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Does Environmental Management Improve Financial Performance? A Meta-Analytical Review

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Abstract

The relationship between corporate environmental performance and financial performance has received a high degree of attention in research literature and the results are still contradictory. Most of the findings have shown that environmental performance improves financial performance while others have suggested that the relationship is neutral or even negative. Our article integrates prior research studying this relationship and identifies the potential moderators that may have played a role in the apparent inconsistent results observed to date. We conducted a meta-analysis of 52 studies over a 35-year period that confirms a positive relationship between environmental performance and financial performance. Moderators' analysis reveals that the relationship is significantly influenced by the environmental and financial performance measures, the regional differences, the activity sector and the duration of the studies. After discussing the theoretical and managerial implications, this meta-analysis tries to answer the question: "When and how does it pay to be green?"

Keywords

environmental performance, natural resources-based view theory, environmental management, meta-analysis, research synthesis

Introduction

A large number of firms have implemented environmental practices that go far beyond environmental regulation in order to reduce their energy consumption, to propose green products or technologies to their consumers, and to minimize their ecological footprint. To that goal, most of these companies have adopted environmental management that encompasses the technical and organizational activities undertaken by the firm for the purpose of reducing environmental impacts and minimizing their effects on the natural environment (Cramer, 1998). Therefore, environmental performance is the output of environmental management, and refers to the effects of the firm's activities and products on the natural environment (Klassen & Whybark, 1999). From these definitions, corporate environmental management (CEM) can be understood as a concept that embraces environmental management, environmental disclosure, and environmental performance.

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From the perspective of managers, the link between CEM and corporate financial performance (CFP) is not straightforward (Bansal, 2005; Sharma, 2000). Environmental management involves significant investment and important modifications of manufacturing processes in order to reduce pollution and energy consumption and/or to use renewable sources of energy rather than fossil fuels. As these environmental investments increase production costs that cannot be reported in the product selling prices, they negatively affect the CFP (Klassen & Whybark, 1999). Moreover, good environmental performance may take time to come to fruition, increasing uncertainty about outcomes (Aragon-Correa & Sharma, 2003; Hart, 1995; Khanna & Damon, 1999).

Nevertheless, CEM practices are also considered as a way of increasing CFP. Since pollution is regarded as the sign of an incomplete, inefficient, or ineffective use of resources (Porter & van der Linde, 1995a), control and pollution prevention strategies can allow companies to make significant cost savings. Product stewardship, integrating the voice of the environment into product design and manufacturing processes, can lead to a competitive advantage through a "first mover" strategy in emergent green market products (Hart, 1995).

A number of studies have proposed conceptual frameworks or explanations for the existence of a causal relationship between CEM and CFP. Numerous studies have suggested that the relationship is positive (Al Tuwaijri, Christensen, & Hughes, 2004; Hart & Ahuja, 1996; Judge & Douglas, 1998; Montabon, Sroufe, & Narisimhan, 2007; Russo & Fouts, 1997; Sroufe, 2003; Stanwick & Stanwick, 1999) following Porter's "win-win" argument and natural resource–based view theory (Hart, 1995; Hart & Dowell, 2011). However, other research has concluded that CFP is negatively associated with CEM over a short period of time (Blacconiere & Patten, 1994; Jaggi & Freedman, 1992); and with proactive environmental strategies over a longer period of time (Cordeiro & Sarkis, 1997; McPeak, Devirian, & Seaman, 2010; Yu, Ting, & Wu, 2009). Yet other studies have established that the relationship between CEM and CFP cannot be proved because of the difficulties of measuring the environmental management consequences on profitability (Collison, Lorraine, & Power, 2004; King & Lenox, 2001; Murray, Sinclair, Power, & Gray, 2006).

Even though the results of previous empirical research remain contradictory, the relationship between CEM and CFP seems to be positive. Therefore the research question worth studying is "When does it pay to be green?" rather than "Does it pay to be green?" Research findings are influenced, among others factors, by sampling size across studies, industrial context, inconsistent measurement of CEM and CFP, different research methodologies, and varying procedures for data collection and analysis. Most research on the relationship between CEM and CFP has used market-based or accounting-based measures of financial performance. Some have used perceptual measures of financial performance based on organizational capabilities such as product stewardship, or environmental innovation (Hassel, Nilson, & Nyquist, 2005).

Moreover, as research in the area of environmental management has increased, various proxies have been utilized to measure CEM (Walls, Phan, & Berrone, 2011; Yu et al., 2009). Most studies have used negative externalities (Earnhart & Lizal, 2007; Hart & Ahuja, 1996); some have used data reported from the Toxic Release Inventory (Clarkson & Li, 2004; Dooley & Lerner, 1994; Hamilton, 1995); some have used voluntary participation in environmental programs (Dowell, Hart, & Yeung, 2000; Khanna & Damon, 1999); yet others have used rewards or similar recognition (Klassen & McLaughlin, 1996) or environmental disclosure (Blacconiere & Northcut, 1997; Cohen, Fenn, & Konar, 1997). These different proxies focus on specific goals of CEM practices such as maintaining legitimacy, conforming to environmental regulation, or improving environmental performance. Thus, a close examination of research findings is critical for furthering knowledge in this area.

Several meta-analyses have studied the relationship between corporate social performance (CSP) and CFP (Allouche & Laroche, 2005; Orlitzky, Schmidt, & Rynes, 2003) or between corporate environmental performance (CEP) and CFP (Darnall & Sides, 2008; Horvathova, 2010). With respect to these previous studies, the contribution of my research is twofold: First, it responds to Orlitzky et al. (2003) who call for research on CEP as a CSP measure and to Molina-Azorín, Claver-Cortés, Lopez-Gamero, and Tari (2009), who call for a meta-analysis of the impact of green management on CFP, which could provide a statistical integration of 35 years of accumulated research on this relationship. Second, my meta-analysis studies the relationship between different environmental management variables (EMVs) and CFP. Hence, it goes beyond the study of the voluntary environmental program impacts on CFP (Darnall & Sides, 2008) and the impact of environmental regulation on CFP (Horvathova, 2010). Moreover, this meta-analysis underlines that moderators, such as environmental and financial practices, or regional differences, influence significantly the relationship between CEM and CFP.

This meta-analysis aims to gain further insights into CEM implications on CFP since meta-analysis is a quantitative review method, for standardizing and aggregating findings across empirical studies, that has proved to be a useful technique in many areas where multiple individual studies have yielded inconclusive and conflicting results (Damanpour, 1991).

By statistically aggregating results across individual studies and correcting statistical artefacts, such as sampling and measurement error, meta-analysis allows for much greater precision than other forms of research review (Hunter, Schmidt, & Jackson, 1982). Furthermore, unlike primary studies, meta-analysis can determine the extent to which different measures of CEM affect the association found and thus provide evidence for measurement as a moderator of the relationship between CEM and CFP. The specific objectives of this meta-analysis are twofold: first, to provide a robust statistical integration of the accumulated research on the relationship between CEM and CFP; second, to examine the effect of moderators, such as the CEM and CFP operationalization variables, industry context, countries, and the observation period of the studies. By integrating empirical results across different study contexts, meta-analysis enables us to explore theoretical moderators and statistical artefacts that might explain the inconsistent results across previous research. Indeed, analysing through a meta-analysis, the influence of the variables partially studied in previous research, enhances knowledge about the circumstances that lead to a stronger relation between CEM and CFP.

The remainder of the article is organized as follows: The following section reviews the background literature on the overall relationship between CEM and CFP, presents the hypotheses of this research, and outlines the influence of possible moderators. Next, the meta-analysis technique, the procedures used in this article, and the results of meta-analytic investigation are provided. Finally, the theoretical and managerial implications resulting from the findings are discussed and the limitations and the recommendations for future research are presented.

