The language of US corporate environmental disclosure

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Abstract

We rely on prior work in environmental disclosure and corporate impression management to investigate whether there are self-serving biases present in the language and verbal tone used in corporations' environmental disclosures. Specifically, we argue that the degree of bias in these narratives varies systematically based on firm environmental performance, hypothesizing that disclosures of worse environmental performers exhibit significantly more "optimism" and less "certainty" than their better-performing counterparts. We test our two hypotheses using a cross-sectional sample of corporate environmental disclosures contained in US 10-K annual reports. Utilizing the content analysis software \textit{DICTION} to determine "optimism" and "certainty" scores for the disclosures, we find empirical support for both hypotheses. Our study contributes significantly to research in environmental disclosure by investigating bias in the use of language and verbal tone as a tool for managing stakeholder impressions and by finding empirical support for this role. Thus, the language and verbal tone used in corporate environmental disclosures, in addition to their amount and thematic content, should be considered when investigating the relation between corporate disclosure and performance.

Introduction

Corporate environmental information is increasingly desired by firm stakeholders (Berthelot, Cormier, & Magnan, 2003; Cormier, Gordon, & Magnan, 2004; Epstein & Freedman, 1994) and is material to their decision-making (Cho, Phillips, Hageman, & Patten, 2009; Milne & Patten, 2002; Neu, Warsame, & Pedwell, 1998). Because environmental disclosures included in corporate accounting reports (e.g., 10-K report or annual report) generally provide relatively more verbal as opposed to numerical information, they tend to be described as “accounting narratives” (Jones & Shoemaker, 1994). Neu et al. (1998) argue that management often prefers accounting narratives such as environmental disclosures rather than financial or other quantifiable information because disclosures can be deliberately tailored to manage public impressions, and, as noted by Hopwood (2009, p. 437) can be used to “increase [the company’s] legitimacy in the wider world” and “facilitate the construction of a new and different image of the company.” Thus, corporate management can use environmental disclosures as an impression management tool by self-servingly biasing the narrative through decisions on the amount of information (quantity), the range of topics (thematic content), and the rhetorical devices (language and verbal tone) to be included in their disclosures (Merkli-Davies & Brennan, 2007).

Based on an extensive review of research on accounting narrative disclosures, Merkli-Davies and Brennan (2007) developed a framework for analyzing corporate impression management strategies. Their framework centers on the premise that managerial self-serving motives drive...
Conceptual development and hypotheses

Managing impressions through biased language

Organizations adopt a number of specific impression management strategies to attempt to maintain or enhance their image (see, e.g., Elsbach, 1994; Elsbach & Sutton, 1992; Ginzel, Kramer, & Sutton, 1992; Livesey & Kearins, 2002). For example, several studies of annual report narratives (e.g., Smith & Taffler, 2000; Sydserff & Weetman, 2002) conclude that corporations use certain language characteristics to try to positively shape stakeholder perceptions of the firm. Furthermore, some researchers claim that managers strategically and consciously decide to provide narrative disclosures designed to manipulate the perceptions and decisions of stakeholders (Clatworthy & Jones, 2001; Yuthas, Rogers, & Dillard, 2002).

We argue that a consequence of an impression management strategy is a resulting bias in the language and verbal tone employed in the disclosure narrative. Aerts (1994), drawing on the work of Schlenker (1980), examined the presence of accounting bias in annual reports from an impression management perspective. He argued that managing impressions can be effectively accomplished with the use of a biased accounting language because explanations of organizational events and performance in annual reports are “not simply the outcome of a straightforward data analysis process” (1994, p. 337).

Accounting disclosures can be systematically biased because of their rationalizing capacities, their ability to avoid responsibility assignments and their inherent ambiguity, which constitute “interrelated performative characteristics of accounting explanations which make them particularly apt to confront and appease a negative performance environment” (Aerts, 1994, p. 341). As Aerts (1994) suggests, the coping strategies people express in their behavior can become visible through systematic biases in their explanations. In other words, the more firm performance differs from a desired benchmark, the more management is motivated to manage impressions, and the more likely it is that narrative disclosures will be affected by a self-serving bias.

Based on their extensive review of the impression management literature, Merkl-Davies and Brennan (2007) proposed a framework that divides corporate impression management strategies into two broad categories: concealment and attribution. These categories are consistent with the proposition that disclosers can introduce bias into the communication process through the use of inherent ambiguity, responsibility avoidance, or both. According to Merkl-Davies and Brennan (2007), disclosers accomplish concealment by emphasizing good news and obfuscating bad news. When developing disclosures, management employs thematic manipulation to emphasize good news. In other words, they exhibit a self-serving bias in their selection of firm performance items to disclose and their disclosure includes more positive than negative keywords (Abrahamson & Park, 1994; Matsumoto, Pronk, & Roelofsen, 2006; Rutherford, 2003). In contrast, management employs rhetorical manipulation to obfuscate bad news. This is accomplished through writing disclosures
Impression Management Strategies
Required Environmental Disclosure

using more persuasive language and including other types of rhetorical devices within the narrative (Sydserff & Weetman, 2002; Yuthas et al., 2002). This description of impression management through concealment mirrors Henry's (2008) conjecture that corporate communications set a positive tone when possible and introduce verbal complexity in order to obfuscate adverse information.

