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Corporate Environmental Policy and Shareholder Value: Following the Smart Money

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Abstract

We examine the value consequences of corporate social responsibility through the lens of institutional shareholders. We find a sharp asymmetry between corporate policies that mitigate the firm's exposure to environmental risk and those that enhance its perceived environmental friendliness ("greenness"). Institutional investors shun stocks with high environmental risk exposure, which we show have lower valuations, as predicted by risk management theory. These findings suggest that corporate environmental policies that mitigate environmental risk exposure create shareholder value. In contrast, firms that increase greenness do not create shareholder value and are also shunned by institutional investors.

> "The social responsibility of a business is to increase its profits."
>
> — Friedman (1970)

I. Introduction

The headline of Friedman's well-known *New York Times Magazine* article reflects a widely held view that only "socially responsible" investors benefit directly from corporate actions that are deemed socially responsible. However, not all socially responsible policies are equivalent. For example, socially responsible corporate actions that mitigate the likelihood of "bad" outcomes may reduce the risk exposure of firms to accidents, lawsuits, fines, and so forth, thereby appealing

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to all investors. In contrast, investments that enhance the firm's perceived corporate social responsibility (CSR) beyond legal requirements and risk management rationales may decrease value and be shunned by investors whose sole objective is profit maximization. However, the current literature does not focus on such nuances in socially responsible policies, nor does it provide much insight into how the form of CSR influences the breadth and depth of ownership and firm value.

In this paper, we study the relation between corporate environmental performance, institutional ownership, and shareholder value in a sample of U.S. firms. Investors scrutinize corporate environmental policies more closely than they do other corporate actions that have social implications. The financial costs and consequences of corporate environmental policies dwarf other socially relevant corporate decisions, as exemplified by such recent episodes as the 2010 British Petroleum (BP) oil spill in the Gulf of Mexico, which has cost BP well in excess of $50 billion to date in losses, damages, and fines. Institutional investors are widely recognized as being better informed and more sophisticated than individual investors (e.g., Allen, Bernardo, and Welch (2000), Boehmer and Kelley (2009), Carleton, Nelson, and Weisbach (1998), Gillan and Starks (2000), Grinstein and Michaely (2005), Hartzell and Starks (2003), McConnell and Servaes (1990), Shleifer and Vishny (1986), and Smith (1996)). Therefore, our institutional investor perspective follows the smart money.

We classify corporate environmental practices into two categories: i) actions that mitigate the likelihood of "bad" outcomes by reducing the exposure of firms to environmental risk (we label this type of exposure as "toxicity"), and ii) actions that enhance the firm's perceived "greenness" through investments that go beyond legal requirements and any conceivable risk management rationale. Examples of the former include deploying safer petroleum drilling technologies or investments that mitigate the risk of hazardous chemical releases. Investments in clean technologies or renewable energy sources serve as examples of the latter.

Although both groups of environmental practices are likely to be viewed as socially responsible, our bifurcation enables new insights into the costs and benefits for investors who are not constrained by socially responsible investing (SRI) norms. Karpoff, Lott, and Wehrly (2005) show that firms pay substantial legal penalties and suffer corresponding market value losses following violations of environmental regulations. Consequently, investments that reduce toxic firms' exposure to the risk of losses arising from environmental accidents, lawsuits, and fines can create value for all shareholders by lowering expected costs of financial distress, financing costs, and underinvestment (Froot, Scharfstein, and Stein (1993), Smith and Stulz (1985)). Thus, sophisticated investors will have decreased interest in toxic firms, an effect that should be even more pronounced if a sophisticated investor is norm-constrained.

Regarding investments in greenness, going beyond legal limits in corporate environmental policies may decrease value, causing sophisticated shareholders to shy away from these stocks. Furthermore, if shareholders do not adhere to SRI norms, they are even less likely to invest in stocks of green firms that spend corporate resources on such environmentally friendly practices. Collectively, these criteria imply that institutional investors are more likely to invest in stocks of environmentally neutral firms rather than those of toxic firms or green firms.

Additionally, the negative effect of toxic stocks is stronger in the subset of SRI norm-constrained institutional investors, whereas the negative effect of green stocks is stronger in investments of SRI norm-unconstrained institutions.

We follow several recent studies in the finance literature by using the KLD Research & Analytics, Inc. (KLD), social performance data set to assess corporate environmental policy (e.g., Chava (2010), Galema, Plantinga, and Scholtens (2008), Gillan, Hartzell, Koch, and Starks (2010), Kempf and Osthoff (2007), Krüger (2015), Sharfman and Fernando (2008), and Statman and Glushkov (2009)). The KLD data provide information on corporate environmental, social, and governance characteristics to a large number of sophisticated investors (e.g., money managers and institutional investors), who then factor these characteristics into their investment decisions. This data set is particularly well suited for our research, because it allows us to differentiate between positive and negative environmental performance. For each stock, KLD provides six subindicators for environmental strengths and seven subindicators for environmental concerns.[1] If the firm meets or exceeds the KLD threshold in each subindicator category, it is assigned a value of 1; otherwise, it is assigned a value of 0.

We use the total number of environmental strengths and concerns reported in the KLD data as measures of positive and negative environmental performance, respectively. Firms that have higher negative scores have higher environmental risk exposure to losses due to accidents, lawsuits, and fines, relative to firms with lower negative scores. A firm that takes actions to decrease its negative KLD score (e.g., by reducing toxic emissions, minimizing regulatory violations, or mitigating hazardous waste exposure) is engaging in environmental risk management efforts that potentially reduce its financial costs. In contrast, actions that increase a firm's positive KLD score (e.g., increasing recycling activity, switching to clean energy, or increasing environmentally relevant communications) are likely to produce tangible social benefits that elevate the firm's standing in the eyes of green investors. However, these actions may not produce direct financial benefits beyond incremental costs.

Accordingly, we use the net environmental score (number of environmental strengths minus the number of environmental concerns) to categorize the firms in our sample into three groups with labels that reflect the differences in their environmental performances: "green," "toxic," and "neutral." Green firms are positive environmental performers in the sense that they have positive net environmental scores, whereas toxic firms are negative environmental performers, having negative net environmental scores. Firms that have a net environmental score of 0 are defined as neutral firms. Thus, the toxic firms in our sample have higher exposure to environmental risk than neutral or green firms do. These classifications enable us to examine the effects of corporate environmental performance variations on ownership structure, analyst coverage, and shareholder value.

[1]The six KLD environmental strength subindicators are (sale of) environmentally beneficial products and services, pollution prevention, recycling, clean energy, management systems (of environmental practices), and other strengths; and the seven environmental concern subindicators are regulatory compliance, substantial emissions, climate change, negative impact of products and services, land use and biodiversity, noncarbon emissions, and other concerns. Appendix B provides the detailed subindicator descriptions.

Our first major contribution is the novel evidence we provide on the formation of institutional holdings based on corporate environmental performance. Specifically, we find a nonmonotonic relationship between environmental performance and institutional ownership ratio. Green and toxic firms have significantly lower institutional ownership than neutral firms have. The difference is made up by individual shareholders, who own green and toxic firms in significantly greater numbers than they do neutral firms. Collectively, these findings are consistent with our conjecture that environmental performance influences institutional investors' decisions.

Consistent with our results for aggregate institutional ownership, we also find lower numbers of institutional investors investing in green and toxic firms for all institutional investor types in our sample. Norm-unconstrained institutional investors (representing banks, insurance companies, financial investment institutions, and advisers) hold significantly smaller fractions of the shares of green firms, whereas norm-constrained institutions (representing universities, pension plans, and employee stock ownership plans) hold a significantly lower percentage of shares of toxic firms. Notably, norm-constrained institutions do not invest more in stocks of green companies than in stocks of neutral companies. Collectively, these results suggest that corporate environmental practices generate a variation in stock holdings between norm-constrained and norm-unconstrained institutional investors.

Our findings on ownership and analyst following are robust to the use of an alternative data set and a battery of additional tests. Specifically, we hand-collect data on corporate environmental expenditures from the 10-K filings of the firms in our sample. We further distinguish whether these environmental expenditures are mandatory, voluntary, or legal. We build alternative measures of positive and negative environmental performance based on the ratio of these expenditures to total assets. After accounting for firm characteristics and industry and year fixed effects, we find significant effects of these measures on the depth and breadth of ownership. These effects are also largely consistent with the findings based on the KLD data. Alternative model specifications also generate similar results, lending further support to the view that environmental performance influences institutional holdings.

Our findings help illuminate the role of social norms in investor behavior. Whereas Hong and Kacperczyk (2009) report significant between-industry effects of sin stocks (stocks of alcohol, tobacco, and gaming companies) and nonsin stocks, our setting permits an examination of within- and between-industry effects. We document that within-industry variation in environmental performance has an important influence on the breadth and depth of ownership. Furthermore, we consider the full spectrum of firms (including positive and negative environmental performers) in our analysis, whereas Hong and Kacperczyk's focus on sin firms limits them to studying only bad social performers. We also observe considerable parallels in the ways that institutional investors perceive sin stocks and toxic stocks. However, we find that SRI norm-unconstrained institutional

investors are repelled by green firms.[2] This finding indicates that unconstrained institutional investors are not indifferent to environmental performance, contrary to the assumptions of Heinkel, Kraus, and Zechner (2001). In fact, this finding suggests that institutions differentiate between investments that reduce toxicity ("prevent bad") and increase greenness ("do good") and shows only the former to be consistent with the interests of unconstrained investors.

Our second major contribution is the evidence we provide on the relation between environmental risk management and shareholder value. Risk management theory (Froot et al. (1993), Smith and Stulz (1985)) predicts that corporate risk management creates shareholder value by reducing the expected costs of financial distress and mitigating underinvestment. However, the empirical evidence is mixed regarding risk management's effect on firm value. On the one hand, Allayannis & Weston (2001), Carter, Rogers, and Simkins (2006), Chidambaran, Fernando, and Spindt (2001), and Graham and Rogers (2002) find a positive relationship between risk management and firm value. On the other hand, Guay and Kothari (2003) and Jin and Jorion (2006) find no significant value effect of risk management. Using the same methodology as Jin and Jorion, we examine the relation between corporate environmental performance and Tobin's Q. Tobin's Q values are significantly lower for toxic stocks than for neutral stocks. This finding is in line with the view that toxic firms are more prone to environmental disasters, lawsuits, and other costly disruptions. Firms that alleviate their environmental risk exposure benefit from higher valuations, which is consistent with the predictions of risk management theory.[3] We also find lower values of Tobin's Q for green firms, indicating that corporate expenditures to enhance greenness beyond the mitigation of environmental risk exposure do not increase firm value. This is consistent with our finding regarding institutional investors' lower propensity to invest in toxic and green stocks.

