TE>0)*. In the second step, we use a linear regression to analyze the determinant factor of the technological effort (TE_{ijt}).

4. Results

4.1. Main models

We find no multicollinearity problems for the regressions performed. All the explanatory variables show VIFs below the rule of thumb cut-off of 10 for regression models (Kutner et al., 2004), and the condition number obtained is also substantially below the rule of thumb of 30 (Belsley, 1991; Pesaran, 2015). Table 1 shows the descriptive statistics of variables we include in our models.

Table 1. Descriptive statistics.

Variable	Obs.	Mean	Std. Dev.	Min	Max
TE_{it}	9,853	0.686	2.547	0.000	54.610
$Size_{it}$	9,853	3.597	1.090	0.000	5.517
AD_{it}	9,853	0.774	2.141	0.000	40.100
EXP_{it}	9,853	0.214	0.288	0.000	1.000
ROA_{it}	9,853	0.540	1.094	-0.895	22.749
SL_{it}	9,853	1.956	2.857	1.000	166.667
A_{it}	9,853	28.796	17.999	1.000	178.000

Model 1 in Table 2 is a panel Tobit with random effect. In Model 1, the coefficient of $ECSR_{it}$ is positive and significant, which indicates that the ECSR fosters technological effort, thus supporting Hypothesis 1. In Model 2, the sample-selection model in two-stages is applied to a pooled sample, and in Model 3, the unobserved heterogeneity is controlled with random effect in both stages. Both models allow us to separately analyze the decision to invest in R&D (*TE–Binary*) (Model 2.1 and 3.1) and the R&D effort in innovative firms *(TE>0*) (Models 2.2 and 3.2). In Models 2.1 and 3.1, the ECSR lagged one period ($ECSR_{it-1}$) is positive and significant. In the same line, in Models 2.2 and 3.2, the coefficients of contemporaneous ECSR ($ECSR_{it}$) are positive and significant. These indicate that ECSR contributes to improving the technological effort of innovative and non-innovative firms, which entails the decision to invest in R&D (*TE–Binary*), and the amount invested in R&D (*TE>0*)[2]. These findings support Hypothesis 2.

Table 2. Tobit estimations.

	(1)	(2)		(3)	
	TOBIT	Two-Step estimation		Two-Step estimatio	
		(2.1)	**(2.2)**	**(3.1)**	**(3.2)**
	RE	Pooled	Pooled	RE	RE
VARIABLES	*TE*	*TE-Binary*	*TE>0*	*TE-Binary*	*TE-Bina*
$ECSR_{it}$	2.260***	0.026	1.467***	0.051	1.059*
$ECSR_{it-1}$	-0.003	0.319***	0.840**	0.159**	-0.108
$Size_{it-1}$	2.173***	0.321***	1.040***	0.641***	0.381*
AD_{it}	0.179***	0.080***	0.241***	0.102***	0.114*
ROA_{it-1}	3.442***	0.205***	1.232***	0.246	0.887*
EXP_{it}	-0.244**	-0.099***	-0.520***	-0.129***	-0.178*
SL_{it-1}	-0.026	-0.019**	-0.030***	-0.015***	-0.011
GM_{it}	-3.139***	1.133***	2.179***	3.565***	1.325*
A_{it}	0.010	0.003***	0.003	0.007**	0.007*
Constant	-16.347***	-9.372***	-2.175***	-4.508***	-2.592*
$Lambda_{it}$			6.872***		2.529*
Temporal Dummies	Yes	Yes	Yes	Yes	Yes
Sectorial Dummies	Yes	Yes	No	Yes	Yes
Max. VIF	1.430	1.430	1.33	1.430	1.330
Conditional Number	12.354	12.354	15.011	12.354	15.011
Observations	9,853	9,853	3,163	9,853	3,163
Number of Firms	2,405	2,405	1,320	2,405	1,320
R^2/pseudo-R^2	0.296	0.243	0.153	0.668	0.144

*** p<0.01, ** p<0.05, * p<0.1

The results of innovation have been analyzed by a panel Probit model with random effects. In Models 4 and 5 (Table 3), the coefficients of contemporaneous $ECSR_{it}$ and lagged one period $ECSR_{it-1}$ are positive and significant. Therefore, ECSR fosters product and process innovation. These findings support Hypothesis 1.

Table 3. Probit estimations.

	(4)	(5)
	Probit	Probit
	RE	RE
VARIABLES	$ProdInn_{it}$	$ProcInn_{it}$
$ECSR_{it}$	0.606***	0.411***
$ECSR_{it-1}$	0.323***	0.249***
$Size_{t-1}$	0.068***	0.043***
AD_{it-1}	0.821***	0.737***
EXP_{it-1}	-0.025	0.056***
ROA_{it-1}	-0.020	-0.011***

[2] The lambdas of models 2.2 and 3.2 are significant, which confirms the dependence between the decision to perform R&D and the R&D intensity.

SL_{it-1}	-0.783***	0.063
GM_{it}	0.003	0.000
A_{it}	0.606***	0.411***
Constant	0.323***	0.249***
Temporal Dummies	Yes	Yes
Sectorial Dummies	Yes	Yes
Max. VIF	1.960	1.960
Conditional Number	7.150	7.150
Observations	9,196	9,196
Number of Firms	2,123	2,123
R^2/pseudo-R^2	0.162	0.313

*** p<0.01, ** p<0.05, * p<0.1

The coefficients of the variables $Size_{t-1}$, AD_{it-1}, EXP_{it-1}, A_{it} are positive and significant in nearly all models, indicating that these factors contribute positively to innovation. The coefficients of ROA_{it-1} are significant and negative in Models 1, 2, and 3.1, and significant and positive in Model 5. Therefore, a return above industry average reduces the R&D expenditure and increases the probability to generate process innovation. The coefficients of GM_{it} are negative and significant in Models 1 and 4, and positive and significant in Models 2 and 3. Therefore, the group membership facilitates the technological effort; however, it reduces product innovation.