Theory and Hypotheses

Overall CEM and CFP Relationship

CEM practices can be classified as pollution control, pollution prevention, and product stewardship (Hart, 1995; Klassen & Whybark, 1999; Russo & Fouts, 1997). Pollution control refers to activities that aim to keep pollution within specifications. This approach is based on techniques of waste removal treatment and disposal, and it usually entails the use of specific facilities that treat the waste or pollution once this has been generated (end-of-pipe approach). Pollution prevention comprises practices that reduce or eliminate the creation of pollutants through increased efficiency in the use of raw materials, energy, or water during the manufacturing processes.

As Porter and van der Linde (1995a) argue, pollution is a form of economic waste, as it is a sign that resources have been used incompletely, inefficiently, or ineffectively during the manufacturing process. Resource inefficiencies are obvious in a company that has insufficient material use and poor process controls. It results in unnecessary waste, defects, and stored material. The "Porter Hypothesis" suggests that cost savings can easily be obtained with a number of simple prevention measures. Installing and operating end-of-pipe pollution control techniques increases productivity and efficiency: Less waste means a better use of inputs resulting in lower raw material and waste disposal costs (Schmidheiny, 1992; Young, 1991).

Furthermore, Hart (1995) predicts that, due to increasing awareness of constraints imposed by the natural environment, pollution prevention, product stewardship, and sustainable development will increasingly be a source of competitive advantage. There are at least two types of competitive advantage—cost advantage and differentiation advantage—that can emerge from environmental strategies.

Cost advantage results from environmental production processes that include redesigning production to be less polluting and using energy-saving appliances or manufacturing processes (Ashford, 1993; Dechant & Altman, 1994; Porter & van der Linde, 1995a). Such practices are intended to reduce the production cost by increasing the efficiency of production processes through the reduction of input and waste during the manufacturing process (Hart, 1995; Shrivastava, 1995; Stead & Stead, 1996).

Differentiation advantage results from best practices of environmental management that focus on product characteristics and the product market. These product-focused aspects include redesigning packaging, producing in more environmentally responsible ways, and developing new environmentally friendly products. Differentiation advantage creates the potential to increase product selling prices that results in higher revenues (Dechant & Altman, 1994; Hart & Ahuja, 1996; Reinhardt, 1999; Stead & Stead, 1996). For these reasons, corporate environmental practices can be considered as a tool for finding new ways to optimize operations. Furthermore, these practices can reduce liability costs from potential spills or health and safety exposures that can involve insurance premium reduction. Integrating concerns for pollution prevention into engineering design criteria can reveal previously unseen opportunities for streamlining or eliminating process components and maintenance procedures. Through this framing, environmental practices are considered to result in strategic improvements by reassessing taken-for-granted engineering practices, rules of thumb, and protocols (Bansal, 2005; Hoffman, 2001).

Hypothesis 1: The overall relationship between corporate environmental management and corporate financial performance is positive.

The inconsistency of the results in the "does it pay to be green?" literature can also be attributed to the different proxies used by researchers in their empirical studies to measure CEM and CFP.

Environmental Management Measure. Empirical research studying the relationship between CEM and CFP has used a large variety of environmental management measures, which can be classified in three categories: EMVs, environmental performance variables (EPVs; Molina-Azorín et al., 2009), and environmental disclosure variables (EDVs; Schultze & Trommer, 2012).

EMVs address a firm's attitudes and objectives towards environmental responsibility as well as environmental management structure and processes (Schultze & Trommer, 2012). In this category, variables mostly refer to environmental strategy, integration of environmental issues into strategic planning processes, environmental practices, process-driven initiatives, product-driven management systems, ISO 14001 certification, environmental management system (EMS) adoption, and participation in voluntary programs (Molina-Azorín et al., 2009; Schultze & Trommer, 2012). These EMVs are based on processes (efficient use of raw material), systems (effectiveness in achieving eco-efficiency targets) or they refer to productivity (economic efficiency in implementing environmental programs). Some measures deal with process changes regarding the manufacturing process or the use of new technology and recycling activities.

EPVs evaluate environmental impacts in physical and monetary terms since companies' outputs affect the environment in various ways; this category comprises a large number of indicators. Measures are mostly quantified in physical units (carbon dioxide emissions, physical waste, water consumption, toxic release) that can be positive (emission reduction) or negative (emission generated). Some are input-oriented (resource consumption) or output-oriented (emissions, toxic waste, oil and chemical spills, and releases that are recovered, treated, or recycled).

EDVs are defined as disclosures that describe the impact company activities have on the physical or natural environment in which they operate (Wilmshurst & Frost, 2000). Depending on the context, these studies can use information releases regarding toxic emission (Hamilton, 1995), environmental awards (Klassen & McLaughlin, 1996), environmental accidents and crises (Blacconiere & Patten, 1994), and environmental investment announcements (Gilley, Worrel, & El Jelly, 2000) to observe their effects on financial performance.

Natural resource–based view theory posits that the link between environmental strategy and competitive advantage depends on the form of environmental improvement being considered, as the mechanism is very different for pollution prevention from what it is for product stewardship. Being committed to pollution prevention is less likely to create profit by itself, than when it is in combination with general capabilities (continuous improvement and new competencies). Profit may be derived along with skills in the implementation of new projects (Christmann, 2000). Actually, higher profit is more often associated with pollution prevention activities than with increased pollution control practices (Hart & Dowell, 2011). A pollution-prevention strategy seeks to reduce emissions using continuous-improvement methods focused on well-defined environmental objectives rather than relying on expensive "end-of-pipe" capital investments to control emissions (Hart, 1995). Developing his theoretical argument, Hart (1995) predicts that innovative environmental management can lead to the development of firm-specific capabilities that can be sources of competitive advantage. Most research in this area has a strong pragmatic or utilitarian focus, investigating the effect of environmental actions on organizational performance, competitive advantage, and anticipated firm performance. Some of these organizational outcomes are not directly associated with financial gains but are critical for the continued growth or the survival of the firm. These organizational outcomes include acquiring organizational resources and capabilities, integrating environmental issues, strategic planning, and perceiving the importance of different stakeholders (Bansal & Gao, 2006).

Organizational capabilities are the coordinating mechanisms that enable the most efficient and competitive use of the firm's assets. The development of these capabilities leads to a sustained first-mover status since the window for technological innovations gets shorter (Sharma & Vredenburg, 1998). The capability of continuously generating a stream of innovations enables an organization to stay a step ahead of competitors who do not possess this capability (Hart, 1995). Therefore, the development of capabilities for stakeholder integration, for higher order learning, and for continuous innovation in firms leads to competitive advantage:

> **Hypothesis 2:** Corporate environmental management influences corporate financial performance more positively when corporate environmental management is measured by environmental management variables rather than by environmental performance or by environmental disclosure variables.

Financial Performance Variables. Financial performance is a meta-construct emphasizing the profitability of the firm. The studies in this meta-analysis have mainly adopted three broad subdivisions of CFP: market-based (investor returns), accounting-based (accounting returns), and organizational measures.

Accounting-based indicators often use earnings per share (EPS), return on equity (ROE), return on assets (ROA), return on sales (ROS), and return on investment (ROI) to measure the financial performance of the firm. ROA and ROE are generally accepted standard measures of financial performance found in research on strategy. In addition to ROA or ROE, Tobin's *q* reflects the inherent value of the firm and the expected future gains in accordance with "[*it*] pays to be green" studies (Dowell et al., 2000). Accounting-based indicators are subject to managers' discretionary allocations of funds to different project choices. They reflect internal decision-making capabilities and managerial performance rather than external market responses to organizational (nonmarket) actions (Cochran & Wood, 1984).