Our paper is also related to studies on the relations between institutional holdings and firm characteristics. Previous studies find that firm characteristics, including firm size, liquidity, and share price, are correlated with institutional holdings (Del Guercio (1996), Fernando, Gatchev, and Spindt (2012), and Gompers and Metrick (2001)). By documenting a significant effect of environmental performance on institutional holdings, this study suggests that institutions account for corporate environmental performance in their investment decisions.

We also contribute to studies on the preferences of analysts (Das, Guo, and Zhang (2006), Hong, Lim, and Stein (2000)) and find a significant effect of environmental performance on analyst following. Specifically, analyst coverage is significantly higher for toxic firms. This finding is consistent with the notion that institutional prudency requirements may increase the demand for analyst coverage of toxic stocks (O'Brien and Bhushan (1990)), because these stocks are likely to have higher exposure to large fines associated with environmental

[2] Krüger (2015) shows that investors respond slightly negatively to the release of positive CSR news by firms, suggesting that investors do not value positive social performance. He also shows that investors react unfavorably to negative CSR news.

[3] In a related study, Krüger (2016) shows that legally mandated increases in the transparency of corporate exposures to potential sanctions and remediation costs associated with greenhouse gas emissions cause significant positive value effects, especially among firms with higher exposures.

noncompliance.[4] By showing a higher analyst following for toxic companies, this study suggests that analysts consider environmental performance in their stock coverage decisions.[5] Overall, our findings suggest that, in addition to investors, financial intermediaries also account for corporate environmental performance in their decisions.

The rest of the paper is organized as follows: We discuss the data and our empirical methodology in Section II. Section III presents our empirical findings, and Section IV offers conclusions based on the findings.

II. Data and Methodology

We obtain our environmental performance measures from the KLD social performance data set. KLD is a financial advisory firm that provides social screenings of firms to clients via its reports and socially screened mutual funds. The KLD data set is the most widely used data set in academic studies to measure corporate social and environmental performance (e.g., Chava (2010), Galema et al. (2008), Gillan et al. (2010), Graves and Waddock (1994), Kempf and Osthoff (2007), Krüger (2015), Mattingly and Berman (2006), Sharfman and Fernando (2008), and Statman and Glushkov (2009)).[6] Graves and Waddock (1994) argue that the KLD data set is the best single source of social and environmental performance measures because of the expertise and objectivity of the analysts who assign the KLD ratings and the wide range of attributes across which these ratings are assigned. For example, in addition to reviewing all major U.S. Securities and Exchange Commission filings (e.g., 10-K, annual reports, and proxies), KLD has surveyed more than 14,000 global news sources for Standard & Poor's (S&P) 500 firms since 1991. It extended its coverage to Russell 1000 firms in 2001 and Russell 3000 firms in 2003.

The KLD data set provides information on corporate environmental, social, and governance characteristics. Although firms have no discretion over some social factors, such as being in a sin industry (other than exiting the industry), firms have considerable discretion over their environmental performance that may drive SRI. Even in such industries as power generation, petroleum, and chemicals, firms have the ability to vary the extent to which their operations affect the natural environment. Additionally, as evidenced by the recent BP episode, corporate environmental costs dwarf other social norm-related corporate expenditures and are, therefore, likely to receive the most attention by firms, investors, and analysts. Consequently, to the extent that investors are affected by social norms, corporate environmental performance is the area where we are most likely to find evidence of SRI.[7] Moreover, the high costs of environmental expenditures affect all

[4] Karpoff et al. (2005) show that legal penalties associated with environmental violations are, on average, 2.26% of the market capitalization of corresponding firms.

[5] In an interesting contrast, Hong and Kacperczyk (2009) show that sin stocks receive less analyst coverage than other comparable stocks. This difference is attributable to the clientele effect we document, which is absent in the case of sin stocks.

[6] In some of our robustness checks, we use hand-collected environmental spending data obtained from 10-K reports. These data are described in Section III.F.

[7] The Social Investment Forum (2003) reports 292 shareholder resolutions on social, environmental, and ethical issues, with the largest number of resolutions being related to environmental issues.

investors, not just socially responsible investors. Therefore, we expect measurement problems to be minimized due to the exceptional scrutiny and reporting requirements associated with corporate environmental performance.[8] For these reasons, we focus exclusively on the environmental performance measures reported in KLD.

As described in Appendix B, the KLD data set includes six subindicators for environmental strengths and seven subindicators for environmental concerns. The subindicators of strengths include the extent to which the firm has environmentally beneficial products and services, uses clean energy, provides open communication about its environmental program, and engages in extensive recycling. The concerns indicate whether the firm releases hazardous waste, agricultural chemicals, or ozone-depleting chemicals; has regulatory problems; has substantial emissions; or contributes to climate change. If the firm meets the KLD analyst criteria in each area, it is assigned a value of 1, and 0 otherwise.

We use the net environmental score, which is the number of environmental strengths minus the number of environmental concerns reported in the KLD data, to measure the environmental performance of the firms in our sample. Although these variables are available for every year since 1991, the firm identification variable (Committee on Uniform Securities Identification Procedures (CUSIP)) is available only from 1996. Therefore, our analysis covers the period between 1996 and 2007.[9] Using the net environmental score allows us to categorize firms into three groups: green, toxic, and neutral. Green firms have positive net environmental scores, and toxic firms have negative net environmental scores; neutral firms' net environmental score is 0. We also define green and toxic industries. Green industries are industries in which more than 10% of firms are green and fewer than 10% are toxic. Toxic industries, on the other hand, are those in which more than 10% of firms are toxic and fewer than 10% are green. These classifications enable us to examine the effects of environmental performance variations between and within industries on institutional holdings, analyst coverage, and stock market valuation and performance.

We obtain accounting measures from Compustat, stock prices from the Center for Research in Security Prices (CRSP), analyst coverage from Institutional Brokers' Estimate System (IBES), and governance variables from the Investor Responsibility Research Center (IRRC) data set on governance and directors. We also extract institutional holdings measures from the CDA/Spectrum 13F Holdings database. As most companies file semiannually, we confine our attention to year-end reports for institutional holdings (Hong and Kacperczyk (2009)).

In a survey conducted by Mercer Consulting in 2006, 39% of investors responded that they environmental sustainability is an important factor in their investment decisions (Starks (2009)).

[8]Corporate environmental performance is constantly monitored by the U.S. Environmental Protection Agency (EPA) and other federal and state agencies and is publicized through various means, including the EPA's Toxics Release Inventory (TRI). Additionally, private entities, such as KLD, RiskMetrics, and the Social Investment Forum, collect and disseminate information on corporate environmental performance, and the majority of large U.S. firms also provide regular reports on their environmental performance.

[9]Two subindicators were added to KLD during the sample period: climate change in 1999 and management systems strength in 2006. Estimations over the period between 2000 and 2005 yield qualitatively similar results.

Consistent with previous studies, we set institutional holdings to 0 for firms that do not have institutional investors reported in the data set. To alleviate concerns regarding reverse causality, we use lagged explanatory variables in our analyses. We also eliminate outliers generated by small and narrowly held firms by excluding firms that have fewer than 500 shareholders, a stock price below $5, and a market capitalization of less than $200 million.[10] The final sample has 7,324 observations of 1,449 distinct firms between 1997 and 2007.[11]

III. Empirical Results

Table 1 reports the descriptive statistics for our sample. The multiple data screens that we apply to identify firms for our study result in a sample of large firms. The mean market capitalization (MARKET_VALUE) of firms in our sample is $10.963 billion. Green firms constitute 10% of the sample, whereas 17% are classified as toxic firms. Seventeen percent of sample firms are in green industries, and 16% are in toxic industries. The number of shareholders (NS) has a mean of 38,190 with a standard deviation of 91,840, indicating considerable variation across our sample. Institutional investors hold 72% of the shares outstanding, on average. Analysts cover 80% of the firms in our sample, and the average number of analysts per firm is 9.12.

TABLE 1
Descriptive Statistics

Table 1 reports summary statistics of the sample. Variable definitions are in Appendix A.

				Percentile	
Variable	*N*	Mean	Std. Dev.	5th	95th
MARKET_VALUE ($millions)	7,324	10,963	24,262	388.00	48,654.00
AGE	7,324	28.26	15.03	7.00	54.00
NS (thousands)	7,324	38.19	91.84	0.77	173.12
TOTAL_NUM_OF_INST_INVESTORS ×1000/ NS	7,324	60.07	85.14	1.78	254.09
FRACTION_OF_SHARES_HELD_BY_INST_INVESTORS	7,324	0.72	0.21	0.35	1.00
NUM_OF_ANALYSTS	7,324	9.12	7.54	0.00	23.00
ANALYST_COVERAGE	7,324	0.80	0.40	0.00	1.00
SP_500_DUMMY	7,324	0.55	0.50	0.00	1.00
TOBINS_Q	7,324	2.03	1.26	1.02	4.70
MARKET_LEVERAGE	7,324	0.16	0.13	0.00	0.41
AVERAGE_MONTHLY_RETURN	7,324	0.01	0.03	−0.03	0.06
1_PRICE	7,324	0.04	0.02	0.01	0.09
STD_DEV_OF_DAILY_STOCK_RETURN	7,324	0.02	0.01	0.01	0.04
TURNOVER	7,324	1.61	1.36	0.42	4.48
CEO_CHAIRMAN_DUMMY	7,324	0.41	0.49	0.00	1.00
INDEPENDENT_BOARD_DUMMY	7,324	0.89	0.31	0.00	1.00
GIM_INDEX	7,324	9.52	2.68	5.00	14.00
NUM_OF_ENVIRONMENTAL_STRENGTHS	7,324	0.20	0.51	0.00	1.00
NUM_OF_ENVIRONMENTAL_CONCERNS	7,324	0.37	0.85	0.00	2.00
NET_ENVIRONMENT_SCORE	7,324	−0.17	0.86	−2.00	1.00
GREEN_FIRM_DUMMY	7,324	0.10	0.30	0.00	1.00
TOXIC_FIRM_DUMMY	7,324	0.17	0.37	0.00	1.00
GREEN_INDUSTRY_DUMMY	7,324	0.17	0.37	0.00	1.00
TOXIC_INDUSTRY_DUMMY	7,324	0.16	0.37	0.00	1.00

[10] We obtain similar results when we do not apply these restrictions. These results are not reported but are available from the authors.

