IS POLLUTION PROFITABLE? A CROSS-SECTIONAL STUDY

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ABSTRACT

Given the global emphasis on corporate social responsibility [CSR] and sustainability initiatives, and an increasing focus of public policy on CSR disclosure and attestation, we investigate whether profitability trumps policy concerns: Specifically whether it is profitable to pollute. Prior research has provided conflicting evidence on this issue. We employ annual returns as a proxy for financial performance, and assess environmental performance using 13 distinct variables. Our conclusion is that policy initiatives should focus on environmentally friendly activities that have the potential to enhance (or not burden) the financial performance of firms if we wish those initiatives to be embraced.

Keywords: *corporate social responsibility, environmental performance, financial performance*

Data availability: Data are available from sources identified in the text

INTRODUCTION

The "Go green" initiatives seen at every level of society demonstrate society's concerns regarding the importance of preserving the environment. Attempts to protect the environment are seen at most, if not all, levels of society. Across borders, countries have worked on international environmental protection treaties such as the Kyoto protocol under which signatory nations committed to binding emission reduction targets (The Kyoto Protocol to the United Nations [UN] Framework Convention on Climate Change is an international treaty adopted on December 11, 1997 in Kyoto, Japan that places binding obligations on industrialized countries to reduce greenhouse gas emissions - of the member nations of the UN all but Andorra, Canada, South Sudan and the United States ratified the treaty). Within countries, governments and regulatory agencies have established rules and regulations to protect and preserve the surrounding environment, but the authority and effectiveness of these agencies varies from one country to another. In the United States, for instance, the Environmental Protection Agency [EPA] sets protective rules and applies clean-up sanctions on firms polluting the environment. In the corporate world, firms strive not just to avoid sanctions from the EPA, but also to maintain an environmentally conscious public image. Further, individuals are, in their daily actives, more aware and oriented towards recycling products and reducing waste. Wasteful activities endanger the environment whether by individuals or by businesses. Firms' large-scale operations constitute a greater threat to the environment especially when financial incentives and social incentives are at odds. In this study we shed light on the issue by providing evidence on the nature of the association between environmental and financial performance.

In the environmental performance literature there has been a vigorous debate about the association between corporate environmental performance and financial performance. One school supports the traditional perspective, which suggests that expenditures on environmental improvements involve additional costs that generally provide no additional value to the firm. Another school supports the relatively newer perspective, which suggests that expenditures on environmental improvements and pollution controls lead to increased firm value. A third school suggests that corporate environmental performance and financial performance have no association whatsoever. We seek to offer some resolution to the debate, and to provide specific guidance for public policy, by employing a variety of distinct attributes of corporate environmental performance in our models.

This research addresses the overall association between firms' environmental performance and capital market valuations. Prior research has provided conflicting evidence on this association, and has often followed an event study methodology that yields results that are not generalizable (See, for example, Blaconniere and Patten 1994, Blaconniere and Northcut 1997, Freedman and Patten 2004, and Griffin and Sun 2013). Unlike prior studies, we conduct an explanatory study to investigate the general association between corporate environmental performance and firms' annual returns independent of any particular environmental event. By taking this approach, we are able to present evidence regarding the nature of the association between environmental and financial performance that is generalizable and that explains the contradictory results of prior studies. We are also able to investigate how environmental attributes interact when combined into a single overall measure. The results of this study may provide guidance to investors, regulators and standard setters with respect to their understanding of the nature of the conflicts involved. It may also help regulators and standard setters identify relevant venues to resolve these conflicts. If, for example, profits are the objective firms seek when conducting operations that endanger the environment, then regulators and standard setters should impose financial sanctions to make such activities unprofitable. If, however, poor environmental performance is not motivated by profit objectives, then financial sanctions will punish firms but not alter their behavior.

LITERATURE REVIEW

The association between environmental performance and financial performance, measured by stock price changes, has been addressed by several studies. Some, such as Belkaoui (1976), Anderson and Frankle (1980), Solomon and Hansen (1985), and Burnett, Skousen and Wright (2001) support a positive association where the cost of a high level of corporate social responsibility is more than offset by increased employee morale, productivity and firm value. Other studies, such as those by Ingram and Frazier (1980) and Jaggi and Freedman (1982) have found, however, that a negative relationship exists between corporate social responsibility and firm performance. Craig Deegan (2004) notes, however, that the study presents limited evidence and low power due to the small sample size and that this limits the generalizability of the results. Lorraine, Collison and Power (2004) on the other hand, find no association between abnormal returns and good environmental news, while bad news results in negative returns. Fryxell and Wang (1994) argue that inaccurate measures for a construct may lead to conflicting results and note that the strong association between the Corporate Reputation Index [CRI] and firms' financial performance stems from the fact that the Corporate Reputation Index is heavily weighted by the financial position of the firm.

McGuire, Sundgren and Schneeweis (1988) provide a summary of the three theoretical relationships between corporate social responsibility [CSR] and financial performance, which

despite their contrary assertions, have all been supported by prior research. They first suggest a negative association since high levels of social responsibility cause firms to incur additional costs that put the firm at an economic disadvantage compared to other less socially responsible firms. They also suggest that a positive association exists between improved employee and customer goodwill (and consequently improved financial performance) and greater social responsibility. Lastly, they hypothesize that no association exists between environmental performance and financial performance because the costs of improving environmental performance, as significant as they may get, will be offset by other reductions in costs and/or increased revenues.

Supporting the first of these conjectures is Friedman (1962), who opines that "few trends would so thoroughly undermine the very foundation of our free society as the acceptance by corporate officials of a social responsibility other than to make as much money for their stockholder as they possibly can" (p. 133).

Ingram and Frazier, (1980), and Warsame, Neu and Simmons (2002) find that poorer performers actually make more CSR disclosures and conclude that since there are no controls on the disclosures firms may be attempting to bias the perceptions of investors, while Fryxell and Wang (1994) note that companies' financial performance may be the driver of CSR reputation whether deserved or not. Similarly, Roberts (1992) and Ling and Mowen (2013) find that CSR disclosures are likely a function of companies' strategic plans, while Walden and Schwartz (1997) find that environmental disclosures tend to be time and event specific.

