



Voluntary disclosure theory and financial control variables: An assessment of recent environmental disclosure research

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ABSTRACT

A growing number of environmental disclosure studies are using financial control variables based on arguments from the voluntary disclosure theory (VDT). The VDT justifications for these controls are based on assumptions that disclosure is used as a tool for reducing information asymmetry between managers and investors. Given the findings reported in a broad sample of legitimacy-based environmental disclosure studies, we question whether the disclosures are primarily aimed at the market, and as such attempt to assess evidence to date on the relation between VDT financial control variables and differences in environmental disclosure. Based on a review of thirteen recent environmental disclosure studies including VDT financial control variables in their analyses, we fail to find, with the exception of firm size, evidence suggesting any systemic associations. Further, we assess whether including VDT financial control variables changes the inferences on the relation between environmental performance and environmental disclosure in one recent legitimacy-based study (Cho & Patten, 2007) and find that even with the controls, a negative association between performance and disclosure still exists. Overall, we question the need for VDT financial control variables in environmental disclosure research, but encourage further exploration of the relations using more consistent measures and media of disclosure.

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1. Introduction

A considerable body of research over the past two decades focuses on corporate environmental disclosure and what drives differences in the information provision across firms, industries, or time (e.g., Deegan & Gordon, 1996; Gao, Heravi, & Xiao, 2005; Gray, Kouhy, & Lavers, 1995; Guthrie, Cuganesan, & Ward, 2008). Many of the investigations rely upon statistical models to determine the significance of various factors posited to influence the disclosure (see, e.g., Aerts & Cormier, 2009; Brown & Deegan, 1998; Patten, 2002a, 2002b; Wilmschurst & Frost, 2000, although also see Cho, 2009; O'Donovan, 2002; Laine, 2009 for examples of other approaches). However, as noted by Kadera and Mitchell (2005, p. 273), “model specification is a ubiquitous challenge in the social sciences” and has led to, among other things, concerns with the use of control variables in empirical analyses. Within the social and environmental accounting domain, a growing number of environmental disclosure studies adopt arguments from the economics-based voluntary disclosure theory (VDT) literature as justification for the inclusion of financial control variables in the explanatory models used (e.g., Bewley & Li, 2000; Clarkson, Li, Richardson, & Vasvari, 2008; Cormier & Magnan, 1999; Magness, 2006). Starr (2005, p. 360) argues that the inclusion of control variables in empirical models should be based on good theoretical reasons and only after “fairly extensive preliminary data analysis reveals. . . the form of the relationship.” In spite of this, we are aware of no attempts to date to assess either the theoretical justifications

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for the application of VDT arguments to the use of financial control variables in environmental disclosure research or the strength of the proposed relations.

A careful review of the articles forming the foundation for the VDT arguments (Dye, 1985; Lang & Lundholm, 1993; Verrecchia, 1983) indicates that all specifically address disclosure as a tool of communication to market participants and none specifically addresses the provision of environmental information. As such, if corporate environmental disclosure is made primarily to reduce information asymmetries between managers and investors, the application of VDT to this practice would be warranted. However, social–political theories of disclosure (see Gray et al., 1995) argue that instead of informing shareholders, corporate social and environmental disclosure is used more as a tool of impression management to reduce the exposures companies face owing to social and political pressures (Patten, 1991; Walden & Schwartz, 1997). As noted by Deegan (2002, 2007) and others, there is considerable empirical support for these social–political arguments. As such, we question the applicability of VDT as justification for the use of financial control variables in corporate environmental disclosure research.

In order to assess evidence to date on the relation between VDT financial control variables and corporate environmental disclosure we review the findings from thirteen recent environmental disclosure studies that include VDT variables in their models. With the exception of firm size, we find no consistent patterns of a significant relation between the financial control variables and environmental disclosure. We next investigate whether omission of VDT financial control variables in one specific legitimacy-based research study, Cho and Patten (2007), may have led to erroneous inferences regarding the relation between environmental performance and environmental disclosure. Using data from Cho and Patten (2007) supplemented with VDT financial control variables used by Clarkson et al. (2008), we find that, consistent with the results originally presented by Cho and Patten (2007), environmental performance continues to exhibit a significant negative relation to disclosure. Thus, the differences in relation between environmental performance and environmental disclosure reported by Cho and Patten (2007) and Clarkson et al. (2008) do not appear to be due to VDT financial control variables.

