CORPORATE DISCLOSURE OF ENVIRONMENTAL CAPITAL EXPENDITURES: A TEST OF ALTERNATIVE THEORIES

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ABSTRACT

In this study, we examine three potential explanations for the corporate choice to disclose environmental capital spending amounts. We investigate, first, whether the disclosure appears to be a function of the materiality of the spending and we find that, for the overwhelming majority of observations, the disclosed amounts are not quantitatively material. This suggests that non-disclosure is likely due to immateriality. We next attempt to differentiate the choice to disclose across voluntary disclosure theory and legitimacy theory arguments. Our findings show that disclosing firms do not exhibit improved subsequent environmental performance relative to non-disclosing companies. Further, controlling for firm size and industry class, we find the choice to disclose is associated with worse environmental performance. Overall, our results suggest that companies use the disclosure of environmental capital spending as a strategic tool to address their exposures to political and regulatory concerns.

Keywords: environmental capital expenditure; environmental disclosure; environmental regulation; legitimacy theory; materiality; Toxic Release Inventory; voluntary disclosure theory.

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Introduction

The United States' Securities and Exchange Commission (SEC), through its Regulation S-K Item 1, requires filing companies to disclose the material impacts that meeting environmental regulations has on, among other items, capital expenditures. However, numerous prior studies (e.g., Al-Tuwaijri et al., 2004; Fekrat et al., 1996; Freedman and Stagliano, 1998; Ingram and Frazier, 1980; Patten, 2000; Wiseman, 1982) document that the disclosure of environmental capital spending (and other pieces of environmental information) is quite limited.[1] The Government Accountability Office (GAO), in a 2004 investigation of corporate environmental reporting, suggests that the low levels of environmental disclosure may be due to a lack of materiality of spending amounts for the non-disclosing companies (GAO, 2004, p. 16). However, no evidence is presented to support that argument.

In this study, we examine three potential explanations for why some firms choose to disclose their environmental capital spending while others do not. We investigate, first, whether the disclosure appears to be a function of the materiality of the spending. We find that, on average and across time, the disclosed environmental capital expenditure amounts do not appear to be in excess of quantitative materiality thresholds, suggesting that the choice to reveal the spending is discretionary. This finding would appear to add weight to the argument that companies not disclosing choose not to do so due to

[1] This is true whether discussing the requirements of a specific U.S. environmental regulation such as the Superfund (e.g., Freedman and Stagliano, 1998, 2008; Patten, 2000), the Emergency Planning and Community-Right-to-Know Act (e.g., Karim et al., 1996), the 1990 U.S. Clean Air Act Amendments (e.g., Freedman et al., 2004) or environmental degradation in general (e.g., Patten and Crampton, 2004).

immateriality. However, it also suggests that disclosing companies see strategic value in the choice to disclose. As such, we next attempt to differentiate the choice to disclose across voluntary disclosure theory and legitimacy theory arguments. This investigation is relevant because the two theories argue differing motivations for the choice to disclose environmental information. Voluntary disclosure theory (see, e.g., Bewley and Li, 2000; Clarkson et al., 2008) suggests companies use the information to signal an unobservable pro-active strategy toward environmental concerns relative to poorer performing firms, while legitimacy theory (see, e.g., Cho and Patten, 2007; Deegan, 2002) argues companies use the disclosure as a tool to reduce exposures to the social and political environment. Prior studies of disclosure (e.g., Cho and Patten, 2007; Clarkson et al., 2008; Patten, 2002) provide conflicting results.

In this stage of our investigation we find, first, that the disclosure of environmental capital spending does not appear to signal better future environmental performance relative to non-disclosers. We also find that, controlling for firm size and industry class, firms with worse environmental performance [based on Toxics Release Inventory (TRI) data] are more likely to disclose a spending amount. Our results are thus supportive of legitimacy, rather than voluntary disclosure theory arguments. Further, the overall findings of our investigation suggest that companies appear to be using environmental disclosure more as a strategic tool for reducing their exposures to political and regulatory concerns than as a vehicle for signaling superior performance. Understanding this motivation would appear to be relevant to users of the 10-K reports.

The remainder of the paper is organized as follows. In the next section we present our justification for the study and hypotheses development. The research methods and results are then provided. Finally, we conclude with a discussion of the paper's contribution to the environmental disclosure debate.