Cho, Roberts, and Patten (2009) investigate whether or not self-serving biases are present in the language and tone of corporate environmental disclosures. They argue that the degree of bias in the disclosure narratives is based on firms' environmental performance. They find a positive association between firms' environmental performance and the certainty score of the firms' environmental disclosures.

Spicer (1978) also tests the association between economic and financial indicators and corporate social performance. His results indicate that firms with better pollution control records tend to be larger, more profitable, have lower total risk, lower systematic risk, and higher price/earnings ratios than companies with poorer pollution control records. He also finds, however, that there is a marked reduction in these associations over time. This suggests that such associations may be short-lived phenomena.

McGuire et al.'s (1988) second proposition (that there is a positive association between employee and customer goodwill, profitability and social responsibility), is supported by Lanis and Richardson (2012), Rao (1996) and Klassen and McLaughlin (1996). Lanis and Richardson (2012) for example, address the association between questionable corporate behavior (tax aggressiveness) and levels of CSR disclosure. They find that higher levels of CSR disclosure are associated with more conservative tax positions. Similarly, Rao (1996) addresses unethical behavior (environmental pollution), and stock performance. The results of that study indicate that actual stock performance for companies with unethical environmental performance is lower than the expected market adjusted returns, twelve months before through six months after, the environmental event. Klassen and McLaughlin (1996) study the association between environmental management efforts, "environmental reward" and "environmental crises," and firm financial performance. They find a significant positive association between environmental performance and firms' market values.

Similarly, Muoghalu et al. (1990) find that environmental lawsuits are associated with negative abnormal returns, but that abnormal returns at the disposition of the suits are statistically insignificant. Hamilton (1995), Konar and Cohen (1997) and and Jaggi (1988) also

find negative financial consequences for firms when news of polluting behavior is released. In this same vein, Hoi, Wu and Zhang (2013) find that companies with irresponsible CSR activities tend to take risky tax positions that result in larger settlements with tax authorities.

Dhaliwal, Radhakrishnana, Tsang and Yang (2012) find that the mere existence of stand-alone CSR reports is associated with greater analyst forecast accuracy, while Dhaliwal, Li, Tsang and Yang (2011) find that reports disclosing superior CSR performance are associated with a lower cost of capital.

McGuire et al.'s (1988) third suggestion (that no association exists between environmental and financial performance), is supported by Lanoie, Laplante, and Roy (1998). They investigate the role that capital markets play in creating an incentive for, or pressure on, firms to improve their environmental performance by measuring how investors react to firms that appear successively on more than one environmental pollution list. They find that, in general, there is no association between firm value and appearing on the pollution lists. Only when firms appeared multiple and successive times on the lists did investors respond (negatively). The authors interpret their results as indicating that investors require extremely strong signals about firms' environmental performance before revising the expected value attributed to a firm.

With respect to positive environmental performance, both Bosch, Eckard and Lee (1998) and Aupperle, Carroll, and Hatfield (1985) find no significant association between concerns for society and financial performance. Aupperle et al., (1985) further find no significant differences in the financial performance of firms with or without a corporate social responsibility policy. Elliott, Jackson, Peecher and White (2013) find, however, that investors who do not explicitly evaluate CSR performance are swayed to over value firms based on positive CSR information, while investors who do explicitly evaluate the information assign lower fundamental values to those same firms. Pflugrath, Roebuck and Simnett (2011) find that CSR reports are viewed as more credible when they are: assured by an accountant, and when the company is from an industry where assurance is commonplace.

Yamashita, Sen and Roberts (1999) examine the relationship between environmental conscientiousness scores and stock returns. Environmental conscientiousness refers to legal environmental obligations as well as corporations' environmental policies and similar "progressive" activities. They find that the environmental consciousness of companies is not strongly related to financial condition, as there is no association between the environmental consciousness scores and company size, the debt-to-assets ratio, or earnings growth.

Lastly, Kreander, Gray, Power and Sinclair (2005) examine the financial performance differences between "ethical investment funds" and "non-ethical investment funds." They find no statistical difference in performance between ethical funds and the market benchmark, or between ethical funds and their matched group of non-ethical funds.

Thus, there is evidence to support each of McGuire et al.'s (1988) conflicting propositions. In this research we attempt to bring some resolution to these conflicts, by determining: which specific attributes of environmental strength or concern are associated with firm value (either positively or negatively) and which are not; and whether broad measures of environmental performance are informative with respect to forecasting the future cash flows of firms.

METHODOLOGY AND HYPOTHESIS

Various methods have been used to measure environmental performance. Some studies, such as Lorraine et al. (2004), Patten (2002), and Al-Tuwaijri et al. (2004), assess environmental

performance each by employing a single variable unique to their study. Other studies, such as Ingram and Frazier (1980), Wiseman (1982), Fryxell and Wang (1994), and Cho, Lee and Pfeiffer (2013) use an index measure that is an aggregation of several variables. Many other investigations (as described in the literature review above) are event studies. Since the conflicting results of these studies may be a consequence of the measures used, in this research we attempt to fill the gap between those methodologies and employ measures that are generalizable across firms. We address environmental performance via single variables as well as with overall indices. We first regress, individual environmental performance measures on sample firm's annual returns, and then aggregate the individual measures to create environmental scoring measures. Finally, the environmental scoring measures are combined into an overall environmental rating measure.

The environmental performance measures we employ are based on those contained in the KLD Research & Analytics database (KLD is now MSCI Analytics). The KLD database provides information about firms' environmental performance based on 13 variables. Six of the variables are classified by KLD as "environmental strength" variables, and are related to firm activities and efforts that preserve the environment or reduce/control pollution. The other seven variables, are classified by KLD as "environmental concern" variables, and are related to the negative impact on the environment caused by the firm operations.