To control the effect of potential endogeneity between innovativeness and ECSR, we propose two complementary methodological approaches: a simultaneous-equations model and a control function method. First, we propose a two simultaneous equations model, explaining TE_{it} and $ECSR_{it}$[3]. A firm will only innovate if $TE_{it}^{*} > 0$, where TE_{it}^{*} is a latent and unobservable variable that measures the contribution of TE_{it} to corporate performance (Equation 1). Similarly, a firm will only engage in ECSR if $ECSR_{it}^{*} > 0$, where $ECSR_{it}^{*}$ is the latent variable that measures the contribution of $ECSR_{it}$ to firm performance (Equation 2).

$$TE_{it} > 0, if\ TE_{it}^{*} = X_{it}'\alpha - \eta_{it} > 0, TE_{it} = 0\ otherwise \quad (1)$$

$$ECSR_{it} = 1, if\ ECSR_{it}^{*} = Z_{it}'\beta - \xi_{it} > 0, ECSR_{it} = 0\ otherwise \quad (2)$$

TE_{it}^{*} and $ECSR_{it}^{*}$ depend on a series of observable factors (X_{it-1}', Z_{it}') as well as on unobservable factors (η_{it}, ξ_{it})[4]. η_{it} and ξ_{it} are correlated, and this will generate a simultaneity problem. We apply the full-information-maximum-likelihood (FIML) for the estimation. This method allows us the simultaneous estimation of a Tobit model when innovation is measured

[3] These simultaneous equation models assume that firms innovate to improve performance (Frondel, Horbach and Rennings, 2008; Levinthal and March 1993; Zahra 1996). The same logic may be applied to expenditures or investments in ECSR (Frondel et al., 2008).

[4] These "disturbances may capture unobserved variables, such as "green" preferences of the management (ξ_{it}) and its attitude towards innovation (η_{it})" (Frondel et al., 2008: 156, brackets not in the original version).

as R&D effort, and two simultaneous Probit estimations when the innovation is measured as product or process innovation.

The results of the simultaneous-equations models are presented in Table 4. In the three recursive model systems, the correlations between the residuals are significant, which confirms the endogeneity of ECSR. These findings confirm the positive impact of ECSR on technological efforts (Model 6), product, and process innovations (Models 7 and 8 respectively). These results confirm the robustness of prior findings after controlling the endogeneity.

Table 4. FIML estimations for the recursive model systems.

	(6)		**(7)**		**(8)**	
	TE_{it}	$ECSR_{it}$	$ProdInnn_{it}$	$ECSR_{it}$	$ProcInnn_{it}$	$ECSR_{it}$
$ECSR_{it}$	13.258***		1.905***		1.747***	0.885***
$ECSR_{it-1}$	-0.170		0.010		0.065**	
TE_{it-1}		0.119***	0.027***	0.019***	0.015***	0.023***
$ProdInn_{it-1}$				0.800***		
$ProcInn_{it-1}$						0.745***
$Size_{t-1}$	0.552***	0.354***	-0.101***	0.354***	-0.074***	0.324***
AD_{it-1}	0.279***	-0.019***	0.037***	-0.023***	0.025***	-0.015**
EXP_{it-1}	0.336	0.444***	-0.062	0.455***	-0.041	0.432***
ROA_{it-1}	-0.299***	-0.038***	0.020***	-0.042***	0.055***	-0.050***
SL_{it-1}	0.020	-0.012	-0.015	-0.002	0.003	-0.007
GM_{it}	0.679**	-0.673***	0.041***	-0.637***	0.297***	-0.670***
A_{it}	0.003	0.002**	-0.001***	0.002**	-0.002***	0.002***
Constant	-14.297***	-1.492***	-1.588***	1.492***	-1.448***	-1.440***
Temporal Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sectorial Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Max. VIF	2,010	1,310	2.030	1.420	2.030	1.470
Conditional Number	13,156	11.672	12.100	10.860	12.100	11.027
Observations	9,853	9,853	9,196	9,196	9,196	9,196
Number of Firms	2,405	2,405	2,123	2,123	2,123	2,123
ρ_{12}	-1.074***		-1.531***		-1.651***	

*** p<0.01, ** p<0.05, * p<0.1

An alternative method to solve the problem of potential endogenous explanatory variables is the control function method (Imbens and Wooldridge, 2007). This approach requires fewer assumptions than the maximum likelihood (Wooldridge, 2015). In the first step, we apply a Probit model to estimate the reduced form[5] of environmental protection ($\hat{v}_{it}$). In the

[5] The model is $Innovativeness_{it} = \gamma_0 + \gamma_1 ECSR_{it} + \gamma_2 X_{it} + u_{it}$. We suppose that $ECSR_{it}$ is an endogenous variable. We have applied the control function method; thus, in the first step, we have estimated the reduced form, which is a Probit model: $ECSR_{it} = \alpha + \beta X_{it} + v_{it}$, where X_{it} is a vector of firm-specific control variables and v_{it} is the error term of reduced form. The endogeneity implies that $u_{it} = \rho v_{it} + e_{it}$, by definition

second step, we include the error terms obtained in the reduced forms ($\hat{v}_{it}$) in the Tobit and Probit models. In Table 5, the coefficients of the variable $ECSR_{it}$ are positive and significant in the Models 9, 10, and 11. Additionally, the coefficient of the same variable lagged one period is positive and significant in Models 10 and 11. The coefficient of error terms estimated $\hat{v}_{it}$is significant, which confirms that ECSR is an endogenous variable. Once the possible biases derived from endogeneity have been controlled, ECSR improves the innovativeness of SMEs. These results are equivalent to those obtained in previous specifications, thus providing additional robustness to our findings.

Table 5. Tobit and Probit estimations with control function method.

