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Corporate environmental and financial performance: a multivariate approach

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Abstract

Purpose – The aim of this paper is to evaluate the significance of the link between corporate environmental and financial performance in order to show managers how an adequate management of environmental factors could contribute to the financial success of the firm.

Design/methodology/approach – The paper analyses the environmental and financial performance of a sample of 230 European companies. Under the stakeholder approach, the commitment to environmental performance is analysed and linked with the firms' financial improvement. The paper proposes a partial least squares model (PLS) for measuring corporate environmental and financial performance that seems to be the first time which has been applied in the field.

Findings – The results support the idea that enterprises which obtained higher rates of environmental performance show better financial performance levels in the future.

Research limitations/implications – The lack of a long series of environmental performance data for organisations is an obstacle for a broader analysis. This research shows the usefulness of the multivariate modelling for analysing the environmental and financial performance of businesses.

Practical implications – In practice, this research may show managers the need of taking into account the environmental management factors when configuring the strategic policy of the firm and how environmental management can impact to the financial success of the firms.

Originality/value – The use of PLS modelling for measuring environmental and financial performance theoretical concepts and considering a sample of European companies for the empirical analysis.

Keywords Corporate governance, Environmental management, Financial performance, Stakeholder analysis, Europe

Paper type Research paper

1. Introduction

The aim of this research is to provide more debate to the literature on the relationship between the degree of corporate environmental performance (CEP) and that of corporate financial performance (CFP). Implications of this research will provide useful information for managers in order to deal with environmental factors at the strategic management level and to evaluate how they will contribute to the success of the firm. Most of the studies in the field are focused on analysing this relationship for

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North American firms. A relevant contribution of the present work is that it considers a sample of European companies for the empirical research.

Most of the literature on this subject considers CEP solely through the environmental outputs generated by the different companies. Records of gas emissions (Reilly, 1992; Hughes, 2000), rankings of (more or less) polluting companies such as *Fortune*'s corporate reputation index (Conine and Madden, 1987; McGuire *et al.*, 1988; Fombrun and Shanley, 1990), penalties assessed for violations of environmental regulations (Vasanthakumar, 1999) or environmental disclosure (ED) (Al-Tuwaijri *et al.*, 2004; Dasgupta *et al.*, 2006; Cormier and Magnan, 2007; Moneva *et al.*, 2007; Moneva and Ortas, 2008) have been the proxies most often used for modelling CEP. Such a diversity of univariate models for measuring the CEP has not helped to lay a strong empirical foundation for testing the possible links between CEP and CFP.

Thus, it seems reasonable to suppose that a firm's CEP should be subject to a deeper review of its management mechanisms, considering its strategic management and its commitment to sustainable development. Consequently, the measuring of CEP must include both the outputs generated by the system (which may have a significant impact on the environment) and the proactive environmental policies implemented within the organization. This paper contributes to the existing literature in the field by considering both internal and external proxies of CEP in order to obtain a more realistic and robust measurement of the CEP construct. Other relevant contribution of this research is its use of a multidimensional perspective of the CEP and CFP dimensions by means of a partial least squares model (PLS), this being the first time that it has been applied in this field.

The rest of the paper is structured as follows. The next section shows the reader the main literature in the area and sets forth the theoretical framework along with the hypothesis to be tested. Section 3 describes the methodology of the empirical work and the sample delimitation procedure. Section 4 develops the model applied in order to measure CEP and CFP. Section 5 summarizes the main results obtained in the estimation of the different theoretical factors, as well as the fine-tuning of the measurement scales. Section 6 summarizes the hypothesis testing and the main findings. Finally, the main conclusions and implications of the paper are covered in the last section.

2. Literature review and hypothesis

The concept of sustainable development, first introduced by the Brundtland Commission in 1987, is based on the idea of meeting the needs of the present without compromising the ability of future generations to meet their own needs. This concept was progressively introduced into strategic management considering factors such as environmental preservation, social well-being or human rights (Moneva *et al.*, 2007). This involves significant changes in the traditional managerial model, mainly focused on the idea of maximizing the shareholders' value. In this sense, Friedman (1962) asserts that "a company's sole responsibility appears to be only to maximize profits in compliance with the law". Moreover, Friedman (1970) reinforces this argument considering that "the manager's only responsibility is to conduct the business in accordance with the shareholders desires to make as much money as possible conforming to the basic rules of society".

Later, in the 1980, Freemans' (1984) seminal work set the basis for a new managerial model. The so-called stakeholder approach introduces some factors previously ignored.