[11] Our sample starts in 1997 because the first available lagged value of environmental performance is in 1996.

A. Univariate Analysis

Table 2 reports mean and median values for variables of interest in subsamples of green, toxic, and neutral firms. The table also shows the differences between the means and medians as well their t- or z-statistics. It presents preliminary evidence that systematic differences exist across subsamples of green, toxic, and neutral firms. For example, relative to neutral firms, green and toxic firms have a higher NS, lower ratios of institutional investors, and lower percentages of shares held by institutions.[12] We also find systematic differences in analyst coverage and other characteristics across the different subsamples. Toxic firms have the highest analyst coverage (91.4%), followed by green firms (85.5%) and neutral firms (76.9%), and we observe a similar pattern in the average number of analysts following each firm. However, we find significant differences in size and age

TABLE 2
Univariate Analysis

Table 2 reports mean (Panel A) and median (Panel B) values of variables for green, toxic, and neutral firms. Variable definitions are in Appendix A. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Firms					
	Green	Toxic	Neutral			
Variables	1	2	3	1 − 3	2 − 3	1 − 2
No. of obs.	726	1,237	5,361			
Panel A. Mean Values						
MARKET_VALUE ($millions)	14,812	17,329	8,973	5,839***	8,356***	−2,517*
NS (thousands)	66.003	74.869	25.958	40.045***	48.911***	−8.866
TOTAL_NUM_OF_INST_INVESTORS_×1000/NS	34.477	32.084	69.996	−35.520***	−37.913***	2.393
FRACTION_OF_SHARES_HELD_BY_INST_INVESTORS	0.662	0.688	0.730	−0.069***	−0.042***	−0.026***
ln(1 + NUM_OF_ANALYSTS)	1.950	2.160	1.804	0.416***	0.356***	−0.210***
ANALYST_COVERAGE	0.855	0.914	0.769	0.087***	0.145***	−0.058***
SP_500_DUMMY	0.592	0.698	0.503	0.089***	0.195***	−0.106***
MARKET_LEVERAGE	0.169	0.229	0.136	0.033***	0.093***	−0.060***
AVERAGE_MONTHLY_RETURN	0.012	0.011	0.013	−0.001	−0.002**	0.000
1_PRICE	0.036	0.033	0.037	−0.001	−0.004***	0.002**
STD_DEV_OF_DAILY_STOCK_RETURN	0.021	0.019	0.023	−0.002***	−0.004***	0.001***
TURNOVER	1.236	1.321	1.726	−0.490***	−0.405***	−0.085*
CEO_CHAIRMAN_DUMMY	0.398	0.331	0.426	−0.028	−0.095***	0.067***
INDEPENDENT_BOARD_DUMMY	0.927	0.956	0.875	0.052***	0.081***	−0.029***
GIM_INDEX	10.044	9.979	9.336	0.708***	0.643***	0.065
Panel B. Median Values						
MARKET_VALUE ($millions)	2,986	5,443	2,887	98**	2,555***	−2,457***
NS (thousands)	17.541	29.047	6.831	10.710***	22.216***	−11.507***
TOTAL_NUM_OF_INST_INVESTORS ×1000/NS	14.209	11.371	32.780	−18.572***	−21.410***	2.838***
FRACTION_OF_SHARES_HELD_BY_INST_INVESTORS	0.695	0.698	0.766	−0.071***	−0.068***	−0.003*
ln(1 + NUM_OF_ANALYSTS)	2.197	2.398	2.197	0.000**	0.201***	−0.201***
ANALYST_COVERAGE	1.000	1.000	1.000	0.000***	0.000***	0.000
SP_500_DUMMY	1.000	1.000	1.000	0.000***	0.000***	0.000
MARKET_LEVERAGE	0.145	0.219	0.105	0.041***	0.115***	−0.074***
AVERAGE_MONTHLY_RETURN	0.012	0.012	0.013	−0.001	−0.002**	0.000
1_PRICE	0.029	0.027	0.030	0.000	−0.003***	0.002**
STD_DEV_OF_DAILY_STOCK_RETURN	0.019	0.018	0.021	−0.002***	−0.003***	0.001***
TURNOVER	0.913	1.001	1.250	−0.337***	−0.248***	−0.088***
CEO_CHAIRMAN_DUMMY	0.000	0.000	0.000	0.000	0.000***	0.000
INDEPENDENT_BOARD_DUMMY	1.000	1.000	1.000	0.000***	0.000***	0.000
GIM_INDEX	10.000	10.000	9.000	1.000***	1.000***	0.000

[12] In an unreported analysis, we find a higher number of individual investors and a lower ratio of institutional investors for green and toxic firms relative to neutral firms when we conduct a matched sample analysis based on industry (2-digit Standard Industrial Classification (SIC)) and size.

across these subsamples that may explain the differences in ownership and analyst coverage. We control for these differences in our multivariate analysis.

Green and toxic firms have higher Gompers–Ishii–Metrick (GIM) (2003) indices than neutral firms, indicating poorer governance, but they also have higher likelihoods of independent boards, indicating better governance (Brickley, Coles, and Terry (1994), Byrd and Hickman (1992), Rosenstein and Wyatt (1990), and Weisbach (1988)). In addition, toxic firms have lower chief executive officer (CEO)/Chair duality than green and neutral firms, suggesting that managers of toxic firms are less likely to be entrenched. Collectively, the conflicting findings on corporate governance suggest that the differences generated by green and toxic firms are unlikely to be driven by variations in corporate governance.

B. Environmental Performance and Institutional Ownership

Table 3 reports the coefficient estimates for our multivariate regressions of environmental performance on the breadth of ownership. Standard errors are robust to heteroscedasticity and to clustering within firms over time. In these regressions, we account for several factors that may affect the breadth of ownership. For instance, larger firms are more likely than smaller firms to attract the attention of investors. Thus, we include the natural logarithm of the market value of equity ln(MARKET_VALUE) to control for the effect of firm size in our analysis. As older firms have established track records, they are less risky and may attract a larger number of investors. Thus, we add the natural logarithm of firm age in our regressions. To account for the influence of S&P 500 membership, we include an S&P 500 dummy in our analysis. We also use a NASDAQ dummy to control for differences across stock exchanges. Corporate governance may potentially affect the breadth of ownership and environmental performance. Therefore, we include a CEO/Chair duality dummy, the GIM (2003) index, and an independent board dummy in the regressions.[13] We also account for market-based measures by adding Tobin's Q, stock return, standard deviation of stock return, turnover, and the inverse of stock price in the regression. As in Hong and Kacperczyk (2009), we control for (but do not report) 1-digit SIC and year dummies in these regressions.

We find significant effects of environmental performance on NS. Specifically, net environmental score has a significant effect on NS. To further assess the nature of the relationship between environmental performance and the breadth of ownership, we successively add green firm and toxic firm dummies in the regression. Finally, we run a regression that includes both variables. We find that green and toxic firms have, on average, 1,493 and 1,629 more investors, respectively, than neutral firms have (model 4). These differences are equivalent to 3.9% and 4.3% increases in NS, respectively, relative to the sample average. Collectively, these findings are consistent with our univariate results and provide strong support for our previous conjecture of the existence of a nonmonotonic relationship between environmental performance and the breadth of ownership.

[13] Jensen (2010) and Tirole (2001) associate a high level of socially responsible corporate behavior with agency problems, suggesting that managers of green companies use company resources wastefully. Including governance measures in the multivariate regressions allows us to disentangle the agency issues that may be associated with corporate environmental performance.

TABLE 3

Environmental Performance and the Breadth of Ownership

Table 3 reports regressions of breadth of ownership. The dependent variables in these regressions are the number of shareholders and the ratio of the number of institutional investors to the total number of investors. Variable definitions are in Appendix A. The *p*-values are given in parentheses and are based on standard errors corrected for heteroscedasticity and clustering of firms over years. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	ln(NS)				ln(NUM_OF_INST_SHAREHOLDERS/NS)			
Variables	1	2	3	4	5	6	7	8
NET_ENVIRONMENT_SCORE	−0.111*** (0.001)				0.117*** (0.000)			
GREEN_FIRM_DUMMY		0.260*** (0.003)		0.401*** (0.000)		−0.223*** (0.007)		−0.367*** (0.000)
TOXIC_FIRM_DUMMY			0.401*** (0.000)	0.488*** (0.000)			−0.418*** (0.000)	−0.498*** (0.000)
ln(MARKET_VALUE)	0.673*** (0.000)	0.680*** (0.000)	0.662*** (0.000)	0.651*** (0.000)	−0.247*** (0.000)	−0.255*** (0.000)	−0.235*** (0.000)	−0.225*** (0.000)
ln(FIRM_AGE)	0.082 (0.169)	0.095 (0.110)	0.067 (0.254)	0.059 (0.313)	−0.098 (0.110)	−0.111* (0.068)	−0.083 (0.174)	−0.075 (0.214)
SP_500_DUMMY	−0.120 (0.145)	−0.107 (0.189)	−0.115 (0.160)	−0.103 (0.200)	0.156* (0.079)	0.144 (0.102)	0.151* (0.087)	0.140 (0.108)
NASDAQ_DUMMY	0.072 (0.385)	0.062 (0.449)	0.081 (0.332)	0.079 (0.337)	−0.064 (0.496)	−0.054 (0.560)	−0.073 (0.439)	−0.071 (0.444)
CEO_CHAIRMAN_DUMMY	−0.071* (0.072)	−0.073* (0.066)	−0.069* (0.079)	−0.069* (0.080)	0.102** (0.026)	0.103** (0.024)	0.100** (0.028)	0.100** (0.029)
INDEPENDENT_BOARD_DUMMY	0.239*** (0.002)	0.238*** (0.002)	0.224*** (0.004)	0.209*** (0.007)	−0.241*** (0.004)	−0.242*** (0.004)	−0.226*** (0.007)	−0.212** (0.011)
GIM_INDEX	−0.004 (0.728)	−0.006 (0.588)	−0.005 (0.675)	−0.006 (0.607)	−0.001 (0.915)	0.001 (0.938)	−0.000 (0.973)	0.001 (0.965)
TOBINS_Q	−0.078*** (0.003)	−0.089*** (0.001)	−0.069*** (0.008)	−0.063** (0.016)	0.067** (0.018)	0.079*** (0.005)	0.058** (0.040)	0.052* (0.066)
AVERAGE_MONTHLY_STOCK_RETURN	1.349** (0.012)	1.485*** (0.005)	1.269** (0.017)	1.226** (0.020)	2.971*** (0.000)	2.829*** (0.000)	3.054*** (0.000)	3.093*** (0.000)
STD_DEV_OF_DAILY_STOCK_RETURN	−16.908*** (0.000)	−16.195*** (0.000)	−16.198*** (0.000)	−14.819*** (0.000)	13.118*** (0.001)	12.520*** (0.001)	12.379*** (0.001)	11.117*** (0.003)
1_STOCK_PRICE	8.753*** (0.000)	8.572*** (0.000)	8.590*** (0.000)	8.327*** (0.000)	−8.106*** (0.000)	−7.946*** (0.000)	−7.937*** (0.000)	−7.696*** (0.000)
TURNOVER	−0.094*** (0.000)	−0.089*** (0.001)	−0.095*** (0.000)	−0.093*** (0.000)	0.127*** (0.000)	0.122*** (0.000)	0.127*** (0.000)	0.125*** (0.000)
CONSTANT	−2.649*** (0.000)	−2.759*** (0.000)	−2.570*** (0.000)	−2.548*** (0.000)	4.952*** (0.000)	5.066*** (0.000)	4.871*** (0.000)	4.851*** (0.000)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	7,324	7,324	7,324	7,324	7,324	7,324	7,324	7,324
R^2	0.479	0.478	0.484	0.490	0.256	0.253	0.261	0.266