Other studies used market-based indicators such as a price-earning ratio, price per share, or share price appreciation (Orlitzky, 2005) to underline the improvement of the firm's economic performance. These measures focus only on the economic performance of a firm without taking into account the specific consequences of pro-environmental strategies on financial performance. Market-based indicators are said to be subject to forces beyond management's control. These indicators reflect the notion that shareholders are a primary stakeholder group whose satisfaction determines the company's fate (Grossman & Hoskisson, 1998).

Furthermore, CEM involves organizational processes measured by other indicators than accounting-based or market-based indexes. Cost advantage generated by pollution control equipment, or differentiation advantage due to green product sales or due to a firm's good environmental reputation are used to measure financial performance (Christmann, 2000). Hart (Hart, 1995; Hart & Dowell, 2011) and Porter and van der Linde (1995a) have presented the argument of innovation offsets and specific capabilities developed by proactive companies. Green product innovation and environmental process innovation are seen to be good proxies for the evaluation of competitive advantage in natural resource–based view research (Judge & Douglas, 1998).

As we saw earlier, companies are supposed to make significant cost savings and obtain competitive advantage by implementing environmental strategies, and thus increase their financial profitability rather than their market-based performance (Hart, 1995). These competitive benefits are perceived by proactive company managers as the outcomes of strengths built up through environmental strategies. These strengths are generally described as organizational capabilities based on tacit learning that is difficult for competitors to imitate. These capabilities usually lack an identifiable owner in an organization and are not traded in factor markets (Sharma & Vredenburg, 1998). They are intangible in nature, rely on the tacit knowledge of the managers, and are not valuable to investors on the stock market (Barney, Ketchen, & Wright, 2011). Furthermore, stock markets do not reward good environmental performance of firms inasmuch as the firm's profitability in the short term will be negatively affected by pollution abatement activities, which usually involve heavy expenditures (Jaggi & Freedman, 1992). Investors' perception about firms that are not meeting current environmental standards is that they may find themselves in a worse situation in the future. They interpret the firm's pollution performance as providing information about its potential liabilities.

We can thus argue that the positive consequences of these pro-environmental strategies will impact financial profitability more than their market-based appreciation:

> **Hypothesis 3:** The corporate environmental management influences the financial profitability more positively than the market-based performance.

Moderators Intervening in the Relationship Between CEM and CFP

A review of the extant literature about the relationship between CEM and CFP points to a number of potential factors that may have played a role in the apparently inconsistent findings observed to date.

Activity Sector. Environmental management is mostly implemented by industrial companies since they are concerned with toxic emissions resulting from their manufacturing processes and are constrained by regulations to reduce pollution. Some empirical studies have explored specific industrial sectors, such as manufacturing, pulp and paper, steel, oil and chemicals, whereas other studies have collected data from the multi-industrial sector in order to allow for a generalization of the results. Even if all industrial companies pollute to a greater or lesser degree, some firms can be responsible for environmental disasters, hazardous pollution, or chemical leaks (Blacconiere & Patten, 1994). Indeed, the chemical industry sector is often singled out to have a high environmental impact due to the industry's toxic emissions (Christmann, 2000, 2004; King & Lenox, 2001; Nehrt, 1996). Moreover, the industries identified as the most polluting by the World Commission on Environment and Development (1987) are chemicals, oil, utilities, and pulp and paper. The environmental impact of these industries has been discussed since the 1960s and 1970s, mainly because their emissions have caused visible environmental degradations (Halme & Huse, 1997). Environmental questions regarding detergents and pesticides attracted much attention in the 1960s and environmental problems related to chemicals and oil became acute in the 1970s. These most polluting industries have addressed the environmental issue for a long time as they face an increasing environmental regulation that induces an extensive amount of pollution control expenditures (Delmas, Hoffmann, & Kuss, 2011). These industries have implemented proactive environmental strategies in order to comply with environmental regulations and reduce their ecological footprint, demonstrating the greatest awareness of the environment (Polonsky, Zeffane, & Medley, 1992). As Hart (1995) has argued, a proactive environmental strategy improves CFP as it leads to significant reduction in production costs through waste and energy consumption reduction. Hence, we can argue that the most polluting sector significantly moderates the relationship between CEM and CFP:

> **Hypothesis 4:** The studies' activity sector moderates the relationship between corporate environmental management and corporate financial performance so that the relationship will be stronger for the most polluting sector.

Duration of the Study. Hart and Ahuja (1996) argue that there is a time lag between the initiation of emission reduction efforts and the realization of bottom line benefits. First, pollution prevention requires up-front investment in training and equipment. Second, it takes time to gain reduction because internal reorganization and renegotiation of supply and waste disposal contracts may be required (Hart & Ahuja, 1996). Evidence also suggests that in the early stages of pollution prevention there is a great deal of "low-hanging fruit"—easy and inexpensive behavioural and material changes that result in large emission reductions relative to costs (Hart, 1994; Rooney, 1993). As the firm's environmental performance improves, further reductions in emissions become progressively more difficult, requiring more significant change in processes or even entirely new production technology (Russo & Fouts, 1997).

Some studies have collected data on a longitudinal perspective (more than 1 year) in order to take into account the long-term payback of environmental management strategies, while others have collected data on a short period of time (1 year and less). Analysing the relationship between CEM and CFP during a short period of time implies that the researcher intends to prove that the environmental management influences regularly and at any time the financial profitability of the firm. Yet the natural and organizational environments are different because of the time markers of their respective materialities, such as short term for the financial profitability and very long term for the environmental issue (Bansal & Knox-Hayes, 2013). Thus, we can argue that the longitudinal characteristic of the studies might explain part of the variation in the results regarding the relationship between CEM and CFP:

Hypothesis 5: The duration of the study moderates the relationship between corporate environmental management and corporate financial performance so that the relationship will be stronger for non-longitudinal studies.

Method

Meta-analysis is a set of statistical techniques that have been developed to identify and quantify associations drawn from an existing body of literature (Hunter & Schmidt, 2004; Stanley, 2001; Wolf, 1986). Meta-analysis is a quantitative method that allows a rigorous integration of the findings of previous studies on a particular topic in order to assess the overall effect of existing studies, and to evaluate the effect of different data characteristics on results (Hunter & Schmidt, 1990; Rosenthal, 1991; Wolf, 1986). Meta-analysis involves statistical analyses that reveal associations or relationships that are less obvious in other approaches used to summarize research. It determines whether differences in results are primarily due to differences in research setting, measurement scale, CFP or CEM variables, or sampling error.

Consequently, this research method is appropriate to investigate the relationship between CEM and CFP, as it will (a) calculate an estimate of the mean effect size for this hypothesized relationship on the basis of all available prior studies; (b) test for the significance and generalizability of the discovered mean effect size by calculating its confidence interval; (c) assess whether there is heterogeneity in the effect size distribution and, if heterogeneity is found; (d) investigate and model this heterogeneity through further moderator analyses (Hedges & Olkin, 1985; Lipsey & Wilson, 2001).

Sample and Coding

In order to construct a comprehensive database, computer searches were conducted on different combinations of keywords (environmental performance/disclosure/strategy /compliance/ regulations, pollution, green marketing, financial performance, profitability, corporate social performance) on ScienceDirect, EJS Ebsco, EconLit, JSTOR, Emerald, SSRN, AoM, and Cairn databases. In addition, rigorous manual searches were also performed to identify additional articles using the reference lists of each study collected. We also consulted the major academic journal that publishes this kind of research.

To be included in this meta-analysis, econometric studies had to provide a statistical measure of the relationship between environmental performance or environmental disclosure and financial performance. Meta-analysis requires statistically independent samples (Cheung & Chan, 2004; Hunter & Schmidt, 2004). As a result, studies based on the same data set are excluded from this meta-analysis to avoid the overrepresentation bias. This meta-analysis neither includes studies that do not provide sufficient data to calculate a common measure of effect size nor those that use very different statistical research methods, such as results from logit or probit regression or multivariate analysis (Doucouliagos & Laroche, 2003; Hunter & Schmidt, 2004).

