Disclosure of Environmental Information by Canadian Manufacturing Companies: A Voluntary Disclosure Perspective

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DISCLOSURE OF ENVIRONMENTAL INFORMATION BY CANADIAN MANUFACTURING COMPANIES: A VOLUNTARY DISCLOSURE PERSPECTIVE

Kathryn Bewley* and Yue Li*

ABSTRACT

This chapter empirically examines factors associated with the environmental disclosures made by Canadian manufacturing firms in their 1993 annual reports. Existing studies suggest that corporate environmental information is value-relevant and that firms may disclose such information in a strategic fashion. This study examines the extent to which voluntary disclosure theory can explain corporate disclosure of general and financial environmental information. We find that firms with more news media coverage of their environmental exposure, higher pollution propensity, and more political exposure are more likely to disclose general

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environmental information. These findings are consistent with the predictions of the voluntary disclosure literature. We also find that disclosure of financial information about corporate environmental impact is influenced less by voluntary disclosure factors than its general disclosure.

1. INTRODUCTION

Disclosure of information about the economic effects of manufacturing activities on the environment has become a significant concern in business management. A survey by KPMG (1994) reports that 87% of responding organizations expected environmental issues to have an increasing impact on their organizations in the next five years. Environmental performance information is important for investors to assess the value and future prospects of businesses and the costs of pollution control. In addition, regulators and the general public are likely to assess the firm's environmental performance by using this information. Due to the possible adverse reactions of different stakeholders, companies have incentives to disclose environmental information in a strategic fashion.

The purpose of this study is to examine the extent to which voluntary disclosure theory can explain the disclosure of different types of environmental information. Since different stakeholder groups are likely to use environmental information differently, it is reasonable to assume that management targets its environmental disclosures to different audiences. Depending on the audience, management will have different incentives when disclosing different types of information. In particular, the study distinguishes between disclosures of general environmental information and financial environmental information.

Prior research suggests that firms have not been forthcoming with disclosure of environmental information, especially financial information. The Canadian Institute of Chartered Accountants' (CICA) review of environmental reporting finds that only 381 out of 863 Canadian 1993 annual reports include environmental information (CICA, 1994). Of these 381, 54 (14%) present only the information specifically required in the CICA Handbook.[1] In a study of environmental disclosures by Canadian companies, Buhr (1994) finds that reporting of environmental information in Canada is an increasing trend, but only 25% of the information reported is accounting/financial information. Market-based studies of environmental disclosure suggest that financial information about environmental costs and liabilities is relevant to investors (e.g. Shane & Spicer, 1983; Blacconiere & Pattern, 1994; Li & McConomy, 1999).

Previous accounting research under the 'social responsibility' paradigm finds that corporate environmental disclosures do not reflect the actual environmental performance (e.g. Ingram & Frazier, 1980; Wiseman, 1982). Further studies find that corporate environmental disclosures are largely selective, self-laudatory and public relations driven (e.g. Harte & Owen, 1992; Deegan & Gordon, 1996; Neu et al., 1998). Other recent studies of environmental liability disclosures use a 'voluntary disclosure' framework[2] to identify factors that may influence disclosure of financial information (e.g. Stanny, 1996; Barth et al., 1997; Li et al., 1997). These studies suggest that management may disclose environmental liability information in a strategic fashion, with disclosure decisions being influenced by outsiders' knowledge of the firm's environmental problems, its pollution propensity, and its political exposure (e.g. the risk of it being adversely affected by corporate environmental stakeholders). To investigate this issue, we extend the prior research by distinguishing the factors that lead to disclosure of two types of environmental disclosure, general information and, more specifically, financial information.

This study uses the environmental disclosure rating scheme in Wiseman (1982) to measure different types of corporate environmental disclosure, and examines whether factors suggested by voluntary disclosure theory can explain these disclosure measures. Using a cross-sectional sample of Canadian manufacturing firms, we investigate the influence of the following firm-specific factors on corporate environmental disclosures: outsiders' knowledge about the firm's environmental problems; pollution propensity; political exposure; auditor quality; and financial performance. Though other interpretations are possible, our findings are consistent with predictions from the voluntary disclosure framework. Our results also suggest that financial environmental disclosure is less predictable than general environmental disclosure, possibly because management has less discretion in disclosing financial environmental information since such disclosures are also subject to generally accepted accounting principles.

This study contributes to accounting research in several ways. First, the study extends prior research (e.g. Fekrat et al., 1996; Barth et al., 1997; Li et al., 1997) by providing a further test of the ability of voluntary disclosure theory to explain corporate disclosure of both general *and* financial information. Second, by attempting to distinguish factors leading to financial environmental disclosures in a general sample of manufacturing firms, the study extends the line of prior research (e.g. Stanny, 1996; Barth et al., 1997; Li et al., 1997) that is focused on the disclosure of environmental liability information by firms with known environmental liabilities. Third, the study adds to the research on general environmental disclosure (e.g. Deegan &

Gordon, 1996; Fekrat et al., 1996; Neu et al., 1998) by providing new empirical measures for various factors and considering the conditional impact of these on the disclosure decisions of a sample of Canadian manufacturing firms.[3] Finally, the findings of the study may shed light on the future development of a framework for corporate environmental disclosure. Specifically, our results suggest that an appropriate environmental disclosure framework should accommodate industrial differences in pollution propensity.

The chapter is organized as follows. Section 2 discusses voluntary disclosure theory as it relates to environmental disclosure, and describes our empirical measures. Section 3 presents the research design, empirical models, and results. Section 4 discusses the implications of the study and concludes.

2. VOLUNTARY DISCLOSURE THEORY AND ENVIRONMENTAL DISCLOSURE

Voluntary disclosure theory suggests that firms will disclose 'good' news and withhold 'bad' news. In equilibrium, there exists a disclosure 'threshold' that separates the good news from the bad news. Prior research in this area suggests that managers tend to suppress unfavourable information under certain conditions. For example, Dye (1985) provides a model in which market participants' uncertainty about whether or not a manager is endowed with private information provides incentives for the manager not to disclose unfavourable information beyond a certain threshold level. Li et al. (1997) extend this line of research by studying corporate disclosure of environmental liability information and suggest that management has incentives to disclose environmental information in a strategic fashion. In particular, their theoretical model predicts that management decisions to disclose environmental liability information relate to the amount of private information outsiders believe the manager has, the firm's propensity to pollute, and the potential risk of adverse actions by environmental stakeholders.