Overall, we fail to find meaningful evidence supporting the need for VDT financial control variables in environmental disclosure research. It is important to note that we are not dismissing VDT as a basis for trying to understand corporate environmental disclosure. It is plausible that some firms with superior but publicly unobservable environmental performance may wish to signal this to their stakeholders. The issue we are raising is that VDT-based models seem to have been adapted from the financial disclosure literature without careful consideration of whether the control variables relevant to that body of work are equally as relevant in explaining disclosure targeted at a different stakeholder group. Indeed, our results suggest these variables may not be relevant. However, we concede that the body of work to date, particularly due to differences in environmental disclosure measures used and the media of disclosure examined, as well as differences across country and time in the samples investigated, may not be sufficient to uncover existing systemic relations. As such, additional research focusing on consistency between these factors should be encouraged. We begin our examination with a review of the accounting articles that principally support the VDT arguments.

2. The foundations of VDT

VDT-based research is rooted in the financial disclosure literature. As noted by Healy and Palepu (2001, p. 420), voluntary disclosure research “focuses on the information role of financial reporting for capital markets. . . [and] supplements the positive accounting literature by focusing on stock market motives for accounting and disclosure decisions.” They further note (p. 420) the explicit assumption within this research that “even in an efficient capital market, managers have superior information to outside investors on their firms’ future performance.” Given imperfect accounting regulation and auditing, managers have an incentive to manage their financial performance reporting “for contracting, political, or corporate governance reasons” (Healy & Palepu, 2001, p. 420). Within the financial reporting domain, VDT-based research attempts to determine what factors drive differences in financial reporting quality and has examined the quality of this reporting relative to the issuance of new capital (Healy, Hutton, & Palepu, 1999), global diversification (Cahan, Rahman, & Perrera, 2005), and board composition (Lim, Matolcsy, & Chow, 2007) among many other issues. Given the breadth of VDT research in the financial reporting arena, it is perhaps not surprising that the theory has also been adapted to explorations of environmental disclosure.

Three primary studies – Verrecchia (1983), Dye (1985), and Lang and Lundholm (1993) – form the foundation for VDT’s application to the environmental disclosure area.¹ Both Verrecchia (1983) and Dye (1985) explore the choice to voluntarily disclose (or withhold) information through formal analytical modeling. In essence, Verrecchia (1983, p. 182) shows that due to the existence of proprietary costs associated with information disclosure, traders are unable to interpret non-disclosure as unambiguously ‘bad news.’ As such, there exists a threshold level of disclosure that is increasing in proprietary cost. Dye (1985, p. 125) further suggests that in the case of non-disclosure, “investors may be uncertain about the nature of the information a manager possesses.” Thus, Lang and Lundholm (1993, p. 249) conclude that “in the face of adverse selection. . .

¹ Certainly, authors of VDT-based environmental disclosure studies use other economics-based accounting articles as support for arguments and/or variables in their models. For example, Clarkson et al. (2008) cite Healy and Palepu (2001), Cormier and Magnan (1999) rely on Scott (1994), and Magness (2006) includes reference to Gibbins, Richardson, and Waterhouse (1990). It is the widespread use of Verrecchia (1983), Dye (1985), and Lang and Lundholm (1993) that leads us to classify them as the primary foundation articles.

firms whose performance exceeds a certain threshold will disclose, while those below the threshold will not.” Based on these findings, Clarkson et al. (2008, p. 304), for example, posit that firms with better environmental performance will want to signal this via disclosure while worse performing companies will remain silent so as to be judged as an ‘average type.’

While many aspects of environmental disclosure are clearly voluntary in nature, it is important to note that both Verrecchia (1983) and Dye (1985) are silent on the provision of environmental, as opposed to financial information and all of their models relate to an analysis of disclosure as a tool for managers to inform investors.² For example, Verrecchia (1983, p. 183) specifically describes his model as a market consisting of “two principal actors, the manager of a risky asset and traders.” Similarly, Dye’s (1985) models all specifically relate to the relationship between managers and investors (see, e.g., pp. 127, 130). This does not mean, however, that the basic signaling argument is invalid in the environmental disclosure setting. As long as there is (1) information asymmetry between managers and potential users of the environmental information, and (2) potential proprietary costs associated with the use of the data, the signaling arguments could apply. That is, Verrecchia’s and Dye’s models can be seen as just a more restrictive case of a disclosure choice, and the application of their work to the environmental disclosure decision would be valid.