Merkel-Davies and Brennan (2007) define attribution as a “defensive framing tactic that shifts the blame for negative outcomes away from themselves,” and in a corporate reporting context, “entails managers attributing positive organizational outcomes to internal factors (“entitlements”) and negative organizational outcomes to external factors (“excuses”).” Both Aerts (1994) and Clatworthy and Jones (2003), in their respective studies of corporate reports, found that corporations tend to attribute positive organizational outcomes to internal factors and negative organizational outcomes to external factors. Aerts (1994) also found that negative performances are more likely to be discussed in technical accounting terms while positive performances are presented in more straightforward, cause–effect language. The language that managers choose to use when making corporate disclosures can also clarify or obscure performance attributions. Language used in corporate narratives has been found to blur attributions (Thomas, 1997) and blur distinctions about the reasons for negative firm performance (Jameson, 2000), perhaps by using convoluted language (Jones, 1996). In framing the performance attribution, corporate managers may deliberately use ambivalent language in the disclosures in order to present the company in a more positive light (Jameson, 2000).

Hypotheses for environmental disclosure

Merkel-Davies and Brennan (2007) provide a comprehensive schema for analyzing managerial impression management strategies in corporate narrative documents (see p. 128). We adapt their schema to focus specifically on how managerial impression management strategies may be revealed through biases in the language and verbal tone of corporate environmental disclosures, concentrating on evidence of concealment and attribution. Our expectations regarding corporate impression management strategies and narrative disclosures by corporations who are worse environmental performers are consistent with the more

Adapted from Merkl-Davies and Brennan (2007)

Fig. 1. Impression management strategies required environmental disclosure.
general expectations posited by Merkl-Davies and Brennan (2007) and are presented in Fig. 1. As shown in Fig. 1, corporate disclosures are expected to emphasize good news by biasing narrative themes through the use of positive keywords. Also, disclosures are expected to attribute positive environmental performance to internal attributions regarding corporate responsibility. The bias toward reporting good news coupled with a strategy that attributes positive performance to internal, corporate efforts, draws on the notion of “optimism” as it is used in the content analysis program DICTION. Management’s concentration on reporting good news sanitizes the disclosure (Henry, 2008). Also, optimistic language can blur distinctions about the corporation’s responsibility for poor performance and attempts to present the corporation in a more positive light (Jameson, 2000). In this context, “optimism” refers to a language “endorsing some person, group, concept, or event, or highlighting their positive entailments” (Hart, 2001, p. 247). In Panel A of Table 1 we provide examples of corporate environmental disclosures that received high and low DICTION “optimism” scores. We expect that corporations that are worse environmental performers will attempt to manage stakeholder impressions by evoking more optimistic language in their 10-K environmental disclosures. We state hypothesis H1 as follows:

**H1.** The “optimism” exhibited in 10-K report environmental disclosures will be negatively related to firm environmental performance.

As also depicted in Fig. 1, if corporate management is implementing an impression management strategy, their disclosures are expected to obfuscate bad news regarding environmental performance and assign external attributions to poor environmental performance. Obfuscation is accomplished through rhetorical plays by invoking persuasive language (Merkel-Davies & Brennan, 2007), weaker language (Subramanian, Insley, & Blackwell, 1993), or using verbal complexity to reduce stakeholders’ abilities to clearly interpret the environmental disclosure (Henry, 2008). Framing poor corporate performance as the result of external factors mitigates blame that stakeholders may place on management (Thomas, 1997). Negative corporate performance may be reported using convoluted, less certain language (Jones, 1996) in order to mask internal attributions. If corporations use these techniques when disclosing environmental performance, their disclosure strategy reflects purposive impression management behavior (Aerts, 2005). As used in the DICTION program, the term “certainty” refers to language that indicates “resoluteness, inflexibility, completeness, and a tendency to speak ex cathedra” (Hart, 2001, p. 246). It follows that language designed to obfuscate bad news or mask internal attribution would be flexible, irresolute, weak, and/or tentative. In Panel B of Table 1 we provide examples of corporate environmental disclosures that received high and low DICTION “certainty” scores. We expect that corporations that are worse environmental performers will attempt to manage stakeholder impressions by using less certain, more obfuscating language in their 10-K environmental disclosures, while better performers will invoke more “certainty” in the language and verbal tone of their disclosures. We state hypothesis H2 as follows:

**H2.** The “certainty” exhibited in 10-K report environmental disclosures will be positively related to firm environmental performance.

**Methods and analysis**

In order to test our hypotheses we obtained a representative sample of US 10-K environmental disclosures, developed empirical proxies for the “optimism” and “certainty” constructs using DICTION, and designed an empirical model that controls for other important factors that may be related to a corporation’s use of optimistic or certain language in its environmental disclosure. The details of these procedures are described below.

**Sample selection**

To be included in this study, sample firms had to meet the following criteria:

1. They had to be listed in the 2002 ratings of corporate social and environmental performance compiled by KLD Research and Analytics, Inc. (hereafter, “KLD”).
2. They had to have a fiscal year ended from June 30, 2002 to December 31, 2002, inclusive.4
3. They had to be listed on the Standards and Poor’s 500 Index for fiscal year 2002.
4. They had to have a 2002 10-K report available on the US Securities and Exchange Commission (SEC)’s EDGAR database, and it had to include Section 1 environmental disclosures.5

A total of 190 firms met all five criteria and constitute the final sample. Of these, 43 are from environmentally sensitive industries (see Table 2 for a more specific breakdown), and sample firms range in size (based on 2002 total asset levels) from $786 million to $370,782 million, with a mean (median) of $23,780 million ($11,090 million). Table 2 provides descriptive statistics on sample company data and other variables used in our analysis.

**Environmental disclosure**

We identify environmental disclosures in the 10-K reports for the same fiscal year as the year of assessed envi-

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4 A fiscal year-end subsequent to June 30, 2002 better reflects and matches 2002 firm environmental disclosure in relation to its 2002 environmental performance.
5 It is important to note that avoidance (i.e., providing no environmental disclosure) is also viewed as an impression management and legitimacy tool. However, we excluded firms using this tactic from the sample because the focus of this study was to analyze the language of environmental disclosures that are actually provided by firms.