Several of our control variables also have explanatory power in the regressions. We find that larger firms attract more investors than smaller firms. Furthermore, NS is negatively related to turnover, stock price, and stock return volatility. Independent boards and CEO/Chair separation, both corporate characteristics that are commonly thought to be indicative of good corporate governance practices, also improve the breadth of ownership.

To capture the effect of environmental performance on institutional investors, we conduct similar regressions for the ratio of the number of institutional investors to total NS and the ratio of shares held by institutions to the total shares outstanding. Models 5–8 in Table 3 report the regressions in which the dependent variable is the natural logarithm of the ratio of the number of institutional investors to NS. Regardless of the model specification, we observe decreases in the ratio of

institutional investors when firms are classified as green or toxic; these decreases are statistically significant at the 1% level. Furthermore, in an unreported analysis on subsamples of size and Tobin's Q quartiles, we continue to find a lower ratio of institutional investors to NS. Combined with a higher number of investors investing in green and toxic stocks, these findings collectively suggest that green and toxic firms attract disproportionately more individual investors and correspondingly fewer institutional investors than neutral firms do.

Table 4 reports regressions of institutional holdings where the dependent variable is the ratio of shares held by all institutional investors to the total number of shares outstanding. The effects of green and toxic firms on total institutional holdings are negative and statistically significant. They are also economically significant. Specifically, model 4 documents that the ratios of institutional holdings in green and toxic firms decrease by 2.8% and 2.1%, respectively, relative to those of neutral firms. Because the average institutional holding percentage in our sample

TABLE 4

Environmental Performance and Institutional Ownership

Table 4 reports regressions of institutional ownership. The dependent variable in these regressions is the fraction of shares held by institutional investors. Variable definitions are in Appendix A. The p-values are given in parentheses and are based on standard errors corrected for heteroscedasticity and clustering of firms over years. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	FRACTION_OF_SHARES_HELD_BY_INST_INVESTORS			
Variables	1	2	3	4
NET_ENVIRONMENT_SCORE	0.001			
	(0.826)			
GREEN_FIRM_DUMMY		−0.021**		−0.028**
		(0.045)		(0.014)
TOXIC_FIRM_DUMMY			−0.015	−0.021**
			(0.123)	(0.040)
ln(MARKET_VALUE)	−0.023***	−0.023***	−0.022***	−0.022***
	(0.000)	(0.000)	(0.000)	(0.000)
ln(FIRM_AGE)	−0.028***	−0.028***	−0.027***	−0.027***
	(0.000)	(0.000)	(0.000)	(0.000)
SP_500_DUMMY	0.044***	0.043***	0.044***	0.043***
	(0.000)	(0.000)	(0.000)	(0.000)
NASDAQ_DUMMY	−0.061***	−0.061***	−0.062***	−0.062***
	(0.000)	(0.000)	(0.000)	(0.000)
CEO_CHAIRMAN_DUMMY	0.006	0.006	0.005	0.005
	(0.365)	(0.363)	(0.374)	(0.378)
INDEPENDENT_BOARD_DUMMY	0.014	0.014	0.015	0.016
	(0.262)	(0.243)	(0.235)	(0.201)
GIM_INDEX	−0.001	−0.001	−0.001	−0.001
	(0.592)	(0.625)	(0.584)	(0.615)
TOBINS_Q	−0.010***	−0.010***	−0.010***	−0.011***
	(0.007)	(0.007)	(0.004)	(0.002)
AVERAGE_MONTHLY_STOCK_RETURN	0.346***	0.345***	0.353***	0.356***
	(0.001)	(0.001)	(0.000)	(0.000)
STD_DEV_OF_DAILY_STOCK_RETURN	−0.462	−0.526	−0.492	−0.587
	(0.416)	(0.356)	(0.385)	(0.301)
1_STOCK_PRICE	−0.794***	−0.782***	−0.789***	−0.771***
	(0.000)	(0.000)	(0.000)	(0.000)
TURNOVER	0.030***	0.029***	0.030***	0.030***
	(0.000)	(0.000)	(0.000)	(0.000)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
No. of obs.	7,324	7,324	7,324	7,324
R^2	0.332	0.333	0.333	0.334

is 72%, the decreases in the institutional holdings correspond to reductions of 3.9% and 2.9% relative to a representative firm in our sample.[14] These results are also consistent with our finding of fewer institutions investing in green and toxic firms than in neutral firms. Overall, these findings support our conjecture that institutional investors account for environmental performance in investment decisions.

We also observe that institutional holdings increase with turnover and stock price, which is consistent with the findings of Gompers and Metrick (2001). Furthermore, firms listed on the S&P 500 index and firms that have higher average monthly stock returns also have larger relative institutional holdings. We do not find a significant effect of corporate governance on institutional holdings, which are unrelated to independent boards, the GIM (2003) index, and CEO/Chair duality.

We also analyze holdings by institution type. Corporate 13F filings report five institutional investor types: banks, insurance companies, mutual funds, independent investment advisers (e.g., hedge funds), and "others" (including universities, pension plans, and employee stock-ownership plans). This classification scheme allows us to test whether environmental performance influences the investments of institutional investors who are known to be norm-constrained, including universities, pension plans, and employee stock-ownership plans.[15] As the classification scheme for institution types changed after 1997, we report institutional holdings by various types for 1998–2007 in Table 5.

Table 5 reports significant effects of environmental performance on holdings of various institutional investors for the 1998–2007 period. Consistent with our previous results for aggregate institutional ownership, we find smaller numbers of institutional investors in green and toxic firms than in neutral firms for all five institutional investor types in this subsample. All SRI norm-unconstrained institutions (including banks, insurance, and investment and financial advisers) hold significantly smaller fractions of the shares of green firms in models 6–9. In contrast, only "other" institutions, representing SRI norm-constrained institutional investors (e.g., universities, endowments, and pension plans), hold a significantly lower percentage of shares of toxic firms. These findings suggest that norm-constrained institutional investors shun stocks with poor environmental performance (i.e., toxic firms), whereas norm-unconstrained institutional investors are significantly less likely to invest in stocks of green firms. However, we find no significant effect of green stocks on norm-constrained investors, suggesting that penalties for deviations from social norms rather than rewards for behaving in accordance with social norms play a more important role in the investment decisions of norm-constrained investors. This choice may be made because the higher risk exposure from toxic firms and the costs of deviating from social norms (e.g., losing a good reputation among green investors or being a target of social activists) are considerably higher than any rewards for investing *exclusively* in

[14] In an unreported analysis, we replicate the analysis for the subsample of firms that have analyst followings and continue to find negative effects of green and toxic firms on total institutional holdings.

[15] Anecdotal evidence suggests that pension funds in particular promote socially responsible investing. For example, the California Public Employees' Retirement System, the largest U.S. pension fund, is well known for its socially responsible investment strategy.

TABLE 5
Institutional Ownership by Different Types of Institutions

Table 5 reports regressions of institutional ownership. The dependent variables in these regressions are the ratio of the number of institutional investors to the total number of investors (Panel A) and the fraction of shares held by institutional investors (Panel B). Variable definitions are in Appendix A. The *p*-values are given in parentheses and are based on standard errors corrected for heteroscedasticity and clustering of firms over years. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variables	Banks 1	Insurance 2	Investment 3	Advisers 4	Other 5
Panel A. ln(NUM_OF_INST_INVESTORS/NS)					
GREEN_FIRM_DUMMY	−0.265*** (0.000)	−0.159*** (0.000)	−0.108*** (0.000)	−0.266*** (0.000)	−0.373*** (0.000)
TOXIC_FIRM_DUMMY	−0.363*** (0.000)	−0.185*** (0.000)	−0.125*** (0.000)	−0.348*** (0.000)	−0.520*** (0.000)
Controls	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
No. of obs.	6,935	6,935	6,935	6,935	6,935
R^2	0.207	0.267	0.245	0.318	0.269
Panel B. FRACTION_OF_SHARES_HELD_BY_INST_INVESTORS					
GREEN_FIRM_DUMMY	−0.005** (0.045)	−0.004*** (0.007)	−0.002** (0.043)	−0.006** (0.019)	−0.016 (0.125)
TOXIC_FIRM_DUMMY	−0.003 (0.254)	−0.000 (0.940)	−0.001 (0.171)	0.001 (0.577)	−0.021** (0.029)
Controls	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
No. of obs.	6,935	6,935	6,935	6,935	6,935
R^2	0.281	0.118	0.078	0.640	0.345

green stocks.[16] Collectively, these results indicate considerable variation in the preference for environmental performance across the different institution types.