These searches yielded a total of 52 independent studies from 1975 to 2011 that explored the relationship between CEM and CFP. Appendix A lists the studies included in the meta-analysis. Data coding has focused on several sample and design characteristics such as the date of observation study (1972-1995, 1996-2008), country (United States and Canada, Europe, and rest of world), industrial context (multi-industrial sector, pulp and paper, manufacturing, steel, chemical, and oil), CEM indicators (EMVs, EPVs, and EDVs), CFP indicators (accounting-based measure, market-based measure, organizational-based measure, cumulative abnormal return). Appendix B presents these different indicators and proxies used by the studies to measure CEM and CFP.

The principal unit of analysis in meta-analysis is the individual study (Hedges & Olkin, 1985). Since some studies contain measurements of several focal effects, and some report more than one sub-relationship within a given focal effect, the total number of effect sizes exceeds the number of studies. The two general approaches for dealing with multiple measurements within studies are (a) using the complete set of measurements and treating them as independent and (b) representing each study by a single value. Monte Carlo simulations have shown that meta-analytical procedures using a complete set of measures from each study outperform single-value approaches (Bijmolt & Pieters, 2001). The results of the meta-analysis will be too conservative and underestimate the degree of generalizability across studies (Hunter & Schmidt, 2004). Consequently, from the 52 studies, we extracted information on the 205 effect sizes, sample sizes, statistical artefacts, and moderator variables.

Meta-Analytic Procedures

This meta-analysis uses Hunter and Schmidt's (1990) statistical aggregation techniques for cumulating correlations and correcting for various study artefacts in order to estimate the common measure of effect size between CEM and CFP.

In the meta-analysis literature, the term *effect size* is used to denote the magnitude of the relationship between the dependent variable (e.g., CFP) and a specific independent variable (industrial context, CEM variables, CFP indicators, country, date of observation, etc.). In this study, the r statistic is calculated to determine the effect size for each pair of variables from each study. Whenever a study reported the r statistic, that is, a coefficient of correlation between CEM and CFP, it is used as a measure of effect size. When the r statistic was not reported, but other statistics transformable into r statistic were presented, formulas given by Rosenthal (1991) or Wolf (1986) were used to transform t-test, and Z-test into an r statistic.

Following Hunter and Schmidt (1990), for each association between CEM and CFP, we first calculate the weighted mean correlation coefficient ($\bar{r} = \Sigma N_i r_i / \Sigma N_i$), the total observed variance ($S_r^2 = \sum N_i (r_i - \bar{r})^2 / \sum N_i$), and the sampling error variance ($S_e^2 = \left(1 - \bar{r}^2\right)^2 k / \sum N_i$), where N_i is the number of observations in each sample, r the effect size for sample i, and k the number of effect sizes. In order to determine whether the empirical correlations are homogeneous, we use two tests: (a) the 75 % rule according to which, if 75% of the observed variance across studies can be explained by sampling errors, we can conclude that the association is considered unmoderated and homogeneous (Pearlman, Schmidt, & Hunter, 1980) and (b) a chi-square test to assess the significance of the null hypothesis (H_0: $\rho = 0$; Hunter & Schmidt, 1990).

Furthermore, credibility and confidence intervals have been calculated with corrected standard deviation estimate and the standard errors of the mean-corrected effect sizes established (Whitener, 1990). Confidence intervals provide information on the *reliability* of the estimate of the weighted mean coefficient correlation by stating the range of values between which the true value of this value is likely to lie, given a self-chosen confidence level (in our case, 95%). Hence, a 95% confidence interval that does not include zero is an indicator that there is a true relationship between the variables of interest (Hunter & Schmidt, 1990). Credibility intervals, in contrast, provide information on the *generalizability* of the estimate of the weighted mean correlation coefficient, defined as the homogeneity of the distribution of the correlation coefficient. They do so by stating a range of values within which a self-chosen fraction of all correlation coefficient lies (in our case, 95%), with narrower intervals indicating greater homogeneity/generalizability (Hunter & Schmidt, 2004). If credibility intervals are large or include zero, some other moderators might influence the relationship (Hunter & Schmidt, 2004; Whitener, 1990).

Moderator analyses are conducted by separating the sample into relevant subgroups with meta-analyses performed on each subgroup. This hierarchical subgroup method, advocated by Hunter and Schmidt (1990) assesses the heterogeneity of the sample. In this method, studies are separated into subgroups according to theoretically predicted moderators. This subgrouping is

Table 1. Overall Meta-Analytic Findings.

	k	N	Mean	SD	CfI 95%	CrI 95%	χ^2	p	Exp Var	Unexp Var	File Drawer
Correlation based	205	62,943	0.09	0.00	0.08/0.09	0.06/0.11	546.04	<.001***	0.11	0.89	
Partial correlation based	52	16,343	0.08	0.01	0.06/0.10	0.04/0.12	123.99	<.001***	0.15	0.85	1,001

Note. k = Number of effect sizes; N = total sample size; Mean = weighted mean correlation coefficient; SD = standard deviation of mean; CfI 95% = 95% confidence interval for mean; CrI 95% = 95% credibility interval for mean; p = probability of CI 95%; Exp Var = expected variance; Unexp Var = unexpected variance; p<0.001.

hierarchical, allowing moderators to "nest" within each other so they can be considered in combination (Steel & Kammeyer-Mueller, 2002).

The purpose of subgrouping is to reduce heterogeneity and to increase explanatory power. Prior meta-analyses suggest that studies can be classified according to differences in the measurement of the dependent and the explanatory variables to reduce the level of variance in results (Steel & Kammeyer-Mueller, 2002).

In the overall meta-analysis, an effect size "file drawer analysis" was performed to address the possibility of publication bias, which is that published studies will report larger and more positive effect sizes than unpublished studies. File drawer analysis addresses this issue by calculating the number of additional unknown studies needed to widen the reported confidence interval enough to include zero (Hunter & Schmidt, 1990; Rosenthal, 1978). Thus, the file drawer can be interpreted as an indication of the stability of the relationship.

Results

Overall CEM–CFP Relationship

Using the meta-analytical techniques described above, we investigated the relationship between CEM and CFP (Table 1) as well as the moderators' influence on this relationship (Table 2).

As Table 1 shows, the mean correlation of the relationship between CEM and CFP is positive (0.09) with a 95% confidence interval of (0.08-0.09) for the total set of 205 effect sizes and a total sample size *N* of 62,943 observations. This holds for all different measures of CEM and all different measures of CFP for all the studies included in this meta-analysis.

The associated confidence interval is small and does not include zero, providing evidence that there is a significant positive relationship between CEM and CFP. Furthermore, the corresponding credibility interval also includes only positive values, suggesting the generalization of the effect.

As shown in Table 1, 1,001 additional studies are necessary to change the overall substantive conclusions of this meta-analysis. Results of our study confirm the meta-analysis of Orlitzky et al. (2003), who argued that the CSP is positively correlated with CFP across a wide variety of industry and study contexts, supporting Hypothesis 1. Our results are also consistent with Allouche and Laroche (2005) who found that CEP, as a measure of CSP, has a positive relationship with CFP, just as all other measures of CSP.

For the overall meta-analysis results, the unexplained variance is 89.33% supporting the existence of moderators regarding the relationship between CEM and CFP. Furthermore, the credibility interval (0.06-0.11) is large enough to support the existence of moderators. In this case, moderators affect the magnitude rather than the direction of the relationship.

The relationship between CEM and CFP is significantly stronger when CEM is measured by EMV (0.13) than when it is measured by EPV (0.06) or by EDV (0.06) supporting Hypothesis 2.