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environmental performance (i.e., 2002) because we hypothesize direct disclosure/performance relationships (see, e.g., Patten, 2002) and examine how companies manage impressions (i.e., measured by “optimism” and “certainty”) in relation to environmental performance. While the SEC requires disclosure of environmental information in Section 1 (Description of Business), Section 3 (Legal Proceedings) and Section 7 (Management’s Discussion and Analysis of Financial Condition and Results of Operations), we focus only on Section 1 disclosure. We exclude Section 3 environmental information because, as noted by Johnson (1993), that area specifically requires disclosure of pending or anticipated environmental legal issues and investigations. Nelson and Pritchard (2008) report that firms with high litigation risk disclose information using more cautionary language intended to reduce the expected costs of litigation. Our concern is that the verbal tone driven by this specific thematic content may confound the analysis of other environmental disclosure.6 We exclude Sec-

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**Table 1** Examples of corporate environmental disclosures.

<table>
<thead>
<tr>
<th>Panel A – Examples of disclosures with high and low “optimism” scores</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High “optimism” score</strong></td>
</tr>
<tr>
<td>Andrew Corporation, 10-K Report Section 1, September 30, 2002, “optimism” score = 51.36</td>
</tr>
<tr>
<td>Andrew is committed to demonstrating the highest standard of global environmental management and achieving environmental best practices. Six locations have been awarded certifications for ISO 14001, an international standard for environmental management systems. The company is committed to the continual improvement of its environmental management system and practices, including resource conservation and pollution prevention. Andrew engages in a variety of activities to comply with various federal, state and local laws and regulations involving the protection of the environment. Compliance with such laws and regulations does not currently have a significant effect on the company’s capital expenditures, earnings, or competitive position. In addition, the company has no knowledge of any environmental condition that might individually or in the aggregate have a material adverse effect on its financial condition</td>
</tr>
</tbody>
</table>

| **Low “optimism” score** |
| Maxim Integrated Products, 10-K Report Section 1, June 30, 2002, “optimism” Score = 40.21 |
| Federal, state, and local regulations impose a variety of environmental controls on the storage, handling, discharge and disposal of certain chemicals and gases used in semiconductor manufacturing. The company's facilities have been designed to comply with these regulations, and it believes that its activities are conducted in material compliance with such regulations. There can be no assurance, however, that interpretation and enforcement of current or future environmental regulations will not impose costly requirements upon the company. Any failure of the company to control adequately the storage, use, and disposal of regulated substances could result in future liabilities |

**Panel B – Examples of disclosures with high and low “certainty” scores**

| **High “certainty” score** |
| ExxonMobil Corporation, 10-K Report Section 1, December 31, 2002, “certainty” score = 120.56 |
| ExxonMobil's worldwide environmental costs in 2002 totaled $2343 million of which $1054 million were capital expenditures and $1289 million were operating costs (including $400 million of site restoration and environmental provisions). These costs were mostly associated with air and water conservation. Total costs for such activities are expected to increase to about $2.5 million in both 2003 and 2004 (with capital expenditures representing about 50 percent of the total). The projected increase is primarily for capital projects to implement refining technology to manufacture low-sulfur motor fuels in many parts of the world |

| **Low “certainty” score** |
| Fluor Corporation, 10-K Report Section 1, December 31, 2002, “certainty” score = 14.61 |
| We believe, based upon present information available to it, that our accruals with respect to future environmental costs are adequate and any future costs will not have a material effect on our consolidated financial position, results of operations or liquidity. Some factors, however could result in additional expenditures or the provision of additional accruals in expectation of such expenditures. These include the imposition of more stringent requirements under environmental laws or regulations, new developments or changes regarding site cleanup costs or the allocation of costs among potentially responsible parties, or a determination that we are potentially responsible for the release of hazardous substances at sites other than those currently identified |

Past and future environmental, safety and health regulations could impose on us significant additional costs that reduce our profits. We are subject to numerous environmental laws and health and safety regulations. Our projects can involve the handling of hazardous and other highly regulated materials which, if improperly handled or disposed of, could subject us to civil and criminal liabilities. It is impossible to reliably predict the full nature and effect of judicial, legislative or regulatory developments relating to health and safety regulations and environmental protection regulations applicable to our operations. The applicable regulations, as well as the technology and length of time available to comply with those regulations, continue to develop and change. In addition, past activities could also have a material impact on us. For example, when we sold our mining business formerly conducted through St. Joe Minerals Corporation, we retained responsibility for certain non-lead related environmental liabilities, but only to the extent that such liabilities were not covered by St. Joe's comprehensive general liability insurance. While we are not currently aware of any material exposure arising from our former St. Joe's business or otherwise, the costs of complying with regulations or satisfying any environmental remediation requirements for which we are found responsible could be substantial and could reduce our profits |

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6 Only 79 of the 190 firms in our sample had Section 3 disclosures. In a non-tabulated sensitivity test we included a one/zero indicator variable identifying these disclosers. Results on the relation between environmental performance and both optimism and certainty remained consistent with those reported in the primary analysis.
tion 7 disclosures because they either repeat or summarize information disclosed in item 1 and/or item 3.

DICTION was developed by Hart, a communications researcher, and focuses on the subtle power of word choice and verbal tone (Hart, 1984). Similar to other content analysis software packages, DICTION relies on word frequency counts, but stands out from others in a number of ways that may be attractive for environmental accounting research. First, the program relies on word counts based on linguistic theory (see Bligh, Kohles, & Meindl, 2004). Second, DICTION uses elements of artificial intelligence that have been underutilized in the accounting literature. Third, DICTION “falls within the scope of systemic linguistics, rendering the approach attractive to accounting researchers investigating impression management” (Sydserff & Weetman, 2002, p. 532). Fourth, the objectivity of DICTION is relatively strong in relation to face validity and reliability due to its automated nature (both for coding and quantification) but, more importantly, the theoretical basis of the approach in linguistic semantics and its independently attested establishment in the applied linguistics literature (Sydserff & Weetman, 2002).