VARIABLES	**(9)** *Tobit* RE TE_{it}	**(10)** Probit RE $ProdInnn_{it}$	**(11)** Probit RE $ProcInnn_{it}$
$ECSR_{it}$	17.400***	3.346***	6.525***
$ECSR_{it-1}$	-0.070	0.225***	0.160***
TE_{it-1}		-0.032*	-0.158***
$Size_{t-1}$	-9.030***	-1.779***	-4.164***
AD_{it-1}	0.389***	0.096***	0.124***
EXP_{it-1}	-12.970***	-2.319***	-5.879***
ROA_{it-1}	0.986***	0.213***	0.554***
SL_{it-1}	0.055	0.007	0.046***
GM_{it}	28.857***	5.065***	13.027***
A_{it}	-0.063***	-0.012***	-0.031***
Constant	28.687***	4.787***	15.648***
$\hat{v}_{it}$	45.189***	8.499***	18.727***
Temporal Dummies	Yes	Yes	Yes
Sectorial Dummies	Yes	Yes	Yes
Max. VIF	4.320	6.410	6.410
Conditional Number	25.839	26.669	26.669
Observations	9,853	9,196	9,196
Number of Firms	2,405	2,123	2,123

*** p<0.01, ** p<0.05, * p<0.1

4.2. Dynamic analysis

We perform a dynamic analysis of the effect of ECSR on SMEs' innovativeness. Accordingly, we simultaneously apply a propensity-score matching and a difference-in-difference (DID) estimation. We compare a group of SMEs that initiate ECSR activities (the "treatment group") and a group of SMEs without ECSR activities (the "control group"). We propose the following specifications (Bertrand, Duflo and Mullainathan, 2004):

$E(v_{it}e_{it}) = 0$ and $E(X'_{it}e_{it}) = 0$. In the second step, we included the initial model the error term:
$Innovativeness_{it} = \gamma_0 + \gamma_1 ECSR_{it} + \gamma_2 X_{it} + \rho v_{it} + e_{it}$

$$Innovativeness_{it} = \gamma_0 + \sum_{t=1}^{5} \beta_t T_t + \gamma_1 ECSR_{it} + \sum_{t=1}^{5} \alpha_t\, ECSR_{it} \times T_t + \gamma_2 X_{it} + \varepsilon_{it},$$

where the dependent variables are the three measures of innovativeness (TE_{it}, $ProdInn_{it}$, $ProcInn_{it}$). We include five temporal dummies (T_t) to denote the number of years after the firm starts to implement ECSR actions. The coefficient β_t measures the time effect on innovativeness. The coefficient γ_1 measures the effect of $ECSR_{it}$ on innovativeness, regardless of the years that have passed since the inception of ECSR. The interaction term $ECSR_{it} \times T_t$ identifies the effect of $ECSR_{it}$ on innovativeness *t* years after starting ECSR. The coefficient α_t measures this effect. X_{it} is a vector of firm-specific control variables, and ε_{it} is the error term.

To remove the systematic differences between the treatment and control groups, we apply a propensity-score matching for each year to homogenize both groups. The Hotelling's test confirms the equality of means between both groups for a set of relevant characteristics: technological effort (TE_{it}), size ($Size_{it}$), export intensity (EXP_{it}), advertising (AD_{it}), ROA, age (A_{it}), and slack (SL_{it}) (Table 6).

Table 6. Hotelling's test.

	SMEs starting ECSR					SMEs without ECSR				
Variable	**Obs.**	**Mean**	**S.D.**	**Min.**	**Max.**	**Obs**	**Mean**	**S.D.**	**Min.**	**Max.**
TE_{it}	455	0.986	3.375	0.000	32.067	377	0.757	2.965	0.000	33.366
$Size_{it}$	455	3.602	0.999	0.693	5.513	377	3.423	0.950	0.693	5.493
EXP_{it}	455	0.214	0.293	0.000	1.000	377	0.182	0.027	0.000	0.962
AD_{it}	455	0.790	2.222	0.000	24.600	377	0.805	2.735	0.000	34.500
ROA_{it}	455	1.291	1.103	-0.320	9.422	377	1.331	1.117	-0.043	9.471
A_{it}	455	26.674	17.372	0.000	129.000	377	27.191	16.854	3.000	127.000
SL_{it}	455	1.471	0.2480	1.002	1.991	377	1.465	0.243	1.005	1.973
2-group Hotellling's T-squared= 8.997 $F_{7,824}$=1.276; $p-value$=0.259										

In Model 12 (Table 7), the coefficients of interactions $ECSR_{it} \times T_t$ (α_t) are positive and significant for all years except for year 5. The inception of ECSR activities has a positive impact on technological effort from the first year. Moreover, this impact persists during the first four years. In Model 13, the coefficients α_t are positive and significant for practically all years. In Model 14, the coefficients α_t are positive and significant during the first four years. Therefore, ECSR fosters product and process innovation from the first year, which persists for almost all years. These findings are in line with Hypothesis 2. We demonstrate that the effect of ECSR on innovativeness is sustained over time. These results suggest that ECSR contributes to building technological resources in firms that present continued sustainable activities.

Table 7. Dynamic relationship between ECSR and innovativeness: DID estimation.[6]

VARIABLES	**(12)** TE_{it}	**(13)** $ProdInnn_{it}$	**(14)** $ProcInnn_{it}$
$ECSR_{it} \times T_1$	3.016***	0.071***	0.136***
$ECSR_{it} \times T_2$	3.577***	0.047**	0.112**
$ECSR_{it} \times T_3$	2.326**	0.050	0.175*
$ECSR_{it} \times T_4$	1.910*	0.117***	0.279***
$ECSR_{it} \times T_5$	1.171	0.131**	0.159
Observations	3,488	2,087	2,087
Number of Firms	832	832	832

*** p<0.01, ** p<0.05, * p<0.1

5. Discussion and conclusions

Our longitudinal study based on 2,405 Spanish SMEs confirms that ECSR stimulates firms' innovativeness. This result is robust to different econometric techniques and various approaches to measuring corporate innovativeness. SMEs that promote ECSR improve their innovative profile in terms of input (R&D or technological effort) and output (product and process innovation). Therefore, our findings show how an environmental commitment fosters the building of technological resources in SMEs. Moreover, ECSR has been shown to be valuable for improving innovativeness both in innovative and non-innovative SMEs. This implies that ECSR exercises a dual effect: first, it generates slack resources that complement the existing technological resources; and second, it has the potential to convert a non-innovative firm into an innovative one by developing technological resources.