In this study, we use the voluntary disclosure theory to test the relation between corporate environmental disclosure and the following five factors: outsiders' knowledge of environmental exposure; pollution propensity; political exposure; auditor quality; and financial performance. The first three variables are voluntary disclosure factors derived directly from the existing literature (e.g. Li et al., 1997). The last two are included as control variables because previous studies suggest that auditor quality and financial performance can influence corporate disclosure (e.g. Barth et al., 1997; Neu et al., 1998; Li & McConomy, 1999). We describe our measures of corporate environmental

disclosure and the factors that are expected to explain these measures in sections 2.1 and 2.2 below.

2.1. Environmental Disclosure Measures (W_i, W_i^{NF}, W_i^F, D_i)

In this study we define two types of environmental disclosure: general information and financial information. The primary objective of this study is to examine the extent to which a voluntary disclosure framework can explain the managerial decision to disclose these two types of environmental information.

Financial environmental disclosure in this study refers to either specific dollar amounts of environment-related items or accounting policies for environment-related activities. Examples include current or planned expenditures for regulatory compliance, amounts accrued for future site restoration liabilities, and accounting policies for environmental costs and contingencies. There is evidence that disclosures of financial information help investors in assessing the effect of a company's environmental problems on its market value (e.g. Clarkson et al., 1999; Li & McConomy, 1999).

General environmental disclosure in this study includes qualitative aspects of corporate environmental performance, attitudes and action towards environmental control, hence benefiting a wide range of environmental stakeholders. Examples include descriptions of applicable environmental regulations, compliance levels, future pollution abatement actions, a statement of the company's environmental policy (or the fact that it has one), and descriptions of environment-related operational changes, training and other programs.

Since there has been no accepted framework for general environmental information disclosure, management has discretion in deciding what and how much to disclose to suit a wide range of audiences. However, disclosures of financial information are also governed by generally accepted accounting principles (GAAP) and thus may be less discretionary than general environmental disclosures; the differences in audiences and standards may render a difference in management decisions to disclose information in each category.

We measure corporate environmental disclosures as follows. General environmental disclosure is measured in two ways, one measure includes total disclosures and the other includes only nonfinancial disclosures. Financial environmental disclosure is also measured in two ways, one measure captures the extent of financial disclosure and the other is simply an indicator of whether or not a firm has made any financial disclosure.

The measure of total environmental disclosure, Wi, is determined by using the content ranking index developed in Wiseman (1982). The Wiseman measure is based on both the breadth (number of different topics discussed) and

depth (specificity of information provided), making it a reasonable measure of management's willingness to provide environmental information in general. Another reason why we use the Wiseman measure is to avoid the subjectivity of separating environmental disclosure into 'good' news versus 'bad' news.[4] Two research assistants and one of the authors assigned a score for each sample firm, using the 'Environmental disclosure rating' sheet presented in the Appendix. If the scores assigned by different evaluators for a particular firm differed, then a consensus was sought. Overall, a high level of consensus was reached among the three evaluators. If no consensus was reached, the average of the three scores is used as the final measure.

We then disaggregate the total Wiseman measure into two components to obtain separate measures of the extent of financial versus non-financial environmental disclosure.[5] The Wiseman measure of financial environmental disclosure extent, W_i^F, is the component of the W_i measure that was awarded for disclosure of financial environmental information shown in the 'Quantititive environmental disclosure' section of the Appendix. The Wiseman measure of non-financial environmental disclosure, W_i^{NF}, is the difference between W_i and W_i^F. As an alternate measure of financial disclosure we use an indicator variable, D_i, which equals one if the sample firm discloses financial environmental information in its annual report and zero otherwise. This indicator measure requires little subjective judgment because it is evaluated directly from firms' annual reports.

2.2. Factors Influencing Environmental Disclosure and Their Empirical Measures

2.2.1. Outsiders' Knowledge of Firms' Environmental Exposure ($ENEWS_i$)

Assessing corporate exposure to environmental problems and the potential financial effect of these problems involves uncertainty due to ever-changing environmental regulations and pollution abatement technology. Prior research indicates that when there are uncertainties about management's private information endowment, the level of voluntary disclosures will be proportional to the level of uninformed outsiders' knowledge about management's private information (Dye, 1985). The more outsiders know about the environmental exposure of a firm, the more the firm will disclose in order to differentiate itself from the worst polluters. Thus, we expect firms' environmental disclosures to be associated positively with the extent to which (uninformed) corporate environmental stakeholders know about firms' environmental exposure.

How much the public knows about firms' environmental exposure is not directly observable. Various proxies for public information level have been

used in the previous studies, including news media coverage, ordinal ranking by environment watchdog groups, and the number of Superfund sites (Ingram & Frazier, 1980; Barth et al., 1997; Li et al., 1997; Neu et al., 1998). In this study, we follow Li et al. (1997) and Neu et al. (1998) and proxy for public information level using the number of news articles pertaining to the environmental exposure of our sample firms. In particular, a key word search of the Canadian Business and Current Affairs (CBCA) database was carried out to identify all news articles that relate to environmental matters for each sample firm.[6] Under the assumption that the number of news articles published reflects the extent of public knowledge about sample firms' environmental exposure, we proxy the extent of public knowledge as the number of environmental articles during the period of 1986 to 1993.[7] We expect that any such manipulation would have more influence on recent news, and so we perform a sensitivity analysis using an alternate news measure that omits the most recent (i.e. 1993) news. This alternate measure is also designed to mitigate any bias that may arise from the fact that some annual reports were issued before the end of 1993, and thus may affect news coverage during 1993. The search period starts with 1986 because that is the earliest date for which the CBCA includes articles. We expect this variable to be associated positively with the environmental disclosure measures.

2.2.2. Pollution Propensity (SIC_i and $NPRI_i$)

Voluntary disclosure theory suggests that, in equilibrium, uninformed stakeholders form their expectations about firms' potential environmental problems using all available information. Given that corporate pollution propensity differs across industries and is public knowledge, uninformed stakeholders' expectations about corporate environmental exposure should reflect the difference in corporate pollution propensity. Hence, we expect that firms in an industry with a higher pollution propensity will make more environmental disclosure than firms in less polluting industries. Firms in a more polluting industry need to disclose more in order to avoid adverse actions by uninformed stakeholders against the worst polluters in the industry.