Table 2. Meta-Analysis Moderators' Results.

Moderator	*k*	*N*	Mean	*SD*	CfI 95%	CrI 95%	χ^2	*p*	Exp Var	Unexp Var
Environmental management variable	80	23,110	0.13	0.04	0.12/0.14	0.09/0.18	254.61	<.001***	0.08	0.91
Environmental performance variable	97	35,610	0.06	0.02	0.05/0.07	0.03/0.09	233.44	<.001***	0.12	0.88
Environmental disclosure variable	28	4,223	0.06	0.02	0.03/0.09	0.00/0.12	50.24	<.004***	0.28	0.72
Accounting-based indicator	49	6,329	0.24	0.08	0.22/0.27	0.17/0.33	176.27	<.001***	0.08	0.92
Market indicator	82	32,842	0.03	0.01	0.02/0.04	0.00/0.05	167.24	<.001***	0.17	0.83
Organizational-based indicator	52	21,433	0.13	0.02	0.12/0.15	0.10/0.18	162.68	<.001***	0.12	0.88
CAR	22	2,339	0.01	0.02	−0.03/0.05	−0.07/0.09	39.46	<.001***	0.25	0.75
United States–Canada	146	39,574	0.08	0.02	0.07/0.09	0.05/0.1	347.27	<.001***	0.14	0.86
Europe	31	6,161	0.03	0.01	0.01/0.06	−0.01/0.08	43.63	<.05*	0.27	0.73
Rest of world	28	17,208	0.12	0.03	0.11/0.14	0.05/0.20	154.97	<.001***	0.04	0.96
Multisector	76	16,016	0.11	0.03	0.09/0.12	0.06/0.15	192.56	<.001***	0.13	0.87
Manufacturing	56	8,435	0.05	0.01	0.03/0.07	0.02/0.09	84.47	<.007***	0.37	0.63
Steel industry	50	35,179	0.08	0.03	0.07/0.09	0.04/0.13	212.2	<.001***	0.05	0.95
Chemical-oil	23	3,313	0.12	0.02	0.08/0.15	0.03/0.20	56.50	<.001***	0.16	0.84
Date: 1972-1995	108	19,041	0.08	0.01	0.07/0.1	0.05/0.12	248.72	<.001***	0.15	0.65
Date: 1996-2008	97	43,902	0.09	0.01	0.08/0.1	0.06/0.12	297.22	<.001***	0.08	0.92
Non-longitudinal	117	21,645	0.13	0.01	0.11/0.14	0.09/0.17	342.46	<.001***	0.09	0.91
Longitudinal	88	41,298	0.07	0.01	0.06/0.08	0.04/0.09	203.46	<.001***	0.14	0.86

Note. k = Number of effect sizes; N = total sample size; Mean = weighted mean correlation coefficient; SD = standard deviation of mean; CfI 95% = 95% confidence interval for mean; CrI 95% = 95% credibility interval for mean; p = probability of CI 95%; Exp Var = expected variance; Unexp Var = unexpected variance, U = U-statistic, CAR = cumulative abnormal return; p<0.001.

The associated confidence interval (0.12-0.14) does not include zero, indicating that the weighted mean correlation coefficient is truly positive. This confidence interval is relatively narrow, suggesting that the estimate is fairly precise and we can note that it does not overlap with the confidence intervals for EPV and EDV. Furthermore, the credibility interval for EMV does not include zero, suggesting that a continued search for moderators of this subgroup is not necessary. Hence, we can conclude that the relationship between CEM and CFP is significantly positive and stronger when CEM is measured by EMV.

As Table 2 shows, indicators chosen to measure financial performance influence the relationship between CEM and CFP, supporting Hypothesis 3. CFP measured by an accounting-based indicator is positively influenced (0.24) by CEM with a 95% confidence interval of (.22-0.27). This associated confidence interval does not include zero, suggesting that mean weighted correlation is truly positive and, furthermore, it does not overlap with the confidence intervals for the three other indicators. Thus, we can conclude that the relationship between CEM and CFP is more positive when CFP is measured by accounting-based indicators than when it is measured by other financial performance variables. Furthermore, the credibility interval for the accounting-based indicator does not include zero, suggesting that a continued search for moderators for this subgroup is not necessary. These data confirm Orlitzky et al.'s (2003) results, which found that CFP measured by accounting-based indicators was more highly influenced by CSP than when it is measured by market-based indicators.

Moderator Analysis

The relationship between CEM and CFP is significantly stronger for studies conducted in the rest of world (0.12) than in the United States–Canada (0.08) and stronger in the United States–Canada than in Europe (0.03). As the 95 confidence intervals of the three sets of studies do not overlap, we can conclude that the regional difference is a significant moderator in this relationship. Furthermore, the credibility interval for studies conducted in Europe includes zero, suggesting that other moderators may influence the relationship between CEM and CFP in Europe.

The relationship between CEM and CFP is not significantly moderated by the studies' activity sector, which leads us to reject Hypothesis 4. As there is only a small difference between the weighted mean correlation coefficient for these four groups of studies (0.12 for the chemical-oil sector, 0.05 for the manufacturing sector) and the 95% confidence intervals of the four sets of the studies overlap, we cannot conclude that activity sector is a moderator in this relationship.

The observation study period of the empirical research included in this meta-analysis ranges from 1972 to 2008. From the mid-1990s, the natural environment-related research jumped from the level of per mille to per cent; 1.1% of articles in the nine top management journals dealt with environmental issues, whereas all the major management journals had published organization and environment-related research (Kallio & Nordberg, 2006). Consequently, the studies sample included in this meta-analysis has been divided into two periods: 1972-1995 and 1996-2008. The weighted mean correlation coefficients for the two studied periods are very close (0.08 for the 1972-1995 period, 0.09 for the 1996-2008 period) and the associated confidence intervals overlap significantly. Further research is needed before any conclusions can be drawn about the role of the studies' observation period in the relationship between CEM and CFP.

The relationship between CEM and CFP is significantly stronger for non-longitudinal studies (0.13) than for longitudinal studies (0.07). The confidence interval for non-longitudinal studies (0.11-0.14) does not include zero, indicating that the weighted mean correlation coefficient is truly positive. This confidence interval is relatively narrow, suggesting that the estimate is fairly precise and we can note that it does not overlap with the confidence intervals for longitudinal studies. Furthermore, the credibility interval for non-longitudinal studies does not include zero, suggesting that a continued search for moderators of this subgroup is not necessary. Hence, we can conclude that the duration of the study strongly moderates the relationship between CEM and CFP so that it is significantly positive and stronger for non-longitudinal studies.

Discussion and Conclusion

The goal of this meta-analysis was to critically examine the relationship between CEM and CFP within a large sample of studies over a period of 35 years.

The results of this meta-analysis show, first, a positive relationship between CEM and CFP, supporting the win-win hypothesis (Porter & van der Linde, 1995a, 1995b) and the "Does it pay to green" literature (Hart & Ahuja, 1996). Second, this meta-analysis was to highlight the significant influence of the moderators on the relationship between CEM and CFP that could explain the inconsistency of the findings.

CEM is more positively related with CFP when CEM is measured through EMVs than when CEM is measured through EPVs. EPV represents resources that have been inefficiently or incompletely used by the firm, and the elimination of such waste and inefficiencies increases the CFP. Furthermore, an improvement in CEP through pollution prevention offers the possibility of reducing emissions well below the levels required by law, lowering the firm's compliance and liability costs.