It seems likely that managers possess considerable information concerning corporate environmental actions that is not publicly available. In the United States, for example, concerns with the level of environmental information being provided by corporations led to a congressionally mandated investigation of the practice (Freedman & Patten, 2008; GAO, 2004), while a number of countries including Australia, France, Norway, Spain, Sweden, and The Netherlands instituted laws in an effort to elicit additional corporate environmental disclosure across a variety of issues (Delbard, 2008; Frost, 2007; Larrinaga, Carrasco, Correa, Lena, & Moneva, 2002). However, Hopwood (2009, p. 437) argues that even where disclosure occurs, companies may be using it to reduce the questions being asked of them so that, despite the apparent openness of their reporting, even less is known about the firm. Further, the reluctance of companies to make more extensive environmental disclosures may well be due to the potential proprietary costs that might ensue. Li, Richardson, and Thornton (1997, p. 441), for example, argue that environmental information can be considered proprietary because outside stakeholders such as government agencies, previously harmed parties, and environmental groups could use the information to institute investigations against the firm or impose new litigation, legislation, or boycotts against the company. Thus, given the existence of information asymmetry and potential proprietary costs associated with environmental information, the signaling arguments of Verrecchia (1983) and Dye (1985) can be argued as valid for this disclosure decision.

In contrast to the analytical modeling of Verrecchia (1983) and Dye (1985), Lang and Lundholm (1993) empirically investigate factors associated with voluntary financial disclosure quality. Using Financial Analysts Federation quality scores, Lang and Lundholm find disclosure varies significantly across firm performance, firm size, the relation between annual stock returns and earnings, and the issuance of securities. In general, these results show that firms with better observable financial performance have higher quality disclosure than companies with worse observable performance and in examining the choice to signal unobservable superior performance this must be controlled for. These relations, and Lang and Lundholm’s arguments for them, have been used extensively in the VDT-based environmental disclosure literature as justification for including a variety of control variables associated with firms’ disclosure decisions. It must be stressed, however, that Lang and Lundholm (1993) couch justification for explanatory variables in their model of disclosure quality on the role of the information specifically in the investment setting. For example, in discussing the potential impact of performance variability, Lang and Lundholm (p. 251) note “disclosure may be related to the variability of firm performance if performance proxies for information asymmetries between *investors and managers*” (our emphasis). Thus, VDT-based arguments for the need for financial control variables relative to examinations of environmental disclosure would require that the environmental information is being made available primarily to reduce information asymmetry between managers and investors.

While many of the VDT-influenced environmental disclosure studies explicitly claim that the practice is related to informing market participants, almost all of the studies also acknowledge other potential audiences for the information. Clarkson et al. (2008, p. 308), for example, discuss environmental disclosure in terms of informing “*investors and other stakeholders*” (our emphasis), while Cormier and Magnan (1999) discuss reporting’s potential role in managing the public’s impression of corporate environmental performance. Indeed, Hooghiemstra (2000, p. 59) argues social disclosure (of which environmental disclosure is a subset) is used as a communications tool aimed at influencing people’s perceptions of the company’s image and reputation. He further cites (p. 57) Elkington’s (1997, p. 171) claim that many “companies engaging in corporate social reporting view their reports as public relations vehicles.” Deegan, Rankin, and Voght (2000) more specifically argue that this disclosure is used to address concerns about the legitimacy of the organization. Deegan (2002, 2007) summarizes a large body of research that examines this use of social and environmental disclosure as a legitimating tool for reducing exposures to what Patten (1991) and Walden and Schwartz (1997) refer to as social and political pressures. Thus, it is unclear that corporations predominantly engage in environmental disclosure to reduce information asymmetry with the market. They instead may be doing so to enhance or maintain their legitimacy within the social and political spheres.

Surveys of the managerial perceptions of the motivations for environmental disclosure provide, at best, mixed support for claims regarding its use to inform investors. Wilmshurst and Frost (2000) report their sample of Australian company CFOs identified ‘shareholders’ rights to information’ as the highest of eleven possible justifications for environmental disclosure

² As we discuss below, Lang and Lundholm (1993) are also silent on the issue of environmental information disclosure.

Table 1
Environmental disclosure studies with VDT-based financial control variables.

Number	Study	Sample
[1]	Aerts et al. (2008)	North American and Continental European Firms
[2]	Aerts and Cormier (2009)	North American Firms
[3]	Ahmad et al. (2003)	Malaysian Firms
[4]	Bewley and Li (2000)	Canadian Manufacturing Firms
[5]	Brammer and Pavelin (2006)	U.K. Firms
[6]	Cho et al. (2012)	U.S. Firms
[7]	Clarkson et al. (2008)	U.S. Firms
[8]	Cormier and Gordon (2001)	Canadian Electric Utilities – Longitudinal
[9]	Cormier and Magnan (1999)	Canadian Firms
[10]	Dawkins and Fraas (2011)	U.S. Firms
[11]	Ho and Taylor (2007)	Japanese and U.S. Firms
[12]	Magness (2006)	Canadian Gold Mining Firms
[13]	Smith et al. (2007)	Malaysian Firms