We have argued that the slack resources generated by ECSR complement the existing resource portfolio of the SME, fostering the building of technological resources. ECSR complements specific features that promote innovation such as flexible managerial structures (Aragón-Correa et al., 2008). Moreover, slack resources can compensate for certain resource constraints (Klewitz and Hansen, 2014). Specifically, ECSR builds trust (Forcadell et al., 2020), which is a key factor for stakeholder reciprocation (Vishwanathan et al., 2020). These arguments serve to bridge a significant gap in the literature related to the effect of ECSR on overall firm innovativeness (beyond green innovation) for the case of SMEs.

In addition, our dynamic analysis provides evidence on the effects of ECSR on innovativeness over time. In particular, we show that the influence of ECSR on innovativeness

[6] We have applied the method proposed by Puhani (2012) to the coefficients in the nonlinear models.

is path-dependent for already innovative SMEs and that, for non-innovative SMEs, the inception of ECSR can lead to the creation of an innovative path (Thrane et al., 2010). Firms that sustain ECSR investments over time can develop technological resources that allow a *continuum* of enhanced innovation. This extends previous research on the time-evolving transformation that sustainable practices can exert on firms' practices (e.g., Inigo and Albareda, 2019).

Our results advance the body of literature initiated by Porter and Van der Linde (1995) and by Hart (1995) in indicating that corporate environmental efforts can yield competitive advantages. We extend that line of thought by showing that ECSR constitutes an important antecedent of competitive advantages based on firms' innovativeness. Additionally, our findings contribute to the literature that jointly analyzes CSR and innovation (McWilliams and Siegel, 2000; Ratajczak and Szutowski, 2016), since ECSR is a particular case within CSR (Lioui and Sharma, 2012). Thus, our study provides a fine-grained analysis of the effects of the CSR environmental dimension on innovation.

Additionally, we enrich existing empirical evidence on the drivers of firm innovativeness (Hult et al., 2004; Rhee et al., 2010), including those related to environmental behavior derived from ECSR. Unlike existing studies that offer a narrower view by focusing on eco-innovations, we prove how ECSR can stimulate organizational innovativeness. This means that a firm can become innovative, or improve their innovativeness, through caring about environmental sustainability beyond eco-innovations. Additionally, our findings suggest the importance of ECSR as a catalyst for innovation in SMEs, in contrast to the extant literature that overlooks the environmental strategies of SMEs. Moreover, we approach innovativeness from the perspective of technological efforts (R&D) and outputs (products and process innovation), in contrast to the few studies on this relationship that are restricted to patents (Li et al., 2020; Wu et al., 2020). Finally, we have shown that ECSR promotes the building of technological resources through a path-dependent process. The influence of ECSR on innovation is sustained over the long term. The development of technological resources requires time and is path-dependent (Garud, Kumaraswamy and Karnøe, 2010; Miller, 2004). A relevant path of development of technological resources emerges from the care of environment.

This study presents future avenues of research. For example, the analysis of how cooperation between firms in performing ECSR actions can stimulate their innovative profile constitutes a promising line of inquiry. The literature investigating innovation has indicated how firm cooperation stimulates innovation (Becker and Dietz, 2004), especially in SMEs (Zeng, Xie and Tam, 2010), and how cooperation in R&D stimulates environmental innovation

(De Marchi, 2012). Finally, future research could also consider other types of innovations that are not related to technological efforts such as business model innovations or marketing.

Our empirical findings offer implications for policymakers since encouraging green strategies or stricter environmental regulations could benefit society, the environment, and the private sector by enhancing their innovativeness. Traditionally, governments target the stimulation of innovation through R&D subsidies (Zúñiga et al., 2014). Nevertheless, public support to promote corporate environmental strategies could drive economic gains based on resource efficiency and simultaneously generate competitive advantages through innovation. Additionally, our findings provide empirical support for the instrumental value of ECSR. Managerial decisions aimed at increasing environmental-care initiatives constitute a means to build or scale-up firms' innovativeness. Thus, managers should consider that a good path towards innovativeness includes environmentally friendly strategies.

References

Aragón-Correa, J. A. (1998). Strategic proactivity and firm approach to the natural environment. *Academy of Management Journal*, *41*(5), 556-567.

Aragón-Correa, J. A., & Sharma, S. (2003). A contingent resource-based view of proactive corporate environmental strategy. *Academy of Management Review*, 28(1), 71-88.

Aragón-Correa, J. A., Hurtado-Torres, N., Sharma, S., & García-Morales, V. J. (2008). Environmental strategy and performance in small firms: A resource-based perspective. *Journal of Environmental Management*, *86*(1), 88-103.

Asongu, J. J. (2007). Innovation as an argument for corporate social responsibility. *Journal of Business and Public Policy*, *1*(3), 1-21.

Babiak, K., & Trendafilova, S. (2011). CSR and environmental responsibility: motives and pressures to adopt green management practices. *Corporate Social Responsibility and Environmental Management*, *18*(1), 11-24.

Bansal, P. (2005). Evolving sustainably: A longitudinal study of corporate sustainable development. *Strategic Management Journal*, *26*(3), 197-218.

Barnett, M. L. (2007). Stakeholder influence capacity and the variability of financial returns to corporate social responsibility. *Academy of Management Review*, 32(3), 794-816.

Baysinger, B., & Hoskisson, R. E. (1989). Diversification strategy and R&D intensity in multiproduct firms. *Academy of Management Journal*, *32*(2), 310-332.