C. Analyst Coverage

Next, we examine whether the nature of corporate environmental performance influences analyst coverage. Table 6 presents results from regressions relating analyst coverage to environmental performance. The dependent variables are the natural logarithm of the number of analysts covering the underlying stock in models 1–4 and the dummy variable for analyst coverage in models 5–8. We use ordinary least squares for the former and employ a probit specification for the latter. Because coefficient estimates are hard to interpret in probit models, we report marginal effects in models 5–8.

We find no significant effect of green firms on the number of analysts covering a firm. On the contrary, three of four models report a significant positive effect for toxic firms, suggesting that analyst coverage is higher for toxic firms.[17] Specifically, model 8 reports a significant effect of toxic firms on the likelihood of analyst coverage (7.5%), whereas the effect of green firms is statistically insignificant. The significant effect of toxic firms corresponds to a 9.4% increase relative to a representative firm in the sample. These results suggest that analysts have a

[16] Karpoff et al. (2005) show that legal penalties associated with environmental violations are, on average, 2.26% of the market capitalization of corresponding firms.

[17] These results largely remain intact when we replicate this analysis for the subsamples of Tobin's *Q* quartiles. These results are not reported but are available from the authors.

TABLE 6

Environmental Performance and Analyst Coverage

Table 6 presents regressions in models 1–4 and probit analysis in models 5–8. The dependent variable in the regressions is the natural logarithm of 1 plus the number of analysts covering the firm. The dependent variable in the probit models is the dummy variable for analyst coverage. The estimates in probit are average marginal effects. Variable definitions are in Appendix A. The *p*-values are given in parentheses and are based on standard errors corrected for heteroscedasticity and clustering of firms over years. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	ln(1+ NUM_OF_ANALYSTS)				P(ANALYST_COVERAGE = 1)			
Variables	1	2	3	4	5	6	7	8
NET_ENVIRONMENT_SCORE	−0.041				−0.029**			
	(0.120)				(0.037)			
GREEN_FIRM_DUMMY		0.046		0.075		0.020		0.036
		(0.567)		(0.363)		(0.562)		(0.251)
TOXIC_FIRM_DUMMY			0.085	0.102*			0.069***	0.075***
			(0.145)	(0.093)			(0.006)	(0.002)
ln(MARKET_VALUE)	0.281***	0.285***	0.281***	0.279***	0.020	0.021	0.018	0.016
	(0.000)	(0.000)	(0.000)	(0.000)	(0.146)	(0.127)	(0.197)	(0.237)
ln(FIRM_AGE)	−0.215***	−0.210***	−0.216***	−0.217***	−0.064***	−0.062***	−0.066***	−0.066***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.003)	(0.002)	(0.002)
SP_500_DUMMY	0.135*	0.138*	0.137*	0.139*	0.017	0.020	0.020	0.022
	(0.083)	(0.076)	(0.080)	(0.074)	(0.591)	(0.540)	(0.548)	(0.503)
NASDAQ_DUMMY	0.012	0.009	0.013	0.013	−0.021	−0.025	−0.021	−0.022
	(0.884)	(0.913)	(0.877)	(0.880)	(0.509)	(0.452)	(0.517)	(0.504)
CEO_CHAIRMAN_DUMMY	−0.014	−0.015	−0.014	−0.014	−0.005	−0.005	−0.004	−0.004
	(0.697)	(0.687)	(0.701)	(0.702)	(0.758)	(0.743)	(0.782)	(0.793)
INDEPENDENT_BOARD_DUMMY	0.176**	0.177**	0.174**	0.171**	0.089***	0.090***	0.086***	0.084***
	(0.012)	(0.012)	(0.013)	(0.015)	(0.003)	(0.004)	(0.004)	(0.005)
GIM_INDEX	0.016	0.016	0.016	0.016	0.000	−0.000	−0.000	−0.000
	(0.116)	(0.131)	(0.124)	(0.129)	(0.963)	(0.996)	(0.989)	(0.963)
TOBINS_Q	−0.039	−0.043	−0.039	−0.037	−0.010	−0.012	−0.009	−0.008
	(0.170)	(0.124)	(0.169)	(0.181)	(0.308)	(0.218)	(0.360)	(0.395)
AVERAGE_MONTHLY_STOCK_RETURN	0.159	0.208	0.162	0.154	−0.027	−0.009	−0.042	−0.051
	(0.753)	(0.677)	(0.746)	(0.758)	(0.887)	(0.961)	(0.825)	(0.784)
STD_DEV_OF_DAILY_STOCK_RETURN	−6.542*	−6.430*	−6.402*	−6.144*	−1.699	−1.627	−1.577	−1.450
	(0.074)	(0.081)	(0.080)	(0.095)	(0.229)	(0.255)	(0.262)	(0.304)
1_STOCK_PRICE	1.347	1.309	1.308	1.259	−0.411	−0.445	−0.440	−0.463
	(0.217)	(0.231)	(0.230)	(0.250)	(0.330)	(0.294)	(0.293)	(0.269)
TURNOVER	0.083***	0.085***	0.083***	0.084***	−0.007	−0.006	−0.007	−0.007
	(0.001)	(0.001)	(0.001)	(0.001)	(0.420)	(0.511)	(0.441)	(0.464)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	7,324	7,324	7,324	7,324	7,324	7,324	7,324	7,324
Pseudo-R^2	0.294	0.293	0.294	0.294	0.173	0.170	0.173	0.174

higher propensity to serve investors in toxic stocks. This finding contrasts sharply with the results of Hong and Kacperczyk (2009), which show that sin stocks receive lower analyst coverage. However, it is consistent with the notion that institutional prudency requirements may increase the demand for analyst coverage of toxic stocks. It is also consistent with Krüger's (2016) finding that investors value disclosures of greenhouse gas (GHG) emissions, especially by companies that emit more GHG and therefore have higher exposure to future costs associated with GHG emissions. Because toxic stocks are more prone to environmental litigation, penalties, and other costs that lower investor returns, institutional investors are more likely to rely on analyst reports when they invest in toxic stocks.

It is important to emphasize that the results reported above are obtained after controlling for other factors that are known to drive analyst coverage. Analyst coverage is significantly and positively related to firm size. We also find that firms

with independent boards have a higher likelihood of analyst coverage. The relationships we document between environmental performance and analyst coverage persist after these controls.

D. The Effect of Industry Environmental Performance on Institutional Ownership and Analyst Coverage

In this section, we examine whether environmental performance of an industry affects the variables of interest. Hong and Kacperczyk (2009) document that institutional investors and analysts shy away from sin stocks, which are classified based on the firm's (or one of its segments') industry grouping. Hong and Kacperczyk's findings for sin stocks suggest that industry environmental performance may also play an important role in investment choices and analyst coverage.

To disentangle the effects of firm and industry, we include green and toxic industry variables in the basic regressions reported in Table 7. We continue to find that firm environmental performance measures (i.e., green and toxic) are statistically and economically significant. Regarding the industry environmental performance, toxic industries have a higher number of investors, lower number of institutional investors, and a lower fraction of institutional holdings. However, the industry environmental performance measures do not have significant effects on analyst coverage. These findings suggest that the within-industry variation in corporate environmental performance documented in this paper is distinct from cross-industry environmental performance.

TABLE 7

The Effect of Industry Environmental Performance on Analyst Coverage and Breadth of Ownership

Table 7 reports the effect of industry environmental performance on variables of interest. Variable definitions are in Appendix A. The *p*-values are given in parentheses and are based on standard errors corrected for heteroscedasticity and clustering of firms over years. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variables	ln(NS)	ln(NUM_OF_INST_INVESTORS / NS)	FRACTION_OF_SHARES_HELD_BY_INST_INVESTORS	ln(1 + NUM_OF_ANALYSTS)	P(ANALYST_COVERAGE = 1)
	1	2	3	4	5
GREEN_FIRM_DUMMY	0.405***	−0.373***	−0.029**	0.073	0.035
	(0.000)	(0.000)	(0.011)	(0.375)	(0.265)
TOXIC_FIRM_DUMMY	0.481***	−0.485***	−0.019*	0.109*	0.079***
	(0.000)	(0.000)	(0.066)	(0.074)	(0.001)
GREEN_INDUSTRY_DUMMY	0.062	−0.076	−0.013	−0.006	0.008
	(0.316)	(0.266)	(0.190)	(0.925)	(0.715)
TOXIC_INDUSTRY_DUMMY	0.123**	−0.180***	−0.031***	−0.063	−0.039
	(0.023)	(0.001)	(0.000)	(0.216)	(0.115)
Controls	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
No. of obs.	7,324	7,324	7,324	7,324	7,324
Pseudo-R^2	0.491	0.268	0.336	0.295	0.175

E. Corporate Environmental Performance and Firm Value

In previous sections, we document that environmental performance has economically meaningful effects on investor holdings and analyst coverage. In this section, we examine whether the nature of corporate environmental performance influences firm values. Specifically, we examine differences in stock valuations using the Tobin's Q measure. Panels A and B of Table 8 report mean and median Tobin's Q values for environmental performance groups. We find that the mean and the median Tobin's Q values of toxic firms are significantly lower than those of neutral firms. Although Panel A shows significantly lower mean Tobin's Q values for green firms relative to neutral firms, we find no significant difference in the corresponding median values in Panel B.

We also conduct a matched sample analysis to assess the difference in valuations in Panel C of Table 8. Specifically, we generate one-on-one matching samples of neutral firms for green and toxic firms that share the same 2-digit SIC. Matching firms are the closest in size from firms whose size is within $\pm 10\%$ of the sample firm. We also statistically verify the efficacy of the size match. We compare Tobin's Q values of green and toxic firms to a group of matched neutral firms. Panel C reports that toxic firms have significantly lower Tobin's Q values relative to matched neutral firms, confirming our findings based on raw Tobin's Q measures in Panels A and B. Additionally, we find that green firms have significantly lower Tobin's Q values.

Finally, we conduct a multivariate regression to assess the effect of environmental performance on stock valuation. In Panel D of Table 8, models 1–4 have the dependent variable as Tobin's Q. In models 5–8, the dependent variable is the natural logarithm of Tobin's Q. Toxic Firm Dummy has negative and significant effects on Tobin's Q in all models. In particular, the coefficient estimate for Toxic Firm Dummy is -0.185 in model 4, representing a 9% decrease relative to the mean Tobin's Q in the sample (2.03). Collectively, these multivariate results and the univariate results in Panels A, B, and C provide strong evidence that higher environmental risk exposure reduces firm value.