in annual reports. Cormier, Gordon, and Magnan (2004), using Wilmshurst and Frost's categories, surveyed environmental management executives from a sample of Canadian, French and German firms and found only providing a 'true and fair view of operations' to be cited as a higher motivator for disclosure than shareholders' rights to information. Cormier et al. also report the executives showed strong agreement that investors were concerned with corporate environmental information, although they also found stronger agreement that it mattered to lenders and the general public. In contrast to the above surveys, Perry and Sheng (1999) indicate that only 21.4% of managers from disclosing companies in Singapore believe shareholder interest was likely to encourage environmental disclosure. Similarly, Solomon and Lewis (2002) report that their U.K. company respondents listed attracting investment as only the tenth highest motivation (out of 12) for corporate environmental disclosure. In line with the arguments of Hooghiemstra (2000), 'acknowledging social responsibility' and 'improving the company's corporate image' were listed as the top cited factors.

In sum, we find no compelling evidence that managers use environmental disclosure primarily for informing investors, and as such we question whether the use of financial control variables is necessary for analyses of differences in corporate environmental disclosure. To answer that question, we begin our investigation by reviewing empirical studies of corporate environmental disclosure employing VDT financial control variables and attempt to discern any consistent patterns in the relation between those variables and the disclosure. We follow that review by testing whether the failure to include financial control variables might have led to false inferences in one recent piece of legitimacy-based research into corporate environmental disclosure, Cho and Patten (2007).

3. Research methods and results

3.1. Review of VDT financial control variable studies

To gather evidence on the relation between financial control variables and corporate environmental disclosure, we reviewed the academic literature looking for studies that met the following criteria:

1. Use of some measure of environmental disclosure as the dependent variable.
2. Inclusion of at least one of the VDT financial control variables used by Clarkson et al. (2008).
3. Specific reference to one or more VDT foundation articles (Dye, 1985; Lang & Lundholm, 1993; Verrecchia, 1983).

In total, we identified 13 studies meeting these criteria. While the majority of the papers focus on disclosure by companies from North America, our sample also includes investigations of environmental disclosure by firms from the U.K., continental Europe, Japan, and Malaysia. Table 1 identifies the studies we include in our assessment of VDT-influenced environmental disclosure research.

The primary intent of our article review is to identify whether the body of empirical evidence indicates that VDT financial control variables are associated with corporate environmental disclosure in a systematic way. Because Clarkson et al. (2008) include the most extensive array of VDT financial control variables, we use their list of measures for our examination. These variables, identified in Table 2, are 'financing', 'Tobin's Q', 'stock return volatility', 'profitability', 'leverage', and 'firm size'.

Table 2 identifies which of the reviewed studies include each of the VDT financial control variables drawn from Clarkson et al. (2008). It is important to note that we allowed for differences in the measurement (and the naming) of specific variables but included them if they were capturing the firm attribute identified by Clarkson et al. for the category. For example, Clarkson et al. (2008, p. 314) operationalize 'Financing' as "the amount of debt and equity financing raised by the firm in the fiscal year following the measurement of the environmental performance." In contrast, Cormier and Magnan (1999, p. 443) define their 'capital markets' variable (which we include as 'financing') as "an indicator variable coded one (1) if public issue of securities within the last three years." Although measured in different ways, both variables relate to reliance on capital markets for financing.

Table 2

Summary of the use of VDT financial control variables across environmental disclosure studies.

Variable	General definition	Included in study
Financing	Reliance on capital market for debt/equity	[7], [8], [9], [12]
Tobin's Q	Measure of unrecorded asset value (intangibles)	[7]
Stock return volatility	Degree of stock price fluctuations	[7], [13]
Profitability	Return on base	[1], [2], [3], [4], [5], [6], [7], [8], [9], [10], [11], [12], [13]
Leverage	Degree of reliance on debt	[1], [2], [3], [5], [6], [7], [8], [9], [11], [13]
Firm size	Measure of firm size	[3], [4], [5], [6], [7], [9], [10], [11], [12], [13]

Table 3

Summary of significance of VDT financial control variables across environmental disclosure studies.