Justification for our Study and Hypotheses Development

Interest in the corporate disclosure of environmental (and other social) information dates at least as far back as the Ernst & Ernst annual report surveys of the mid-1970s (Ernst & Ernst, 1973 *et seq.*). Studies of environmental disclosure (e.g., Cho and Patten, 2008; Freedman and Stagliano, 1998; 2002; Gamble et al., 1995; Kreuze et al., 1996) consistently report that while there is considerable variation in the extent of environmental disclosure across companies and across time, the provision of this information tends to be rather limited. And, in spite of considerable investigation over the past three decades (e.g., Al-Tuwaijri et al., 2004; Fekrat et al., 1996; Freedman and Wasley, 1990; Hughes et al. , 2001; Hughes et al., 2000; Ingram and Frazier, 1980; Patten, 2002; Wiseman, 1982), the question of what drives differences in the corporate disclosure of environmental information remains unresolved. We add to this body of research by investigating the disclosure of one specific piece of environmental information, the amount of capital expenditures incurred for pollution abatement and control.

We focus on the disclosure of environmental capital expenditures both because it is specifically identified as a potential disclosure in SEC reporting guidelines and because prior research shows that the expenditure amounts, where available, appear to be value relevant in at least some situations. For example, Clarkson et al. (2004) investigate the

market valuation of environmental capital expenditures by firms in the pulp and paper industry and report incremental economic benefits. However, these positive impacts appear to be limited to low-polluting companies. Johnston (2005) differentiates *regulatory* environmental capital expenditures from *voluntary* environmental capital expenditures,[2] and finds a negative relation between regulatory environmental capital expenditures and future abnormal earnings, stock prices and stock returns. He also reports that the two types of environmental capital expenditures have different firm-specific consequences. While both Clarkson et al. (2004) and Johnston (2005) find that environmental capital expenditure information can be value relevant, neither study investigates why some firms disclose their environmental capital spending while others do not.

In July of 2004 the GAO released a report on its congressionally mandated investigation of corporate environmental disclosure (GAO, 2004). In the report, the GAO suggests differing levels of environmental disclosure may be due to differences in the materiality of environmental spending/exposure across firms. The GAO specifically argues that, without access to company information, it is impossible to assess whether low levels of environmental disclosure are due to non-compliance with environmental reporting requirements or the lack of materiality of environmental cost impacts. Of course this argument then implies that amounts that are disclosed must be considered as materially relevant.

We are aware of no studies that attempt to assess the extent to which materiality may be driving the disclosure of environmental spending amounts. As such, the first

[2] It is important to note that Johnston (2005) is not classifying *disclosures* as regulatory or voluntary, but instead is attempting to differentiate spending amounts as being due to regulatory or voluntary programs.

stage of our analysis centers on investigating whether the disclosure of capital spending for pollution abatement and control appears to be a function of materiality. We state our materiality hypothesis as:

> *H_{MAT}: Ceteris paribus, disclosed environmental capital spending amounts are material in nature.*

Voluntary Disclosure Theory versus Legitimacy Theory Arguments

If environmental capital spending is indeed material, its disclosure, where it occurs, can be assumed to be a non-discretionary action by management. In contrast, however, if companies are disclosing spending figures that do not appear to be material in amount, it suggests management may be doing so because the information is believed to have strategic value. Two competing theories have emerged that attempt to offer explanations for the corporate choice to disclose discretionary environmental information and each relates disclosure choice to firm environmental performance. Voluntary disclosure theory posits that firms with better environmental performance have an incentive to disclose while legitimacy theory argues an opposite relation. Two recent studies (Clarkson et al., 2008; Cho and Patten, 2007) highlight the distinctions between the two theories.

Clarkson et al. (2008) investigate the disclosure of environmental information by corporations through stand-alone environmental reports or on company web sites from the perspective of voluntary disclosure theory. This economics-based theory (see, e.g., Dye, 1985; Verrecchia, 1983), as it relates to environmental disclosure (Bewley and Li, 2000; Li et al., 1997), argues that companies with better environmental performance due to an unobservable proactive environmental strategy have an incentive to use disclosure to signal this strategy to investors and other relevant stakeholders (Clarkson et al., 2008).

Further, these good performers are argued to have an incentive to focus on "objective, 'hard' measures that cannot be easily mimicked by poor environmental performers" (Clarkson et al., 2008, p. 309). Thus, from the voluntary disclosure theory perspective, companies disclose environmental information to signal their proactive strategy. Clarkson et al. (2008), using a multi-category disclosure analysis based on guidelines aligned with the Global Reporting Initiative, find that companies with better environmental performance tend to make more extensive disclosures in their stand-alone reports. They find this to be particularly true with respect to hard (difficult for poor performers to mimic) information disclosures.

In contrast to voluntary disclosure theory, proponents of legitimacy theory (see, e.g., Deegan, 2002; Deegan and Gordon, 1996; Milne and Patten, 2002; Patten 2002) assert that companies use disclosure as a tool to address their exposure to social and political pressures. According to this belief, because firms with poorer environmental records face greater exposure, they have an incentive to make more extensive disclosures in an attempt to reduce potential regulatory costs. Cho and Patten (2007) adopt the legitimacy theory perspective in their analysis of 10-K report environmental disclosures. Focusing on non-litigation related environmental information, Cho and Patten find that disclosure is more extensive for companies with worse environmental performance (based on evaluations by the firm KLD Research and Analytics, Inc.), a finding that is consistent with the legitimacy arguments.