We also examine the stock valuation of green firms in the multivariate regressions. Although the Green Firm Dummy has a significant negative effect in models 3 and 4 at the 10% confidence level, the effect lacks statistical significance in models 7 and 8. Collectively, these findings suggest that greenness does not increase shareholder value.

We also assess the portfolio returns of green and toxic firms. Specifically, we calculate the net portfolio returns as the returns of green and toxic portfolios minus the corresponding equal-weighted neutral firm portfolio returns. We then regress separately the net portfolio returns over 12 months on i) excess market returns in the conventional market model, ii) the 3 factors in the Fama–French (1992) model, and iii) the 4 factors in the Fama–French (1992) and Carhart (1997) models. The intercept terms of the net returns regressions indicate abnormal returns (Alpha), while coefficient estimates are the risk loadings on the corresponding factors. Panel A of Table 9 reports the estimates from these regressions over 132 months between 1997 and 2007.

TABLE 8

Environmental Performance and Firm Value

Table 8 reports the effects of a firm's environmental performance on Tobin's *Q*. Panels A and B report mean and median values of Tobin's *Q* for environmental performance groups, respectively. Panel C presents the difference in Tobin's *Q* ratios of green and toxic firms and matched neutral firms. In Panel D, models 1–4 have the same dependent variable as Tobin's *Q*. In models 5–8, the dependent variable is the natural logarithm of Tobin's *Q*. Variable definitions are in Appendix A. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Firms					
	Green	Toxic	Neutral			
	1	2	3	1 – 3	2 – 3	1 – 2
Panel A. Mean Values						
TOBINS_Q	1.977	1.628	2.071	−0.095*	−0.443***	0.349***
Panel B. Median Values						
TOBINS_Q	1.605	1.373	1.634	−0.029	−0.261***	0.231***

Panel C. Matched Subsample Analysis

	Green – Matched Neutral				Toxic – Matched Neutral			
TOBINS_Q	−0.364***				−0.646***			
	TOBINS_Q				ln(TOBINS_Q)			
Variables	1	2	3	4	5	6	7	8
Panel D. Regression								
NET_ENVIRONMENT_SCORE	0.059*** (0.000)	0.063*** (0.000)			0.032*** (0.000)	0.034*** (0.000)		
GREEN_FIRM_DUMMY			−0.093* (0.062)	−0.093* (0.063)			−0.025 (0.226)	−0.025 (0.230)
TOXIC_FIRM_DUMMY			−0.172*** (0.000)	−0.185*** (0.000)			−0.088*** (0.000)	−0.093*** (0.000)
ln(FIRM_AGE)	−0.054 (0.110)	−0.054 (0.110)	−0.048 (0.160)	−0.047 (0.163)	−0.026** (0.041)	−0.027** (0.040)	−0.024* (0.067)	−0.023* (0.068)
SP_500_DUMMY	0.280*** (0.000)	0.280*** (0.000)	0.282*** (0.000)	0.282*** (0.000)	0.122*** (0.000)	0.122*** (0.000)	0.123*** (0.000)	0.123*** (0.000)
NASDAQ_DUMMY	0.329*** (0.000)	0.331*** (0.000)	0.324*** (0.000)	0.326*** (0.000)	0.125*** (0.000)	0.125*** (0.000)	0.123*** (0.000)	0.123*** (0.000)
CEO_CHAIRMAN_DUMMY	−0.021 (0.458)	−0.022 (0.445)	−0.022 (0.436)	−0.023 (0.421)	−0.010 (0.326)	−0.010 (0.313)	−0.011 (0.305)	−0.011 (0.289)
INDEPENDENT_BOARD_DUMMY	−0.026 (0.692)	−0.027 (0.673)	−0.018 (0.779)	−0.019 (0.763)	−0.025 (0.266)	−0.026 (0.254)	−0.022 (0.329)	−0.023 (0.318)
GIM_INDEX	−0.021*** (0.002)	−0.022*** (0.002)	−0.021*** (0.003)	−0.021*** (0.002)	−0.008*** (0.004)	−0.008*** (0.004)	−0.007*** (0.006)	−0.007*** (0.006)
RD_TA	8.585*** (0.000)	8.714*** (0.000)	8.546*** (0.000)	8.678*** (0.000)	3.040*** (0.000)	3.092*** (0.000)	3.021*** (0.000)	3.075*** (0.000)
RD_MISSING_DUMMY	−0.027 (0.621)	−0.022 (0.681)	−0.037 (0.500)	−0.033 (0.550)	−0.033 (0.115)	−0.032 (0.132)	−0.038* (0.077)	−0.036* (0.089)
STD_DEV_OF_DAILY_STOCK_RETURN	−0.007 (0.997)	0.106 (0.961)	−0.636 (0.770)	−0.541 (0.803)	−1.216 (0.157)	−1.176 (0.169)	−1.461* (0.088)	−1.429* (0.094)
EBITDA_TA	8.635*** (0.000)	8.620*** (0.000)	8.600*** (0.000)	8.581*** (0.000)	3.494*** (0.000)	3.488*** (0.000)	3.478*** (0.000)	3.471*** (0.000)
GREEN_INDUSTRY		−0.096** (0.046)		−0.101** (0.036)		−0.037** (0.045)		−0.039** (0.032)
TOXIC_INDUSTRY		0.013 (0.723)		0.015 (0.674)		0.008 (0.589)		0.009 (0.515)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	7,324	7,324	7,324	7,324	7,324	7,324	7,324	7,324
R^2	0.526	0.527	0.527	0.528	0.580	0.580	0.580	0.581

We fail to find any statistically or economically significant effect of environmental performance on net portfolio returns. Specifically, Alpha lacks statistical significance for toxic firms in all models. Combined with the lower institutional

TABLE 9

Environmental Performance and Portfolio Returns

Table 9 reports the effects of firm environmental performance on portfolio returns. Models 1–3 have the same dependent variable as long Green (monthly return for an equal-weighted portfolio of green firms) and short Neutral (monthly return for an equal-weighted portfolio of matched neutral firms). In models 4–6, the dependent variable is long Toxic (monthly return for an equal-weighted portfolio of toxic firms) and short Neutral (monthly return for an equal-weighted portfolio of matched neutral firms). *p*-values are given in parentheses. Variable definitions are in Appendix A. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Green − Matched Neutral			Toxic − Matched Neutral		
Variables	1	2	3	4	5	6
EXCESS_RETURN_ON_MARKET	−0.0939***	−0.0802**	−0.0549	−0.1357***	−0.0304	0.0184
	(0.007)	(0.034)	(0.159)	(0.005)	(0.513)	(0.725)
SMALL_MINUS_BIG_RETURN		0.0486	0.0338		−0.1170*	−0.1455**
		(0.300)	(0.499)		(0.064)	(0.037)
HIGH_MINUS_LOW_RETURN		0.0731	0.0883		0.2394***	0.2686***
		(0.175)	(0.124)		(0.001)	(0.000)
MOMENTUM_FACTOR			0.0536*			0.1031**
			(0.087)			(0.024)
ALPHA	0.0007	0.0003	−0.0002	0.0001	−0.0004	−0.0014
	(0.666)	(0.852)	(0.891)	(0.976)	(0.833)	(0.494)
No. of obs.	132	132	132	132	132	132
R^2	0.056	0.073	0.095	0.064	0.238	0.282

holdings (Table 4), higher demand for analyst coverage (Table 6), and lower Tobin's Q values for toxic firms (Table 8), this finding suggests that toxic firms' stocks do not rebound, in part because toxic firms are more prone to environmental disasters, lawsuits, and other costly disruptions.

F. Robustness

In the preceding analysis, we utilize the widely used KLD data set to assess the effects of environmental performance. In this section, we further validate our findings by utilizing an alternative data set on firms' environmental expenditures. Because there is no readily available commercial data set on corporate environmental expenditures, we generate our own data by hand-collecting environmental expenditure variables from the 10-K filings for 7,298 firm-years in our sample.[18] We search the filings for mention of environmental expenses that the company discloses, which are typically listed under sections titled "environmental matters" or "environment." We require the data collected to be actual expenditures, not accounting charges. The data are then classified as either voluntary, mandatory, or legal environmental expenditures. Voluntary expenditures are environmental spending that is not mandated by the government through laws or regulations. Expenditures are classified as mandatory if the filing explicitly specifies that the expense is undertaken in response to regulatory compliance or remediation activities. Finally, we classify environmental expenditures as legal expenses if they are related to legal cases or legal penalties occurring in the year when a final legal settlement is reached. We define total environmental expenditures as the sum of voluntary, mandatory, and legal environmental expenditures. In our sample, 26.5% of firms disclose at least one of these expenditures. Most of the reporting

[18] We could not find information for 26 firm-years in our 7,324 firm-year sample, which leaves us with 7,298 firm-year observations for this data set.

comes from mandatory environmental expenditure disclosures (23.2%); voluntary and legal spending disclosures constitute 3.1% and 2.5%, respectively.

We test the robustness of the findings by normalizing the various environmental expenditures by total assets (TOTAL_ENVIRONMENTAL_EXP_TA). Panel A of Table 10 reports the effects of the TOTAL_ENVIRONMENTAL_EXP_TA ratio on the variables of interest. After accounting for firm characteristics, industry, and year fixed effects, we find that total environmental expenditures have a significant economic effect on the breadth of ownership and analyst coverage. Specifically, an increase of 1 standard deviation in TOTAL_ENVIRONMENTAL_EXP_TA increases the total NS by 1,102, which corresponds to an increase of 2.95% relative to the average NS in the sample.