Becker, W., & Dietz, J. (2004). R&D cooperation and innovation activities of firms—evidence for the German manufacturing industry. *Research Policy*, 33(2), 209-223.

Belsley, D. A. (1991). A guide to using the collinearity diagnostics. *Computer Science in Economics and Management*, *4*(1), 33-50

Berrone, P., Cruz, C., Gomez-Mejia, L. R., & Larraza-Kintana, M. (2010). Socioemotional wealth and corporate responses to institutional pressures: Do family-controlled firms pollute less? *Administrative Science Quarterly*, *55*(1), 82-113.

Bertrand, M., Duflo, E., & Mullainathan, S. (2004). How much should we trust differences-in-differences estimates? *The Quarterly Journal of Economics*, 119(1), 249-275

Bhattacharya, C. B., & Sen, S. (2003). Consumer–company identification: A framework for understanding consumers' relationships with companies. *Journal of Marketing*, 67(2), 76-88.

Bocquet, R., Le Bas, C., Mothe, C., & Poussing, N. (2013). Are firms with different CSR profiles equally innovative? Empirical analysis with survey data. *European Management Journal*, *31*(6), 642-654.

Bos-Brouwers, H. E. J. (2010). Corporate sustainability and innovation in SMEs: evidence of themes and activities in practice. *Business Strategy and the Environment*, *19*(7), 417-435.

Brunnermeier, S. B., & Cohen, M. A. (2003). Determinants of environmental innovation in US manufacturing industries. *Journal of Environmental Economics and Management*, *45*(2), 278-293.

Cai, W. G., & Zhou, X. L. (2014). On the drivers of eco-innovation: empirical evidence from China. *Journal of Cleaner Production*, *79*, 239-248.

Cameron, A. C., & Trivedi, P. K. (2005). Multinomial models. *Microeconometrics, Methods and Applications*, 113-146.

Chiu, Y. C., Lai, H. C., Lee, T. Y., & Liaw, Y. C. (2008). Technological diversification, complementary assets, and performance. *Technological Forecasting and Social Change*, 75(6), 875-892.

Choi, B., & La, S. (2013). The impact of corporate social responsibility (CSR) and customer trust on the restoration of loyalty after service failure and recovery. *Journal of Services Marketing*, 27(3), 223-233.

Chuang, S. P., & Huang, S. J. (2018). The effect of environmental corporate social responsibility on environmental performance and business competitiveness: The mediation of green information technology capital. *Journal of Business Ethics*, *150*(4), 991-1009.

Corsini, F., Appio, F. P., & Frey, M. (2019). Exploring the antecedents and consequences of environmental performance in micro-enterprises: The case of the Italian craft beer industry. *Technological Forecasting and Social Change*, 138, 340-350.

Cuerva, M. C., Triguero-Cano, Á., & Córcoles, D. (2014). Drivers of green and non-green innovation: empirical evidence in Low-Tech SMEs. *Journal of Cleaner Production*, *68*, 104-113.

Dangelico, R. M., Pujari, D., & Pontrandolfo, P. (2017). Green product innovation in manufacturing firms: A sustainability-oriented dynamic capability perspective. *Business Strategy and the Environment*, 26(4), 490-506.

De Marchi, V. (2012). Environmental innovation and R&D cooperation: Empirical evidence from Spanish manufacturing firms. *Research Policy*, 41(3), 614-623.

Del Brìo, J. A., & Junquera, B. (2003). A review of the literature on environmental innovation management in SMEs: implications for public policies. *Technovation*, *23*(12), 939-948.

Del Río, P., Morán, M. Á. T., & Albiñana, F. C. (2011). Analysing the determinants of environmental technology investments. A panel-data study of Spanish industrial sectors. *Journal of Cleaner Production*, *19*(11), 1170-1179.

Dhaliwal, D., Li, O. Z., Tsang, A., & Yang, Y. G. (2014). Corporate social responsibility disclosure and the cost of equity capital: The roles of stakeholder orientation and financial transparency. *Journal of Accounting and Public Policy*, 33(4), 328-355.

Dixon-Fowler, H. R., Slater, D. J., Johnson, J. L., Ellstrand, A. E., & Romi, A. M. (2013). Beyond "does it pay to be green?" A meta-analysis of moderators of the CEP–CFP relationship. *Journal of Business Ethics*, *112*(2), 353-366.

Edwards, T., Delbridge, R., & Munday, M. (2005). Understanding innovation in small and medium-sized enterprises: a process manifest. *Technovation*, 25, 1119–1120.

Esteve-Pérez, S., & Rodríguez, D. (2013). The dynamics of exports and R&D in SMEs. *Small Business Economics*, *41*(1), 219-240.

Feldman, M. P. (1994). Knowledge complementarity and innovation. *Small Business Economics*, 6(5), 363-372.

Flammer, C. (2013). Corporate social responsibility and shareholder reaction: The environmental awareness of investors. *Academy of Management Journal*, *56*(3), 758-781.

Forcadell, F. J., Aracil, E., & Ubeda, F. Using reputation for corporate sustainability to tackle banks digitalization challenges. *Business Strategy and the Environment*, 1-13.

Frondel, M., Horbach, J., and Rennings, K. (2008). What triggers environmental management and innovation? Empirical evidence for Germany. *Ecological Economics*, 66(1), 153-160.

García, F., Avella, L., & Fernández, E. (2012). Learning from exporting: The moderating effect of technological capabilities. *International Business Review*, 21(6), 1099-1111.

Garud, R., Kumaraswamy, A., & Karnøe, P. (2010). Path dependence or path creation?. *Journal of Management Studies*, 47(4), 760-774.

Golovko, E., & Valentini, G. (2014). Selective learning-by-exporting: Firm size and product versus process innovation. *Global Strategy Journal*, *4*(3), 161-180.