Measuring relative pollution propensity of different industries is challenging because the potential environmental impact of industrial wastes is not always known. We follow a simple approach in this study, categorizing our sample firms into two broad groups. Following previous research (Li et al., 1997), we define $SIC_i = 1$ if firm i belongs to chemical, pulp and paper, petroleum, or primary metal industry, and $SIC_i = 0$ otherwise. Although this is a rough measure of corporate pollution propensity, it is consistent with the existing public perception that the aforementioned four industries are more polluting

than other manufacturing industries (Cormier et al., 1993; Cormier & Magnan, 1997).

As an additional proxy, we measure sample firms' environmental exposure based on whether they reported their toxic substance release quantities to Environment Canada, the federal ministry responsible for the environment. In particular, if a sample firm was included in Environment Canada's 1993 National Pollutant Release Inventory (NPRI) database (Environment Canada, 1994),[8] we assign $NPRI_i = 1$; otherwise, $NPRI_i = 0$. This measure assumes that a firm that reported its toxic waste releases has a relatively higher overall environmental exposure than a firm that did not report.

We hypothesize that both these pollution propensity measures will be related positively to environmental disclosure.

2.2.3. Political Exposure ($LNTA_i$)

Both the voluntary disclosure framework and positive accounting theory suggest that political costs associated with the information disclosed may affect management disclosure decisions. Since the magnitude of political costs associated with corporate environmental disclosures is rarely observable, we focus on firms' political exposure only. Political exposure refers to the extent to which environmental stakeholders may differ in their tolerance of or sensitivity towards environmental incidents caused by different types of firms. Anecdotal evidence suggests that environmental groups tend to target larger firms more than smaller ones, reflecting the fact that society may have higher expectations for the environmental performance of larger firms.[9] For instance, a large firm without an office waste recycling program is more likely to be forced to start one by the actions of environmental stakeholders than a smaller firm, either through regulations or direct public campaign. We use firm size to proxy for political exposure and hypothesize that larger firms would disclose more to fulfill the higher expectations of corporate environmental stakeholders.[10] The logarithm of total assets is used to minimize the potential heteroskedasticity caused by uneven distribution of firm size.

2.2.4. Auditor Quality (AU_i)

The audit literature predicts that high quality auditors will produce high quality information (Teoh & Wong, 1993; Scott & Zhang, 1996). We posit that the extent of disclosure reflects the quality of information because more disclosures, in particular more quantitative disclosures, will allow uninformed stakeholders to better assess the environmental impact of firms' operations. Higher quality auditors are likely to require more environmental disclosure because they are expected to be better able to assess the potential

environmental impact of firms' business operations. Li & McConomy (1999) find that auditor quality is associated positively with a firm's decision to adopt a new accounting standard that requires disclosure of environmental liability information. Following the convention in the audit research literature, we use auditor firm size to proxy for audit quality by assigning $AU_i = 1$ for a 'Big Six' accounting firm and AUi = 0 otherwise. We expect this factor to be associated positively with environmental disclosure.

2.2.5. Financial Performance (ROA_i)

Prior empirical research has studied the relation between firms' financial condition and their environmental disclosure decisions. Research under the social responsibility paradigm investigates a possible positive link between corporate financial performance and corporate social responsibility, including environmental performance. This line of research has not been conclusive (Spicer, 1978; Freedman & Jaggi, 1992; Jaggi & Freedman, 1992). Recent studies suggest that firms use environmental disclosure to establish a reputation for credible disclosure, especially if they need to raise financing. For example, Barth et al. (1997) find that the number of times a firm raised financing is associated positively with the amount of environmental disclosure. Li & McConomy (1999) find that financial condition is a factor affecting the decision of Canadian resource companies to disclose provisions for future removal and site restoration liabilities. Neu et al. (1998) find that firms disclose more environmental information in unprofitable years. These authors suggest that firms' environmental disclosures are related to their financial condition. One reason for this is that environmental problems impair a firm's financial performance because financial resources are diverted to overcoming them. Alternately, firms with higher profitability may have higher political exposure, and thus disclose more for the reasons discussed in Section 2.2.3.

In this study, we consider the relation between financial performance and environmental disclosure using return on total assets (ROA) to measure sample firms' financial performance. We do not predict the direction of this relation.

3. RESEARCH DESIGN, EMPIRICAL ANALYSIS, AND RESULTS

3.1. Empirical Models

Four models are examined in this study. The models all use the same determining factors discussed in Section 2. However, there are four different dependent variable measures, so as to distinguish how these factors relate to

each type of disclosure: W_i (a Wiseman index measure of total environmental disclosures); W_i^{NF} (a Wiseman index measure of the extent of non-financial environmental disclosures); W_i^F (a Wiseman index measure of the extent of financial environmental disclosures; and D_i (an indicator variable that equals one if the firm discloses financial environmental information and zero otherwise). The general form of the models examined is:

$$DISC_i = \alpha_0 + \alpha_1 ENEWS_i + \alpha_2 SIC_i + \alpha_3 NPRI_i + \alpha_4 LNTA_i + \alpha_5 AU_i + \alpha_6 ROA_i + \varepsilon_i$$

where, for firm i:

$DISC_i$ is W_i, W_i^{NF}, W_i^F and D_i for models (1), (2), (3) and (4), respectively;
$ENEWS_i$ is the number of articles in the Canadian Business and Current Affairs database that relate to its environmental exposure from 1986 to 1993 inclusive;
SIC_i is a proxy for its pollution propensity based on standard industry classification;
$NPRI_i$ is an additional proxy for its pollution propensity based on records in the NPRI database;
$LNTA_i$ is a proxy for its political exposure (logarithm of total assets);
AU_i is a proxy for its auditor quality that equals one for Big Six auditing firms and zero otherwise;
ROA_i is a proxy for its financial performance (return on total assets).
ε_i is an error term.

Models (1), (2) and (3) are estimated by the ordinary least squares method. Model (4) is implemented by logit analysis because its dependent variable is a zero-one indicator measure.