The KLD database is a data set that provides an annual snapshot of the environmental, social, and governance performance as assessed by KLD Research & Analytics, Inc. KLD covers approximately 80 indicators in seven major qualitative issue areas including community, corporate governance, diversity, employee relations, environment, human rights and product. The data are gathered from several research processes. This process yields a full profile of the companies' performance.

Based on the criteria used for environmental performance measurement, the data is classified as either "environmental strengths" [ES] or "environmental concerns" [EC]. Whenever a strength activity is present, we code it "1," otherwise "0." Similarly whenever a concern activity is present, we code it "1," otherwise "0." Overall environmental performance is assessed by using both the strengths score and concerns score, as well as the overall combined score.

We measure the market valuation of firms' environmental performance using annual stock market returns from the Center for Research in Securities Prices [CRSP] database. We employ annual stock returns to examine the association between environmental performance and firm valuation. Since the efficient markets hypothesis suggests that all information regarding a firm is impounded into price, the individual environmental variables (ES and EC) should be significantly associated with stock prices if the issues they represent, are viewed by market participants as impacting future cash flows. Because of the conflicting results in the prior research and the three competing propositions of McGuire et al. (1988), we make no predictions regarding the sign of the coefficients on our model variables.

Our initial hypotheses (in alternative form) are thus:

H1 *Individual environmental strength variables [ES_i] are associated with firms' annual stock returns.*

H2 *Individual environmental concern variables [EC_i] are associated with firms' annual stock returns.*

There are six "environmental strength" measures and seven "environmental concern" measures available from KLD. We employ all of these variables in this investigation. Each individual ES measure (ESi, where "i" ranges from 0 to 6) is regressed on annual stock returns.

To test whether the magnitude of environmental strength is associated with firm value we combine the ESi scores into a total strength rating variable (TES) which, in turn, is regressed on annual stock returns. Likewise, each environmental concern measure (EC_i, where "i" ranges from 0 to 7) is regressed on annual stock returns and, similar to TES, combined into a total concern rating (TEC) which we use to test whether the magnitude of environmental concerns are associated with firm value. TES represents the accumulation of all environmental strength variables. Since these variables are dichotomous in nature, TES will range from 0 (in the case where a firm does not engage in any strength activities), to 6 (where a firm engages in all of the identified strength activities). TEC represents the accumulation of all environmental concern variables. As with the ES measures, these variables are also dichotomous in nature. TEC will thus range from 0 (in the case where a firm does not have any identified environmental concerns), to 7 (in the case where a firm is deemed to have all of the identified environmental concerns).

As above, we hypothesize that each of these constructs will be significantly associated with stock returns. Our third and fourth hypotheses (in alternative form) are thus:

H3 *The total strength rating [TES] is associated with annual stock returns.*

H4 *The total concern rating [TEC] is associated with annual stock returns.*

A company's overall environmental rating measure [OER] is constructed by combining the total strength rating variable [TES] and total concern rating variable [TEC]. This rating is used to test the association between firms' overall environmental position and firms' annual stock returns.

Combining individual variables into an index or rating variable is a process that depends essentially on the nature of the variables that will be combined; two main characteristics of these variables, namely weights and independence, are of interest in this current context. All environmental rating variables are assumed to be independent and equally weighted. Thus, the combination process was performed by simply adding the scores of both individual environmental strength variables and environmental concern variables into a total environmental strength rating and a total environmental concern rating respectively and then adding the scores of both total rating variables into one overall environmental rating variable (OER).

The OER is calculated by subtracting TEC from TES to create a measure of overall environmental performance. The higher the TES score the better a firm performs environmentally, while the higher the TEC score, the worse a firm's environmental performance. Our fifth hypothesis (in alternative form) is thus:

H5 Overall environmental rating [OER] is associated with annual stock returns.

VARIABLES

Environmental Performance Variables

The environmental strength variables provided by the KLD database are: *beneficial products and services*; *pollution prevention*; *recycling*; *clean energy*; *managements systems*; and *other strengths*. The environmental concern variables are: *hazardous wastes*; *regulatory problems*; *ozone depleting chemicals*; *substantial emisssions*; *agricultural chemicals*; *climate change*; and

other concerns. Exhibit 1, Panel A provides KLD's definitions for the six ES variables. Panel B provides the definitions of the seven EC variables.

Exhibit 1 - Definitions of Environmental Variables

Panel A – Strength Variables

Beneficial Products and Services	An environmental strength only if the company derives substantial revenues from innovative remediation products, environmental services, or products that promotes the efficient use of energy.
Pollution Prevention	An environmental strength only if the company has notably strong pollution prevention programs including both emissions reductions and toxics-use reduction programs.
Recycling	An environmental strength only if the company is either a substantial user of recycled materials as raw materials in its manufacturing processes, or is a major provider of recycling services.
Clean Energy	An environmental strength only if the company has taken significant measures to reduce its impact on climate change and air pollution through the use of renewable energy and clean fuel or through energy efficiency.
Managements Systems	An environmental strength only if the company includes environmental objectives as part of the firm's overall plans.
Other Strengths	An environmental strength only if the company has demonstrated a superior commitment to management systems, voluntary programs, or other environmentally proactive activities.

Panel B – Concern Variables

Hazardous Wastes	An environmental concern only if the company's liabilities for hazardous waste sites exceed $50 million, or the company has recently paid substantial fines or civil penalties for waste management violations.
Regulatory Problems	An environmental concern only if the company has recently paid substantial fines or civil penalties for violations of air, water, or other environmental regulations, or if the company has a pattern of regulatory controversies under the Clean Air Act, Clean Water Act or other major environmental regulations.
Ozone Depleting Chemicals	An environmental concern only if the company is among the top manufacturers of ozone pollution chemicals such as HCFCs, Methyl chloroform, methylene chloride, or bromines.
Substantial Emissions	An environmental concern only if the company's legal emissions of toxic chemicals from individual plants into the air and water are among the highest of the companies within the KLD database
Agricultural Chemicals	An environmental concern only if the company is a substantial producer of other polluting chemicals such as pesticides or chemical fertilizers.