In addition to these unique benefits, DICTION allows the flexibility of other software programs where users can customize their own dictionaries (Short & Palmer, 2008; Sydserff & Weetman, 2002). DICTION deploys some 10,000 search words in 33 separate dictionaries that can be used to analyze any given text (Short & Palmer, 2008). Based in linguistic theory (see Bligh et al., 2004), the dictionaries were constructed from the analysis of more than 20,000 texts, which yield a large total word corpus, and contain no duplication (Short & Palmer, 2008; Sydserff & Weetman, 2002). The dictionaries are subsequently used for lexical analysis (i.e., to study vocabulary and word choice) through the analysis of five master variables: “certainty”, “optimism”, “activity”, “realism”, and “commonality” (Hart, 2000, 2001; Short & Palmer, 2008; Sydserff & Weetman, 2002). DICTION’s master variables were developed based on the rationale that “if only five questions could be asked of a given passage, these five would provide the most robust understanding” (Hart, 2001, p. 43). Because DICTION can separately assess those five master variables, it provides the “optimism” and “certainty” scores6 needed for our hypotheses testing. A further distinctive feature of DICTION is its use of normative values for comparative purposes, including one called “corporate financial reports” that is specifically tailored for corporate disclosures.8 Finally, DICTION extrapolates each particular text to a 500-word norm “equivalent” (which is the basic unit of analysis) so that input texts of any length, such as the environmental disclosures used in our study, can be controlled and measured consistently. Given the strengths of the DICTION program, we use it to calculate scores of the “optimism” and “certainty” of our sample environmental disclosures.

Following Ober, Zhao, Davis, and Alexander (1999) and Sydserff and Weetman (2002), we report the “optimism” master variable scores without adjustment. However, as argued by Demers and Vega (2009), DICTION’s choice to classify numerical terms as a negative adjustment to “certainty”, while relevant in political speeches and other forms of expository prose, is inappropriate for financial report disclosures. Instead, they note that inclusion of ex post verifiable quantitative information is actually indicative of more direct and precise expression in this context, and accordingly should be considered a positive, rather

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**Table 2**

Descriptive statistics.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Median</th>
<th>Std. Dev.</th>
<th>Maximum</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm size (2002 assets, in millions)</td>
<td>$23,780</td>
<td>$11,090</td>
<td>$49,830</td>
<td>$370,782</td>
<td>$786</td>
</tr>
<tr>
<td>Firm profitability (2002 ROA)</td>
<td>1.60%</td>
<td>2.90%</td>
<td>10.32%</td>
<td>19.81%</td>
<td>–66.06%</td>
</tr>
<tr>
<td>Firm capital intensity (2002 assets/2002 revenues)</td>
<td>2.12</td>
<td>1.53</td>
<td>1.84</td>
<td>0.32</td>
<td>14.31</td>
</tr>
<tr>
<td>Firm age (as of 2002)</td>
<td>45.74</td>
<td>36.50</td>
<td>35.06</td>
<td>150</td>
<td>0</td>
</tr>
<tr>
<td>KLD environmental concern ratings</td>
<td>0.96</td>
<td>0.00</td>
<td>1.292</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Environmental disclosure “optimism” score</td>
<td>48.21</td>
<td>48.58</td>
<td>3.06</td>
<td>63.78</td>
<td>37.13</td>
</tr>
<tr>
<td>Environmental disclosure “certainty” score</td>
<td>42.78</td>
<td>39.75</td>
<td>17.95</td>
<td>120.56</td>
<td>0</td>
</tr>
</tbody>
</table>

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6 The definitions of “optimism” and “certainty”, as used in DICTION and provided by its developer (Hart) are given in the second section (“Hypotheses development for environmental disclosure”). The formulas for master variables consist of subaltern variables. As such, the formula for “optimism” is: [“praise” + “satisfaction” + “inspiration”]−[“blame” + “hardship” + “denial”] while the one for “certainty” is: [“tenacity” + “leveling” + “collectives” + “insistence”]−[“numerical terms” + “ambivalence” + “self-reference” + “variety”]. A typical DICTION output generally includes the names of the variables (and subaltern variables), their frequency, the percentage of words analyzed, the normal score range, the standard range and whether they are out of range. DICTION is also able to make the conversion, transfer, import and export of texts and data with other computer programs (e.g., Excel, SPSS) easy and user-friendly (Hart, 2000, 2001).

8 We conducted the empirical tests under both the generic “all cases” and the “corporate financial reports” normative values and, for our particular case and sample, the results were qualitatively the same for both hypotheses.
than a negative component of “certainty.” As such, we follow Demers and Vega (2009) and compute an adjusted “certainty” score whereby the numerical terms subcomponent is treated as a positive addition to the formula. For our sample firms, environmental disclosure “optimism” scores range from 37.13 to 63.78 and “certainty” scores ranged from 0 to 120.56. The sample mean (median) disclosure scores were 48.21 (48.58) and 42.78 (39.75) for “optimism” and “certainty”, respectively.9

Environmental performance

Although a number of external corporate social and environmental performance (SEP) evaluations have been published over the past 30 years, most have been limited to a relatively small number of companies, or have focused on only smaller subsets of performance. In response to this need, the independent ratings firm KLD10 has, since 1994, maintained a database that appears to overcome these problems. KLD independently rates hundreds of companies traded on US stock exchanges in terms of their social performance across a range of dimensions related to stakeholder concerns. The company draws upon a variety of sources to capture relevant social performance data (Hillman & Keim, 2001; Waddock & Graves, 1997). Because the KLD database provides a quantifiable and enhanced corporate SEP measure and preserves its independent rating system (Hillman & Keim, 2001), the KLD data have been used extensively in US management research on corporate social performance issues (e.g., Waddock & Graves, 1997) and also used recently in environmental accounting research (see, e.g., Cho & Patten, 2007; Cho, Patten, & Roberts, 2006). KLD separately assigns strengths and concerns across seven SEP categories11 and gives a score of zero or one for each of the strength and concern areas included in each category.