Reconciling the alternative findings of Clarkson et al. (2008) and Cho and Patten (2007) is difficult. Clarkson et al. (2008) suggest that one potential explanation for the conflicting results between their study and other legitimacy-based research (particularly

Patten, 2002) is the latter studies' reliance on 10-K report disclosures which Clarkson et al. (2008) suggest may not be discretionary in nature and their inclusion of items that are more "soft" in nature (e.g., statements of the company's concern for the environment). Although both Cho and Patten (2007) and Patten (2002) exclude litigation related disclosures from their analyses due to the more mandatory nature of these provisions, they include spending items that, in theory at least, are potentially required information. Further, whereas Cho and Patten (2007) focus on 10-K report disclosures, Clarkson et al. (2008) examine only non-accounting report information. The latter study also relies on a much broader disclosure scheme.[3] Thus, the conflicting findings could be due to the use of differing disclosure scales and different disclosure media.

Contingent on finding that the provision of the information is a discretionary management choice, we believe that focusing only on environmental capital expenditures allows for a more refined test of whether the disclosure aligns more closely with the voluntary disclosure theory or legitimacy arguments. This is because the two theories appear to predict differing, testable relations between the disclosure of the expenditure amounts and toxics release-related environmental performance. From the voluntary disclosure theory perspective, the disclosure would be made to signal a pro-active strategy for dealing with pollution issues implying, relative to non-disclosing firms, better future environmental performance. That is, current disclosure is expected to relate to future performance. This hypothesis is stated as:

> *H_{VDT}: Ceteris paribus, firms disclosing their environmental capital expenditures exhibit better future environmental performance than non-disclosing firms.*

[3] Clarkson et al.'s (2008) disclosure index includes 45 different items in contrast to the eight areas assessed by Cho and Patten (2007).

In contrast, proponents of legitimacy theory would argue that companies with poorer environmental performance have an incentive to disclose environmental capital spending amounts to forestall other, potentially costly regulatory actions. The disclosures are not assumed to signal future performance, but to reduce current political cost exposures. Thus the choice to disclose is related to current (or perhaps past) rather than future environmental performance. Further, because worse performing firms are presumed to face greater regulatory scrutiny (and thus a greater likelihood of costly regulatory actions against them), a negative relation between environmental performance and the choice to disclose is expected. We state the legitimacy hypothesis as:

> *H_{LT}: Ceteris paribus, firms with worse environmental performance are more likely to disclose environmental capital expenditure amounts than better performing companies.*

Research Methods and Results

Sample Selection

We limit our examination to companies that, based on prior research findings (e.g., Deegan and Gordon, 1996; Hackston and Milne, 1996; Patten, 2002) might generally be expected to face environmental exposures resulting in a need for environmental spending. Wolf (1996) notes that all companies with manufacturing facilities under SIC codes 20xx through 39xx are subject to both the Environmental Protection Agency's (EPA) TRI program and the Occupational Safety and Health Administration's Hazard Communication Standards. Further, based on the arguments of Gray et al. (1995) we limit our analysis to relatively larger firms. More specifically, sample companies had to meet the following criteria:

1. They had to be included in the 2006 Fortune 500.

2. They had to have a primary SIC code in the 20xx-39xx range.

Further, due to the need for comparative data relating to disclosure and subsequent performance, companies also had to have 10-K reports available on the SEC's EDGAR database for fiscal years 1996 through 2005 (although, where available, 10-K reports from 1993 through 1995 were also used for the first stage of our study). Finally, companies had to have financial data available on the Research Insight database.

A total of 119 companies met our screening criteria and constitute the final sample.[4] The sample firms represent 16 different industries (based on two-digit primary SIC codes) with the largest representation, 19 companies, coming from the 28xx classification. Firm size (based on 2004 revenues) ranges from $3.5 billion to $291.2 billion with a mean (median) of $23.0 billion ($9.8 billion). Forty-five of the 119 firms disclosed their environmental capital expenditures in at least one year over the sample period.

Tests of Materiality

The first stage of our analysis centers on assessing the extent to which disclosure of environmental capital spending may be driven by materiality. If the spending amounts are clearly material in nature it would support the argument that disclosure is likely driven by mandatory requirements as opposed to being a discretionary choice. Such a finding would also support Clarkson et al.'s (2008) contention for the observed negative relation between performance and disclosure shown in Patten (2002) and Cho and Patten (2007).

[4] A list of sample firms is available from the authors.