The different stakeholders (public administrations, environment, customers, shareholders, employees, etc.) demands are considered. Nowadays, it is widely recognized that corporations need to act in a socially responsible way in order to contribute to social well-being and competitiveness and financial success of the firm. Freeman (2008) states:

> [. . .] Does that mean that maximizing profits is the goal or purpose of the corporation? Absolutely not. I believe that that is an outcome of a well-managed company, and stakeholder theory is an idea about what it means to be well-managed.

Also, Wood (2008) considers that:

> [. . .] corporations that cannot earn profits legally, ethically, and responsibly do not deserve to survive, nor can our planet afford for business to continue to treat their stakeholders as just another environmental factor to be managed.

Analyzing these considerations, it seems that business and ethics are two factors that need to be jointly considered (Freeman, 2008).

In practice, the stakeholder approach has been progressively considered by organizations worldwide during the last decade. Furthermore, it is shown a growing interest by several social and institutional agents in measuring the level of corporate social and environmental performance (CSEP). Freeman's statement anticipated later research on the link between social responsibility and financial performance and suggested a positive correlation between the two in the long run (van Beurder and Gössling, 2008). However, research carried out into the relation between CEP and CFP has not yielded conclusive results (Chen and Metcalf, 1980; Hart and Gautum, 1996; Filbeck and Gorman, 2004; Moneva *et al.*, 2007), there being a considerable divergence both as regards the sign and the significance of the relation. The main reasons for obtaining the differences in the sign of the relationship, when linking CEP and CFP, are the different methodologies used for measuring these constructs, along with the varying time periods and geographic areas considered. As examples of this multitude of proxies for modelling CEP and CFP, see Orlitzky *et al.* (2003) and van Beurder and Gössling (2008). The main problem for the obtaining of non-significant results is the stakeholder mismatching effect (Wood and Jones, 1995). This effect appears when there are linked dependent and independent variables related to different stakeholder groups.

Nevertheless, the most recent meta-analyses analysing the relationship between corporate social performance (CSP) or CEP and CFP confirms the idea that they are positively linked (Roman *et al.*, 1999; Orlitzky *et al.*, 2003; Margolis and Walsh, 2003; Wu, 2006; van Beurden and Gössling, 2008). Bearing these issues in mind, this paper seeks to add more debate when linking CEP and CFP latent constructs. Furthermore, the following hypothesis is proposed for testing:

H0. Leader companies in CEP commitment levels will not improve their CFP significantly in the future.

Rejecting the *H0* would inform us that firms that included CEP issues in their strategic management policies would obtain a competitive advantage in the mid/long-term, significantly increasing their CFP levels. In other words, improving environmental performance would induce cost savings and increase sales and, thus, improve firms' financial performance (Schaltegger and Synnestvedt, 2002).

3. Research method and sample definition

As mentioned in Section 1, a PLS model has been applied for modelling both the CEP and CFP constructs. Generically, PLS models provide high flexibility (Wold, 1980) and have been called second-generation multivariate analysis models (Fornell, 1982). Their main advantage is that they facilitate working with both observable variables and latent constructs. They have several advantages over models involving structural equations based on the covariance matrix like Lisrel models or other structural equation modelling (SEM) approaches (Wold, 1980). First, they present fewer restrictions in the sample selection (Chin, 1998b). Second, the measurement scales of the variables or indicators do not have to accomplish any specific requirements (Fornell and Bookstein, 1982). Moreover, PLS modelling does not require a normal distribution of the initial variables or any other known statistical distribution (Falk and Miller, 1992). The enhanced flexibility offered by PLS models makes them suitable for application in this field due to the complexity of the CEP and CFP constructs.

A sample of European companies has been selected for the empirical analysis. The CEP indicators are from the year 2004, while those for CFP are collected from the 2005 to 2007 period. The use of this time lapse is intended to overcome the limitations found in works based on short-term relations, which may offer contradictory results in view of the small variations in the period they contemplate. Additionally, considering three years of CFP data will ensure the robustness of the results.

A two-stage procedure was adopted in order to ensure the representativeness of the sample. First, a list of firms was obtained that was sufficiently representative of the European economic setting so as to rule out any possible bias of a geographical nature. A total of 18 European countries were represented in the final sample. The spatial delimitation of the sample can be seen in Table I. In the second stage, the ten most representative economic sectors of each region were considered in order to minimize any possible bias of a sectoral nature (Table I).

The sample consists of 230 European companies, which exceeds the requirements for PLS modelling, and it can therefore be assumed that the estimations will show the best parameters of the population (Chin *et al.*, 2003).