Climate Change	An environmental concern only if the company derives substantial revenues from the sale of coal or oil and their derivative products, or if the company derives substantial revenues indirectly from the combustion of coal or oil and its derivative fuel products.
Other Concerns	An environmental concern only if the company has been involved in any environmental controversy that is not covered by the other EC variables.

Annual Stock Returns

Monthly stock returns for the sample companies were obtained from the CRSP database and then transformed into annual returns [Cum_Ret] in the following fashion:

$$Cum\_Ret = [1 * (1 + Ret_1) * (1 + Ret_2) * (1 + Ret_3) * (1 + Ret_4) * (1 + Ret_5) * (1 + Ret_6) * (1 + Ret_7) * (1 + Ret_8) * (1 + Ret_9) * (1 + Ret_{10}) * (1 + Ret_{11}) * (1 + Ret_{12})] - 1 \quad (1)$$

The cumulative annual returns are thus calculated by compounding the monthly returns where the initial base is 100% or 1, which corresponds to Cum_Ret at T=0. After one month, Cum_Ret will take the value $1*(1+Ret_1)$, which is the accumulation of the initial base 100% and Ret_1. After the second month, Cum_Ret will take the value $1*(1+Ret_1)*(1+Ret_2)$. This process is repeated until the twelve months are compounded.

Control Variables

Prior research indicates that a number of firm-specific factors are related to environmental performance. In order to more carefully investigate the association between firms' environmental performance and stock returns, we control for these factors. Specifically, we control for firm size, environmentally sensitive industry membership, profitability, financial leverage, capital intensity, and return on assets.

Firm Size (Lnas) And Environmentally Sensitive Industry Membership (SIC)

Prior studies, such as: Blacconiere and Patten (1994) and Cho et al. (2009), report that a significant association exists between firm size and environmental performance, with larger companies performing different environmentally than smaller companies. Consistent with general practice, our proxy for firm size is the natural log of total assets.

Similarly, various studies indicate that companies in industries whose activities have a significant impact on the environment performed differently, with respect to the environment, than firms in other industries. We control for industry membership by employing a dichotomous variable coded "1" for firms that belong to environmentally sensitive industries. Otherwise it is coded "0."

Patten (2002), Cho and Patten (2007), and Cho et al. (2009) conclude that environmentally sensitive industries include firms that operate within the: chemical (SIC code 28XX); metals (SIC code 33XX); mining (SIC code 10XX); oil exploration (SIC code13XX); paper and pulp (SIC code 26XX); and petroleum (SIC code 2911) industries. We follow these classifications in coding industry membership.

Capital Intensity (Cap_Int), Return on Assets (Roa), and Profit Margin (Prf_Mrgn)

Although not as consistently documented as firm size and industry, in some cases, capital intensity (Aerts & Cormier, 2009; Clarkson et al, 2008; Reitenga, 2000) and profitability (Bewley & Li, 2000; Magness, 2006; Al-Tuwaijri et al,2004) are found to be associated with environmental performance. Capital intensity is measured by dividing total assets by total revenues. Profitability is measured using return on assets (net income divided by total assets), and profit margin (net income divided by sales revenue).

Financial Leverage (Fin_Lev)

Several studies employ financial leverage as a control variable (Freedman and Jaggi, 1992; Cormier and Megnan, 1999). Financial leverage indicates the extent to which the business relies on debt financing and is measured by dividing long-term debt by stockholders equity.

MODELS

Inclusion of the control variables (above) yields the following empirical test models. All variables are illustrated in Exhibit 2. The models used to test hypotheses 1 and 2 are thus:

$$Cum\_Ret = \alpha_0 + \alpha_1 ES_i + \alpha_2 LnAs + \alpha_3 SIC + \alpha_4 ROA + \alpha_5 Fin\_Lev + \alpha_6 Prf\_Mrgn + \alpha_7 Cap\_Int + \varepsilon \quad (M1)$$

$$Cum\_Ret = \alpha_0 + \alpha_1 EC_i + \alpha_2 LnAs + \alpha_3 SIC + \alpha_4 ROA + \alpha_5 Fin\_Lev + \alpha_6 Prf\_Mrgn + \alpha_7 Cap\_Int + \varepsilon \quad (M2)$$

The tests of total environmental Strengths and Concerns (hypotheses 3 and 4) employ the following empirical models:

$$Cum\_Ret = \alpha_0 + \alpha_1 TES_i + \alpha_2 LnAs + \alpha_3 SIC + \alpha_4 ROA + \alpha_5 Fin\_Lev + \alpha_6 Prf\_Mrgn + \alpha_7 Cap\_Int + \varepsilon \quad (M3)$$

$$Cum\_Ret = \alpha_0 + \alpha_1 TEC_i + \alpha_2 LnAs + \alpha_3 SIC + \alpha_4 ROA + \alpha_5 Fin\_Lev + \alpha_6 Prf\_Mrgn + \alpha_7 Cap\_Int + \varepsilon \quad (M4)$$

The test model for the Overall Environmental Profile variables (hypothesis 5) is:

$$Cum\_Ret = \alpha_0 + \alpha_1 OEP_i + \alpha_2 LnAs + \alpha_3 SIC + \alpha_4 ROA + \alpha_5 Fin\_Lev + \alpha_6 Prf\_Mrgn + \alpha_7 Cap\_Int + \varepsilon \quad (M5)$$