3.2. Sample and Data Collection

The sample included in this study is a subset of the sample firms in the Canadian Institute of Chartered Accountants' study, *Environmental Reporting in Canada: A Survey of 1993 Reports* (CICA, 1994). As part of its routine financial reporting monitoring, the CICA received the 1993 annual reports from a total of 863 Canadian companies and reviewed the environmental reporting in these annual reports. In this study, we focus on the annual reports of the 196 manufacturing firms identified in the CICA sample because manufacturing activities consume natural resources and energy and thus may cause environmental damage. Since the conversion process of manufacturing differs significantly from that of other industries, focusing on the manufacturing industry provides limited control in industry homogeneity. Our final sample

includes 188 manufacturing firms. Eight firms have been dropped from the sample because they are not included in the Compact Disclosure Canada database from which we obtain the other financial data and SIC classifications.[11]

3.3. Distribution of Environmental Disclosures

The distribution of the sample firms' environmental disclosures is presented in Table 1. Of the 188 firms, 70 firms disclose general (i.e. both financial and nonfinancial) environmental information and 118 do not. Of these 70 disclosing firms, a subset of 30 report financial information relating to environmental issues. Panel A of Table 1 describes environmental disclosure and firm size. It appears that larger firms are more likely to disclose environmental information than are smaller firms. Panel B of Table 1 describes the distribution of environmental disclosure by industry. It shows that many firms in each industry group do not make any environmental disclosure at all. Also, the extent to which companies provide financial disclosures varies considerably across industry groups. Finally, Panel C of Table 1 shows the distribution of environmental disclosure in terms of annual report locations. It shows that financial disclosures tend to be found in the financial statements, notes and management discussion and analysis sections. In contrast, nonfinancial environmental disclosures occur most frequently in annual report locations that may allow more disclosure flexibility, such as the management discussion and analysis, operating review, president's letter or corporate overview sections.

3.4. Descriptive Statistics of the Variables

Table 2 presents descriptive statistics for the variables used in this study. Panel A in Table 2 shows that there are significant variations in corporate environmental disclosure. The Wiseman total (financial; nonfinancial) measure has a mean of 2.44 (1.98; 0.47) and a maximum of 24.3 (21.3; 9.0). The financial disclosure indicator variable has a mean of 0.16, corresponding to the fact that only 30 out of 188 sample firms disclosed financial information regarding their environmental activities. Also, significant variations exist in the ENEWS variable, which measures the number of news articles during the 1986 to 1993 period concerning the sample firms' environmental exposure, with the mean being 0.86 and maximum being 27. The SIC variable has a mean of 22% because 42 of the 188 firms belong to the four industries identified as being highly polluting. Of the 188 sample firms, 34 firms reported their toxic-waste releases to Environment Canada, resulting in a mean of 18% for NPRI proxy.

Table 1. Distribution of Environmental Disclosures (n = 188)

Panel A: Environmental Disclosure by Firm Size

TOTAL ASSETS	TOTAL NUMBER OF COMPANIES	NON-DISCLOSERS	GENERAL* DISCLOSERS	FINANCIAL DISCLOSERS
Less than $10 million	25	24	1	0
$10 million to $100 million	78	56	22	6
$100 million to $1 billion	64	34	30	19
Greater than $1 billion	21	4	17	5
TOTAL	188	118	70	30

* 'General disclosers' provide both nonfinancial and/or financial environmental information.

Panel B: Environmental Disclosures by Industry

PRIMARY SIC	INDUSTRY	NUMBER OF COMPANIES	NON-DISCLOSERS	GENERAL* DISCLOSERS	FINANCIAL DISCLOSERS
20	Food	23	13	10	2
21–23	Tobacco,textiles, apparel	8	7	1	0
24–25	Lumber, furniture	6	2	4	1
26	Paper	7	2	5	4
27	Printing	2	1	1	1
28	Chemicals	19	10	9	3
29–30	Petrol,rubber,plastics	8	7	1	1
31–32	Leather; stone, clay and glass	7	3	4	3
33	Primary metal	13	4	9	6
34	Metal fabrication	11	7	4	2
35	Industrial machinery	19	15	4	2
36	Electronic equipment	26	18	8	3
37	Transportation equipment	14	7	7	0
38	Instruments	4	4	0	0
39	Miscellaneous manufacturing	4	3	1	0
Other SIC	Classification differences **	17	15	2	2
TOTAL		188	118	70	30

* 'General disclosers' provide both nonfinancial and/or financial environmental information.
** Seventeen sample manufacturing companies identified in the CICA [1994a] survey were assigned non-manufacturing SICs in the Compact Disclosure Canada database. This may be due to arbitrary assignment of the 'primary SIC' when a company is involved in more than one activity. The discrepancy does not affect our overall results.

Table 1. Continued

Panel C: Environmental Disclosures by Annual Report Location

ANNUAL REPORT LOCATION	GENERAL DISCLOSURES	NON-FINANCIAL DISCLOSURES	FINANCIAL DISCLOSURES
Financial statements	4	0	4
Notes to financial statements	13	0	13
Management's discussion & analysis	35	18	17
Operating review	15	8	7
Other locations*	33	27	6
TOTALS**	100	53	47

* Other disclosure locations include president's letter, corporate overview, etc.
** There are more disclosure locations than disclosing companies in the sample because some of the companies disclose in more than one location.

The auditor quality variable has a mean of 0.83 reflecting the fact that about 83% of the sample firms (156 out of 188) used a Big Six auditing firm in 1993. The logarithm of total assets of the sample firms has a mean of 11.37 and standard deviation of 1.87, the logarithmic transformation having reduced the dispersion of this variable. Finally, the ROA measure has a mean of –0.01, a maximum of 0.36 and a minimum of –3.26. Since the ENEWS and ROA distributions both include observations that are extremely far from their means, sensitivity analyses are performed below in section 3.6 to assess the impact of extreme observations on our results.

Correlation coefficients for all the variables are presented in Panel B of Table 2. The correlation between our two general disclosure measures, W and W^{NF}, is 0.97, while the correlation between the two financial disclosure measures, W^{F} and D, is 0.80. The correlation between W and $W^{F}(D)$ is 0.64 (0.59), and between W^{NF} and $W^{F}(D)$ is 0.43 (0.44). The correlation coefficients between all the independent variables are less than 0.45.