4. Measuring corporate environmental and financial performance

The main problem that arises in similar studies is the difficulty in measuring the CEP construct. In recent years, four models have been developed to carry out this task (Orlitzky *et al.*, 2003): CEP disclosures, CEP reputation ratings, social audits and managerial CEP principles and values. In this paper, social audit proxies have been selected to measure the companies' CEP (Fogler and Nutt, 1975; Spicer, 1978). While most of the research in the area draws only on univariate econometric models to measure companies' CEP, this paper contributes to the literature by analysing both internal management procedures and outputs, or final results, with the aim of developing a more exhaustive modelling of the CEP factor. The multivariate approach proposed for measuring CEP and CFP latent constructs will minimize the bias of the incorrect exclusion of some variables for both dimensions.

The secondary source of data for measuring CEP has been provided by Analistas Internacionales en Sostenibilidad (AIS) and Sustainable Investment Research International Company (SiRi Co.). Their mission is to obtain a measure of the capacity and commitment of the management of different firms. For this purpose,

	Frequency	%
Country		
Austria	3	1.30
Belgium	6	2.61
Denmark	5	2.17
Finland	6	2.61
France	27	11.74
Germany	29	12.61
Greece	1	0.43
Ireland	3	1.30
Italy	6	2.61
The Netherlands	9	3.91
Norway	6	2.61
Poland	1	0.43
Portugal	4	1.74
Russian Federation	1	0.43
Spain	12	5.22
Sweden	13	5.65
Switzerland	46	20.00
UK	52	22.61
Sectors		
Consumer discretionary	48	20.87
Consumer staples	23	10.00
Energy	12	5.22
Financial	8	3.48
Health care	21	9.13
Industrial	45	19.57
Information technology	18	7.83
Material	29	12.61
Telecommunication services	14	6.09
Utilities	12	5.22

Table I.
Sample delimitation

they draw up ratings evaluating the transparency, policies and management systems of the companies regarding social and environmental issues. The construction of the ratings is based on the widely recognized methodology introduced by SiRi Co., a recognized international organization within the field of socially responsible investment (Appendix 1).

The database for the empirical work is made up of 23 reflective indicators, which are related to some CEP dimensions (Appendix Table AI). These indicators refer to the level of performance achieved by the firms in the different CEP dimensions, such as the systems, processes and mechanisms of environmental management. Each indicator is represented by a Likert scale, where a high or low degree of performance on each indicator is quantified by the highest (ten) or lowest (0) mark. Some studies have used similar databases in research about corporate social responsibility (CSR) issues, such as KLD Research & Analytics ratings (Graves and Waddock, 1994; Griffin and Mahon, 1997; Waddock and Graves, 1997; Greening and Turban, 2000), due to the good quality of their rating system (Hillman and Keim, 2001). In order to measure CFP, the widely known AMADEUS database was provided by Bureau van Dijk (www.bvdep.com/).

4.1 Multivariate modelling

The selection of a multivariate model for measuring CEP and CFP enables us to overcome the low level of significance obtained by the unifactorial models commonly used. Besides, by obtaining the underlying factors through observable variables, the taxonomy of CEP and CFP is ensured, which appears to adopt a multivariate character (Carroll, 1979). By means of the procedure set forth above, it is possible to obtain constructs that are not directly observable and which explain the level of CEP and CFP in a particular period of time. Specifically, the underlying factors have been identified after reviewing the main related literature. Four CEP dimensions were identified. The first one relates to ED, considered in some research testing different theoretical frameworks (Patten, 2002; Al-Tuwaijri *et al.*, 2004; Cho and Patten, 2007). The sign of the relation (ED and CEP) is not yet definitive, due to the different findings of these studies. However, this issue does not have an influence on the present model because sign-relation effect does not disturb the PLS estimates. The environmental management system (EMS) constitutes a different selected dimension related to CEP. The role played by an EMS in improving CEP is obvious (Sayre, 1996; Tibor and Feldman, 1996). In fact, developing and implementing an EMS in any organization is one of the keys to obtaining better levels of CEP (Melnyk *et al.*, 2003; Henri and Journeault, 2008). Thus, modelling CEP without considering EMS could lead to an erroneous parameter estimation. The third field that refers to the CEP construct is the mechanisms that develop programmes to reduce the impact of corporate activities on the environment (Programs to reduce environmental impacts, PREI). Henriques and Sadorsky (1996) indicate that companies under higher stakeholder pressure with respect to environmental impacts were more likely to establish better programmes to monitor and reduce these impacts. Finally, and considering the growing institutional concern about the need to save energy, energy consumption (EC) was the last underlying factor selected.