Given the apparent benefits of the KLD ratings and because our focus is on examining the relation between firm environmental performance and the extent of bias of environmental disclosure, we use this database to identify environmental performance for our sample companies. KLD analyzes corporate environmental performance based on an extensive assessment of each firm’s environmental management, planning and impact assessment, utilization of resources, compliance with applicable laws and regula-

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**Table 3**

Pearson’s correlation matrix (n = 190).

<table>
<thead>
<tr>
<th>Variable</th>
<th>EDO</th>
<th>EDC</th>
<th>EP</th>
<th>SIZE</th>
<th>EXTR</th>
<th>CHEM</th>
<th>PAP</th>
<th>MET</th>
<th>PETR</th>
<th>MIN</th>
<th>CAPINT</th>
<th>ROA</th>
<th>AGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDO</td>
<td>1.000</td>
<td>0.089</td>
<td>0.247**</td>
<td>0.168*</td>
<td>-0.013</td>
<td>0.118</td>
<td>-0.008</td>
<td>0.036</td>
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<td>-0.027</td>
<td>-0.061</td>
<td>0.084</td>
<td>0.042</td>
</tr>
<tr>
<td>EDC</td>
<td>1.000</td>
<td>0.023</td>
<td>0.036</td>
<td>-0.125</td>
<td>0.150*</td>
<td>0.084</td>
<td>0.064</td>
<td>0.243**</td>
<td>-0.031</td>
<td>-0.236*</td>
<td>0.171</td>
<td>0.356*</td>
<td></td>
</tr>
<tr>
<td>EP</td>
<td>1.000</td>
<td>0.000</td>
<td>0.059</td>
<td>0.066</td>
<td>-0.078</td>
<td>0.129</td>
<td>0.304**</td>
<td>-0.046</td>
<td>0.018</td>
<td>0.015</td>
<td>0.117</td>
<td></td>
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<tr>
<td>SIZE</td>
<td>1.000</td>
<td>-0.087</td>
<td>-0.152*</td>
<td>-0.067</td>
<td>-0.089</td>
<td>0.170*</td>
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<td>0.024</td>
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<td>EXTR</td>
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<td>-0.040</td>
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<td>-0.043</td>
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<td>-0.022</td>
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<td>0.032</td>
<td></td>
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<tr>
<td>PAP</td>
<td>1.000</td>
<td>-0.003</td>
<td>-0.005</td>
<td>-0.024</td>
<td>-0.011</td>
<td>-0.022</td>
<td>-0.051</td>
<td>0.048</td>
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<td>MET</td>
<td>1.000</td>
<td>-0.026</td>
<td>-0.019</td>
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<td>-0.038</td>
<td>-0.015</td>
<td>-0.100</td>
<td>0.013</td>
<td>0.138</td>
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<tr>
<td>PETR</td>
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<td>-0.007</td>
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<td>-0.020</td>
<td>-0.015</td>
<td>-0.086</td>
<td>0.088</td>
<td>0.081</td>
<td></td>
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</tr>
<tr>
<td>MIN</td>
<td>1.000</td>
<td>-0.057</td>
<td>-0.247**</td>
<td>-0.057</td>
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<td>0.236</td>
<td>-0.031</td>
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<tr>
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<td>0.000</td>
<td>0.026</td>
<td>0.036</td>
<td>0.031</td>
<td>0.171</td>
<td>-0.356**</td>
<td>0.150</td>
<td>0.356*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>0.134</td>
<td>0.072</td>
<td>0.057</td>
<td>0.050</td>
<td>0.171</td>
<td>-0.356**</td>
<td>0.150</td>
<td>0.356*</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>AGE</td>
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<td>0.000</td>
<td>0.026</td>
<td>0.036</td>
<td>0.031</td>
<td>0.171</td>
<td>-0.356**</td>
<td>0.150</td>
<td>0.356*</td>
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EDO, = the 2002 environmental disclosure “optimism” score for firm i.
EDC, = the 2002 environmental disclosure “certainty” score for firm i.
EP, = the 2002 KLD environmental concern score for firm i.
SIZE, = the natural log of 2002 assets for firm i.
EXTR, = one if firm i belongs to the oil and gas extraction industry, and zero otherwise.
CHEM, = one if firm i belongs to the chemicals industry, and zero otherwise.
PAP, = one if firm i belongs to the paper industry, and zero otherwise.
MET, = one if firm i belongs to the primary metals industry, and zero otherwise.
PETR, = one if firm i belongs to the petroleum refining industry, and zero otherwise.
MIN, = one if firm i belongs to the metal mining industry, and zero otherwise.
CAPINT, = the 2002 capital intensity for firm i.
ROA, = the 2002 return on assets for firm i.
AGE, = the age of firm i as of 2002.
* p < 0.05 (two-tailed).
** p < 0.01 (two-tailed).

---

9 Applying the Demers and Vega (2009) adjustment to the certainty scores resulted in one company with a negative value for this measure. Because we interpreted this as evidence of little or no indication of certainty language use we coded this observation as a zero. As a sensitivity check, we reran all tests (1) using the negative certainty value for the firm, and (2) deleting this company from the sample. Results in both cases were qualitatively unchanged.

10 The professional services firm of KLD Research and Analytics, Inc. is located at 250 Summer Street, Boston, MA 02210, USA. KLD’s social research is distributed in SOCRATES - The Corporate Social Ratings MonitorSM. SOCRATES is a proprietary database program that provides access to KLD’s ratings and other data pertaining to the social records of over 3000 publicly traded US companies (KLD Research and Analytics, Inc., 2003).