3.5. Multivariate Analysis of Environmental Disclosures

3.5.1. Analysis of General Environmental Disclosure

The results of our analysis of general environmental disclosure, models (1) and (2), are presented in Table 3. The results for model (1), presented in panel A, indicate that ENEWS, SIC, NPRI and LNTA are associated positively with the total environmental disclosure measure. The results suggest that public

Table 2. Descriptive Statistics (n = 188)

Panel A: Distributions of the Variables

Variable	Mean	Minimum	Median	Maximum	Standard Deviation
W_i	2.44	0	0	24.30	4.49
W_i^{NF}	1.98	0	0	21.30	3.88
W_i^{F}	0.47	0	0	9.00	1.21
D_i	0.16	0	0	1.00	0.37
$ENEWS_i$	0.86	0	0	27.00	2.77
SIC_i	0.22	0	0	1.00	0.42
$NPRI_i$	0.18	0	0	1.00	0.39
$LNTA_i$	11.37	7.07	11.14	16.13	1.88
AU_i	0.83	0	1.00	1.00	0.38
ROA_i	–0.01	–3.26	0.04	0.36	0.30

Panel B: Correlation Matrix of the Variables

	W_i	W_i^{NF}	W_i^{F}	D_i	$ENEWS_i$	SIC_i	$NPRI_i$	$LNTA_i$	AU_i	ROA_i
W_i	1.00									
W_i^{NF}	0.97	1.00								
W_i^{F}	0.64	0.43	1.00							
D_i	0.59	0.44	0.80	1.00						
$ENEWS_i$	0.47	0.52	0.09	0.12	1.00					
SIC_i	0.25	0.21	0.27	0.25	0.08	1.00				
$NPRI_i$	0.43	0.41	0.32	0.32	0.24	0.28	1.00			
$LNTA_i$	0.47	0.47	0.26	0.33	0.44	0.06	0.42	1.00		
AU_i	0.15	0.16	0.06	0.04	0.10	0.14	0.10	0.19	1.00	
ROA_i	0.06	0.05	0.07	0.04	–0.01	–0.05	0.09	0.27	–0.02	1.00
	W_i	W_i^{NF}	W_i^{F}	D_i	$ENEWS_i$	SIC_i	$NPRI_i$	$LNTA_i$	AU_i	ROA_i

where, for firm i:

W_i is a Wiseman index measure of total environmental disclosures;

W_i^{NF} is a Wiseman index measure of the extent of nonfinancial environmental disclosures;

W_i^{F} is a Wiseman index measure of the extent of financial environmental disclosures;

D_i is an indicator variable that equals one if it discloses financial environmental information and zero otherwise;

$ENEWS_i$ is the number of articles in the Canadian Business and Current Affairs database that relate to its environmental exposure from 1986 to 1993 inclusive;

SIC_i is a proxy for its pollution propensity based on standard industry classification;

$NPRI_i$ is an additional proxy for its pollution propensity based on records in the NPRI database;

$LNTA_i$ is a proxy for its political exposure (logarithm of total assets);

AU_i is a proxy for its auditor quality that equals one for Big Six auditing firms and zero otherwise;

ROA_i is a proxy for its financial performance (return on total assets).

Table 3. Analysis of General Environmental Disclosure (n = 188)

Panel A: Total disclosure

OLS Model:

[1] $W_i = \alpha_0 + \alpha_1 ENEWS_i + \alpha_2 SIC_i + \alpha_3 NPRI_i + \alpha_4 LNTA_i + \alpha_5 AU_i + \alpha_6 ROA_i + \varepsilon$

Variable	Prediction	Coefficient estimate	Standard deviation	White t-ratio*	p-value**
$ENEWS_i$	+	0.468	0.131	3.566	0.000
SIC_i	+	1.587	0.716	2.216	0.014
$NPRI_i$	+	2.516	1.073	2.344	0.010
$LNTA_i$	+	0.588	0.176	3.344	0.000
AU_i	+	0.395	0.430	0.920	0.180
ROA_i	?	−0.235	0.490	−0.480	0.632
Constant		−5.791	1.861	−3.111	0.002
R^2 (adjusted)		0.366			
F (6, 181)		13.046			0.000

Panel B: Nonfinancial disclosure

OLS Model:

[2] $W_i^{NF} = \alpha_0 + \alpha_1 ENEWS_i + \alpha_2 SIC_i + \alpha_3 NPRI_i + \alpha_4 LNTA_i + \alpha_5 AU_i + \alpha_6 ROA_i + \varepsilon$

Variable	Prediction	Coefficient estimate	Standard deviation	White t-ratio*	p-value**
$ENEWS_i$	+	0.494	0.112	4.421	0.000
SIC_i	+	0.979	0.585	1.675	0.048
$NPRI_i$	+	1.898	0.893	2.126	0.018
$LNTA_i$	+	0.461	0.161	2.868	0.003
AU_i	+	0.468	0.326	1.436	0.077
ROA_i	?	−0.256	0.416	−0.616	0.539
Constant		−4.647	1.698	−2.736	0.007
R^2 (adjusted)		0.378			
F (6, 181)		13.863			0.000

where, for firm i:

W_i is a Wiseman index measure of total environmental disclosures;
W_i^{NF} is a Wiseman index measure of the extent of nonfinancial environmental disclosures;
$ENEWS_i$ is the number of articles in the Canadian Business and Current Affairs database that relate to its environmental exposure from 1986 to 1993 inclusive;
SIC_i is a proxy for its pollution propensity based on standard industry classification;
$NPRI_i$ is an additional proxy for its pollution propensity based on records in the NPRI database;
$LNTA_i$ is a proxy for its political exposure (logarithm of total assets);
AU_i is a proxy for its auditor quality that equals one for Big Six auditing firms and zero otherwise;
ROA_i is a proxy for its financial performance (return on total assets).

* t-ratios are computed using the White heteroskedasticity-consistent covariance matrix
** significance levels are for a one-tail test, except for ROA and the constant which are for a two-tailed test.

knowledge about firms' environmental exposure, corporate pollution propensity, and firm size are all associated with the decision to provide general environmental disclosures. The results for model (2), presented in panel B, show that these same factors are also significant in explaining nonfinancial disclosure. These findings are consistent with predictions from the voluntary disclosure literature. The AU and ROA measures are not associated with either of these general environmental disclosure measures at conventional levels of significance, suggesting that disclosure decisions are not strongly affected by these control factors. The adjusted R^2 of 0.37 for total disclosure and 0.38 for nonfinancial disclosure suggest that the models explain a reasonable amount of the variation in the general disclosure variables. The F test of the joint hypothesis that all coefficients are zero indicate both models (1) and (2) are significant at the 1% level.