Regarding CFP, the literature proposes two models in order to measure this construct. The first model incorporates market-based measures like stock performance, market return share price appreciation and others (Dowell *et al.*, 2000; Kumar *et al.*, 2002; Schnietz and Epstein, 2005; Luo and Bhattacharya, 2006; Barnett and Salomon, 2006). This approach has been considered by studies when analysing, for example, the financial impact of several environmental events (like the implementation of environmental regulations or environmental disasters) on stocks prices. The second model for measuring CFP incorporates accounting-based measures like profitability, returns on assets, asset turnover and growth proxies (Carter *et al.*, 2000; Ruf *et al.*, 2001; Wu, 2002; Goll and Rasheed, 2004; Peinado-Vara, 2006; He *et al.*, 2007). It has been noted that both models for measuring CFP have their benefits (van Beurden and Gössling, 2008). In this paper, we have chosen accounting-based measures to measure CFP because they reflect the organization's internal efficiency. This approach will present to the reader the contribution of considering environmental factors when configuring the corporate strategic policies to the long-term financial success of the firm.

Although there are some different opinions about the selection of the indicators for measuring CFP, the most common reflective indicators chosen for measuring the CFP factor in accounting research have been identified (Capon *et al.*, 1990; Russo and Fouts, 1997): return on assets (ROA), profit margin, return on equity (ROE), which are relative magnitudes, and cash-flow and operating profits which are absolute magnitudes. These five proxies or reflective indicators regarding CFP have been restructured into two

first-order multivariate factors in order to ensure unidimensionality criteria (Section 5). They have been called absolute corporate financial performance (ACFP) and relative corporate financial performance (RCFP). Table II shows the main descriptive statistics of the reflective indicators regarding the ACFP and RCFP constructs. One contribution of the paper is that the two mentioned first-order CFP dimensions (ACFP and RCFP) have been modelled into a second-order factor called CFP. So, the measurement of CFP is more robust than the selection of some univariate indicators.

After identifying the underlying dimensions of CEP and CFP, a multivariate model that represents the research hypothesis is developed. As shown in Figure 1, six first-order dimensions (four about CEP and two about CFP) and two second-order factors (one about CEP and the other about CFP) have been modelled in order to test the research hypothesis. It is important to note that the research hypothesis has been estimated three times (CEP2004-CFP2005; CEP2004-CFP2006 and CEP2004-CFP2007) in order to test the robustness of the results.

$n = 230$

Period	Statistic	ROA	Profit margin	ROE	Cash-flow	Operating profits
2007	Mean	9.09%	11.56%	16.08%	2.46×10^6	2.01×10^6
	SD	10.65	12.73	14.09	3.57×10^6	3.29×10^6
	Variance	113.50	162.12	198.74	1.27×10^{13}	1.08×10^{13}
2006	Mean	9.60%	11.33%	16.20%	2.33×10^6	1.69×10^6
	SD	7.79	8.94	10.21	3.59×10^6	2.86×10^6
	Variance	60.68	79.94	104.27	1.29×10^{13}	8.18×10^{12}
2005	Mean	8.18%	10.06%	14.28%	2.04×10^6	1.55×10^6
	SD	7.22	8.64	9.78	3.44×10^6	2.83×10^6
	Variance	52.26	74.71	95.787	1.18×10^{13}	8.05×10^{12}

Table II.
Descriptive statistics of CFP reflective indicators (2005-2007)