Golovko, E., & Valentini, G. (2011). Exploring the complementarity between innovation and export for SMEs' growth. *Journal of International Business Studies*, *42*(3), 362-380.

González-Benito, J., & González-Benito, Ó. (2005). Environmental proactivity and business performance: an empirical analysis. *Omega*, *33*(1), 1-15.

Greve, H. R. (2003). A behavioral theory of R&D expenditures and innovations: Evidence from shipbuilding. *Academy of Management Journal*, 46(6), 685-702.

Guoyou, Q., Saixing, Z., Chiming, T., Haitao, Y., & Hailiang, Z. (2013). Stakeholders' influences on corporate green innovation strategy: a case study of manufacturing firms in China. *Corporate Social Responsibility and Environmental Management*, 20(1), 1-14.

Hadj, T. B. (2020). Effects of corporate social responsibility towards stakeholders and environmental management on responsible innovation and competitiveness. *Journal of Cleaner Production*, 250, 119490.

Hagedoorn, J. (1993). Understanding the rationale of strategic technology partnering: interorganizational modes of cooperation and sectoral differences. *Strategic Management Journal*, 14, 371–385.

Halme, M., & Laurila, J. (2008). Philantropy, integration or innovation? Exploring the financial and societal outcomes of different corporate responsibility. *Journal of Business Ethics, 84, 325-339.*

Hammann, E. M., Habisch, A., & Pechlaner, H. (2009). Values that create value: socially responsible business practices in SMEs–empirical evidence from German companies. *Business Ethics: A European Review*, 18(1), 37-51.

Harjoto, M. A., & Jo, H. (2015). Legal vs. normative CSR: Differential impact on analyst dispersion, stock return volatility, cost of capital, and firm value. *Journal of Business Ethics*, 128(1), 1-20.

Hart, S. L. (1995). A natural-resource-based view of the firm. *Academy of Management Review, 20*(4), 986-1014.

Helfat, C. E. (1997). Know-how and asset complementarity and dynamic capability accumulation: the case of R&D. *Strategic Management Journal*, 18(5), 339-360.

Helfat, C.E. (1997). Know-howand asset complementarity and dynamic capability accumulation: the case of R&D. Strategic Management Journal, 18(5), 339–360.

Heras-Saizarbitoria, I., Molina-Azorín, J. F., & Dick, G. P. (2011). ISO 14001 certification and financial performance: selection-effect versus treatment-effect. *Journal of Cleaner Production*, *19*(1), 1-12.

Horbach, J. (2008). Determinants of environmental innovation—New evidence from German panel data sources. *Research Policy*, 37(1), 163-173.

Hult, G. T. M., Hurley, R. F., & Knight, G. A. (2004). Innovativeness: Its antecedents and impact on business performance. *Industrial Marketing Management*, 33(5), 429-438.

Hurley, R. F., & Hult, G. T. M. (1998). Innovation, market orientation, and organizational learning: an integration and empirical examination. *Journal of Marketing*, *62*(3), 42-54.

Imbens, G., and Wooldridge, J. (2007). What's New in Econometrics: Difference-in-Differences Estimation. Lecture Notes, 10.

Inigo, E. A., & Albareda, L. (2019). Sustainability oriented innovation dynamics: Levels of dynamic capabilities and their path-dependent and self-reinforcing logics. *Technological Forecasting and Social Change*, 139, 334-351.

Jaffe, A.B., and Palmer, K. (1997). Environmental regulation and innovation: a panel data study. *The Review of Economics and Statistics*, 97 (4), 610–619.

Judge, W. Q., & Douglas, T. J. (1998). Performance implications of incorporating natural environmental issues into the strategic planning process: An empirical assessment. *Journal of Management Studies, 35*(2), 241-262.

Kazadi, K., Lievens, A., & Mahr, D. (2016). Stakeholder co-creation during the innovation process: Identifying capabilities for knowledge creation among multiple stakeholders. *Journal of Business Research*, 69(2), 525-540.

Kesidou, E., & Demirel, P. (2012). On the drivers of eco-innovations: Empirical evidence from the UK. *Research Policy*, 41(5), 862-870.

Klewitz, J., & Hansen, E. G. (2014). Sustainability-oriented innovation of SMEs: a systematic review. *Journal of Cleaner Production*, 65, 57-75.

Kutner, M.H., Nachtsheim, C.J., and Neter, J. (2004). *Applied Linear Regression Models* (fourth ed.), McGraw-Hill Irwin.

Lee, N., Sameen, H., & Cowling, M. (2015). Access to finance for innovative SMEs since the financial crisis. *Research Policy*, 44(2), 370-380.

Lee, S., Park, G., Yoon, B., & Park, J. (2010). Open innovation in SMEs—An intermediated network model. *Research Policy*, 39(2), 290-300.

Leonidou, C. N., & Skarmeas, D. (2017). Gray shades of green: Causes and consequences of green skepticism. *Journal of Business Ethics*, *144*(2), 401-415.

Levinthal, D. A., and March, J. G. (1993). The myopia of learning. *Strategic Management Journal*, 14(S2), 95-112.

Li, Z., Liao, G., & Albitar, K. (2020). Does corporate environmental responsibility engagement affect firm value? The mediating role of corporate innovation. *Business Strategy and the Environment*, 29(3), 1045-1055.

Link, S., & Naveh, E. (2006). Standardization and discretion: does the environmental standard ISO 14001 lead to performance benefits?. *IEEE transactions on Engineering Management*, *53*(4), 508-519.

Lioui, A., & Sharma, Z. (2012). Environmental corporate social responsibility and financial performance: Disentangling direct and indirect effects. *Ecological Economics*, *78*, 100-111.

Luo, X., & Du, S. (2015). Exploring the relationship between corporate social responsibility and firm innovation. *Marketing Letters*, *26*(4), 703-714.

Lyon, T. P., & Maxwell, J. W. (2008). Corporate social responsibility and the environment: A theoretical perspective. *Review of Environmental Economics and Policy*, *2*(2), 240-260.