3.5.2. Analysis of Financial Environmental Disclosure

The results of the analysis of financial environmental disclosure are presented in Table 4, with panel A showing the results for model (3) and panel B for model (4). Similar to the general disclosure analysis, SIC and LNTA also have significant explanatory power for both the existence and the extent of financial environmental disclosure. NPRI is a significant predictor of the extent of financial disclosure, but is only marginally significant for the existence of financial disclosure (t-ratio = 1.355, p-value < 0.10 for the one-tail test). These results suggest that pollution propensity, as measured by industry membership, and firm size are important factors in explaining financial disclosure. In contrast to the general disclosure results, the ENEWS variable is not significant for either of the two measures of financial disclosure, suggesting that environmental news has a different impact on financial versus nonfinancial environmental disclosures. As was the case in the analysis of general environmental disclosure, the AU and ROA variables are not significant in explaining either measure of financial disclosure. The adjusted R2 for the extent of financial disclosure model is 0.14 and the F test indicates that this model is significant at the 1% level. The logit model is significant with a likelihood ratio test value of 36.15 with 6 degree of freedom and right prediction rate of 87%, slightly higher than the 84% nave prediction rate.

Overall, the financial disclosure analysis suggests that larger firms and firms in polluting industries tend to make more financial disclosures related to their environmental operations. Although this finding is still consistent with two key predictions of the voluntary disclosure theory, there are reasons to believe other forces may be influencing our results. In particular, unlike general environmental disclosure, public information level about firms' environmental

Table 4. Analysis of Financial Environmental Disclosure (n = 188)

Panel A: Extent of financial disclosure

OLS Model: [3] $W_i^f = \alpha_0 + \alpha_1 ENEWS_i + \alpha_2 SIC_i + \alpha_3 NPRI_i + \alpha_4 LNTA_i + \alpha_5 AU_i + \alpha_6 ROA_i + \varepsilon$

Variable	Prediction	Coefficient estimate	Standard deviation	White t-ratio*	p-value**
$ENEWS_i$	+	–0.026	0.044	–0.595	0.276
SIC_i	+	0.607	0.263	2.308	0.011
$NPRI_i$	+	0.618	0.331	1.868	0.032
$LNTA_i$	+	0.127	0.047	2.730	0.004
AU_i	+	–0.073	0.181	–0.402	0.344
ROA_i	?	0.021	0.168	0.127	0.899
Constant		–1.144	0.491	–2.332	0.021
R^2 (adjusted)		0.138			0.001
F (6, 181)		3.692			

Panel B: Existence of financial disclosure

Logit Model: [4] $D_i = \alpha_0 + \alpha_1 ENEWS_i + \alpha_2 SIC_i + \alpha_3 NPRI_i + \alpha_4 LNTA_i + \alpha_5 AU_i + \alpha_6 ROA_i + \varepsilon$

Variable	Prediction	Coefficient estimate	Standard deviation*	White t-ratio*	p-value**
$ENEWS_i$	+	–0.086	0.069	–1.251	0.105
SIC_i	+	1.381	0.506	2.731	0.003
$NPRI_i$	+	0.714	0.527	1.355	0.088
$LNTA_i$	+	0.611	0.173	3.527	0.000
AU_i	+	–0.752	0.673	–1.117	0.132
ROA_i	?	–0.643	1.065	–0.604	0.546
Constant		–8.865	1.986	–4.465	0.000
Likelihood ratio test (6 d.f.)		36.15			
% of right predictions		87%			
R^2 – Maddala		0.175			
R^2 – Chow		0.207			

where, for firm i:

W_i^f is a Wiseman index measure of the extent of financial environmental disclosures;
D_i is an indicator variable that equals one if it discloses financial environmental information and zero otherwise;
$ENEWS_i$ is the number of articles in the Canadian Business and Current Affairs database that relate to its environmental exposure from 1986 to 1993 inclusive;
SIC_i is a proxy for its pollution propensity based on standard industry classification;
$NPRI_i$ is an additional proxy for its pollution propensity based on records in the NPRI database;
$LNTA_i$ is a proxy for its political exposure (logarithm of total assets);
AU_i is a proxy for its auditor quality that equals one for Big Six auditing firms and zero otherwise;
ROA_i is a proxy for its financial performance (return on total assets).

* t-ratios are computed using the White heteroskedasticity-consistent covariance matrix in the OLS model; standard errors and t-ratios are asymptotic in the logit model
** significance levels are for a one-tail test, except for ROA and the constant which are for a two-tailed test.

exposure, as reflected by news media coverage, is not a sufficient predictor for financial environmental disclosure. A possible reason for this observation is that disclosure of financial environmental information is subject to generally accepted accounting principles and is less likely to be voluntary under the existing disclosure regulations. In addition, reporting to the NPRI has less impact on financial disclosure than on general disclosure. One possible explanation for this finding is that having reportable toxic-waste releases does not necessarily imply that a firm has material environmental problems that warrant financial disclosure.

3.6. Sensitivity Analysis

We perform several sensitivity tests to check the robustness of the results. First, we note that our ENEWS proxy measures the number of news articles in the CBCA database that relate to sample firms' environmental exposure during the period 1986 to 1993, and thus can be affected by corporate press releases or the release of annual reports prior to December 31, 1993. For instance, if a firm issues a press release about an environmental incident during the year, which in turn will affect news coverage, then the firm will be more likely to discuss the incident in its annual report. Thus, a positive association between environmental disclosure and the ENEWS measure may be caused by a sequential release of environmental information by a sample firm within the year. To mitigate the impact of such a scenario on our results, we repeated our analyses using ENEWS measured by the number of news articles that relate to firms' environmental exposure during the 1986 to 1992 period. The results with this new proxy are little changed, suggesting that our results are not significantly influenced by firms choosing to release environmental information sequentially.[12]

The second sensitivity test involves using alternate proxies for pollution propensity based on the NPRI database. In particular, we develop the following new measures to proxy for the relative pollution propensity of our sample firms: (1) the ratio of toxic release quantity by each sample firm divided by the national total (if a firm releases more than one toxic substance we use the weighted average); (2) the number of all-waste-material releases reported to the NPRI by each sample firm; and (3) the number of toxic-waste-material releases reported to the NPRI by each sample firm. We find that the results for models (1), (2) and (4) remain unchanged and that NPRI becomes an insignificant factor in model (3) when the alternate NPRI measures are used. This result supports our finding that reporting to NPRI would have less impact on financial disclosure than on general disclosure, as discussed in section 3.5.2. Other than

the decrease in significance of the NPRI coefficient, the model parameters are largely unchanged and are not reported.