As noted by the Financial Accounting Standards Board (FASB) in its *Statement of Financial Accounting Concepts No. 2* (*SFAC No. 2*), materiality, at its essence, requires individual judgments as to whether "the magnitude of the item is such that it is probable that the judgment of a reasonable person" would be influenced by its inclusion (FASB, 1980, par. 132). Vorhies (2005, p. 54), however, notes that "because such a qualitative analysis is very complex, almost everyone – including CPAs – uses quantitative estimates to identify potential materiality issues." Indeed, *SFAC No. 2* identifies several authoritative pronouncements that include quantitative materiality thresholds. Particularly relevant to our investigation, the SEC's *Accounting Series Release No. 41* identifies the materiality guideline for separate disclosure of balance sheet items as "10% or more of their immediate category or more than 5% of total assets" (FASB, 1980, p. 70). As such, we rely on a quantitative analysis of disclosed environmental capital spending amounts to assess the extent to which they appear to be clearly material in nature. We concede that, even in the absence of meeting a quantitative threshold management may believe a spending figure is material. However, the point of this stage of our investigation is to show that, if spending is not quantitatively material, an argument is available to management for choosing not to disclose (see GAO, 2004). Such an argument is also consistent with the arguments of, for example, Lyon and Maxwell (2006), that due to proprietary costs, firms would prefer not to reveal their environmental spending unless there is strategic value associated with the disclosure.

Assuming that the choice to disclose is an independent decision for each 10-K report period,[5] we calculated, first, each firm's disclosed environmental capital expenditure amount in period *t* as a percentage of the company's period *t* (1) total assets and (2) total capital expenditures. Table 1 presents a summary of these percentages for each disclosing firm and for the sample overall. In general, the results of our analysis suggest that the choice to disclose environmental capital expenditure amounts, on average and across time, is not based on a quantitative materiality threshold. As noted in Table 1, stated as a percentage of total assets, the firm-year environmental capital spending ranged from a low of 0.01 percent to a high of 5.01 percent. The average across all firm-year observations was 0.44 percent of companies' total assets. Furthermore, only four of the 45 companies making disclosure of an environmental capital expenditure amount in at least one year had spending averages of more than one percent of total assets. Finally, non-tabulated analysis revealed that while the spending as a percentage of total assets was less than 0.1 percent for 94 of our 433 firm-year observations, it was above one percent only 34 times. Such low percentages do not appear to make a very strong case that the spending would be considered material relative to companies' asset bases.

The argument for materiality is at least slightly stronger where the environmental capital expenditures are stated as a percentage of companies' total capital expenditures. As also summarized in Table 1, these observations range from 0.07 percent of total capital expenditures on the low end to 55.34 percent at the high end. The mean firm-year environmental capital spending was 6.27 percent of companies' total firm-year capital

[5] In support of this assumption, we find for our sample firms over our period of investigation, that of the 45 disclosing environmental capital expenditures, five began doing so, eight stopped reporting, and three irregularly reported the spending amounts.

spending amounts. However, for 54 of the 416 firm-year observations[6] the environmental spending was less than one percent of total capital expenditures. Further, 16 of the 45 companies disclosing environmental capital expenditure amounts did so in at least one year where the spending was less than one percent of total capital expenditures. So, while the environmental capital spending could be argued to be quantitatively material in terms of its relation to total capital expenditures in at least some cases, we find that for the overwhelming majority of observations, the amount is not likely to be considered a material percentage of the related base. Accordingly, on average and across time, our results suggest that the disclosure of environmental capital spending does not appear to be a function of quantitative materiality, and as such, can be argued as a discretionary management choice.

---------- Table 1 about here ----------

It is worth noting that the results showing a lack of quantitative materiality for the disclosed environmental capital spending amounts would appear to support the GAO's argument that non-disclosing firms may not be disclosing environmental information because the spending amounts are immaterial. Further supporting this conjecture is evidence that, first, for the disclosed environmental capital expenditures, the amount of spending is significantly correlated with pollution performance (see Table 2). Higher levels of toxic releases (both raw amounts and size-adjusted[7]) are associated with higher levels of environmental capital expenditures. Second, in non-tabulated tests we find that toxic releases (both raw and size-adjusted) are significantly larger for disclosers than non-

[6] Total capital expenditure data were not available for 17 of the firm-year observations.
[7] A number of prior studies (e.g., Patten, 2002; Al-Tuwaijri et al., 2004; Clarkson et al., 2008) use size-adjusted toxic releases as a measure of environmental performance. Given our focus on spending related to pollution abatement and control, this performance measure seems particularly relevant.

disclosers. It seems logical, therefore, that spending by non-disclosing firms is likely below quantitative materiality thresholds. Of course, actual spending by non-disclosing firms is not observable and this conjecture cannot be proved.