11 KLD’s social responsibility categories include community, corporate governance, diversity, employee relations, environment, human rights, and product (KLD Research and Analytics, Inc., 2003).
Significance levels are based on a one-tailed test for the EP variable, and two-tailed for all control variables.

Table 4

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<td>PETR</td>
<td>(+/-)</td>
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<td>MIN</td>
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</tr>
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<td>ROA</td>
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<td>AGE</td>
<td>(+/-)</td>
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<td>-0.584</td>
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EDO = the 2002 environmental disclosure “optimism” score for firm i.
EP = the 2002 KLD environmental score for firm i.
SIZE = the natural log of 2002 assets for firm i.
EXTR = one if firm i belongs to the oil and gas extraction industry, and zero otherwise.
CHEM = one if firm i belongs to the chemicals industry, and zero otherwise.
PAP = one if firm i belongs to the paper industry, and zero otherwise.
MET = one if firm i belongs to the primary metals industry, and zero otherwise.
PETR = one if firm i belongs to the petroleum refining industry, and zero otherwise.
MIN = one if firm i belongs to the metal mining industry, and zero otherwise.
CAPINT = the 2002 capital intensity for firm i.
ROA = the 2002 return on assets for firm i.
AGE = the age of firm i as of 2002.

* Significance levels are based on a one-tailed test for the EP variable, and two-tailed for all control variables.

Significant ratings are assigned to companies that (1) reveal poor compliance records with environmental laws and regulations; (2) emit hazardous or toxic substances and waste in large quantities; (3) fall behind their industry competitors in implementing preventive measures to reduce environmental impact; and/or (4) generate a significant portion of their revenues from products or services that negatively affect the environment (KLD Research and Analytics, Inc., 2003). Scores for our sample firms ranged from 0 (i.e., no environmental concern) to 4 (i.e., relatively high environmental concern) with a mean score of 0.96.12

12 KLD concern ratings are: (1) hazardous waste (liabilities for hazardous waste sites exceeds $50 million), (2) regulatory problems (payment of substantial fines or civil penalties for violations of environmental regulations), (3) ozone depleting chemicals (top manufacturer of ozone depleting chemicals such as HFCs, methyl chloroform, methane chloride, or bromines), (4) substantial emissions (legal emissions of toxic chemicals from individual plants into the air and water are among the highest), (5) agricultural chemicals (substantial producer of agricultural chemicals, i.e., pesticides or chemical fertilizers), (6) climate change (derives substantial revenues from the sale of coal or oil and its derivative fuel products, and (7) other concern (other environmental problem such as environmental accident (KLD Research and Analytics, Inc., 2003).

13 A substantial number of our sample companies (n = 102) have KLD scores of zero. To assure that the results we report are not driven by this sample characteristic, we include as a sensitivity test an estimation of our test models using only the 88 firms with KLD concern scores greater than zero. We report those results later in the paper.

Conclusions and emissions. Concern ratings12 are generally assigned to companies that (1) reveal poor compliance records with environmental laws and regulations; (2) emit hazardous or toxic substances and waste in large quantities; (3) fall behind their industry competitors in implementing preventive measures to reduce environmental impact; and/or (4) generate a significant portion of their revenues from products or services that negatively affect the environment (KLD Research and Analytics, Inc., 2003). Scores for our sample firms ranged from 0 (i.e., no environmental concern) to 4 (i.e., relatively high environmental concern) with a mean score of 0.96.13

Control variables

Prior research documents that a number of firm-specific factors appear to influence the extent and/or thematic content of environmental disclosure provided in corporate financial reports. In order to more carefully identify whether differences in the language and verbal tone of these disclosures are associated with differences in environmental performance we control for these additional factors. More specifically, we include control variables for firm size, environmentally sensitive industry membership, capital intensity, return on assets (ROA), and company age. Each is discussed in more detail below.

Firm size

Almost all prior studies of environmental disclosure indicate the extent of disclosure is significantly related to firm size (see, e.g., Cho & Patten, 2007; Patten, 1992, 2002). Larger companies (presumably due to higher visibility) tend to disclose more extensive environmental information. We control for firm size using the natural log of each company’s 2002 total assets.

Environmentally sensitive industry membership

Numerous studies (e.g., Aerts & Cornier, 2009; Cho & Patten, 2007; Hackston & Milne, 1996; Patten, 2002) also document that companies in industries whose processes place greater stress on the natural environment appear to
We measure capital intensity as year 2002 total assets divided by year 2002 revenues, profitably as year 2002 return on assets (ROA), and company age as of year 2002. All data is gathered from COMPUSTAT.

### Statistical analysis

We use ordinary least squares multiple regression to identify the relation between environmental performance and the different characteristics of firm environmental disclosure, controlling for other factors potentially influencing language choice. Our models are stated as:

1. EDO = \( a_1 + B_1 EPI + B_2 \text{SIZE}_i + B_3 \text{EXTR}_i + B_4 \text{CHEM}_i + B_5 \text{PAP}_i + B_6 \text{MET}_i + B_7 \text{PETR}_i + B_8 \text{MIN}_i + B_9 \text{CAPINT}_i + B_{10} \text{ROA}_i + B_{11} \text{AGE}_i \)

2. EDC = \( a_1 + B_1 EPI + B_2 \text{SIZE}_i + B_3 \text{EXTR}_i + B_4 \text{CHEM}_i + B_5 \text{PAP}_i + B_6 \text{MET}_i + B_7 \text{PETR}_i + B_8 \text{MIN}_i + B_9 \text{CAPINT}_i + B_{10} \text{ROA}_i + B_{11} \text{AGE}_i \)

Because firms with worse environmental performance have a higher KLD environmental concern score, we expect to find a positive numeric relation between the EP and EDO systematically provide more extensive environmental disclosures. Similar to Patten (2002) and Cho and Patten (2007) we classify the chemical (primary SIC code 28xx, excluding pharmaceutical, code 283x), metals (33xx), mining (10xx), oil exploration (13xx), paper (26xx), and petroleum (2911) industries as “environmentally sensitive.” However, consistent with Cowen, Fererri, and Parker (1987) we allow for differing environmental industry impacts by including separate one/zero indicator variables to separate firms operating in each specific environmentally sensitive industry from other sample firms.