Our third sensitivity analysis is based on an alternative audit quality proxy. We set $AU_i = 1$ if Ernst & Young or KPMG were the auditors, and $AU_i = 0$ otherwise. This alternative measure is adopted because these two audit firms were particularly active in Canada in developing internal policies for addressing environmental issues during financial statement audits.[13] Thus, the alternate proxy may provide a finer measure of this aspect of audit quality because these two firms are expected to have applied extra effort in training their employees and in examining environmental issues during their 1993 audits. For model (3), the alternate auditor quality measure has a coefficient estimate of 0.332 (t-ratio = 1.799, significant at the 5% level for the one-tail test). However, the alternate auditor quality variable remains insignificant for models (1), (2) and (4). These results are not reported as they do not suggest that the alternate audit quality measure has a significant impact on corporate environmental disclosure.

The fourth sensitivity analysis repeats all the models with two alternative financial performance measures, one being the return on shareholder equity and the other being the change in NIBT between 1993 and 1992 divided by total assets in 1993 (a ROA measure). These alternate financial performance measures also are not significant and are not reported here.[14]

Finally, we estimate the models after eliminating some possible 'abnormal' observations.[15] Seven observations with negative shareholder equity values and one extreme ROA observation (–326%) are eliminated to reduce possible bias in our results. The results are very similar to the results in Tables 3 and 4, and thus are not reported. Further, we estimate the models after excluding one extreme ENEWS observation (27 stories) and 12 observations that have no news coverage of any kind during the period 1986 to 1993.[16] The results of repeating these analyses using the remaining observations are also similar to the original analysis and are not reported.

4. SUMMARY AND CONCLUSION

Consistent with voluntary disclosure theory, our results suggest that both financial and general environmental disclosure are associated positively with pollution propensity and political exposure. We find general disclosure to be associated positively with our measure of outsiders' knowledge of the firm's environmental exposure, although financial disclosure does not appear to be influenced by this measure. One possible interpretation of these findings is that financial environmental disclosures are less voluntary than are general

disclosures because financial disclosures would also be subject to generally accepted accounting principles. Of the control factors we identify, auditor quality and financial performance, financial performance is not found to have a notable influence on either type of disclosure. We find no strong association between audit quality and general environmental disclosure. We find a modest positive association between auditor quality and the extent of financial disclosure, though this relation depends on how audit quality is defined.

One interesting finding in this study is that environmental articles in the news media pertaining to the firm preceding corporate environmental disclosures have a significant positive relation with general environmental disclosure but no relation with financial environmental disclosures. This finding is consistent with Li et al. (1997) but not with Neu et al. (1998). The latter study finds that the number of articles containing environmental criticism has a negative impact on overall environmental disclosures. Though it is recognized that environmental disclosures and news media coverage are measured differently in the two studies, further study is needed to resolve this difference.

Although our results are robust to alternative proxy measures, there may be other explanations for management disclosure decisions. One possible omitted variable is the actual environmental performance of the sample firms.[17] Also, our empirical measures are relatively rough and may not capture well the theoretical constructs of the voluntary disclosure framework. This may weaken the theoretical support and subject the findings to different interpretations. For instance, the finding that firm size is significant in explaining corporate environmental disclosure is consistent with other possible interpretations. Finally, the results in this study are based on a cross-sectional sample of different types of manufacturing firms for a single year. Future study is required to determine whether these findings are applicable in other settings.

This study examines factors that affect environmental disclosures by Canadian manufacturing companies. In particular, we examine factors that may affect general environmental disclosure and financial environmental disclosure under a voluntary disclosure framework. Overall, our findings suggest that a voluntary disclosure framework can explain a significant proportion of corporate environmental disclosure. We find that public knowledge level of firms' environmental exposure, corporate pollution propensity, and firm size are significant variables in explaining management disclosure of general environmental information. Our results also indicate that disclosures of financial environmental information are associated with the pollution propensity of the firm's industry and firm size, and that financial environmental disclosures are less predictable than general environmental disclosures. One interpretation of this finding is that management has less discretion in

disclosing financial environmental information because such disclosures are also subject to generally accepted accounting principles.

NOTES

1. CICA Handbook (CICA, 1999) recommendations for capital assets include a requirement to provide for future removal and site restoration costs (environmental liabilities), when reasonably determinable, in a rational and systematic manner by charges to income. The standards were effective for all fiscal periods beginning on or after December 1, 1990 (CICA Handbook section 3060, paragraphs .39 and .65).

2. In this chapter we use the term 'voluntary disclosure theory' to refer to the literature that attempts to explain why managers disclose different levels of information. This theory holds that full disclosure is necessary because non-disclosure suggests that a firm is concealing 'bad news' (e.g. Grossman, 1981; Milgrom, 1981). Therefore, there must be some frictions, such as uncertainty or proprietary costs, that allow partial disclosure equilibria to exist (e.g. Dye, 1985). A summary of voluntary disclosure theory can be found in Richardson (1998).

3. Fekrat et al. (1996) study the environmental disclosures of 168 major international companies in six industries from 18 countries. The information content of corporate environmental disclosure contained in annual reports is measured by a scoring scheme similar to Wiseman (1982). The study finds that companies from Canada and New Zealand appear to provide significantly more environmental disclosures than companies from other countries, and that companies in pollution–prone industries tend to disclose more environmental information than those in less polluting industries. The authors conclude that the significant variation in environmental disclosures is not consistent with voluntary disclosure theory because firms 'are not competing to match one another in providing comparable environmental disclosures in annual reports' (p. 184). We question whether their findings may, in fact, be consistent with voluntary disclosure theory. For instance, voluntary disclosure theory predicts that pollution propensity affects corporate environmental disclosures (see Section 2.2.2). The composition of the sample firms from Canada and New Zealand may differ from other countries in that Canada and New Zealand have mostly natural-resource-based economies, and hence have more polluting firms in the sample. Another possible factor that is consistent with voluntary disclosure theory is that public awareness of environmental issues is higher in these two countries. Note that the environmental movement started in these two countries in the early sixties. This higher awareness would lead to a higher public expectation of corporate environmental performance in these two countries, resulting in more corporate environmental disclosure.