The results of this meta-analysis confirm that CEM measured by EDVs is positively correlated with CFP. Many industrial companies have published voluntary annual environmental reports detailing emissions, spills, accidents, fines, and penalties as well as improvements in pollution prevention. Managers have used environmental disclosure to maintain or increase the legitimacy of their firms, in order to reassure stakeholders and their approval of the firm's activities, since stock market reactions seem to be positively linked to this kind of disclosure (Aerts & Cormier, 2009; Cho & Patten, 2007; Cormier, Gordon, & Magnan, 2004). Companies tend to disclose "good news" and suppress "bad news" about their exposure to environmental risks, which is why investors may interpret these disclosures as a positive signal concerning the firm's exposure. As a result, firms often use voluntary disclosure to present a proactive environmental image by providing "green washing" information about their environmental performance. For this reason, it is worth asking to what extent environmental management practices are really implemented by companies (Carruthers, 1995).

This meta-analysis shows that CEM measured by EMV has a significantly stronger relationship with CFP. The influence of EMV on firm performance results from both the positive impact on firm costs and differentiation levels. Preventing pollution enables firms to save pollution control costs, input and energy consumption, and to reuse materials through recycling (Hart, 1997). Furthermore, product stewardship, such as eco-efficiency, involves producing and delivering goods, while simultaneously reducing the ecological impact and use of resources (Schmidheiny, 1992).

Therefore, this result confirms the move away from asking "Does it pay to be green?" to the more nuanced question "When and how does it pay to be green?" (Reinhardt, 1998). As we have seen, the different moderators significantly influence the relationship between CEM and CFP highlighting the complexity of the environmental issue and how organizations manage it. This positive relationship is stronger when companies develop complex capabilities, such as making continuous environmental innovations either in manufacturing processes (to increase energy efficiency and reduce inputs and wastes), and/or in product-focused practices involving redesign, highlighting the environmental attributes of products and services to green consumers. The pollution control or prevention practices must be associated with certain strategic managerial and manufacturing processes in order to lead to environmental and competitive improvements (Aragon-Correa & Sharma, 2003). Managerial skills as well as the complex environmental capabilities for pollution prevention, continuous innovation, and stakeholder integration seem to play an important role in the relationship between CEM and CFP (Hart, 1995, 1997; Russo & Fouts, 1997; Sharma & Vredenburg, 1998).

Organizational performance as a measure of financial performance positively influences the relationship between CEM and CFP. Firms that have addressed the environmental issue by implementing an EMS need to develop particular organizational capabilities. This type of environmental management transforms the organization, modifying manufacturing processes and integrating environmental management into day-to-day operations. Environmental performance improvement becomes an objective of a firm's strategy, just as financial profitability is. The goal of an environmentally proactive strategy is to significantly reduce pollution through well-defined environmental objectives rather than to merely control emissions through end-of-pipe investments. This kind of strategy is people-intensive and depends on tacit skill development through employee involvement (Hart, 1995; Hart & Dowell, 2011).

Our results confirm that organizational resources and capabilities, rooted in the firm's interaction with its natural environment, can lead to competitive advantage. These resources are the basic units of analysis, and include physical and financial assets as well as employees' skills and organizational processes. They must be valuable and non-substitutable in order for companies to obtain a decisive competitive advantage from their environmental management practices (Barney et al., 2011). The key issue is the challenge of measuring both organizational resources and competitive advantages because most of them are intangible. The costs of the organizational capabilities required by any environmental management practices must be obviously taken into account in the evaluation of the ROI of these practices. In addition, measuring the competitive advantage is necessary to go further in the implementation of these environmental management practices. Clearly, this issue highlights the crucial role of the environmental management control system in this win-win opportunities context: Its main role is to calculate the savings made by the proactive environmental strategy and the extent to which this is economically profitable (Buhr & Gray, 2012).

The results confirm theoretical inconsistencies (stakeholder mismatching), as the relationship between CEM and CFP is not significant when CFP is measured by market-based indicators. As Wood and Jones (1995) argue, there is no theory that explains whether stakeholders would or would not prefer a company that invests money in green issues to be ranked higher in pollution control indexes. The pollution rankings might not be correlated with the accounting measure of CFP unless there were some organized, large-scale, systematic efforts to boycott high-polluting firms and purchase from cleaner ones (Wood & Jones, 1995). In addition, a market-based evaluation of the organizational capabilities may be problematic since these capabilities are intangible by nature. Outside companies, shareholders are facing an asymmetric information problem while managers are in possession of valuable private information.

What the results highlight is that the relationship between CEM and CFP is consistent from 1972 to 2008 even if national and international awareness about the environmental issue varies significantly over the period. Governments began to address environmental issues in the 1970s with the creation of the Environmental Protection Agency (EPA) in the United States and environment ministries in Europe and Japan. From 1970 to 1995, major restrictive environmental laws came into effect in the United States, Europe, and Japan, constraining firms to be more and more proactive in addressing increasing environmental regulation. From 1996 to 2008, different initiatives from voluntary organizations or conferences addressed the environmental issue collectively and internationally. To reduce the heterogeneity of the EMS implemented by companies, some voluntary organizations (ISO 14001 certification, 1996, Global Reporting Initiative, 1997 and the Eco-Management and Audit Scheme, 2001) drew up guidelines to certify their efficiency. From the latter part of the 1990s, the association between economic and environmental concern has grown increasingly stronger (Harring, Jagers, & Martinsson, 2011). Academic research has extensively encouraged proactive environmental strategy implementation through numerous empirical studies or case studies that show that the environment can be seen as an opportunity (Kallio & Nordberg, 2006).

Theoretical Implications

The main theoretical contribution of this meta-analysis is to underline the major influence of moderators on the relationship between CEM and CFP. The way of measuring environmental performance, financial performance, and the regional differences can contribute to understanding when the relationship is stronger.

The meta-analysis suggests that EMV is a more significant moderator in the relationship between CEM and CFP than EPV is. EMV refers to different environmental practices enacted by companies: EMS adoption, participation in voluntary programs, ISO 14001 certification, pollution prevention programs, environmental innovation in manufacturing processes, eco-efficiency, "green" product-driven processes, and so on. All these practices suggest that managers address the environmental issue differently according to their perception of threats or opportunities offered by the environment, or according to environmental pressures from various stakeholders that might influence their environmental strategies to varying degrees (Henriques & Sadorsky, 1999). Our results highlight the central role of the EMVs on the relationship between CEM and CFP. The environmental management refers to different practices implemented by organizations, the diversity of which shows that the managers' perception of the environmental issue is variable and determines the degree of organization's commitment to this issue (Henry & Dietz, 2012). Some managers implement a proactive environmental strategy as they are convinced that this can help reduce the ecological footprint of organization. On the other hand, sceptical managers are less keen to invest time and money on these environmental practices since they do not believe that climate change can be reversely impacted by organization's activity (Hoffman, 2011). The diversity of proxies used to represent environmental management practices underlines the heterogeneity of the managers' behaviour regarding the environmental issue as well as the variety of environmental practices. These findings confirm that environmentalism is not a unified category of behaviour as it can be influenced by the characteristics of each organization and the knowledge of the manager (Greenspan, Handy, & Katz-Gerro, 2012). In-depth studies are therefore necessary in order to understand under which conditions it pays to be green, and to determine the influence of environmental management characteristics on profitability.

Our results emphasize the role of internally oriented practices enhancing environmental innovations that may lead to first-mover advantages for companies. As we have seen, the EDV influences positively CFP underlying the increasing demand of local communities and external stakeholders for more visible and transparent corporate environmental practices; in other words, environmental management practices require the deployment of several externally focused capabilities (Aragon-Correa, Martin-Tupia, & Hurtado-Torres, 2013). Our results support a contingent resource-based view of proactive corporate environmental strategy, inasmuch as they emphasize the dynamic capabilities and skills associated with CEM enhancing the CFP (Aragon-Correa & Sharma, 2003).