Variable	Significant in at least one model	Insignificant in at least one model
Financing	[7], [8], [9], [12]	[7], [8], [12]
Tobin's Q		[7]
Stock return volatility		[7], [13]
Profitability	[8], [9], [11], [13]	[1], [2], [3], [4], [5], [6], [7], [8], [9], [10], [11], [12]
Leverage	[1], [3], [5], [7], [9]	[1], [2], [5], [6], [8], [9], [11], [13]
Firm size	[4], [5], [7], [9], [10], [11], [12]	[3], [6], [10], [13]

While only Clarkson et al. (2008) include all six of the financial control variables we assess here, all of the other studies include a minimum of two of the measures. The specific VDT financial control variables included most often were profitability (all 13 studies), leverage (10 studies), and firm size (10 studies).³ In terms of variables used least often, only Clarkson et al. (2008) include Tobin's Q as an explanatory variable in their models.

Table 3 summarizes, for each of the VDT financial control variables, which of the reviewed studies had at least one model of environmental disclosure where the variable was statistically significant (at $p < .10$). It also identifies which studies had at least one model of disclosure with insignificant results for that variable. It is worth highlighting that all of the studies reviewed conducted multiple analyses, varying the sample of companies included, the measure of environmental disclosure, the combination of explanatory variables included,⁴ or some combination thereof. For the identification in Table 3, inclusion in the 'significant' and 'insignificant' columns was based the results of any of the models used.

A review of Table 3 indicates no strong patterns of significance or insignificance for the VDT financial control variables. This is true both overall, and for each separate variable. There are several sets of comparisons that warrant further discussion. First, while each of the six variables is statistically insignificant in at least one model in at least one of the studies in which it is used, four of the six variables are also statistically significant in at least one model in at least one of the investigations using the measure. The exceptions are 'Tobin's Q' and 'stock return volatility', but it must be noted that these variables are used in the fewest studies. Second, for four of the six VDT financial control measures, more studies including their use report models with insignificant variable results than report models where the variable is significant. The exceptions are 'financing', and 'firm size', and we discuss each of these in more detail below.

With respect to the 'financing' measure, both Cormier and Magnan (1999) and Magness (2006) report a consistent positive relation between this financial control variable and the extent of environmental disclosure. The former find it significant in all of their models based on a sample of Canadian firm disclosure. These models include analyses using both ordinary least squares (OLS) and Tobit estimation techniques, and use disclosure measures standardized across both (1) total sample medians and (2) industry and year-specific sample medians. Magness (2006), examining the disclosures for a sample of Canadian gold mining firms, reports a significantly positive relation between financing and disclosure for all but one of her measures of environmental disclosure. The exception is disclosure only of environmental liability information. However, Magness specifically identifies this disclosure as being mandated, and as such it would appear to fall outside the domain of VDT arguments.

Clarkson et al.'s (2008) findings with respect to the relation between financing and environmental disclosure for their sample of U.S. firms are less robust than those reported by Cormier and Magnan (1999) and Magness (2006). Clarkson et al. (2008) measure disclosure across what they label as 'hard' and 'soft' categories of information where hard disclosures provide information that focuses on measures "that cannot be easily mimicked by poor environmental performers." In Tobit analyses controlling for industry fixed effects, they find financing to be highly associated with their soft disclosure scores but insignificant for the hard disclosure measure.⁵ Further, in subsequent analysis based on within-industry variation, the financing variable is no longer significant for any of the disclosure metrics. Similarly, Cormier and Gordon's (2001) results regarding the relation between financing and environmental disclosure are equivocal. They report a significantly positive correlation between financing and disclosure, but they do not test the relation in a multivariate format. This is potentially

³ The financial control variables we assess are not always brought into the specific analyses from a VDT perspective. For example, Bewley and Li (2000) included firm size as a control for political exposure.

⁴ This included changes in the use of non-VDT variables.

⁵ For the total scores (the combination of hard and soft), the financing variable is significant but only at the $p < .10$ level.

Table 4
Summary of significance of VDT financial control variables across environmental disclosure studies.

Variable	Significant in at least one model	Insignificant in at least one model
Panel A – financial report environmental disclosure models		
Financing	[8], [12]	[8], [12]
Tobin's Q		
Stock return volatility		[13]
Profitability	[8], [13]	[2], [3], [4], [6], [8], [12], [13]
Leverage	[3]	[2], [6], [13]
Firm size	[4], [12]	[3], [6], [13]
Panel B – financial environmental information disclosure models		
Financing		[12]
Tobin's Q		
Stock return volatility		
ROA		[4], [6], [12]
Leverage		[6]
Firm size	[4], [12]	[6]

relevant as both Clarkson et al. (2008) and Magness (2006) report a statistically significant positive correlation between financing and firm size. Further, in sensitivity tests comparing median measures across high and low disclosers, financing is no longer statistically significant. Thus, while some evidence for a positive relation between financing and environmental disclosure exists, it is not without challenge.