---------- Table 2 about here ----------

Voluntary Disclosure Theory Tests

Given our findings that the overwhelming majority of disclosed environmental spending amounts are not quantitatively material, the second stage of our analysis investigates whether the choice to disclose appears to be a signal of a more pro-active environmental strategy. Relative to pollution performance, such a pro-active strategy would be expected to manifest in better subsequent environmental performance relative to peer (non-disclosing) firms. Our test of the voluntary disclosure argument for disclosure, therefore, centers on the change in pollution performance over time. We use total TRI releases as compiled by the Political Economy Research Institute (PERI) at the University of Massachusetts – Amherst as our measure of pollution performance. TRI data from the PERI was available only for periods up to 2002 (based on 2004 TRI reports). As such, we compute performance changes over the period from 1996 through 2002. More specifically, we identify the change in pollution performance as:

$$(TRI_{i,t+1} - TRI_{i,t})/TRI_{i,t}$$

where $TRI_{i,t}$ is firm *i*'s raw TRI releases in period *t*, and $TRI_{i,t+1}$ is firm *i*'s raw TRI releases in period *t+1*. In addition to one year out changes, we also compute average changes over two-year and three-year periods relative to period *t*.[8] To eliminate outlier bias, we delete all observations falling more than three standard deviations from the

[8] We also compute changes using size-adjusted TRI measures. Results, not presented here, were consistent with those reported for the raw TRI changes.

mean.[9] Using these measures, we test for differences in the change in performance between disclosers and non-disclosers of environmental capital spending amounts. Observations were classified in the *discloser* group if firm *i* disclosed its environmental capital spending in period *t*, and in the *non-discloser* group if it did not. Table 3 presents the results of this analysis.

As noted in Table 3, both groups show improved subsequent environmental performance (decreases in toxics released relative to the base disclosure year) across all three observation periods. In contrast to voluntary disclosure theory arguments, however, the disclosing firms do not show better subsequent performance than their non-disclosure counterparts. Instead, the decreases across all three measurement periods are large for the non-disclosure firm-year observations. However, results of *t-tests* for differences in the mean changes indicate no statistically significant differences.[10] Our tests fail to find support for the voluntary disclosure hypothesis.

---------- Table 3 about here ----------

A potentially confounding factor in the preceding analysis is that not all disclosing firms may be doing so as a signal of a pro-active environmental strategy (relative to peer firms). To control for this possibility, we identify a sub-sample of disclosers that would appear to be "Most Likely Signalers." We define "Most Likely Signalers" as companies disclosing an environmental capital spending amount at least once during our period of investigation, but for whom the disclosed spending is never

[9] This resulted in the removal of three observations from the one year change pool, eight from the two year average change pool, and seven from the three year average change pool. With the exception that non-parametric tests of differences in subsequent performance across disclosers and non-disclosers were significant at better than the $p = .05$ level, two-tailed for all three periods (parametric tests were not significant), results with the outlier observations included were qualitatively similar to those reported in the paper.

[10] Non-parametric Mann-Whitney tests of the differences are also not significant at conventional levels.

greater than five percent of total capital expenditures for the corresponding year. This sub-sample includes 13 firms with a total of 62 firm-year disclosures over our period of investigation. We compare changes in pollution performance for this group relative to non-disclosers and other disclosing companies, respectively. While the percentage change in toxics released is slightly better for the "Most Likely Signalers" relative to the other disclosing firms (see Panel B of Table 4), these differences are not statistically significant.[11] As highlighted in Panel A of Table 4, there are also no statistically significant differences in subsequent performance between the "Most Likely Signalers" and non-disclosers.[12] As such, we find no evidence supporting the voluntary disclosure theory hypothesis.

---------- Table 4 about here ----------

Legitimacy Theory Tests

The final stage of our analysis examines whether the disclosure of environmental capital spending is consistent with legitimacy arguments. We, in essence, replicate the work of Patten (2002) with the exception that we focus more specifically on what Clarkson et al. (2008) refer to as a hard piece of environmental information.[13] Similar to Patten (2002) we use ordinary least squares (OLS) multiple regression analysis to test for

[11] Non-parametric Mann-Whitney tests of the differences are also not significant at conventional levels.
[12] Because firms from environmentally sensitive industries are more likely to disclose their environmental capital spending (see results from next section), we repeat the change in subsequent performance tests separately for firms from environmentally sensitive industries and for all other firms. There is no statistically significant difference in performance between disclosers and non-disclosers, or between "Most Likely Signalers" and non-disclosers for either of these groups.
[13] Patten (2002) uses an eight item content disclosure scheme that includes non-monetary and projected monetary disclosures in addition to the item analyzed in our study.

the degree of association between environmental performance and disclosure.[14] More specifically, we model the choice to disclose environmental capital expenditures as:

$$EnvDisc_i = a_1 + B_1 Firm\ Size_i + B_2 Ind_i + B_3 EnvPerf_i + B_4 Ind_i * EnvPerf_i$$