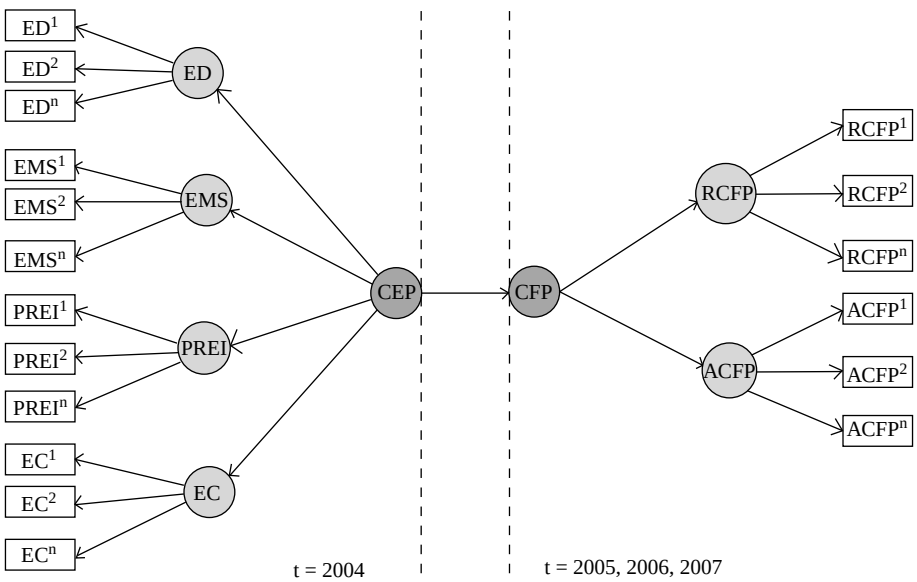

Figure 1.
Proposed model

The measurement of CFP and CEP was structured in a five-stage procedure. First, the theoretical constructs were proposed and the indicators were selected to measure them. Second, an exploratory factor analysis was carried out. Later, the measurement scales' fine-tuning process was undertaken in accordance with reliability and unidimensionality criteria. The measurement scale shows reliability, when it is free from random error. Although there are different criteria for evaluating the reliability of the scale, the most widely used is the internal consistency criterion. According to this method, a scale will hold reliability when the indicators that form it are found to be highly correlated, as long as they are measuring the same construct (Nunnally, 1978; Churchill, 1979). This paper uses Cronbach's alpha to evaluate the internal consistency of the scales and, hence, their reliability. The unidimensionality of a scale refers to the capacity of the indicators to define the same underlying theoretical factor in each and every one (McDonald, 1981; Hattie, 1985; Gerbing and Anderson, 1988; Steenkamp and van Trijp, 1991). In stage four, the second-order factors (CEP and CFP) were developed. These constructs were estimated using the factor-scores of the first-order constructs, according to the hierarchical component model suggested by Wold (Lohmöller, 1989; Chin *et al.*, 2003). In the last stage, the scales' fine-tuning procedure was applied to these second-order factors in order to ensure their reliability and unidimensionality (as explained in stage three).

5. Estimating factors and fine-tuning of scales

5.1 First-order factors' adequacy

In order to model the CEP and CFP first-order constructs, an exploratory factor analysis of the principal components has been applied to all the considered dimensions (Hair *et al.*, 1995). These multivariate procedures have been carried out using varimax rotation. To measure the adequacy of the factor analysis, the Bartlett's sphericity and Kaiser-Meyer-Olkin (KMO) tests were applied. The results are shown in Table III.

The results of the exploratory factor analysis of the constructs related to CEP were satisfactory, showing a high level of adequacy in all cases. For each of the four dimensions considered, only one factor was extracted with an eigenvalue >1. So, the unidimensionality of the four selected dimensions of CEP is ensured. Moreover, the variance explained by each of the four factors in the different dimensions attains satisfactory values, above 67 per cent in all cases. The factorial loadings of each of the different indicators are significant and it can be stated that none of the reflective indicators are redundant. Similarly, it can be observed that the adequacy levels of the factor analyses show optimal results. The KMO test for the four factors is above 0.77 (significance level is around 0.6). Likewise, the Bartlett's sphericity tests indicate that the correlation matrix of the variables included in the analysis differs significantly from the identity matrix (sig. = 0 per cent), so the *H0* (*H0*: $\delta = I$) cannot be accepted. Likewise, the values provided by Cronbach's alpha in the four dimensions are satisfactory because they are all above the recommended value of 0.7 (Nunally, 1978). Thus, the measurement scales present a high degree of reliability and, therefore, the theoretical concepts are properly defined by the measurement variables. Therefore, it is not necessary to carry out further operations to refine the scales.

Similarly, Table IV shows the results obtained from the application of the exploratory factor analysis for the factors related to CFP during the three periods of analysis.

As for the CEP first-order constructs, the CFP dimensions have reached high levels of adequacy. The three factors extracted show evidence of unidimensionality.