Without question, firm size is the VDT financial control variable showing the strongest consistent relation to differences in corporate environmental disclosure. Six of the ten studies including a firm size variable in their analyses (Bewley & Li, 2000; Brammer & Pavelin, 2006; Clarkson et al., 2008; Cormier & Magnan, 1999; Ho & Taylor, 2007; Magness, 2006) find it significantly and positively related to disclosure in all models tested. Further, Dawkins and Fraas (2011) report a significant positive association between log of company revenues and disclosure for three of their four models. Finally, in all models across all studies reporting a statistically insignificant firm size variable, the measure remains positively signed. These strong findings for a firm size relation are not unexpected given substantial prior research documenting a similar association (for a summary, see, e.g., Deegan, 2002; Patten, 2002b). However, it must be noted that firm size, although sometimes included as a VDT-based financial control variable, is often brought into analyses as a control for political cost exposure.

Our final comparisons center on the 'leverage' and 'profitability' variables. While leverage is found to be significantly associated with environmental disclosure in models from five different studies, the direction of the relation varies. Aerts, Cormier, and Magnan (2008), Ahmad, Hassan, and Mohammad (2003), and Cormier and Magnan (1999) find only a negative relation between leverage and environmental disclosure whereas Clarkson et al. (2008) report a significant positive association. Brammer and Pavelin's (2006) results indicate a statistically significant negative relation for most of their models, but a statistically significant positive association between leverage and disclosure in one of two models focusing on the quality of the reporting for their sample of U.K. companies. Results on profitability measures are similarly mixed. Cormier and Magnan (1999) and Cormier and Gordon (2001) both report significant positive associations between their respective profitability variables and environmental disclosure while both Ho and Taylor (2007) and Smith, Yahya, and Amiruddin (2007) find a significant negative relation. All four of these studies also report models where the profitability measure is insignificant. Finally, five studies including leverage as a control variable (Aerts & Cormier, 2009; Cho, Freedman, & Patten, 2012; Cormier & Gordon, 2001; Ho & Taylor, 2007; Smith et al., 2007) and nine analyses including profitability (Aerts & Cormier, 2009; Aerts et al., 2008; Ahmad et al., 2003; Bewley & Li, 2000; Brammer & Pavelin, 2006; Cho et al., 2012; Clarkson et al., 2008; Dawkins & Fraas, 2011; Magness, 2006) show no models where the respective variables are statistically significant.

Certainly, one of the problems with trying to find patterns in the research examined above is that, although all of the studies use a measure of environmental disclosure as their dependent variable, both the measurement and the media of disclosure vary. It seems plausible that certain disclosures, for example those made in financial reports or those consisting of financial-oriented environmental information, might be expected to have a stronger likelihood of being made with the intent to signal market participants. As such, we next refine our focus by examining, first, only those models based on financial report disclosures, and second, only models using a financial environmental information dependent variable. Seven of the sample studies (Aerts & Cormier, 2009; Ahmad et al., 2003; Bewley & Li, 2000; Cho et al., 2012; Cormier & Gordon, 2001; Magness, 2006; Smith et al., 2007) include models based only on financial report environmental disclosures. Panel A of Table 4 indicates which of these studies had models of financial report environmental disclosure with each of the respective financial control variables showing either significance or insignificance. Similarly, Panel B of the table shows the same for those studies using models based on a financial environmental information dependent variable. Only three of the reviewed studies included models based on a dependent variable measuring some aspect of financial environmental information. Cho et al. (2012) include a model where the dependent variable is the disclosure of environmental capital expenditures, Magness (2006) analyses disclosure of environmental liability information, and Bewley and Li (2000) report results for models focusing

Table 5
Results of regression tests on Cho and Patten (2007) data legitimacy variables only.

Model explanatory power				
Number of observations		95		
Adjusted R ²		0.178		
F-Statistic		7.793		
Significance of F-statistic		0.000		
Variable	Predicted sign	Parameter estimate	t-Statistic	Significance ^a (t-statistic)
Parameter estimates				
INTERCEPT	None	0.981	0.317	0.752
LogRevs	(+)	−0.005	−0.037	0.971
Industry	(+)	0.856	3.175	0.001
EnvCon	(+)	0.426	3.205	0.001

^a Significance levels are based on a one-tailed test for the industry and EnvCon variables.

on “financial environmental disclosures” based on the economic disclosure category of Wiseman’s (1982) metric.⁶ A review of Table 4 suggests that focusing on financial report disclosures and the disclosure of only financial environmental disclosure dependent variables does not strengthen the evidence for a systematic relation between the VDT financial control variables and differences in environmental disclosure, as the patterns for significance and insignificance with respect to the models used in the various studies are similar to those reported in Table 3.