### Capital intensity, profitability, and company age

Although not as consistently documented as firm size and industry affiliation, at least in some cases, capital intensity (e.g., Aerts & Cormier, 2009; Clarkson, Li, Richardson, & Vasvari, 2008; Reitenga, 2000), profitability (Bewley & Li, 2000; Clarkson et al., 2008; Magness, 2006), and company age (Roberts, 1992) have been shown to be significantly associated with environmental disclosure, as well as include these as control variables in our analysis. We measure capital intensity as year 2002 total assets divided by year 2002 revenues, profitability as year 2002 return on assets (ROA), and company age as of year 2002. All data is gathered from COMPUSTAT.

### Table 5

Results of OLS regression analysis testing the relation between environmental performance and environmental disclosure “certainty” (EDC = \( \alpha_1 + B_1 EPI + B_2 \text{SIZE}_i + B_3 \text{EXTR}_i + B_4 \text{CHEM}_i + B_5 \text{PAP}_i + B_6 \text{MET}_i + B_7 \text{PETR}_i + B_8 \text{MIN}_i + B_9 \text{CAPINT}_i + B_{10} \text{ROA}_i + B_{11} \text{AGE}_i \)).

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<td>AGE</td>
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<td>3.613</td>
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<td>1.138</td>
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EDC = the 2002 environmental disclosure “certainty” score for firm i.
EP = the 2002 KLD environmental concern score for firm i.
SIZE = the natural log of 2002 assets for firm i.
EXTR = one if firm i belongs to the oil and gas extraction industry, and zero otherwise.
CHEM = one if firm i belongs to the chemicals industry, and zero otherwise.
PAP = one if firm i belongs to the paper industry, and zero otherwise.
MET = one if firm i belongs to the primary metals industry, and zero otherwise.
PETR = one if firm i belongs to the petroleum refining industry, and zero otherwise.
MIN = one if firm i belongs to the metal mining industry, and zero otherwise.
CAPINT = the 2002 capital intensity for firm i.
ROA = the 2002 return on assets for firm i.
AGE = the age of firm i as of year 2002.

Significance levels are based on a one-tailed test for the EP variable, and two-tailed for all control variables.
variables, and we predict a negative numeric relation between the EP variable and the EDC variable. Table 3 reports Pearson product-moment correlation values for all of our model variables. To assure that multicollinearity is not a problem, we calculate and report variance inflation factors for all independent variables.

Results

Primary tests

Table 4 presents the results of the regression analyses testing the “optimism” hypothesis (H1). As highlighted in the table, the model is significant (based on the model F-statistic) and variance inflation factors are well below the threshold value of 3.0, indicating that multicollinearity does not appear to be a problem. With the exception of SIZE (p = .052, two-tailed) and CHEM (p = .086, two-tailed), the control variables do not approach statistical significance. More importantly, the firm environmental performance measure is positively associated with the “optimism” level of environmental disclosure (EDO), and is significant at the p = .029 level, one-tailed. This supports the argument that poorer environmental performers use a more optimistic language tone in the wording of their environmental disclosures.

Table 5 presents test results of the “certainty” hypothesis (H2). As noted in the table, this model is also significant (based on the model F-statistic) and the variance inflation factors are also well below the concern threshold. Control variables SIZE, CHEM, MET, PETR, CAPINT, ROA, and AGE are all significantly associated with the “certainty” variable (at p < .10, two-tailed). Firms that are larger, more profitable, and older tend to use more certainty in the language of their environmental disclosures, whereas companies with higher levels of capital intensity use exhibit lower levels of certainty. In support of hypothesis 2, the firm environmental performance score is significantly and negatively related to environmental disclosure “certainty” level (p = .021, one-tailed). This result indicates that firms with worse environmental performance use less certain language in their 10-K environmental disclosures than their better-performing counterparts.

Sensitivity tests

A substantial number of our sample firms (n = 102) have KLD environmental concern scores of zero (0) and this could be influencing the results we report above. If differences in environmental performance do, in fact, lead to differences in the language and verbal tone of environmental disclosures, we would expect that within the subset of companies with cited environmental concerns (KLD > 0),

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16 For all of the tests reported in this section, we repeat analyses using only control variables exhibiting statistical significance (at p < .10, two-tailed). In all cases, the significance of the EP variable remains qualitatively similar to the level reported for the full model tests.
higher concern scores (worse performance) would still be associated with differences in “optimism” and “certainty.” To test these relations, we repeat our analyses using those sample companies with a KLD concern score of one or greater (n = 88).

Tables 6 and 7 present the results of our “optimism” and “certainty” regression analyses, respectively, using only the sample firms with cited environmental concerns. In each case the model adjusted R-squared is higher than for the model using the total sample, and with the exception that SIZE in the optimism regression and CAPINT in the certainty model are no longer statistically significant, relations for the control variables are consistent with the results using the total sample. Most importantly, in each case, the EP variable remains significantly associated with the respective dependent variable. EP is positively related to the “optimism” score (at p = .014, one-tailed) and negatively related to the “certainty” measure (at p = .005, one-tailed). These results are again consistent with our hypotheses that worse environmental performance leads to the use of more “optimism” and less “certainty” in environmental disclosures.\(^{17}\)

Overall, the findings from both our primary analysis and our sensitivity tests provide evidence that, as predicted, there is a significant relationship between firm environmental performance and the use of biased language and verbal tone in 10-K report environmental disclosures.