Exhibit 2 MODEL VARIABLES			
Dependent Variable			
Cum_Ret		=	Cumulative annual stock market returns, which represents the accumulation of monthly returns for each firm year. For model 6, Δ Cum_Ret = Annual return$_{2008}$ – Annual return$_{2006.}$
Variables of Interest in each Model			
M1	ESi	=	Environmental strength measures. "i" ranges from 1 to 6 where, i = 1 refers to clean energy, i = 2 refers to beneficial (green) products and services, i = 3 pollution prevention, i = 4 refers to recycling, and i = 5 management systems, i = 6 is other strengths. Equal to 1 if a firm performs any of these environmental activities, otherwise 0;
M2	ECi	=	Environmental concern measures. "i" ranges from 1 to 7, i = 1 refers to climate changes concern, i = 2 refers to regulatory problems, i = 3 refers to substantial emissions, i = 4 refers to ozone depletion chemicals concern, i = 5 refers to hazardous waste, i = 6 refers to agricultural chemicals, and i = 7 refers to other concerns. Equal to 1 if a firm has any of these concerns, otherwise 0;
M3	TES	=	Total environmental strength rating. Equal to the sum of the environmental strength variables. TES = ∑ (ESi)
M4	TEC	=	Total environmental concern rating. Equal to the sum of the environmental concern variables. TEC = ∑ (ECi)
M5	OER	=	Overall environmental rating. Equal to the total environmental concern rating less the total environmental strength rating. OER = TEC - TES
Control Variables			
LnAs		=	Natural logarithm of Total Assets;
SIC		=	1 if the firm operates in industries classified as environmentally unsafe, 0 otherwise;
ROA		=	Net Income / Average Total Assets;
Fin_Lev		=	(Debt in current liabilities + Debt in long term Liabilities) / Total Shareholder's Equity;
Prf_Mrgn		=	Net income / Total sales;
Cap_Int		=	Total Assets / Total Revenues.
e		=	Error term

Sample Selection

Sample firms were required to meet the following criteria:

1. Listed in the ratings of corporate social and environmental performance compiled by KLD Research and Analytics, Inc.
2. Financial accounting information available in the Standard & Poors' COMPUSTAT database.
3. Stock prices data available in the CRSP Monthly Returns database.

We collected environmental performance data available in the KLD database for the years 2006, 2007, and 2008. Earlier years could not be included in the sample because prior to 2006 some of the environmental performance variables were not available. We do not include observations beyond 2008 to avoid the confounding effects of the global financial crisis that began late in that year. A total of 6680 firm-years met the sample criteria and constitute the final sample as illustrated in Table 1.

Table 1
SAMPLE SELECTION

The overall cross-sectional sample set obtained for each year and the matched sample for years 2006 through 2008

	2006	2007	2008	Total
Environmental data	2,962	2,937	2,923	8,822
(-) firms with no annual returns	236	218	44	498
Environmental data and annual returns	2,726	2,719	2,879	8,324
(-) firms missing some or all of the accounting data	544	477	623	1,644
Final sample set	2,182	2,242	2,256	6,680
Match sample: 2006 through 2008				1,654

Table 2 presents selected descriptive information for the sample of 6,682 firm-year observations. More specifically, the table presents the minimum, maximum, mean, standard deviation, and variance of the variables used in the model. The data shows that, on average, the firms reported negative (-0.055) annual returns. The low mean of the environmental variables indicates that most firms were not assessed as meeting KLD's definitions of ES and EC, i.e. more firms reported 0 rather than 1 in regard to both environment strength and concern variables. Also, it appears that most firms do not belong to environmentally sensitive industries.

Table 2
DESCRIPTIVE STATISTICS

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
lnAs	6680	1.231	14.598	7.593	1.647	2.713
SIC_01	6680	0	1	0.149	0.356	0.127
Fin_Lev	6680	-782.545	1726.896	1.498	30.871	953.006
Prf_Mrgn	6680	-29319.000	21.846	-7.653	405.096	164103.117
Cap_Int	6680	-164.092	54344.300	16.767	692.937	480161.619
ROA	6680	-2.096	3.018	0.021	0.151	0.023
Cum_Ret	6680	-0.980	7.952	-0.055	0.453	0.205
Beneficial products and services	6680	0	1	0.024	0.153	0.023
Pollution prevention	6680	0	1	0.013	0.114	0.013
Recycling	6680	0	1	0.017	0.128	0.016
Clean energy	6680	0	1	0.043	0.202	0.041
Management system strength	6680	0	1	0.055	0.227	0.052
Other strengths	6680	0	1	0.007	0.084	0.007
Strength total	6680	0	4	0.158	0.532	0.283
Hazardous waste	6680	0	1	0.043	0.203	0.041
Regulatory problems	6680	0	1	0.069	0.254	0.065
Ozone depletion chemicals	6680	0	1	0.001	0.024	0.001
Substantial emissions	6680	0	1	0.055	0.227	0.052
Agricultural chemicals	6680	0	1	0.006	0.077	0.006
Climate change	6680	0	1	0.057	0.232	0.054
Other concerns	6680	0	1	0.019	0.137	0.019
Concern total	6680	0	5	0.250	0.693	0.480
OEP	6680	-5	4	-0.092	0.690	0.476
Valid N	6680					

RESULTS AND ANALYSIS

The models' goodness of fit and the R-square, and the analysis of variance are presented in Table 3 for the individual environmental strength models. All models reported high residual sums of squares in comparison to regression sums of squares. The F statistics for all of the models are, however, significant ($p \leq 0.001$), which indicates that the independent variables significantly explain the variation in the dependent variable.