Madueño, J. H., Jorge, M. L., Conesa, I. M., & Martínez-Martínez, D. (2016). Relationship between corporate social responsibility and competitive performance in Spanish SMEs: Empirical evidence from a stakeholders' perspective. *BRQ Business Research Quarterly*, 19(1), 55-72.

Martín-de Castro, G., Delgado-Verde, M., Navas-López, J. E., & Cruz-González, J. (2013). The moderating role of innovation culture in the relationship between knowledge assets and product innovation. *Technological Forecasting and Social Change*, 80(2), 351-363.

Massa, S., & Testa, S. (2008). Innovation and SMEs: Misaligned perspectives and goals among entrepreneurs, academics, and policy makers. *Technovation*, *28*(7), 393-407.

Mazzanti, M., & Zoboli, R. (2009). Embedding environmental innovation in local production systems: SME strategies, networking and industrial relations: evidence on innovation drivers in industrial districts. *International Review of Applied Economics*, *23*(2), 169-195.

McWilliams, A., & Siegel, D. (2000). Corporate social responsibility and financial performance: correlation or misspecification?. *Strategic Management Journal*, *21*(5), 603-609.

McWilliams, A., & Siegel, D. (2001). Corporate social responsibility: A theory of the firm perspective. *Academy of Management Review*, *26*(1), 117-127.

Miller, D. J. (2004). Firms' technological resources and the performance effects of diversification: a longitudinal study. *Strategic Management Journal*, 25(11), 1097-1119.

Mytelka, L. (1991). Crisis, technological change and the strategic alliance. In: Mytelka, L. (Ed.), Strategic Partnerships and the World Economy. Printer, London, pp.7–34.

Nidumolu, R., Prahalad, C. K., & Rangaswami, M. R. (2009). Why sustainability is now the key driver of innovation. *Harvard Business Review*, *87*(9), 56-64.

Noci, G., & Verganti, R. (1999). Managing ‘green’product innovation in small firms. *R&D Management*, *29*(1), 3-15.

OECD (2009). Declaration on Green Growth. Adopted at the OECD Meeting of the Council at Ministerial Level on 25 June 2009. Paris.

Orlitzky, M., Schmidt, F. L., & Rynes, S. L. (2003). Corporate social and financial performance: A meta-analysis. *Organization Studies*, *24*(3), 403-441.

Pesaran, M.H. (2015). *Time series and panel data econometrics*. Oxford University Press.

Porter, M. E., & Van der Linde, C. (1995). Toward a new conception of the environment-competitiveness relationship. *Journal of Economic Perspectives*, *9*(4), 97-118.

Puhani, P. A. (2012). The treatment effect, the cross difference, and the interaction term in nonlinear “difference-in-differences” models. *Economics Letters*, 115(1), 85-87.

Rahman, N., & Post, C. (2012). Measurement issues in environmental corporate social responsibility (ECSR): Toward a transparent, reliable, and construct valid instrument. *Journal of Business Ethics*, *105*(3), 307-319.

Ratajczak, P., & Szutowski, D. (2016). Exploring the relationship between CSR and innovation. *Sustainability Accounting, Management and Policy Journal*.

Rehfeld, K.M., Rennings, K., & Ziegler, A. (2007). Integrated product policy and environmental product innovations: An empirical analysis. *Ecological Economics*, 61, 91-100.

Ren, S., Hu, Y., Zheng, J., & Wang, Y. (2020). Emissions trading and firm innovation: Evidence from a natural experiment in China. *Technological Forecasting and Social Change*, 155.

Rennings, K., Ziegler, A., Ankele, K., Hoffmann, E., & Nill, J. (2006). The influence of different characteristics of the EU environmental management and auditing scheme on technical environmental innovations and economic performance. *Ecological Economics*, 57, 45-59.

Rhee, J., Park, T., & Lee, D. H. (2010). Drivers of innovativeness and performance for innovative SMEs in South Korea: Mediation of learning orientation. *Technovation*, 30(1), 65-75.

Rothwell, R., & Dodgson, M. (1994). Innovation and size of firm. In: Dodgson, M. (Ed.), Handbook of Industrial Innovation. Edward Elgar Publishing Limited, Aldershot, pp. 310–324.

Russo, A., & Tencati, A. (2009). Formal vs. informal CSR strategies: Evidence from Italian micro, small, medium-sized, and large firms. *Journal of Business Ethics*, 85(2), 339-353.

Russo, M. V., & Fouts, P. A. (1997). A resource-based perspective on corporate environmental performance and profitability. *Academy of Management Journal*, *40*(3), 534-559.

Rycroft, R. W. (2007). Does cooperation absorb complexity? Innovation networks and the speed and spread of complex technological innovation. *Technological Forecasting and Social Change*, 74(5), 565-578.

Salomon, R. M. (2006). Spillovers to foreign market participants: assessing the impact of export strategies on innovative productivity. *Strategic organization*, *4*(2), 135-164.

Salomon, R., & Jin, B. (2008). Does knowledge spill to leaders or laggards? Exploring industry heterogeneity in learning by exporting. *Journal of International Business Studies*, *39*(1), 132-150.

Senge, P., Smith, B., Kruschwitz, N., Laur, J., & Schley, S. (2009). The Necessary Revolution: How Individuals and Organizations Are Working Together to Create a Sustainable World. Random House. New York

Severo, E. A., de Guimarães, J. C. F., & Dorion, E. C. H. (2017). Cleaner production and environmental management as sustainable product innovation antecedents: a survey in Brazilian industries. *Journal of Cleaner Production*, *142*, 87-97.

Sharma, S., & Vredenburg, H. (1998). Proactive corporate environmental strategy and the development of competitively valuable organizational capabilities. *Strategic Management Journal*, *19*(8), 729-753.

Shaver, M.J. (2011). The benefits of geographic sales diversification: How exporting facilitates capital investment. *Strategic Management Journal*, *32*(10), 1046-1060.