### Conclusions, limitations, and future research

Prior research reports that corporate environmental disclosures are, like other disclosures, often used by corporations to attempt to manage stakeholder impressions regarding environmental performance. This stream of research shows that worse environmental performers tend to use more extensive disclosures or tend to publish selective, partial disclosures as strategies for managing impressions. Relying on prior research in environmental disclosure and corporate impression management, we argued here that corporations also may attempt to manage stakeholder impressions by self-servingly biasing the language and verbal tone used in their environmental disclosures.

Our results support our contention that worse environmental performers use language and verbal tone to bias the message presented in their financial report environmental disclosures. We find, first, that worse environmental performance is associated with the use of more optimistic language in our test companies’ disclosures. This

\(^{17}\) We also repeated the analyses using only firms from environmentally sensitive industries (and deleting one of the specific industry dummy variables). Results, not presented here, indicate that EP continued to be positively associated with the “optimism” score and negatively related to the “certainty” scores for this sub-sample, and both relations were statistically significant (at p < .05, one-tailed).

---

Table 7
Results of OLS regression analysis testing the relation between environmental performance and environmental disclosure “certainty” for firms having at least one environmental concern (EDC = \(a_1 + B_1\text{EP}_i + B_2\text{SIZE}_i + B_3\text{EXTR}_i + B_4\text{CHEM}_i + B_5\text{PAP}_i + B_6\text{MET}_i + B_7\text{PETR}_i + B_8\text{MIN}_i + B_9\text{CAPINT}_i + B_{10}\text{ROA}_i + B_{11}\text{AGE}_i\)).

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<th>t-Stat.</th>
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<td>EP</td>
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<td>1.434</td>
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<td>0.001</td>
<td>1.596</td>
</tr>
<tr>
<td>EXTR</td>
<td>(+/-)</td>
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<td>-0.055</td>
<td>0.956</td>
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<td>1.163</td>
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<td>0.343</td>
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</tr>
<tr>
<td>MET</td>
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<td>1.004</td>
<td>0.319</td>
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<td>PETR</td>
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<td>0.080</td>
<td>0.936</td>
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<td>ROA</td>
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<td>AGE</td>
<td>(+/-)</td>
<td>0.097</td>
<td>2.146</td>
<td>0.035</td>
<td>1.147</td>
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</tbody>
</table>

EDC\(_i\) = the 2002 environmental disclosure “certainty” score for firm \(i\).

EP\(_i\) = the 2002 KLD environmental concern score for firm \(i\).

SIZE\(_i\) = the natural log of 2002 assets for firm \(i\).

EXTR\(_i\) = one if firm \(i\) belongs to the oil and gas extraction industry, and zero otherwise.

CHEM\(_i\) = one if firm \(i\) belongs to the chemicals industry, and zero otherwise.

PAP\(_i\) = one if firm \(i\) belongs to the paper industry, and zero otherwise.

MET\(_i\) = one if firm \(i\) belongs to the primary metals industry, and zero otherwise.

PETR\(_i\) = one if firm \(i\) belongs to the petroleum refining industry, and zero otherwise.

MIN\(_i\) = one if firm \(i\) belongs to the metal mining industry, and zero otherwise.

CAPINT\(_i\) = the 2002 capital intensity for firm \(i\).

ROA\(_i\) = the 2002 return on assets for firm \(i\).

AGE\(_i\) = the age of firm \(i\) as of 2002.

\(^*\) Significance levels are based on a one-tailed test for the EP variable, and two-tailed for all control variables.
indicates that the language and verbal tone of these disclosures more strongly focus on reporting good news and attributing positive performance to the reporting companies' internal efforts while potentially blurring responsibility for poorer performance than the language of better performing companies. We also find that our environmental performance measure is negatively related to the certainty scale of the disclosure. It appears, therefore, that companies with worse environmental performance attempt to mask internal attributions for their poor performance by using convoluted and less certain language.

Our findings lend empirical support to the Merkl-Davies and Brennan (2007) managerial impression management framework that states corporations may use concealment and attribution in corporate disclosures in order to present a more favorable depiction of their performance. We conclude, based on our results, that corporate environmental disclosures of poorer performing firms appear to emphasize good news, obfuscate bad news, and slant attributions of performance to their advantage in an attempt to manage stakeholder impressions of their corporate environmental performance. Our study suggests that the language and verbal tone used in corporate disclosures, in addition to their amount and thematic content, should be considered when investigating the relationship between corporate disclosure and performance.

Our study is subject to several limitations. A key shortcoming of DICTION is its limited ability to detect homographs (Short & Palmer, 2008). Further, the quantitative scores provided by DICTION capturing verbal tone and language cannot portray the subtleties and complexities that can be better analyzed by qualitative case studies of individual firms' environmental disclosures. In addition, such quantitative measures themselves reflect research-design decisions and could be refined in future research (Henry, 2008). It also must be noted that our study relies on a relatively small sample of firms (especially for the sensitivity analyses focusing only on companies with at least one environmental concern) and as such, the results should be interpreted with caution. There are other limitations that are common in empirical work. Our results are based on a cross-sectional sample of public companies listed on US stock exchanges. This limits the scope of our study and the extent to which these findings would be generalizable and hold in other periods cannot be determined. Although we relied on prior research to help design our empirical model, there may be other factors that explain these differences in the language and verbal tone of corporate environmental disclosures. Our research may be extended through longitudinal analyses of the language and tone of environmental disclosures or through the development of a more complete model of disclosure.

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