As we have seen, CEM influence more positively the financial performance than market-based performance. Yet the improvement of financial performance can rely on different environmental practices that do lead to a reduction of the organization's ecological footprint. Hence, what is good for business is not always good for the environment. Companies that sell their allowance and offset on the carbon market in Europe increase their financial profitability without considering their carbon footprint. Actually, carbon credit can generate capital from wherever the carbon exchange operates and such transactions provide a manager with the advantage of generating capital for companies that would otherwise not be available (Bansal & Knox-Hayes, 2013). Therefore, the trade value given to the natural environment through this carbon market has set the environmental and financial performance on the same short-term period of time. Yet a short period of time may not be the best way to consider and to address the environmental issue. Furthermore, we can regret that carbon market cannot succeed to reach its initial goal: reduce carbon emissions. Transactions on the carbon market encourage a short-term management of the environmental issue even though this may not be the best way to address this issue.

These results contribute to the evolution of the literature on organization and environment from strategic management theory to organization theory, which provides a more multiform basis for the CEM–CFP debate. The public now embraces a view where environmental protection and economic development can be furthered simultaneously (Harring et al., 2011). In this context it seems that "*How* does it pay to be green?" is a more accurate question than "Does it pay to be green?" when addressing the consequences of CEM on CFP (Kallio & Nordberg, 2006). Our results confirm that the organization and environment-related research is today legitimate without the need to find win–win solutions.

The moderator analysis underlines the significant influence of regional differences on the relationship between CEM and CFP. This result suggests that "it pays more to be green" in the United States–Canada than in Europe. Indeed, the positive relationship seems to be stronger when regulatory scrutiny is less restrictive. In this context, firms have the most potential to gain from CEM when they have the most discretion on how to address environmental issues. Our results suggest that flexible environmental policies give greater incentive to innovate than prescriptive regulations, which supports the "narrow" version of Porter's hypothesis (Jaffe & Palmer, 1997). The conservationist approach to the environment that originally emerged in Europe, has emphasized that natural areas should be protected for use and enjoyment by people, thereby putting faith in collective use policies to solve environmental problems (Shrivastava & Kennelly, 2013). The relationship between CEM and CFP proves less positive when the environmental regulation is constraining, as in Europe, since a large part of the investments necessary to comply with regulations entail additional production costs (Lanoie, Laurent-Lucchetti, Johnstone, & Ambec, 2011). Therefore, flexible environmental regulation makes it possible to identify numerous "win–win" opportunities and may explain the regional difference in the relationship between CEM and CFP.

Managerial Implications

The results of the meta-analysis confirm that managers may be more likely to pursue CEM as a part of their strategy for increasing CFP. Strategic leaders need to legitimize environmental issues as an integral part of corporate identity, allowing managers the time and resources they need to manage the environmental issue at their discretion. A high allocation of investment in environmental technologies towards pollution prevention, product stewardship, and life cycle analysis is necessary. To make such investments, firms must develop strategic organizational resources to recognize and deploy environmental strategy at plant level (Klassen & Whybark, 1999). The adoption of innovative environmental technologies would be enhanced if managers interpreted environmental issues as opportunities rather than as threats (Delmas et al., 2011; Sharma, 2000).

A clear and fully integrated environmental strategy should not only guide the development of competencies but also shape the company's relationship with customers, suppliers, other companies, policy makers, and all other stakeholders. Knowledge, practices, systems, and routines in the interface between business and the natural environment must be enhanced to increase proactive strategy results on both economic profit and environmental protection. To attain this goal, environmental departments must play a major role in developing environmental awareness across the organization. Training on an ongoing basis can help employees to address new regulations and community concerns. Educated employees can be a source of innovative ideas in pollution prevention technology and processes (Dechant & Altman, 1994). Taking a strong stand in acquiring, assimilating, transforming, and exploiting knowledge seems a valuable precondition to realize the benefits of a proactive environmental strategy (Delmas et al., 2011).

As Sharma, Pablo, and Vredenburg (1999) argue, organizations that create a context within which their employees are encouraged to embrace environmental issues as opportunities, stand to realize significant benefits from a number of sources, including a lower cost of input materials, higher process efficiencies, lower energy use, waste reuse and recycling, differentiated products, and higher levels of corporate reputation and goodwill. Companies often consider environmental issues as strictly the environment department's job and not as an inherent part of every employee's job. To change this way of thinking, companies might base the incentives of their operational managers on, among other things, how well they meet environmental goals (Dechant & Altman, 1994).

Limitations and Future Research

The results of this study need to be interpreted with caution. First, CFP and CEM are metaconstructs that can be operationalized in a variety of ways. The "estimate" calculated in this meta-analysis depends on the researchers' choices of CEP and CFP measures and on their theoretical significance. Furthermore, this effect size is calculated from the different studies, countries, periods, and operational definitions used in measuring the explanatory variables, and from a variety of research methods. The heterogeneity of the analysis is often criticized in meta-analysis studies (Laroche & Schmidt, 2004). Despite these limitations and concerns, meta-analysis is a well-established social science technique for aggregating test statistics, and the inclusion criteria used in this article are consistent with the literature.

Furthermore, as we have seen, the characteristics of the studied companies—size, geographical location, industrial sector, financial performance, number of employees—determine significantly the environmental management practices implemented by the managers, and thus, the environmental performance.

CEM is operationalized in a heterogeneous manner. EPV and EMV are very different indicators to measure the environmental performance, as the former measures the output of the latter. Some indicators are input-oriented (resource consumption), or output-oriented (pollution or waste generated); others refer to process- or product-driven initiatives (Molina-Azorín et al., 2009). This heterogeneity of environmental performance indicators highlights that CEM is a metaconstruct that is difficult to define and thus to measure (Schultze & Trommer, 2012). These different measures of environmental performance might suggest a lack of theoretical foundations (Wood & Jones, 1995), or that they do not automatically capture the underlying construct to the same extent (Carroll, 2000) or that their conceptual connections are not fully understood (Ilinitch, Soderstrom, & Thomas, 1998; Wagner, 2005).

This meta-analysis shows that the positive relationship between CEM and CFP varies according to the EMV used by researchers, confirming the need to address the environmental performance measurement problem in order to obtain consistent results across studies.

To conclude, the positive relationship between CEM and CFP is stronger when CEM is measured by EMV rather than by EPV, when CFP is measured by accounting-based rather than by market-based measures, particularly for studies in the rest of world or in the United States–Canada, for the chemical-oil sector and for the non-longitudinal studies. This study highlights the environmental performance measurement issue since researchers use various proxies to illustrate the way companies manage their ecological footprint. There is no doubt that environmental performance is quantified with the aim of measuring the relationship between environmental and financial performance and determining its significance. Nevertheless, we have seen that the managerial dimension of this issue is becoming increasingly important. Therefore, the understanding of the relationship between CEM and CFP relies on in-depth studies of all the determinants of the environmental management practices.

Appendix A

Overview of Studies Included in This Meta-Analysis.