Table 3
MODEL SUMMARY AND ANOVA RESULTS OF THE ASSOCIATION BETWEEN THE ENVIRONMENTAL STRENGTH VARIABLES AND THE FIRMS' ANNUAL RETURN
$Cum\_Ret = \alpha_0 + \alpha_1 ES_i + \alpha_2 LnAs + \alpha_3 SIC + \alpha_4 ROA + \alpha_5 Fin\_Lev + \alpha_6 Prf\_Mrgn + \alpha_7 Cap\_Int + \varepsilon$

	Environmental strength variables	Model Summary		ANOVA		
		R Square	Adjusted R Square	Regression sum of squares	Residual sum of squares	Model significance
Model 1_1	Beneficial products & services (ES1)	0.0668	0.0658	91.549	1278.6	0.000
Model 1_2	Pollution prevention (ES_2)	0.0669	0.0659	91.647	1278.5	0.000
Model 1_3	Recycling (ES_3)	0.0669	0.0659	92.083	1278.07	0.000
Model 1_4	Clean energy (ES_4)	0.0668	0.0658	91.511	1278.64	0.000
Model 1_5	Management systems (ES_5)	0.067	0.066	91.742	1278.41	0.000
Model 1_6	Other strengths (ES_6)	0.0679	0.067	93.093	1277.06	0.000

Table 4 presents the unstandardized coefficients of the uncombined environmental strength regression models. The results indicate that, across all strength models, both industry classification and ROA are positively associated with the sample firms' annual returns while the coefficient on firm size is negative. All of these are as would be expected. Of the environmental strength variables, only Recycling ($p \leq 0.075$) and Other Strengths ($p \leq 0.004$) are significant at conventional levels. It is interesting to note, however, that while the coefficient on recycling is positively associated with returns, the coefficient on Other Strengths is negative. None of the other environmental strength variables would be significantly associated with returns, even if a one-tailed test could be justified. Thus, based on these results, H1 is accepted for Other Strengths and Recycling, and rejected for the rest. This result is interesting in that it points out that the measures employed can yield contrary results. The Recycling measure is consistent with the second proposition of McGuire, et al. (1998), and with the results of Spicer (1978), Anderson and Frankel (1980), and Ziegler et al. (2007). The Other Strengths measure is consistent with McGuire et al.'s first proposition and with the results of Klassen and McLaughlin (1996), Cho et al. (2009), and Spicer (1978). The failure to find a significant association, between returns and the remaining ES measures, is consistent with the third proposition of McGuire, et al. (1998), and with the findings of Mahapatra (1984), Aupperle, Carroll, and Hatfield (1985), Jaggi and Freedman (1992), and Kreander et al. (2005).

Table 4
REGRESSION RESULTS OF THE ASSOCIATION BETWEEN THE ENVIRONMENTAL STRENGTH VARIABLES AND THE FIRMS' ANNUAL RETURNS

Model1	Model 1_1		Model 1_2		Model 1_3		Model 1_4		Model 1_5		Model 1_6	
Environmental strength variables	Beneficial products and services (ES1)		Pollution prevention (ES2)		Recycling (ES3)		Clean energy (ES4)		Management system (ES5)		Other strengths (ES6)	
	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.
(Constant)	0.070	0.007	0.067	0.010	0.074	0.005	0.072	0.007	0.064	0.015	0.064	0.015
lnAs	-0.020	0.000	-0.019	0.000	-0.020	0.000	-0.020	0.000	-0.019	0.000	-0.019	0.000
SIC_01	0.051	0.001	0.052	0.001	0.049	0.001	0.050	0.001	0.052	0.001	0.053	0.000
ROA	0.790	0.000	0.791	0.000	0.789	0.000	0.791	0.000	0.792	0.000	0.791	0.000
Fin_lev	0.000	0.854	0.000	0.856	0.000	0.849	0.000	0.852	0.000	0.869	0.000	0.859
Prf_Mrgn	0.000	0.762	0.000	0.767	0.000	0.757	0.000	0.762	0.000	0.771	0.000	0.768
Cap_Int	0.000	0.654	0.000	0.659	0.000	0.649	0.000	0.654	0.000	0.663	0.000	0.661
ESi	0.022	0.540	-0.045	0.346	0.075	0.075	0.012	0.675	-0.029	0.240	-0.187	0.004

The individual environmental concern models' goodness of fit and the R-square, and the analysis of variance are presented in Table 5. As with the ES models, all models report high residual sums of squares in comparison to regression sums of squares. The F statistics for all of the models are, however, significant ($p \leq 0.001$), which indicates that similar to the ES models, the independent variables significantly explain the variation in the dependent variable.

Table 6 presents the regression results of the tests for an association between the uncombined environmental concern variables and returns. As with the ES models, we find that both industry classification and ROA are positively associated with firms' annual returns, while the coefficient on firm size is negative. The hazardous waste concern variable ($p \leq 0.032$), substantial emissions concern ($p \leq 0.008$), and agricultural chemicals concerns ($p \leq 0.000$) are all significantly associated with returns. Interestingly, the coefficients on each of these are positive which is consistent with the results of Ingram and Frazier (1980) and Freedman and Jaggi (1982) who report a negative association between environmental and financial performance. Thus, it appears as though hazardous waste concerns, substantial emissions and the use of agricultural chemicals may translate into greater profitability. Based on these results, H2 is accepted for hazardous wastes, substantial emissions and agricultural chemicals. Again, these results make sense. If, for example, firms that produce products that yield hazardous wastes were to alter their processes or treat those wastes so has to negate the hazard, their costs would likely be substantially increased thus reducing their profitability. The same could be said for firms that elect to clean their emissions, or for firms that might choose to use organic rather than chemical fertilizers.

Table 5
MODEL SUMMARY AND ANOVA RESULTS OF THE ASSOCIATION BETWEEN THE ENVIRONMENTAL CONCERN VARIABLES ANDTHE FIRMS' ANNUAL RETURNS
$Cum\_Ret = \alpha_0 + \alpha_1 EC_i + \alpha_2 LnAs + \alpha_3 SIC + \alpha_4 ROA + \alpha_5 Fin\_Lev + \alpha_6 Prf\_Mrgn + \alpha_7 Cap\_Int + \varepsilon$

	Environmental concern variable	Model Summary		ANOVA		
		R Square	Adjusted R Square	egression sum of squares	Residual sum of squares	Model significance
Model 2_1	Hazardous and waste (EC_1)	0.067	0.066	92.358	1277.794	0.000
Model 2_2	Regulatory problems (EC_2)	0.067	0.066	91.905	1278.246	0.000
Model 2_3	Ozone depletion chemicals (EC_3)	0.067	0.066	91.629	1278.522	0.000
Model 2_4	Substantial emission (EC_4)	0.068	0.067	92.806	1277.345	0.000
Model 2_5	Agricultural chemicals (EC_5)	0.071	0.07	96.84	1273.312	0.000
Model 2_6	Climate changes (EC_6)	0.067	0.066	91.704	1278.448	0.000
Model 2_7	Other concerns (EC_7)	0.067	0.066	91.54	1278.611	0.000