4. For instance, capital expenditures for pollution control may be 'good' news for corporate environmental stakeholders but may represent cash outflow with no expected economic benefit from a shareholder's perspective. Fines and violations of environmental regulation may be 'bad' news to environmental stakeholders but may be the least costly option for the firm given its present operations and financial conditions. Hence, they could be 'good' news to shareholders.

5. We thank one of the referees for suggesting this approach.

6. Specifically, the search in the CBCA electronic database was conducted using joint key words in the following order: COMPANY NAME and (YEAR) and

(ENVIRONMENT? or POLLUT? or EMISSION? or EFFLUENT? or DISCHARG? or CONTAMINA? or CLEANUP or CLEAN? or SPILL?). Whenever possible, identified items were further screened to eliminate articles that are not related to environmental issues.

7. As noted by several participants at the 1999 BAA conference, news coverage could be manipulated by management and hence may not be independent of annual report disclosure decisions. We expect that any such manipulation would have more influence on recent news, and so we perform a sensitivity analysis using an alternate news measure that omits the most recent (i.e.1993) news. This alternate measure is also designed to mitigate any bias that may arise from the fact that some annual reports were issued before the end of 1993, and thus may affect news coverage during 1993. The search period starts with 1986 because that is the earliest date for which the CBCA includes articles.

8. National Pollutant Release Inventory (NPRI) is a database produced by Environment Canada (1994) that contains information collected under the Canadian Environmental Protection Act. The database is similar to the Toxic Release Inventory database produced by the Environment Protection Agency in the US. It contains detailed information about each reporting party, including name, location, substances released, type of release (land, air, water, etc.) and amounts released.

9. See 'MacBlo Loses Another British Customer: Kimberly-Clark Cancels $2.5 Million Pulp Contract after Environmental Audit, Greenpeace Says' (Globe & Mail (1994)).

10. There are other possible reasons for a positive association between corporate disclosures and firm size (see Lang & Lundholm (1993, pp. 250–251), for a summary). For instance, large firms may have a relatively lower cost of disclosure and thus will disclose more. Also, large firms disclose more in order to reduce potential litigation risk which is generally increasing in firm size. Finally, disclosure will increase with firm size because there are greater incentives for private information acquisition for large firms. We believe that cost of information collection and litigation risk associated with environmental disclosure are directly related to firms' pollution propensity, which is controlled for in our empirical models by other proxies. Hence, if firm size in this study affects environmental disclosures, we argue that it is because environmental stakeholders demand more environmental information from larger firms than from smaller firms. This argument is consistent with political (or discretionary) cost argument because insufficient environmental disclosure by large firms may convey bad news to outsiders.

11. We note that the CICA sample firms from which our sample is drawn are not selected in a strictly random manner, rather they are the result of a routine annual report collection process. Companies send their annual reports to the CICA either because they are publicly listed or they have the CICA on their annual-report mailing list. Nonetheless, we believe sample selection bias due to this selection process would be minimal for the following reasons. First, when firms voluntarily submit their annual reports to CICA, they do not know ex ante that their annual reports will be used in an environmental disclosure (or any other) research study. Even if firms knew their annual reports would be used in this way, it is not easy to see any incentives for firms to participate in such a way as to bias the results of this study. Second, the amount of environmental disclosure observed does show significant variation both across all sample firms and within each industry type (see Table 1). Finally, in comparing to the

general population of companies listed on the Toronto Stock Exchange for 1993, the 863 firms in the CICA sample represent about 29% of the total number of listed firms. Thus, the sample includes a substantial proportion of the available population, so the concern that it is non-representative is somewhat lessened.

12. See footnote 7.

13. The CICA Handbook (CICA, 1999) first provided detailed guidance for auditing financial statements affected by environmental matters in December 1994. Prior to this material being issued there may have been a lack of audit effort in relation to environmental problems because auditors were unaware of their financial implications, or because auditors believed they were not responsible for uncovering environmental issues during a financial statement audit. From discussions with members of the auditing profession, we learned that Ernst & Young and KPMG had developed and used their own, extensive internal guidance for auditing environment-related disclosures prior to 1994; these internal guidelines formed the basis of the CICA material that was later issued to all auditors in Canada.

14. An interesting observation, consistent with Neu et al. (1998), is that the coefficients for various financial performance measures are negative in most cases, except that here the coefficients are not statistically significant.

15. We thank one of the referees for suggesting this analysis.

16. Although we have many observations with no environmental news, there are only 12 firms that have no news coverage at all during the 1986 to 1993 period. These 12 observations may reflect some selection bias on the part of the news media. We exclude these 12 firms, together with one firm with 27 news articles for the same period, because they represent extreme observations on both sides of the environmental news variable's distribution.

17. Note that under voluntary disclosure theory, knowledge of a firm's environmental performance may affect outsiders' expectations about the manager's private information. This would affect the manager's disclosure decisions. However, we were not able to identify a valid environmental performance measure that is consistently applicable to all our sample firms.

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APPENDIX

ENVIRONMENTAL DISCLOSURE RATING (WISEMAN INDEX, 1982)

Economic Factors

Past and current expenditures for pollution control equipment and facilities
Past and current operating costs of pollution control equipment and facilities
Future estimates of expenditures for pollution control equipment and facilities
Future estimates of operating costs for pollution control equipment and facilities
Provisions for future site cleanup

Litigation
Present litigation related to environmental incidents
Potential litigation related to environmental incidents

Pollution Abatement
Air emission information
Water discharge information
Solid waste disposal information
Control, installation, facilities and process described
Compliance status of facilities

Other Environment-Related Information
Discussion of regulations and requirements
Environmental policies and company concern for the environment
Conservation of natural resources
Awards for environmental protection
Recycling effort
Department or offices for pollution control

Rating scale
3 if item described in monetary and quantitative terms
2 if item described specifically
1 if item discussed in general

FINANCIAL AND QUANTITATIVE ENVIRONMENTAL DISCLOSURES (WISEMAN INDEX, 1982)

Category	*Amount*
Capital Expenditure	
Legal expenses	
Fines and Penalty	
Land Cleanup and Reclamation	
Environmental Contingency	
Provisions for Future Land Reclamation	
Provisions for Environmental Litigation	
Other	

Rating Scale
3 if item described in monetary and quantitative terms
2 if item described specifically
1 if item discussed in general