Indicator	Loading	Factors
ED		
ED1	0.884***	1
ED2	0.799***	Percentage of variance
ED3	0.860***	70.31%
ED4	0.813***	KMO: 0.840
ED5	0.834***	Barlett
		$\chi^2 = 328.745^{***}$ (10 df)
		Cronbach alpha
		0.894
PREI		
PREI1	0.805***	1
PREI2	0.825***	Percentage of variance
PREI3	0.864***	67.69%
PREI4	0.787***	KMO: 0.893
PREI5	0.784***	Barlett
PREI6	0.868***	$\chi^2 = 390.338^{***}$ (15 df)
		Cronbach alpha
		0.904
EMS		
EMS1	0.787***	1
EMS2	0.765***	Percentage of variance
EMS3	0.907***	73.99%
EMS4	0.871***	KMO: 0.908
EMS5	0.897***	Barlett
EMS6	0.912***	$\chi^2 = 890.151^{***}$ (28 df)
EMS7	0.809***	Cronbach alpha
EMS8	0.918***	0.949
EC		
EC1	0.835***	1
EC2	0.892***	Percentage of variance
EC3	0.788***	67.32%
EC4	0.762***	KMO: 0.774
		Barlett
		$\chi^2 = 185.542^{***}$ (6 df)
		Cronbach alpha
		0.837

Note: Significant at: *90, **95, and ***99 per cent levels

Table III.
Exploratory factor analysis for environmental performance dimensions (2004)

The variance explained by each of the constructs is over 89 per cent. The factor scores for each indicator also turned out to be significant. Although the results of the KMO test are not fully satisfactory for the RCFP and ACFP, the Bartlett test indicates that the factor analysis has an optimal level of adequacy and that, therefore, $\delta \neq I$. The values provided by Cronbach's alpha achieve optimal levels in the two dimensions considered, all above 0.88. In this way, the reliability of the measurement scales for CFP is guaranteed.

5.2 Second-order factors' adequacy

As mentioned in Section 4, the second-order factors related to CEP and CFP have been modelled according to the hierarchical component model. Once the factors' scores of

Indicator	Loadings 2007	2006	2005	Factors 2007	2006	2005
RCFP						
RCFP 1	0.968***	0.948***	0.967***	1	1	1
				Percentage of variance	Percentage of variance	Percentage of variance
RCFP 2	0.900***	0.816***	0.831***	89.152	81.674	82.387
RCFP 3	0.963***	0.942***	0.920***	KMO: 0.716	KMO: 0.671	KMO: 0.608
				Barlett	Barlett	Barlett
				$\chi^2 = 360.726^{***}$	$\chi^2 = 254.202^{***}$	$\chi^2 = 270.433^{***}$
				(3 df)	(3 df)	(3 df)
				Cronbach alpha	Cronbach alpha	Cronbach alpha
				0.939	0.886	0.891
ACFP						
ACFP 1	0.939***	0.945***	0.957***	1	1	1
				Percentage of variance	Percentage of variance	Percentage of variance
ACFP 2	0.939***	0.945***	0.957***	93.869	89.346	91.652
				KMO: 0.500	KMO: 0.500	KMO: 0.500
				Barlett	Barlett	Barlett
				$\chi^2 = 163.776^{***}$	$\chi^2 = 107.659^{***}$	$\chi^2 = 132.014^{***}$
				(1 df)	(1 df)	(1 df)
				Cronbach alpha	Cronbach alpha	Cronbach alpha
				0.935	0.881	0.909

Note: Significant at: *90, **95, and ***99 per cent levels, respectively

Table IV.
Exploratory factor analysis for financial performance dimensions (2005-2007)

CEP and CFP first-order constructs have been obtained, an exploratory factor analysis is applied in order to check the second-order factors' reliability and unidimensionality. The results are shown in Tables V and VI.

CEP has reached a high level of adequacy in the exploratory factor analysis according to the reliability and unidimensionality criteria. The first CEP dimensions (ED, EMS and PREI) were significant, but the EC factor turned out to be non-significant. Although it could be deleted from the measurement scale, the authors decided to maintain this dimension in the model specification in order not to disturb the nature of the CEP second-order factor.

The CFP second-order factors show acceptable levels of adequacy in all the three periods analysed. As can be seen in Table VI, the unidimensionality and reliability criteria are guaranteed in this multivariate factor. Once the fine-tuning of the measurement scales had been performed, the multivariate model could be estimated in order to test the work hypothesis.