Table 6
REGRESSION RESULTS OF THE ASSOCIATION BETWEEN THE ENVIRONMENTAL CONCERN VARIABLES AND THE FIRMS' ANNUAL RETURNS
$Cum\_Ret = \alpha_0 + \alpha_1 EC_i + \alpha_2 LnAs + \alpha_3 SIC + \alpha_4 ROA + \alpha_5 Fin\_Lev + \alpha_6 Prf\_Mrgn + \alpha_7 Cap\_Int + \varepsilon$

Model2	Model 2_1		Model 2_2		Model 2_3		Model 2_4		Model 2_5		Model 2_6		Model 2_7	
Environmental variables	Hazardous and waste (EC_1)		Regulatory problems (EC_2)		Ozone depletion chemicals (EC_3)		Substantial emission (EC_4)		Agricultural chemicals (EC_5)		Climate changes (EC_6)		Other concerns (EC_7)	
	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.
(Constant)	0.084	0.002	0.079	0.003	0.070	0.007	0.085	0.001	0.074	0.004	0.067	0.010	0.068	0.009
lnAs	-0.022	0.000	-0.021	0.000	-0.020	0.000	-0.022	0.000	-0.020	0.000	-0.019	0.000	-0.020	0.000
SIC_01	0.046	0.003	0.046	0.003	0.050	0.001	0.043	0.006	0.041	0.007	0.054	0.000	0.052	0.001
ROA	0.789	0.000	0.788	0.000	0.790	0.000	0.785	0.000	0.784	0.000	0.790	0.000	0.791	0.000
Fin_lev	0.000	0.845	0.000	0.870	0.000	0.854	0.000	0.907	0.000	0.856	0.000	0.857	0.000	0.859
Prf_Mrgn	0.000	0.752	0.000	0.754	0.000	0.763	0.000	0.747	0.000	0.756	0.000	0.765	0.000	0.765
Cap_Int	0.000	0.643	0.000	0.645	0.000	0.655	0.000	0.638	0.000	0.646	0.000	0.659	0.000	0.658
ECi	0.059	0.032	0.033	0.135	0.195	0.373	0.066	0.008	0.370	0.000	-0.026	0.277	-0.023	0.565

The positive associations between returns and Hazardous wastes, substantial emissions, and agricultural chemicals are consistent with the results reported by Spicer (1978), Anderson and Frankel (1980), and Ziegler et al. (2007). The regression results with respect to Regulatory

problems, Ozone depletion, climate change, and other concerns are consistent with the results of Mahapatra (1984), Aupperle, Carroll, and Hatfield (1985), Jaggi and Freedman (1992), and Kreander et al. (2005).

The total environmental strength rating and total environmental concern rating models are significantly associated with stock returns ($p \leq 0.001$). The results of these tests are reported in panel A of tables 7 and 8, respectively. Panel B results show that, for both the TES and TEC models, industry classification and ROA as a measure of profitability, are positively associated with annual returns while firms' size is negatively associated. The total environmental strength rating variable is not significantly associated with firms' annual returns at conventional levels ($p \leq 0.687$). The coefficient on the total Environmental Concern Rating variable is, however, positive and significantly different from zero ($p \leq 0.021$). From a comprehensive perspective, it appears that firm activities that are deemed to be environmental strengths do not translate into positive financial performance. Thus, Hypothesis 3 is rejected. The findings of the TEC model are consistent, however, with the negative perspective, thus Hypothesis 4 is supported.

Table 7
Model Summary, ANOVA, and Regression Results of the Association between the Total Environmental Strength Rating Variable and the Firms' Annual Returns

$$Cum\_Ret = \alpha_0 + \alpha_1 TES + \alpha_2 LnAs + \alpha_3 SIC + \alpha_4 ROA + \alpha_5 Fin\_Lev + \alpha_6 Prf\_Mrgn + \alpha_7 Cap\_Int + \varepsilon$$

Panel A

	Model Summary		ANOVA		
	R Square	Adjusted R Square	Regression sum of squares	Residual sum of squares	Model significance
Model 3	0.067	0.066	91.508	1278.64	0

Panel B

Regression coefficients		
	B	Sig.
(Constant)	0.068	0.011
lnAs	-0.019	0
SIC_01	0.052	0.001
ROA	0.791	0
Fin_lev	0	0.858
Prf_Mrgn	0	0.766
Cap_Int	0	0.658
TES	-0.004	0.687

Table 8
MODEL SUMMARY, ANOVA, AND REGRESSION RESULTS OF THE ASSOCIATION BETWEEN THE TOTAL ENVIRONMENTAL CONCERN RATING VARIABLE AND THE FIRMS' ANNUAL RETURNS

$Cum\_Ret = \alpha_0 + \alpha_1 TEC + \alpha_2 LnAs + \alpha_3 SIC + \alpha_4 ROA + \alpha_5 Fin\_Lev + \alpha_6 Prf\_Mrgn + \alpha_7 Cap\_Int + \varepsilon$

Panel A

	Model Summary		ANOVA		
	R Square	Adjusted R Square	Regression sum of squares	Residual sum of squares	Model significance
Model 4	0.068	0.067	92.5	1277.65	0

Panel B

Regression coefficients		
	B	Sig.
(Constant)	0.088	0.001
lnAs	-0.023	0
SIC_01	0.04	0.011
ROA	0.787	0
Fin_lev	0	0.87
Prf_Mrgn	0	0.746
Cap_Int	0	0.635
TEC	0.02	0.021

The evidence presented above indicates that, cross-sectionally, firm attempts to perform in an environmentally sensitive fashion are not associated with improved financial performance. Indeed, these results indicate that environmental disregard may be associated with higher returns. This result is consistent with the results reported by Ingram and Frazier (1980) and Jaggi and Freedman (1982). This could be because activities that may have a negative environmental affect (without establishing clean up or pollution reduction activities) could result in considerable cost savings. Even if clean up or pollution reduction activities are ultimately mandated, pushing those costs into future periods would result in greater near term cash flows and a higher net present value of firm earnings.