TABLE 10
Alternative Definitions of Environmental Performance

Table 10 reports the effect of alternative definitions of environmental performance on variables of interest. Models 1–4 report coefficient estimates of ordinary least squares, while model 5 presents coefficient estimates of probit analysis. Variable definitions are in Appendix A. The *p*-values are given in parentheses and are based on standard errors corrected for heteroscedasticity and clustering of firms over years. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variables	ln(NS)	ln(NUM_OF_INST_INVESTORS / NS)	FRACTION_OF_SHARES_HELD_BY_INST_INVESTORS	ln(1 + NUM_OF_ANALYSTS)	P(ANALYST_COVERAGE = 1)
	1	2	3	4	5
Panel A. Analysis of Total Environmental Expenditures					
TOTAL_ENVIRONMENTAL_EXP_TA	40.610*** (0.000)	−45.064*** (0.000)	−2.718** (0.033)	3.209 (0.647)	40.897 (0.209)
Controls	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.479	0.264	0.350	0.293	0.171
Panel B. Analysis of Voluntary Environmental Expenditures					
VOLUNTARY_ENVIRONMENTAL_EXP_TA	166.628*** (0.000)	−172.134*** (0.000)	−9.063* (0.080)	−18.635 (0.570)	11.326 (0.881)
Controls	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.479	0.264	0.349	0.293	0.169
Panel C. Analysis of Mandatory Environmental Expenditures					
MANDATORY_ENVIRONMENTAL_EXP_TA	41.856*** (0.002)	−48.473*** (0.000)	−2.930* (0.087)	13.713* (0.051)	135.106*** (0.000)
Controls	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.476	0.261	0.349	0.293	0.175
Panel D. Analysis of Legal Environmental Expenditures					
LEGAL_ENVIRONMENTAL_EXP_TA	−410.787 (0.815)	26.765 (0.988)	103.309 (0.500)	838.352 (0.167)	3,962.865** (0.045)
Controls	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.474	0.258	0.349	0.293	0.184

(continued on next page)

TABLE 10 (continued)
Alternative Definitions of Environmental Performance

Variables	ln(NS)	ln(NUM_OF_INST_INVESTORS / NS)	FRACTION_OF_SHARES_HELD_BY_INST_INVESTORS	ln(1 + NUM_OF_ANALYSTS)	P(ANALYST_COVERAGE = 1)
	1	2	3	4	5
Panel E. Alternative Definitions of Environmental Performance					
GREEN_FIRM_DUMMY_2	0.435***	−0.403***	−0.030**	0.091	0.187
	(0.000)	(0.000)	(0.011)	(0.292)	(0.219)
TOXIC_FIRM_DUMMY_2	0.486***	−0.500***	−0.028**	0.110	0.344**
	(0.000)	(0.000)	(0.016)	(0.107)	(0.011)
GRAY_FIRM_DUMMY_2	0.664***	−0.661***	−0.032**	0.306***	0.954***
	(0.000)	(0.000)	(0.029)	(0.000)	(0.000)
Controls	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.494	0.271	0.335	0.298	0.182
Panel F. Alternative Models					
GREEN_FIRM_DUMMY	0.447***	−0.414***	−0.031***	0.105	0.208
	(0.000)	(0.000)	(0.007)	(0.215)	(0.166)
TOXIC_FIRM_DUMMY	0.545***	−0.556***	−0.026**	0.139**	0.408***
	(0.000)	(0.000)	(0.017)	(0.033)	(0.002)
GRAY_FIRM_DUMMY	0.505***	−0.517***	−0.042**	0.332***	1.329***
	(0.000)	(0.000)	(0.024)	(0.000)	(0.000)
Controls	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.493	0.270	0.335	0.297	0.181

Furthermore, such an increase in TOTAL_ENVIRONMENTAL_EXP_TA leads to a decrease of 0.7% in the fraction of institutional holdings. Because the average institutional holding in the sample is 72%, this decrease corresponds to a reduction of 0.9% for a representative firm in our sample. Finally, TOTAL_ENVIRONMENTAL_EXP_TA has a positive but insignificant effect on the probability of analyst coverage. These findings are largely similar to and therefore validate our findings on the effect of net environmental score on the variables of interest in Tables 3, 4, and 6.

Next, we take advantage of the different expenditure types reported (i.e., voluntary, mandatory, and legal) to isolate the source of the effects. Specifically, voluntary disclosures suggest going beyond legal and regulatory requirements, parallel to voluntary actions that give rise to environmental strengths in the KLD data set. Panel B of Table 10 reports that an increase in the ratio of voluntary environmental expenditures to total assets (VOLUNTARY_ENVIRONMENTAL_EXP_TA) increases the number of investors and decreases the ratio of institutional investors and the fraction of institutional holdings. In particular, an increase of 1 standard deviation in VOLUNTARY_ENVIRONMENTAL_EXP_TA results in a decrease of 5.4% in the fraction of institutional holdings, but it does not affect analyst coverage. These findings are consistent with the effects of green firms documented in Tables 3, 4, and 6.

Mandatory environmental expenditures are comparable to the net environmental scores that we derive from the KLD data set. Mandatory environmental expenditures are intended to decrease environmental concerns, similar to the regulatory compliance (ENV_CON_B) variable in the KLD data set. Mandatory environmental expenditures also may improve the strengths of environmental performance, such as beneficial products and services (ENV_STR_A) in the KLD data set. Panel C presents significant effects of the ratio of mandatory environmental expenditures to total assets (MANDATORY_ENVIRONMENTAL_EXP_TA) on the variables of interest. Specifically, a 1-standard-deviation increase in MANDATORY_ENVIRONMENTAL_EXP_TA leads to a decrease of 4.7% in the fraction of institutional holdings. The significant effects of MANDATORY_ENVIRONMENTAL_EXP_TA in Panel C are also consistent with the effects of the net environmental score reported in Tables 3, 4, and 6. These findings provide further robustness to the results previously reported in this paper.

In Panel D of Table 10, we analyze legal environmental expenditures, which are similar to environmental concerns in the KLD data set. We find that legal expenditures have a significant effect on the likelihood of analyst coverage, which is consistent with the effect of toxic firms reported in Table 6. However, we find no significant effect of legal expenditures on breadth of ownership, likely due to the small number of firms reporting the payment of fines. Notwithstanding the lack of significance in this one case, the overall findings generated by our hand-collected environmental expenditure data set are notably consistent with the results based on the KLD data set.

We next examine whether our findings are sensitive to the definitions of green and toxic firms in the KLD data set. It is possible that environmental strengths and concerns do not offset each other and, therefore, that subtracting the number of environmental concerns from the number of strengths may not generate an accurate measure for environmental performance. Thus, we redefine firms conservatively based on their involvement in environmentally positive and negative activities. In this alternative definition, GREEN_FIRM_2 takes the value of 1 if the firm has at least one environmental strength while having no environmental concerns. Likewise, TOXIC_FIRM_2 takes the value of 1 if the firm has at least one environmental concern while having no environmental strengths. We also define a new firm category, GRAY_FIRM_2, which takes the value of 1 if the firm has environmental strengths and concerns, whereas in this alternative definition, neutral firms have neither strengths nor concerns. Panel E of Table 10 reports the effects of these new measures on the variables of interest. After accounting for independent variables, the results remain intact, which suggests that our earlier findings are robust to alternative definitions of green and toxic firms.

We also examine alternative model specifications. Specifically, firms that have equal numbers of strengths and concerns generate zero net environmental performance scores and may alter our findings. We address this possibility in Panel F of Table 10 by adding a redefined GRAY_FIRM_DUMMY, which takes the value of 1 if the firm has an equal number of strengths and concerns, to our

previous models. Including the GRAY_FIRM_DUMMY does not change the earlier findings. In particular, toxic firms continue to have a larger number of individual investors and lower institutional holdings. Furthermore, analysts are more likely to cover toxic stocks. In sum, alternative definitions and model specifications do not change our findings, and they lend further support to the view advanced in this paper that environmental performance affects the breadth of ownership and analyst coverage.

IV. Conclusions

This paper examines the effect of corporate environmental policy on institutional holdings, analyst coverage, and shareholder value. We find a sharp asymmetry between corporate policies that affect the firm's exposure to environmental risk ("toxicity") and its perceived environmental friendliness ("greenness"). We find a nonmonotonic variation in ownership across the environmental performance spectrum. Green and toxic firms have a larger NS than neutral firms have, but a smaller percentage of institutional holdings. We observe some variation in holdings based on environmental performance across different types of institutional investors. Our finding that institutional investors, including SRI norm-unconstrained institutions, shun stocks with high environmental risk exposure is consistent with the predictions of risk management theory; this finding suggests that corporate environmental policies that mitigate risk exposure create value for all shareholders. Green investors may derive nonpecuniary benefits from holding "green" stocks, but we find that institutional investors, especially those unconstrained by SRI norms, also shun firms that have high greenness scores. This finding suggests that high greenness also does not increase shareholder value. Additionally, we find that analyst following is significantly higher for toxic firms. Collectively, these findings indicate that the "smart money" controlled by institutional investors distinguishes among and reacts differently to different forms of corporate environmental policies.

We observe significant differences in Tobin's Q across different environmental performance groupings. Toxic and green firms have lower Tobin's Q values than neutral firms have. We also fail to find a significant Alpha in a portfolio of toxic stocks. Collectively, these findings indicate that lower valuations of green and toxic firms persist, which is in line with the lower institutional holdings in these stocks.

This study complements the growing literature on socially responsible investment by providing a much-needed investor perspective on corporate environmental policy. Our findings provide several new insights and point to a fruitful new line of research that is likely to grow in importance as environmental performance takes a more central position in the way firms run their businesses and investors perceive them.

Appendix A. Variable Definitions

ADVISERS are independent investment advisers and correspond to institutional investor type 4 in the CDA/Spectrum 13F Holdings database.

AGE refers to the number of years between the year of estimation and the year in which the firm is first listed in CRSP data set.

ALPHA is the intercept from regressing the monthly return of the portfolio less the 1-month Treasury bill rate on the 3 Fama–French factors plus the momentum factor.

ANALYST_COVERAGE takes a value of 1 if the firm is covered by an analyst in the IBES data set.

AVERAGE_INST_INVESTOR_HOLDINGS is the ratio of FRACTION_OF_SHARES_HELD_BY_INST_INVESTORS to the NUM_OF_INSTITUTIONAL_INVESTORS.

AVERAGE_MONTHLY_STOCK_RETURN is the mean monthly holding period return.

BANKS refers to institutional investor type 1 in the CDA/Spectrum 13F Holdings database.

BOOK_DEBT is the sum of total debt in current liabilities (Compustat item DLC) and total long-term debt (Compustat item DLTT).

CEO_CHAIR_DUMMY takes a value of 1 if the CEO is chairman of the board of directors.

EBITD_TA is operating income before depreciation (Compustat item OIBDP), divided by TA.

EXCESS_RETURN_ON_MARKET refers to monthly return on the value-weighted market portfolio of NYSE, NASDAQ, and AMEX stocks less the 1-month Treasury bill rate.