We focus on disclosures in 2004 10-K reports.[15] In our legitimacy model, $EnvDisc_i$ is a binary variable coded one if firm *i* discloses environmental capital expenditures in 2004. Environmental performance ($EnvPerf_i$) is measured as the size-adjusted toxic releases for firm *i* from 2002 (made publicly available in 2004). Legitimacy theory arguments predict that worse performers have a higher incentive to disclose environmental information. Because a larger coefficient for $EnvPerf_i$ indicates worse environmental performance, this variable would be expected to be positively related to disclosure. Firm $Size_i$ and Ind_i are included to control for potential effects of firm size and industry classification on disclosure. Prior studies (e.g., Cowen et al., 1987; Deegan and Gordon, 1996; Gray et al., 1995; Hackston and Milne, 1996; Patten, 1992, 2002) provide evidence that larger firms tend to make more extensive environmental disclosures than smaller companies and that firms from industries with greater environmental exposures tend to disclose more than companies with lesser exposure. As such, both control variables are expected to have a positive relation to disclosure. We measure firm size as the natural log of 2004 revenues for each firm. Similar to Patten (2002) and Cho and Patten (2007) we classify companies from the 26xx (paper), 28xx (chemical and allied products), 2911 (petroleum), and 33xx (metals) industries as being more environmentally sensitive. Finally, we include the $Ind_i * EnvPerf_i$ interaction variable due to Patten's (2002) findings that differences in

[14] We repeated the analysis using binary logistic regression. Results, not presented here, were qualitatively similar to the results using OLS.

[15] We repeated our analysis using 1998 disclosures and 1996 toxic releases. Results, not presented here, were qualitatively similar to those reported in the paper for the 2004 disclosures.

environmental performance appeared to impact disclosure more for firms from non-environmentally sensitive industries than for companies from industries with greater environmental exposure. If such a relation holds for the choice to disclose environmental capital spending, the coefficient on the variable would be expected to be negatively signed.

Table 5 presents the results of our regression analysis on the choice to disclose environmental capital expenditures. As noted in the table, the model is highly significant (based on model F statistic) and the adjusted R square is 0.474. We find a statistically significant (at $p = 0.003$, one-tailed) relation between environmental performance and the choice to disclose environmental capital spending amounts. Controlling for size and industry effects, worse performers are more likely to disclose than better performers. However, similar to Patten (2002), we find that performance impacts disclosure more for firms from non-environmentally sensitive industries than for companies in environmentally sensitive industries. To assure that these results are not driven by companies disclosing their spending due to materiality, we repeat our analysis deleting first, all firms whose 2004 environmental capital spending is greater than 10 percent of the company's total capital expenditures for the year, and second, deleting all firms whose amount is greater than five percent of the total capital expenditures. Non-tabulated results indicate the environmental performance variable remains statistically significant (at $p < .01$, one-tailed) in both sensitivity tests.[16] Overall, the results are thus supportive of legitimacy theory expectations for disclosure.

---------- Table 5 about here ----------

[16] We also repeated the analysis using deleting all disclosing firms not identified as "Most Likely Signalers." The environmental performance variable remained statistically significant, although only at $p =$. 056, one-tailed.

Conclusion

In the U.S., material disclosures of capital expenditures for pollution controls are mandated by the SEC. However, only a limited number of firms impacted by pollution controls actually disclose environmental capital spending. However, we show in this study that, based on quantitative measures of materiality, an overwhelming majority of these firm-year disclosed amounts appear to be immaterial in nature. And while this finding appears to support the GAO's (2004) argument that non-disclosing companies may not be disclosing due to a lack of material spending, it also suggests that the firms disclosing this information must be doing so in an attempt to gain strategic value.

Our examination of two competing theories of discretionary environmental disclosure, voluntary disclosure theory and legitimacy theory, provides evidence supporting the latter justification. We show that, while both disclosing and non-disclosing companies are improving their pollution performance (as based on TRI releases) over our period of examination, the disclosing firms do not outperform non-disclosing counterparts. Thus, it does not appear that disclosure is made to signal superior future pollution performance. We also show, consistent with prior studies of broader disclosure measures (e.g., Cho and Patten, 2007; Patten, 2002) that, controlling for firm size and industry classification, worse polluters are more likely to disclose their largely immaterial spending amounts. Interpreting disclosed environmental information, therefore, would appear to require careful understanding of the underlying motivations.

This study has a number of limitations. The sample is comprised of only relatively larger firms from certain industries and this limits the generalizability of the findings. Smaller firms and those from excluded industries may have other reasons to choose to

disclose environmental information (although prior studies suggest disclosure by these groups of firms is very limited). Further, we rely upon TRI data to assess pollution performance. The information in this dataset is self-reported by affected companies, and the data are only sporadically inspected. Although TRI has been used in many studies in accounting and economics its reliability is only as good as the inputs. Finally, although prior studies support that environmental capital spending is a potentially relevant piece of information (Clarkson et al. 2004; Johnston, 2005), our investigation does not examine other types of environmental information disclosure. Whether these other information items serve a signaling function is not addressed by our results.