Although the overall environmental Rating (OER) could, theoretically, range from +6 to -7, the actual sample ranges from +4 to -5. The models' goodness of fit and the R-square for the firms' overall environmental rating model are presented in Table 9, Panel A. The regression results for the overall environmental rating model are presented in Panel B. Once again, the results show that both industry classification and ROA are positively associated with annual returns ($p \leq 0.005$ and 0.000 respectively), while firm size is negatively associated ($p \leq 0.000$).The coefficient on the

overall environmental rating variable is negative and statistically significant at the $p \leq 0.014$ level. This result is consistent with McGuire et al.'s first proposition and with the results reported by Ingram and Frazier (1980) and Jaggi and Freedman (1982). Thus, hypothesis 5 is supported.

Table 9
MODEL SUMMARY, ANOVA, AND REGRESSION RESULTS OF THE ASSOCIATION BETWEEN THE OVERALL ENVIRONMENTAL RATING VARIABLE AND THE FIRMS' ANNUAL RETURNS

$$Cum\_Ret = \alpha_0 + \alpha_1 OER + \alpha_2 LnAs + \alpha_3 SIC + \alpha_4 ROA + \alpha_5 Fin\_Lev + \alpha_6 Prf\_Mrgn + \alpha_7 Cap\_Int + \varepsilon$$

Overall Environmental rating variable analysis

Panel A

	Model Summary		ANOVA		
	R Square	Adjusted R Square	Regression sum of squares	Residual sum of squares	Model significance
Model 5	0.068	0.067	92.63	1277.52	0

Panel B

Regression coefficients		
	B	Sig.
(Constant)	0.077	0.003
lnAs	-0.021	0
SIC_01	0.043	0.005
ROA	0.789	0
Fin_lev	0	0.887
Prf_Mrgn	0	0.759
Cap_Int	0	0.648
OER	-0.02	0.014

CONCLUSIONS

In this research, we shed light on the contradictory evidence of prior studies that examine firm performance and corporate social responsibility. We do this by investigating whether measures of firms' environmental performance are associated with annual returns independent of any particular environmental event. We find that only five out of the thirteen environmental variables we test, namely, the other strengths variable; the recycling variable; the hazardous waste concern variable; the substantial emissions concern variable; and the agricultural chemicals concern variable, are significantly associated with returns. The coefficients of the

individual measures support the perspective of the negative association between environmental and financial performance. This is logical given the nature of the constructs. The positive association between returns and the recycling activities supports notion that firms will act with environmental sensitivity only when it increases profits. Similarly, profit-maximizing firms that choose to deal with hazardous wastes, emissions and agricultural chemicals in a manner that does not neutralize their negative environmental impact, would only do so (ceteris paribus) because alternative, environmentally friendly measures are more costly. Both perspectives can be integrated into a framework that suggests that profit maximization, as a primary objective of firms, will be sought either by engaging in environmental strength activities that increase profitability (such as recycling) or by engaging in less effective environmental activities, that are not as preventative or corrective, which gives rise to environmental concerns (such as the production of hazardous wastes).

These results are significant in that not only do they provide an explanation for the contradictory results of prior research into the association between firms' financial performance and corporate social responsibility, but they may provide guidance to regulators in developing environmental policy. In the context of McGuire et al. (1988), we find that proposition 2 (a positive association between corporate social responsibility and financial performance) only holds when the activity increases profits. Similarly, we find that proposition 1 (a negative association between corporate social responsibility and financial performance) holds when the responsible actions reduce profitability. Proposition 3 (no association between corporate social responsibility and financial performance) seems to be the case for many activities with environmental impact. In regards to policy implications, it is thus our conclusion that encouraging or facilitating recycling activities is likely to be viewed positively by firms and thus embraced by them. It is also our view that policies that require process changes or emissions reductions will likely be met with resistance and that regulators would have to mandate such activities if they want firms to engage in them.

We also tested whether individual environmental indicators are informative when combined into a single metric. Our results revealed a positive association between the total environmental concerns rating and firms' annual returns. This result is consistent with the results of the individual measures and leads to similar conclusions. The total environmental strength rating was not, however, significantly associated with annual returns. A look at the components of the environmental strength measure shows that other than recycling, none of the constructs were tied financial performance.

The last stage of our analysis addresses the interaction between the significant and insignificant individual environmental variables that yield an overall environmental rating measure. This overall measure was significantly and negatively associated with firms' annual returns, again indicating that with respect to environmental issues, greater corporate social responsibility is negatively associated with financial performance.

Together, these results suggest that environmental protection or remediation activities impose additional costs on firms that in turn lead to an economic disadvantage. The total and overall measures used in our analysis leads us to further conclude that indices and/or comprehensive measures may need further consideration and perhaps weighting before they can be applied in a meaningful sense as depictions of corporate behavior. Future research is required to develop and model the constructs regarding environmental performance, as there is some level of vagueness which raises the question of whether or not a component index assesses the same constructs as the individual measures or whether the individual measures are indeed unique

attributes. Why, for instance, are substantial emissions negatively associated with financial performance, while ozone depletion and climate change are not?

This research contributes to the environmental performance literature by presenting evidence on the nature of the general association between environmental performance and firms' financial performance instead of just focusing on the immediate effect of a particular environmental event. We also provide an explanation for why prior research has provided conflicting results on this issue. Understanding how environmental activities affect capital markets should, likewise, be important in determining how regulatory agencies motivate and enforce environmentally sensitive regulations to promote the public good.

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