In sum, with the exception of firm size and to a lesser extent, financing, the results of the 13 studies using VDT financial control variables do not appear to make a very strong case that the measures explain differences in corporate environmental disclosure. However, it must be acknowledged that the body of this work is very limited to date, and as discussed above, differences in the measurement and the media of disclosure, as well as differences in samples with respect to countries and time, may not be sufficient at this time to uncover systematic relations. Therefore, we turn to an alternative approach for examining the potential value of including VDT-based financial control variables in environmental disclosure studies.

3.2. Testing for erroneous inferences

As noted above, VDT arguments led Clarkson et al. (2008), among others, to posit a positive relation between environmental performance and environmental disclosure. That is, better performers have an incentive to signal this to potential users of the information, and Clarkson et al.’s (2008) findings support this claim. However, this is in direct contrast to the arguments of legitimacy theory as applied to the environmental disclosure setting. Cho and Patten (2007), for example, argue that because disclosure is used as a tool to reduce exposures to social and political pressures, worse environmental performers are expected to make more extensive environmental disclosures. Cho and Patten’s (2007) results support this alternative claim. In the second stage of our analysis, we attempt to determine whether Cho and Patten’s failure to include VDT financial control variables might explain the differing relations between environmental performance and environmental disclosure reported in Cho and Patten (2007) and Clarkson et al. (2008). If environmental disclosure is a function of VDT arguments, failure to control for these effects could substantially alter the statistical relation between the performance and disclosure variables leading to false inferences about the relation.

We obtained, with permission, Cho and Patten’s (2007) data on environmental disclosure, industry grouping, firm size, and environmental performance (based on KLD concern scores). We then gathered from COMPUSTAT and individual company 10-K reports data needed to compute each of the VDT financial control variables used in Clarkson et al. (2008). All VDT measures were calculated using Clarkson et al.’s definitions. Because one or more pieces of required financial information was not available for five of the 100 companies originally included in Cho and Patten (2007), our final sample for this stage of the analysis is 95 firms.

The primary finding reported by Cho and Patten (2007) is that environmental disclosure is more extensive for companies with worse environmental performance. However, their analysis is based on comparisons of mean data points. To assure that the primary inferences of their study hold both for the reduced sample and in a multi-regression setting, we first estimate the association between environmental performance and environmental disclosure, controlling for firm size and membership in environmentally sensitive industries.⁷ Results of this regression, presented in Table 5, show that KLD environmental concern scores are positively and significantly (at $p = .001$, one-tailed) related to levels of environmental disclosure. Because higher

⁶ Bewley and Li (2000, p. 225) report the Wiseman (1982) economic disclosure categories as (1) past and current expenditures for pollution control equipment and facilities, (2) past and current operating costs of pollution control equipment and facilities, (3) future estimates of expenditures for pollution control equipment and facilities, (4) future estimates of operating costs for pollution control equipment and facilities, and (5) provisions for future site cleanup.

⁷ Cho and Patten (2007) base their study on the arguments of Patten (2002b). Patten (2002b) argues that because differences in environmental disclosure have consistently been documented to be associated with differences in firm size and industry membership, tests of the relation between environmental performance and environmental disclosure need to control for these factors.

Table 6
Results of regression tests on Cho and Patten (2007) data including VDT financial control variables.^a

Variable	Predicted sign	Parameter estimate	t-Statistic	Significance ^b (t-statistic)
Model explanatory power				
Number of observations		95		
Adjusted R ²		0.237		
F-Statistic		3.661		
Significance of F-statistic		0.000		
Parameter estimates				
INTERCEPT	None	1.801	0.534	0.595
LogRevs	(+)	-0.055	-0.384	0.702
Industry	(+)	0.861	3.071	0.002
EnvCon	(+)	0.363	2.438	0.009
FIN	(+)	-0.107	-0.096	0.923
Tobin Q	(+)	-0.133	-1.318	0.191
VOLAT	(+)	-3.981	-2.231	0.028
ROA	(+)	2.121	0.976	0.166
LEV	(+)	1.470	1.921	0.029
NEW	(+)	1.898	1.766	0.041
CAPIN	(+)	0.096	0.089	0.465
J-F coefficient	(-)	0.052	0.173	0.863

^a For consistency with Clarkson et al. (2008), variables capturing asset newness (NEW), capital intensity (CAPIN), and media exposure (J-F coefficient) are also included as controls.