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Table 1 – Results of percentages of environmental capital expenditures for sample companies in relation to (1) total assets and (2) total capital expenditures (based on the same year).

		% of Total Assets			% of Total Capital Expenditures		
	Disc. Yrs.	Min.	Max.	Avg.	Min.	Max.	Avg.
3M	02 to 05	0.08	0.19	0.14	1.81	5.02	3.09
Abbott Laboratoires	93-05	0.03	0.42	0.17	0.75	3.36	2.2
Air Products & Chem	94-05	0.04	0.42	0.16	0.39	3.44	1.52
AK Steel Holding	96-05	0.03	0.66	0.29	0.68	28.64	9.04
Alcoa	93-05	0.12	0.72	0.41	4.29	11.27	7.77
Archer Daniels Midland	94-05	0.1	0.34	0.2	2.28	12.12	5.57
Baker Hughes	03 to 05	0.03	0.06	0.05	0.66	0.89	0.78
BristolMyersSquibb	03 to 05	0.09	0.2	0.14	3.99	5.87	5
Campbell Soup	94-96, 02-05	0.05	0.29	0.12	0.72	3.42	2.1
Caterpillar	93-95	0.06	0.07	0.07	1.59	1.74	1.65
Chevron	93-05	0.16	1.88	0.69	2.27	20.73	7.31
Clorox	04,05	0.02	0.1	0.06	0.4	2.33	1.37
Colgate-Palmolive	93-05	0.16	0.39	0.26	2.58	8.84	4.62
ConocoPhillips	93-05	0.41	1.8	0.71	2.69	20.49	7.25
Dow Chemical	94-05	0.3	0.5	0.36	4.66	12	8.32
DuPont	93-05	0.02	1.35	0.54	3.74	13.81	7.7
Eastman Chemical	96-98	0.5	1.21	0.89	5.8	9.35	7.2
Eastman Kodak	93-05	0.05	0.26	0.16	1.48	3.81	2.25
Ecolab	94-05	0.05	0.13	0.08	0.66	1.57	0.99
Exxon Mobil	93-05	0.26	0.76	0.55	4.65	10.16	7.53
General Motors	93-01	0.02	0.1	0.05	0.23	1.64	0.52
Goodyear Tire	94-01	0.05	0.18	0.12	1.06	2.83	1.81
Harley-Davidson	93-99	0.05	0.17	0.09	0.54	1.82	0.86
Hess	93-05	0.01	0.33	0.08	0.07	2.17	0.7
Honeywell International	93-99	0.17	0.5	0.35	4.06	9.62	6.43
International Paper	93-05	0.16	0.6	0.37	5.27	14.05	8.75
Johnson Controls	95	0.05	0.05	0.05	0.44	0.44	0.44
Lyondell Chemical	93-05	0.22	3.09	1.05	N/A	N/A	N/A
Merck	93- 05	0.08	0.61	0.28	2.18	12.09	5.32
Murphy Oil	93-05	0.83	2.49	1.98	4.27	19.9	10.01
Owens Corning	93-05	0.03	0.46	0.25	0.86	7.05	4.56
Pfizer	93-05	0.04	0.49	0.24	1.7	8.17	4.42
Phelps dodge	93-05	0.2	0.77	0.46	4.72	21.8	9.43
PPG Industries	93-05	0.1	0.51	0.27	3.36	7.56	4.82
Praxair	96-05	0.06	0.12	0.08	0.55	1.2	0.93
Rohm & Haas	93-05	0.19	1.56	0.52	5.31	14.4	8.43
Schering-Plough	93-03	0.03	0.74	0.23	0.39	11.07	3.54
Smithfield Foods	96	0.13	0.13	0.13	1.88	1.88	1.88
Smufit-Stone Container	98-00	0.16	1.68	0.71	6.27	52.07	25.64
Sunoco	93-05	0.49	5.01	1.7	6.05	51.34	18.39
Temple-Inland	93-05	0.02	0.21	0.09	1.47	16.18	5.7
Tesoro	94-05	0.12	1.88	0.51	0.82	37.21	7.72
Tyson Foods	94-96,01-05	0.04	0.22	0.12	0.82	4.55	2.41
Valero Energy	93-05	0.16	3.45	1.03	3.89	55.34	18.65
Weyerhaeuser	96-05	0.11	0.97	0.52	3.24	18.9	11.82
Overall Sample		0.01	5.01	0.45	0.07	55.34	6.59

Table 2 – Correlation coefficients for the association between pollution performance and environmental capital spending amounts. Pearson product-moment statistics are provided above the diagonal, and Spearman rank order correlations are reported below the diagonal.[a, b]