FRACTION_OF_SHARES_ HELD_BY_INST_INVESTORS is the ratio of shares held by institutional investors to shares outstanding.

GIM_INDEX refers to the number of antitakeover provisions reported in the IRRC data set.

GRAY_FIRM_DUMMY takes a value of 1 if the firm has equal numbers of environmental strengths and concerns.

GRAY_FIRM_DUMMY_2 takes a value of 1 if the firm has one or more environmental strengths as well as one or more environmental concerns.

GREEN_FIRM_DUMMY takes a value of 1 if the firm has a positive Net Environmental score.

GREEN_FIRM_DUMMY_2 takes a value of 1 if the firm has at least one environmental strength and no environmental concerns.

GREEN_INDUSTRY_DUMMY takes a value of 1 if 10% or more of the industry consists of Green Firms and the percentage of Toxic Firms is less than 10%.

HIGH_MINUS_LOW_RETURN refers to the difference between the returns on portfolios of high– and low–Book Equity/Market Equity stocks.

INDEPENDENT_BOARD_DUMMY takes a value of 1 if the ratio of independent board members is greater than 50%.

INSURANCE refers to insurance companies and is identified as institutional investor type 2 in the CDA/Spectrum 13F Holdings database.

INVESTMENT refers to mutual funds and is identified as institutional investor type 3 in the CDA/Spectrum 13F Holdings database.

LEGAL_ENVIRONMENTAL_EXP_TA is the ratio of the amount of legal environmental expenditures that the firm discloses in the 10-K filing to TA. Environmental spending data are classified as legal if the environmental spending is related to legal cases or legal penalties.

MANDATORY_ENVIRONMENTAL_EXP_TA is the ratio of the amount of mandatory environmental expenditures that the firm discloses in the 10-K filing to TA. Environmental spending data are classified as mandatory if the filing explicitly specifies that the expense is undertaken in response to regulatory compliance or remediation activities.

MARKET_VALUE refers to market capitalization (shares outstanding (Compustat item CSHO) multiplied by stock price (Compustat item PRCC_F)).

MARKET_LEVERAGE is BOOK_DEBT divided by TA minus the book value of equity (Compustat item CEQ) plus the MARKET_VALUE of equity.

NASDAQ_DUMMY takes a value of 1 if the firm trades at the NASDAQ Stock Exchange.

NET_ENVIRONMENTAL_SCORE equals the number of environmental strengths minus the number of environmental concerns.

NEUTRAL_FIRM takes a value of 1 if the NET_ENVIRONMENTAL_SCORE of the firm is 0.

NEUTRAL_INDUSTRY takes a value of 1 if the industry is not classified as TOXIC_INDUSTRY or GREEN_INDUSTRY.

NUM_OF_ANALYSTS refers to the number of analysts covering the company.

NUM_OF_ENVIRONMENTAL_CONCERNS is the number of environmental concerns reported in the KLD data set. The concerns indicate whether the firm releases hazardous waste, agricultural chemicals, or ozone-depleting chemicals; has regulatory problems; has substantial emissions; or contributes to climate change. If the firm meets the KLD threshold in each area, it is assigned a value of 1, and 0 otherwise.

NUM_OF_ENVIRONMENTAL_STRENGTHS is the number of environmental strengths reported in the KLD data set. The subindicators of strengths include the extent to which the firm has environmentally beneficial products and services, uses clean energy, provides open communication about its environmental program, and engages in extensive recycling. If the firm meets the KLD threshold in each area, it is assigned a value of 1, and 0 otherwise.

NS refers to number of shareholders of the company (Compustat item CSHR).

OTHER refers to institutional investors including pension plans, endowments, and employee stock-ownership plans and corresponds to institutional investor type 5 in the CDA/Spectrum 13F Holdings database.

RD_MISSING_DUMMY is a dummy variable that takes a value of 1 if Compustat reports R&D expense (Compustat item XRD) as missing, and 0 otherwise.

RD_TA is defined as R&D expenses (Compustat item XRD) divided by TA.

RATIO_OF_GREEN_FIRMS is the ratio of firms with GREEN_FIRM_DUMMY $= 1$ in the firm's industry.

RATIO_OF_TOXIC_FIRMS is the ratio of firms with TOXIC_FIRM_DUMMY $= 1$ in the firm's industry.

SP_500_DUMMY takes a value of 1 if the firm is listed in the S&P 500 Index.

SMALL_MINUS_BIG_RETURN refers to the difference between the returns on portfolios of small and big stocks.

STD_DEV_OF_DAILY_STOCK_RETURN is the standard deviation of daily holding period stock returns.

TOBINS_Q is the ratio of TA minus the book value of equity (Compustat item CEQ) plus the MARKET_VALUE of equity to TA.

TA refers to total assets, measured as the book value of assets (Compustat item AT).

TOTAL_ENVIRONMENTAL_EXP_TA is the ratio of the amount of total environmental expenditures that the firm discloses in the 10-K filing to TA. Total environmental expenditures are the sum of voluntary, mandatory, and legal environmental expenditures.

TOXIC_FIRM_DUMMY takes a value of 1 if the firm has a negative NET_ENVIRONMENTAL_SCORE.

TOXIC_FIRM_DUMMY_2 takes a value of 1 if the firm has one or more environmental concerns and no environmental strengths.

TOXIC_INDUSTRY_DUMMY takes a value of 1 if 10% or more of the industry consists of TOXIC_FIRM_DUMMY=1 and the percentage of GREEN_FIRM_DUMMY=1 is less than 10%.

TURNOVER is the average monthly trading volume divided by shares outstanding.

VOLUNTARY ENVIRONMENTAL EXP_TA is the ratio of the amount of voluntary environmental expenditures that the firm discloses in the 10-K filing to TA. Voluntary expenditures are environmental spending that is not mandated by the government through laws and regulations.

1_STOCK_PRICE is 1 divided by the stock price at the beginning of the fiscal year.

Appendix B. Variable Descriptions for the KLD Data Set

1. Environmental Strengths

BENEFICIAL PRODUCTS AND SERVICES (ENV_STR_A): This indicator measures the positive environmental impact of a firm's products and/or services. Factors affecting this evaluation include, but are not limited to, products/services that reduce other firms' and individuals' consumption of energy, production/consumption of hazardous chemicals, and overall patterns of resource consumption.

POLLUTION PREVENTION (ENV_STR_B): This indicator measures a firm's method of mitigating noncarbon air emissions, water discharges, and solid waste from its operations. Factors affecting this evaluation include, but are not limited to, initiatives to reduce a firm's noncarbon air emissions from its operations; to reduce the release of raw sewage, industrial chemicals, and other regulated substances; to reduce hazardous and nonhazardous waste; and to reduce the use of packaging materials, to support recycling, and to recycle old products, such as televisions and other consumer electronics.

RECYCLING (ENV_STR_C): This indicator measures a firm's use of recycled materials in its products/services. Factors affecting this evaluation include, but are not limited to, assessment of the volume and recycled content of products made with recycled input materials, including paper, metal, and plastic; and any certification of its practices by a third party, such as the Forest Stewardship Council for timber product companies.

CLEAN ENERGY (ENV_STR_D): This indicator measures a firm's policies regarding climate change. Factors affecting this evaluation include, but are not limited to, acknowledgment of direct and/or indirect impacts on operations due to climate change and formal commitments to reduce GHG emissions and initiatives to reduce energy consumption and to increase the use of renewable energy.

MANAGEMENT SYSTEMS (ENV_STR_G): This indicator measures a firm's monitoring and management of its environmental practices. Factors affecting this evaluation include, but are not limited to, the establishment and monitoring of environmental performance targets, the presence of environmental training, communications programs for employees, and stakeholder engagement.

OTHER STRENGTH (ENV_STR_X): This indicator measures a firm's environmental management policies. Factors affecting this evaluation include, but are not limited to, a stated commitment to integrate environmental considerations into all operations; to reduce the environmental impact of operations, products and services; and to comply with regulations.

2. Environmental Concerns

REGULATORY COMPLIANCE (ENV_CON_B): This indicator measures a firm's record of compliance with environmental regulations. Factors affecting this evaluation include, but are not limited to, fines/sanctions for causing environmental damage and/or violations of operating permits.

SUBSTANTIAL EMISSIONS (ENV_CON_D): This indicator measures a firm's emission of toxic chemicals according to data from TRI, an EPA database of information on toxic chemical releases and waste management activities. Factors affecting this evaluation include, but are not limited to, how the firm compares to its industry peers.

CLIMATE CHANGE (ENV_CON_F): This indicator measures the severity of controversies related to a firm's climate change related policies and initiatives. Factors affecting this evaluation include, but are not limited to, a history of involvement in GHG-related legal cases, widespread or egregious impacts due to corporate GHG emissions, resistance to improved practices, and criticism by nongovernmental organizations (NGOs) and/or other third-party observers. In addition, factors cover whether a company derives substantial revenues from the sale of coal or oil and its derivative fuel products and whether the company derives substantial revenues indirectly from the combustion of coal or oil and its derivative fuel products.

NEGATIVE IMPACT OF PRODUCTS & SERVICES (ENV_CON_G): This indicator measures the negative environmental impact of a firm's products and/or services. Factors affecting this evaluation include, but are not limited to, products/services that involve regulated substances, the production/consumption of hazardous chemicals, and controversial products, such as those that use genetically modified organisms or nanotechnology.

LAND USE & BIODIVERSITY (ENV_CON_H): This indicator measures the severity of controversies related to a firm's use or management of natural resources. Factors affecting this evaluation include, but are not limited to, a history of involvement in natural resource–related legal cases, widespread or egregious impacts due to the firm's use of natural resources, resistance to improved practices, and criticism by NGOs and/or other third-party observers.

NONCARBON EMISSIONS (ENV_CON_I): This indicator measures the severity of controversies related to a firm's non-GHG emissions. Factors affecting this evaluation include, but are not limited to, a history of involvement in land-, air-, or water emissions–related legal cases; widespread or egregious impacts due to corporate non-GHG emissions; resistance to improved practices; and criticism by NGOs and/or other third-party observers.

OTHER CONCERN (ENV_CON_X): This indicator measures the severity of controversies related to a firm's environmental impact. Factors affecting this evaluation include, but are not limited to, widespread or egregious environmental impacts, resistance to improved practices, criticism by NGOs and/or other third-party observers, and any other environmental controversies not covered by other environmental ratings.

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