Authors	Sample Size	Nb $\bar{r}$	Av $\bar{r}$	Corporate Environmental Performance Indicator	Corporate Financial Performance Indicator
Al Tuwaijri et al. (2004)	198	4	0.237	Toxic waste recycled/ Total waste generated	Industry-adjusted annual return—adjusted for dividends
				Environmental disclosure	
Alvarez-Gil, Burgos-Jimenez, and Cespedes-Lorente (2001)	71-112	4	0.163	Seven different environmental practices	Profit of the year and of the past 3 years
Aragon-Correa and Rubio-Lopez (2007)	86	2	0.039	Emission of organic carbon	ROI and ROE
Berrone and Gomez-Meija (2009)	2,088	5	0.034	Chemical emission (TRI)	ROE and Tobin's *q*
				Pollution level (waste generation level)	
Blacconiere and Northcut (1997)	72	3	0.185	Environmental disclosure	Variation of the stock price
Blacconiere and Patten (1994)	47	4	–0.298	Environmental disclosure	Variation of the stock price
Bush and Hoffmann (2011)	174	2	0.036	Carbon emissions	ROA, ROE, and Tobin's *q*
				Carbon management	
Christmann (2000)	88	5	–0.013	Environmental best practices	Cost advantage, cost saving
Clarkson, Li, Richardson, and Vasvari (2004)	105-183-256	6	0.168	Total toxic releases and toxic waste treated, TRI/sales, environmental disclosure using GRI	Debt or equity capital raised, Tobin's *q*, ROA, leverage ratio
Clemens (2006)	76	4	0.163	Firm's green program	Insurance premium, rewards
Cordeiro and Sarkis (1997)	523	8	–0.077	Recovering, recycling, treatment of TRI release	Industry analyst earnings forecast
Sarkis and Cordeiro (2001)	482	4	–0.087	TRI, end-of-pipe control	ROS
				pollution prevention	
Delmas, Hoffmann, and Kuss (2011)	157	1	0.190	Environmental reporting, regulatory proactivity, environmental partnerships	Comparative cost benefits, innovation, differentiation, reputation
Dooley and Lerner (1994)	222	4	0.188	TRI releases to air, to water, off-site transfer	ROA
Dowell, Hart, and Yeung (2000)	107-338	7	0.075	IRRC corporate environmental profile data	Tobin's *q*
Earnhart and Lizal (2007)	436	4	0.022	Lagged air pollutant emissions	ROA, ROE, ROS

(continued)

Appendix A (continued)

Authors	Sample Size	Nb $\bar{r}$	Av $\bar{r}$	Corporate Environmental Performance Indicator	Corporate Financial Performance Indicator
Fogler and Nutt (1975)	9	4	0.7	Environmental disclosure	Price stock variation
Freedman and Patten (2004)	112	2	–0.287	Environmental disclosure	Price stock variation
Gilley, Worrel, and El Jelly (2000)	71	3	0.058	Waste reduction, pollution control	Stock return
Goh Eng, Zailani, and Wahid (2006)	45	2	0.494	EMS ISO 14001 certified	Sales, reputation of the firm, product quality
Hamilton (1995)	436	2	–0.018	TRI emissions	Price stock variation
Hart and Ahuja (1996)	127	4	0.191	Emission reduction based on TRI from IRRC Corporate environmental data	ROA, ROE
Hassel, Nilson, and Nyquist (2005)	329	2	–0.241	Caring Company Research Index	Book value, net income
Jaggi and Freedman (1992)	13	5	0.342	Pollution Performance Index	Net income, ROE, ROA, cash flow, cash flow/assets
Judge and Douglas (1998)	170	12	0.157	Integration of environmental issues into strategic process Environmental compliance	ROI, earnings growth, sales growths, market share
Karagozoglu and Lindell (2000)	83	4	0.281	Environmental strategy Competitive advantage	Profit, environmental advantage
Khanna and Damon (1999)	702	2	0.063	Participation in 33/50 Program Emissions of toxic chemicals	Market value/sales
Khanna, Quimio, and Bojilova (1998)	273	2	0.156	TRI, environmental disclosure	Market value
King and Lenox (2001)	652-544	4	–0.079	TRI, pollution reduction	ROA, Tobin's q
Klassen and McLaughlin (1996)	22	2	0.102	Environmental disclosure	Price stock variation
Klassen and Whybark (1999)	69	6	0.201	TRI, pollution prevention index, pollution control index	Cost, speed, product quality, flexibility performance
Konar and Cohen (2001)	233	2	0.043	Toxic chemical emissions environmental lawsuits	Tobin's q, sales growth, R&D expenditures
Madsen (2008)	3,318	4	0.065	Pollution Index pollutant emissions	Market share growth
Mahapatra (1984)	67	4	0.645	Pollution control expenditures	Average market return

(continued)

Appendix A (continued)

Authors	Sample Size	Nb $\bar{r}$	Av $\bar{r}$	Corporate Environmental Performance Indicator	Corporate Financial Performance Indicator
Makni, Francoeur, and Bellavance (2009)	168-179	2	–0.182	Environmental indicators developed by MJRA	ROA, ROE, market return
Melnyck, Sroufe, and Calantone (2003)	910	4	0.238	EMS, ISO 14001 certification	Sales, cost of products
Menguc, Auh, and Ozanne (2010)	150	2	0.220	Manager's environment involvement	Market share, sales growth, profit
Menguc and Ozanne (2005)	140	12	0.601	Environmental Commitment	Market share, sales growth, profit after tax
Montabon, Sroufe, and Narisimhan (2007	45	4	0.453	Environmental management practices	Product innovation, process innovation
Morris (1997)	58	5	0.009	TRI, pollution released	ROA, ROS
Murray, Sinclair, Power, and Gray (2006)	660	2	0.071	Environmental disclosure	Market value
Nakao, Amano, Matsumura, Genba, and Nakano (2007)	556	2	0.072	Overseas environmental management system	Earnings per share, ROA, Tobin's *q*
Nehrt (1996)	44-50	2	0.386	Part of production elemental of totally chlorine-free pulp	Sales growth, net income, timing of investments
Russo and Fouts (1997)	486	3	0.424	Environmental rating from FRDC	ROA, firm growth rate, market share
Sharma and Vredenburg (1998)	99	2	0.588	Organizational capabilities	Competitive benefit
Thomas (2001)	291	3	0.021	Explicit environmental policy	Stock market return
Wagner (2005)	63	3	0.222	Pollution prevention policy	Return on capital employed
Wagner and Schaltegger (2004)	94	4	0.167	Pollution and waste reduction,	Overall business performance
Wahba (2008)	156	2	0.221	EMS ISO 14001 certificated	Tobin's *q*
Walls, Phan, and Berrone (2011)	184	2	–0.029	Proactive environmental strategy	Competitive advantage, sales, Tobin's *q*, R&D expenditures
Wu, Liu, and Sulkowski (2010)	287	2	0.035	Environmental disclosure	Tobin's *q*
Yu, Ting, and Wu (2009)	51	6	0.098	Proactive strategy, sustainable value created,	Ebit/assets, ROA, ROE, earnings per share

Note. ROE = return on equity; ROA = return on assets; EMS = environmental management system; FRDC = Future Research Design Company; MJRA, Michael Jantzi Research Associates; TRI = Toxic Release Inventory.

Appendix B

Indicator	Strategy	Example of Proxy Used by the Studies Included in This Meta-Analysis
Environmental management measure	Environmental performance variable	Total emissions, relative emissions, industry emissions, Toxic Release Inventory (TRI), Carbon emission reporting, end-of-pipe control pollution, environmental reporting, pollution performance index, toxic chemical emission, pollution released, emission reduction based on TRI, waste recycling rate, waste reduction, toxic waste treated, greenhouse gas/ozone depleting substances emissions, emission of organic carbon
	Environmental management variables	Integration of environmental issues into the strategic planning process (perceptual measures), environmental policy, EMS adoption, EPA's voluntary 33/50 program, process-driven and product-driven environmental initiative, environmental strategy (perceptual measure), ISO 14001 certification, environmental practices
	Environmental disclosure variable	Environmental disclosure in annual report, in the 10-K report, or in newspapers, environmental lawsuits, ranking, environmental awards
Corporate financial performance indicator	Accounting-based indicator	Earnings per share (EPS), return on equity (ROE), return on assets (ROA), return on sales (ROS), return on investment (ROI), Tobin's *q*
	Market-based indicator	Price-earning ratio, market share, sales, sales growth, profit, industry analyst earnings forecast, book value, net income
	Organizational measure	Cost advantage involved in pollution control equipment, differentiation advantage due to "green product," insurance premium rewards
	Cumulative abnormal return	Price stock variation, stock return

Note. EMS = environmental management system; EPA = Environmental Protection Agency.

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