	Raw Releases	Size-adj. Releases	Capital Spending	Size-adj. Spending
Raw Releases	1.000	.967 (.000)	.040 (.511)	.151 (.014)
Size-adj. Releases	.808 (.000)	1.000	-.038 (.534)	.145 (.018)
Capital Spending	.573 (.000)	.236 (.000)	1.000	.298 (.000)
Size-adj. Spending	.444 (.000)	.463 (.000)	.706 (.000)	1.000

[a] Pollution performance is measured as, first, the raw total toxics released in year *t* by company *i*, and second, as the size-adjusted releases (raw releases divided by company *i*'s year *t* revenues. Environmental capital spending is the disclosed amount of company *i*'s environmental capital expenditures in year *t*, and size-adjusted spending is the environmental spending amount divided by company *i*'s year *t* revenues.

[b] Significance levels are reported in parentheses below the correlation coefficients.

Table 3 – Differences in subsequent environmental performance[a] across firm-years with the environmental capital expenditures disclosed and firm-years without such disclosures.[b]

	1 Yr. Change in Perf.	2 Yr. Change in Perf.	3 yr. Change in Perf.
Disclosure Firm-Years	-.0369	-.0527	-.0659
Non-Disclosure Firm-Years	-.0493	-.0993	-.1136
t-statistic	0.367	1.431	1.156
(significance)[c]	(0.714)	(0.153)	(0.248)

[a] Future environmental performance is measured as the percentage change in total toxics released relative to the year of disclosure.

[b] Number of observations across the three time periods are 209, 175, and 142 for disclosure firm-years, and 502, 412, and 327 for non-disclosure firm-years.

[c] Significance levels are two-tailed.

Table 4 – Differences in subsequent environmental performance[a] between "Most Likely Signalers" and other companies.[b]

Panel A - Compared to Non-Disclosing Firms[c]

	1 Yr. Change in Perf.	2 Yr. Change in Perf.	3 yr. Change in Perf.
"Most Likely Signalers"	-.0480	-.0764	-.1004
Non-Disclosers	-.0493	-.0993	-.1136
t-statistic	0.022	0.402	0.186
(significance)[d]	(0.982)	(0.688)	(0.852)

Panel B - Compared to Other Disclosers

	1 Yr. Change in Perf.	2 Yr. Change in Perf.	3 yr. Change in Perf.
"Most Likely Signalers"	-.0446	-.0733	-.0983
Other Disclosers	-.0323	-.0427	-.0510
t-statistic	0.457	0.798	0.985
(significance)[d]	(0.649)	(0.427)	(0.328)

[a] Future environmental performance is measured as the percentage change in total toxics released relative to the year of disclosure.

[b] "Most Likely Signalers" designates a firm-year disclosure for any company that disclosed an environmental capital spending amount in at least one year over our period of investigation but for whom the disclosed spending is never greater than five percent of total capital expenditures for the corresponding year. "Non-Disclosers" designates a firm-year observation where the amount of environmental capital expenditures is not disclosed. "Other Disclosers" designates a firm-year observation where environmental capital expenditures are disclosed, but for at least one year of disclosure over the period of investigation, the company's spending is greater than five percent of total capital expenditures.

[c] Number of observations across the three time periods are 62, 52, and 43 for the "Most Likely Signalers" group, and 147, 123, and 99 for the Other Disclosers. The number of observations for the Non-Disclosure group is as reported in Table 3.

[d] Significance levels are two-tailed.

Table 5 – Regression results for tests of the relation between environmental capital spending disclosure (FY 2004) and legitimacy variables.

The regression model is stated as: $EnvDisc_i = a_1 + B_1 Firm\ Size_i + B_2 Industry_i + B_3 EnvPerf_i + B_4 Ind_i * EnvPerf_i$ where $EnvDisc_i$ is a 1/0 binary variable with 1 indicating the disclosure of environmental capital expenditures in firm i's 2005 10-K report, Firm $Size_i$ is the natural log of 2004 revenues for firm i, $Industry_i$ is a one/zero classification variable where 1 indicates firms from environmentally sensitive industries,[a] $EnvPerf_i$ is firm i's 2002 TRI releases divided by its 2002 revenues, and $Ind_i * EnvPerf_i$ is an interaction variable. The sample size is 119.

Adj. R^2 = 0.474 F-statistic = 27.610 Significance of F-stat = .000

Variable	Parameter Estimate	*t-statistic*	Significance of *t-statistic*[b]
Constant	- 0.918	-1.190	.236
Firm Size	0.041	1.232	.111
Industry	0.650	8.587	.000
EnvPerf	0.001	2.861	.003
Ind*EnvPerf	-0.001	-2.483	.007

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[a] The chemical, petroleum, paper, and metals industries were classified as being environmentally sensitive.

[b] Significance levels are one-tailed for the Firm Size, Industry, EnvPerf and Ind*EnvPerf variables.