6. Results and discussion

6.1 Measurement model estimates

The analysis of the model has been structured in two phases. First, the outer model or measurement model is analysed with the aim of obtaining a view of the way in which the indicators measure the underlying constructs (in this case, first-order factors as second-order factors' indicators). In this stage, the regression coefficients between the

Indicator	Loading	Factors
CEP		
ED	0.932^{***}	1
EMS	0.943^{***}	Percentage of variance
PREI	0.928^{***}	71.71%
EC	0.499^{***}	KMO: 0.788
		Barlett
		$\chi^2 = 324.256^{***}$ (6 df)
		Cronbach alpha
		0.851

Note: Significant at: *90, **95, and ***99 per cent levels

Table V.
Exploratory factor analysis for CEP (2004)

	Loadings			Factors		
Indicator	2007	2006	2005	2007	2006	2005
CFP						
RCFP	0.757^{***}	0.729^{***}	0.750^{***}	1	1	1
ACFP	0.757^{***}	0.729^{***}	0.750^{***}	Percentage of variance 57.321	Percentage of variance 53.147	Percentage of variance 56.252
				KMO: 0.500	KMO: 0.671	KMO: 0.608
				Barlett	Barlett	Barlett
				$\chi^2 = 135.126^{***}$ (1 df)	$\chi^2 = 110.759^{***}$ (1 df)	$\chi^2 = 124.925^{***}$ (1 df)
				Cronbach alpha 0.901	Cronbach alpha 0.845	Cronbach alpha 0.891

Note: Significant at: *90, **95, and ***99 per cent levels

Table VI.
Exploratory factor analysis for CFP (2005-2007)

indicators and underlying constructs should be analysed. As can be appreciated from Table VII, all the loadings are higher than 0.707 (excluding the EC construct in the CEP factor), which is the minimum recommended value (Carmines and Zeller, 1979). Thus, it is ensured that the variance shared by the construct and its indicators is greater than the variance error and, therefore, the factor shares more than 50 per cent of the variance of the exogenous indicator. The authors decided to maintain the EC in the CEP factor because removing it could drastically reduce the significance of the model (Barclay *et al.*, 1995; Chin, 1998b).

The PLS technique does not allow us to obtain a significance test of parameters since its execution algorithm does not require any specific statistical distribution of the data (Chin, 1998b). Nonetheless, it is possible to develop non-parametric resampling techniques in order to examine the significance of the estimations generated by PLS. In that sense, a bootstrap resampling method model with a total of 250 random sub-samples is applied. As can be seen from Table VII, all the regression coefficients between the exogenous variables and their latent constructs are significant to a level of 99 per cent in the dimensions of both CEP and CFP (except the EC dimension related to the CEP factor), thus guaranteeing the significance of the estimations of the underlying factors.

Factor	Reflective indicator	Loading	Bootstrap *t*-statistic
CEP (2004)			
	ED	0.8882*	13.9303
	EMS	0.8504*	11.6372
	PREI	0.9260*	16.2514
	EC	0.4217**	1.5713
CEP (2004)			
	ED	0.8980*	27.2385
	EMS	0.8813*	23.0131
	PREI	0.9263*	29.7080
	EC	0.3058***	1.6852
CEP (2004)			
	ED	0.8866*	18.7390
	EMS	0.8676*	20.0042
	PREI	0.9281*	33.0967
	EC	0.3853***	2.1619
CFP (2007)			
	RCFP	0.8568*	4.1982
	ACFP	0.8959*	3.6306
CFP (2006)			
	RCFP	0.8672*	10.7772
	ACFP	0.8991*	11.1260
CFP (2005)			
	RCFP	0.8734*	5.0001
	ACFP	0.9078*	5.8564

Table VII.
Outer model estimates

Note: Significant at: *99, **90, ***95 per cent levels

6.2 Hypothesis testing

The second stage of the model analysis consists of characterizing the structural model. In this case, the extent and significance of the relations between the latent constructs were analysed. Additionally, the regression coefficients obtained and the extracted variances of the endogenous variables were considered. Table VIII summarizes the information for testing the research hypothesis. The proposed multivariate model has been estimated for three times (once per CFP year data, 2005-2007) in order to capture short- and long-term relations in linking CEP and CFP.

The significance of the causal relations is determined by the regression coefficients between CEP and CFP, which are all above the recommended value of 0.2 (Chin, 1998a). Likewise, the values adopted by the variance of the endogenous constructs (R^2) are greater than the minimum recommended value of 0.1 (Falk and Miller, 1992). At the same time, the use of a bootstrapping technique indicates that the estimated parameters are stable.

Hypothesis		Loading	Bootstrap *t*-statistic	Latent var. (R^2)
CEP → CFP	CEP (2004) → CFP (2005)	0.285***	3.6630	0.230
	CEP (2004) → CFP (2006)	0.273***	4.3704	0.215
	CEP (2004) → CFP (2007)	0.263***	4.0762	0.201

Table VIII.
Inner model estimates

Note: Significant at: *90, **95, and ***99 per cent levels

Thus, our findings suggest that the proposed *H0* is rejected. During all the periods considered, CEP seems to be linked to the CFP construct. In fact, the research outputs indicate that firms that reached a high degree of CEP in 2004 obtained satisfactory CFP levels in 2005-2007. Therefore, these findings suggest that companies that obtained better levels of CEP improved their internal efficiency and their CFP in the next periods. Furthermore, the link between CEP and CFP was significant in all the periods analysed, showing that it was a persistent effect and not based on short-term issues.