^b Significance levels are based on a one-tailed test for the industry, EnvCon, ROA, LEV, NEW, and CAPIN variables.

concern scores indicate worse environmental performance, our results show that the inferences drawn by Cho and Patten (2007) hold for the reduced sample in a multivariate setting.

We next estimate the regression model including the VDT financial control variables used by Clarkson et al. (2008). In order to be consistent with their analysis we also include control measures for potential endogeneity due to the level of investment in clean technology (asset age and capital intensity), as well as a control for positive media visibility, the Janis–Fadner measure of imbalance (J–F coefficient).

As reported in Table 6, the explanatory power of the model including the VDT financial control variables increased fairly substantially relative to the preliminary disclosure model (the adjusted R² rose from 0.178 to 0.237). Further, two of the VDT financial control variables, stock return volatility (VOLAT) and leverage (LEV) are statistically significant at better than the .05 level. However, while Clarkson et al. (2008) posit that environmental disclosure should be positively related to stock return volatility, our measure exhibits a negative association. Thus we are left with only one of the VDT variables (leverage) showing a significant relation with disclosure in the predicted direction. We also find that asset age (NEW) is significantly (at $p = .041$, one-tailed) and positively related to environmental disclosure for the Cho and Patten (2007) sample. Interestingly, Clarkson et al. (2008) report a negative (and statistically significant) association between asset age and environmental disclosure in all of their models. Perhaps most importantly, even with the inclusion of Clarkson et al.'s (2008) control variables, the environmental performance measure remains positively, and statistically significantly (at $p = .009$, one-tailed) related to differences in disclosure. As such, the exclusion of VDT financial control variables did not appear to lead to incorrect inferences in the findings between environmental performance and environmental disclosure as originally reported by Cho and Patten (2007).

4. Conclusion

A growing number of environmental disclosure studies have begun using VDT-based financial control variables in their analyses. And while careful consideration of potentially omitted variables is important in empirical research, Starr (2005) notes that it is also important to assure that measures included for control purposes be theoretically justified and that the form of the proposed relations be well specified. The concern we have identified in this examination is that VDT justification for financial control variables appears to hinge on the argument that environmental disclosure is used by corporations as a tool for reducing information asymmetries between managers and investors, and based on evidence from the legitimacy-based research, that is, at best, a questionable premise. We thus question the existence of a sound theoretical argument for inclusion of these control variables. Further, our review of 13 environmental disclosure studies using VDT-based financial control variables fails to find, with the exception of firm size, a consistent association between the control measures and differences in corporate environmental disclosure. The lack of a systemic relation holds when examining disclosures deemed more likely to be targeted at market participants (financial report environmental disclosures and items of financial environmental information). Finally, our extension of Cho and Patten's (2007) legitimacy-based examination of environmental disclosure shows that the negative relation between the disclosure and firm environmental performance reported in the original continues to hold when financial control variables are included in the analysis. In sum, evidence to date does not support the need for including financial control variables in environmental disclosure research.

It is important to note that our investigation centers only on the use of financial control variables in environmental disclosure research and is not meant to be a critique of the potential role that VDT might play in explaining at least some corporate environmental disclosure. Firms with unobservable superior environmental performance would clearly have incentives for signaling this information to its relevant stakeholders.⁸ Our concern is that the use of financial control variables in the VDT-based environmental disclosure work seems to be based on arguments that, while relevant for examinations of financial disclosure quality (because it is targeted at market participants), may not be valid for explaining differences in environmental disclosure. Rather than focusing on controls for observable financial performance, VDT-based environmental disclosure research should perhaps, instead, attempt to control for differences in observable environmental performance in order to isolate any potential signaling due to unobservable superior environmental performance by disclosing firms.

Although our analysis fails to find evidence supporting the use of financial control variables in environmental disclosure research, we concede the body of work in this area to date is limited. The lack of comparability across disclosure measures, media of disclosure, and sample attributes all may be leading to difficulties in uncovering systemic relations. As such, we encourage future researchers exploring VDT-based arguments for environmental disclosure to focus more specifically on the use of consistent measures and media of disclosure. This may be particularly relevant given the movement of environmental reporting from financial reports to standalone sustainability reporting documents.

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⁸ Of course, legitimacy theory arguments suggest that companies with worse environmental performance also have incentives for disclosure. As suggested by an anonymous reviewer, disclosure choice may therefore follow a u-shaped curve where both better and worse performers disclose more. The concern, beyond the scope of this analysis, is that given the largely voluntary sphere of environmental reporting, users may be unable to distinguish whether higher disclosure is due to better or worse underlying performance.

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