Shrivastava, P. (1995). The role of corporations in achieving ecological sustainability. *Academy of Management Review*, *20*(4), 936-960.

Shu, C., Zhou, K. Z., Xiao, Y., & Gao, S. (2016). How green management influences product innovation in China: The role of institutional benefits. *Journal of Business Ethics*, *133*(3), 471-485.

Singh, K. (1997). The impact of technological complexity and interfirm cooperation on business survival. *Academy of Management Journal*, 40(2), 339-367.

Singh, S. K., Del Giudice, M., Chierici, R., & Graziano, D. (2020). Green innovation and environmental performance: The role of green transformational leadership and green human resource management. *Technological Forecasting and Social Change*, 150.

Skeels, C. L., and Vella, F. (1999). A Monte Carlo investigation of the sampling behavior of conditional moment tests in Tobit and Probit models. *Journal of Econometrics*, *92*(2), 275-294.

Stern, N. (2007). *The economics of climate change: the Stern review*. Cambridge university press.

Tang, M., Walsh, G., Lerner, D., Fitza, M. A., & Li, Q. (2018). Green innovation, managerial concern and firm performance: An empirical study. *Business Strategy and the Environment*, *27*(1), 39-51.

Teece, D. (1986). Profiting from technological innovation. *Research Policy*, 15(6), 285–305.

Teece, D. (2006). Reflections on “profiting from innovation”. *Research Policy*, 35(8), 1131-1146.

Teece, D., Peteraf, M., & Leih, S. (2016). Dynamic capabilities and organizational agility: Risk, uncertainty, and strategy in the innovation economy. *California Management Review*, 58(4), 13-35.

Thrane, S., Blaabjerg, S., & Møller, R. H. (2010). Innovative path dependence: Making sense of product and service innovation in path dependent innovation processes. *Research Policy*, 39(7), 932-944.

Torugsa, N. A., O'Donohue, W., & Hecker, R. (2012). Capabilities, proactive CSR and financial performance in SMEs: Empirical evidence from an Australian manufacturing industry sector. *Journal of Business Ethics,* 109(4), 483-500.

Vishwanathan, P., van Oosterhout, H., Heugens, P. P., Duran, P., & Van Essen, M. (2020). Strategic CSR: a concept building meta-analysis. *Journal of Management Studies,* 57(2), 314-350.

Wagner, M. (2010). Corporate social performance and innovation with high social benefits: A quantitative analysis. *Journal of Business Ethics*, *94*(4), 581-594.

Weyzig, F. (2009). Political and economic arguments for corporate social responsibility: Analysis and a proposition regarding the CSR agenda. *Journal of Business Ethics*, *86*(4), 417-428.

Winston, A. S. (2009). Green Recovery: Get Lean, Get Smart, and Emerge from the Downturn on Top. Harvard Business Press. Boston.

Wooldridge, J. M. (2015). Control function methods in applied econometrics. *Journal of Human Resources*, *50*(2), 420-445.

Wu, W., Liang, Z., & Zhang, Q. (2020). Effects of corporate environmental responsibility strength and concern on innovation performance: The moderating role of firm visibility. *Corporate Social Responsibility and Environmental Management,* 27(3), 1487-1497.

Xu, X., Zeng, S., & Chen, H. (2018). Signaling good by doing good: How does environmental corporate social responsibility affect international expansion?. *Business Strategy and the Environment*, *27*(7), 946-959.

Yang, D., Wang, A. X., Zhou, K. Z., & Jiang, W. (2019). Environmental strategy, institutional force, and innovation capability: A managerial cognition perspective. *Journal of Business Ethics*, *159*(4), 1147-1161.

Yang, J., Zhang, F., Jiang, X., & Sun, W. (2015). Strategic flexibility, green management, and firm competitiveness in an emerging economy. *Technological Forecasting and Social Change,* 101, 347-356.

Zahra, S. A. (1996). Technology strategy and financial performance: Examining the moderating role of the firm's competitive environment. *Journal of Business Venturing*, *11*(3), 189-219.

Zeng, S. X., Xie, X. M., & Tam, C. M. (2010). Relationship between cooperation networks and innovation performance of SMEs. *Technovation,* 30(3), 181-194.

Zúñiga-Vicente, J. Á., Alonso-Borrego, C., Forcadell, F. J., & Galán, J. I. (2014). Assessing the effect of public subsidies on firm R&D investment: a survey. *Journal of Economic Surveys*, 28(1), 36-67.

Author Biographies

Dr. Francisco Javier Forcadell is associate professor of management in the Rey Juan Carlos University, and professor in ESIC Business and Marketing School. His research and teaching revolve primarily around Strategic Management and Corporate Social Responsibility. He is the author of some international publications, focusing on diverse aspects of CSR, innovation, and corporate strategy, including *Research Policy*, *Long Range Planning*, *Journal of World Business*, *Business Strategy and the Environment*, *Corporate Social Responsibility and Environmental Management*, *Journal of Business Ethics*, *Business Ethics: A European Review*, *Journal of Economic Surveys*, and S*cientometrics*.

Dr. Fernando Úbeda is assistant professor of Finance in Universidad Autónoma de Madrid. Ph.D. in Finance and Master in International Business. I have different academic papers in international business, strategy, technology, and banking. I collaborate with the Spanish State Research Agency.

Dr. Elisa Aracil is a Professor of Economics at Universidad Pontificia-ICADE in Madrid. She has built her career in a variety of roles in the investment banking industry and in the academic world. Her research focuses on economic development, sustainable finance, sustainable banks, Corporate Social Responsibility, Environmental related innovations, digitalization, and the progress towards the Sustainable Development Goals. Her works have been published in *Business Strategy & the Environment, Corporate Social Responsibility and Environmental Management, Business Ethics: A European Review, International Journal of Emerging Markets* and *Global Policy,* among other Journals.