Additionally, the strength of the parameter estimates shows us that the power of the link between the CEP and CFP factors decreases when the test period is increased. However, the parameter significance is guaranteed at the 99 per cent level.

7. Concluding remarks

The present work set out to analyse the possible link between the CEP and CFP of companies from a multidimensional perspective, which is an innovative approach as regards the literature on the subject. A second-order partial least squares (PLS) model has been proposed to measure the CEP and CFP more efficiently. The analysis has been carried out for a sample of European firms, thus broadening the traditional approach based on individual countries, above all on the USA (McGuire *et al.*, 1988; Herremans *et al.*, 1993; Vasanthakumar, 1999).

The main findings are consistent with some previous literature that evidences a positive and significant relation between CEP or CSP and CFP (Karpoff and Lott, 1993; Hamilton, 1995; Klassen and McLaughlin, 1996; Russo and Fouts, 1997; Kumar *et al.*, 2002; Margolis and Walsh, 2003; Schnietz and Epstein, 2005; Luo and Bhattacharya, 2006; Wu, 2006; van Beurden and Gössling, 2008). On the basis of the results obtained, the premises set forth the stakeholder theory (Freeman, 1984) seem to be confirmed.

The results of this research are very important from a managerial perspective. Nowadays, stakeholder pressure highlights the need to include policies oriented towards environmental protection in companies' strategic management. This study shows that improving its CEP could maintain the efficiency of the firm, consolidate its financial situation and answer the demands of its stakeholders. This issue could be of interesting managers since ignoring environmental factors when establishing the firm's strategic management policies could lead to a loss of competitiveness in the mid-long-term (Porter and Kramer, 2006).

The findings of this paper are also interesting for the community. It is noted that if companies obtain better levels of CEP, they need, for example, to decrease the level of green-house emissions, guarantee environmental preservation, improve programs to reduce the impact of their activities on the environment or use renewable energies. These processes would contribute to the social well-being in the mid-term by, for example, mitigating the climate change effect. Finally, the conclusions are also useful for agents operating in the market because they can introduce the CEP variable into the evaluation criteria for making investment decisions. Finally, we offer researchers into the subject a new multivariate approach with which they can embark on further studies.

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Appendix 1. *AIS & SiRi Co. information and data development*

AIS is the first company established in Spain with the objective of developing ratings of sustainability issues. The main mission of this institution is to measure the ability and commitment of the management board of enterprises and to integrate social and environmental risks and opportunities in their strategic management. AIS is one of the 11 members of SiRi Co., and has more than 100 of researchers focused on analysing sustainability and sustainable development practices of MSCI world firms. SiRi Co. methodology is based on trust and relevance principles. Their analysis is focused on seven strategic areas (business ethics,

community, corporate governance, contractors, customers, employees and the environment). Each strategic area is examined by evaluating the firm transparency in their policies, management systems and system results. For more information, it is recommended to visit the AIS (www.ais.com.es) and SiRi Co. (www.siricompany.com) web-pages.

Appendix 2

Table AI. Description of the CEP and CFP reflective indicators

Factor	Description of reflective indicator
ED	
ED1	Separate environmental report
ED2	Environmental information on website
ED3	Environmental policies and principles
ED4	Description of EMSs
ED5	Disclosure of quantitative data on environmental indicators
EMSs	
EMS1	Board/management level responsibility for environmental issues
EMS2	An environmental department
EMS3	An EMS
EMS4	Monitors its environmental impact
EMS5	Sets quantitative environmental performance targets
EMS6	Conducts internal audits
EMS7	Conducts third-party audits
EMS8	Conducts environmental training of employees
PREI	
PREI1	Programs to take into account environmental impact of products at the R&D stage
PREI2	Programs to reduce water consumption
PREI3	Programs to reduce air emissions
PREI4	Programs to reduce water pollution
PREI5	Programs to reduce the impact of waste
PREI6	Programs to improve energy efficiency
EC	
EC1	Electricity consumption
EC2	Gas consumption
EC3	Oil consumption
EC4	Other
RCFP	
RCFP1	ROA
RCFP2	Profit margin
RCFP3	ROE
ACFP	
ACFP1	Cash-flow
ACFP2	Operating profits

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