

The Informational Contribution of Social and Environmental Disclosures for Investors

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In this paper, we extend the existing literature on corporate social responsibility (CSR) by investigating the substitution effect of social disclosure and environmental disclosure in reducing information asymmetry between managers and investors. Most professional guidelines (e.g., GRI) and prior research on CSR disclosure consider environmental and social components as additive. Our results suggest that social disclosure and paper-based environmental disclosure substitute each other in reducing stock market asymmetry. Hence, firms benefit if they refine their message. We also show that environmental information communicated on the web page or by press releases does not affect information asymmetry when we consider social disclosure. These observations suggest that future research in CSR disclosure may fruitfully distinguish between social and environmental disclosures as well as communication devices. Furthermore, as expected, environmental performance is negatively associated with environmental disclosure. Finally, results show that environmental news exposure and firm size are key drivers of environmental disclosure.

Key words: Environmental disclosure, governance attributes, information asymmetry, social disclosure.

Introduction

Most voluntary guidelines (e.g., Global Reporting Initiative or GRI) as well as most prior research view corporate social responsibility (CSR) disclosure as an additive process where more is better (e.g., Ingram, 1978; Patten, 1991). In other words, more social and environmental disclosure benefits the disclosing firm as well as its shareholders. In that regard, there is anecdotal and empirical evidence that, on their own, both social disclosure (e.g. Downing, 1997; Cormier, Ledoux and Magnan, 2009; Cormier, Aerts, Ledoux and Magnan, 2009) and environmental disclosure (e.g. Cormier, Magnan and Morard, 1993; Barth and McNichols, 1994; Li and McConomy, 1999; Aerts, Cormier and Magnan, 2008) convey value relevant information to investors.

However, such evidence is not conducive to the development of efficient disclosure practices by firms since it is likely that there is much overlap in the strategies underlying a firm's social and environmental actions and performance. Moreover, despite the growth and development of CSR disclosure by many organisations, it is still unknown how investors interpret social and environmental disclosures together. Neu, Warsame and Pedwell (1998) offer a tentative template to analyze CSR by treating social disclosure as a determinant of environmental disclosure. They argue that social disclosure helps investors to frame the interpretation of environmental disclosures.

In this study, we investigate whether social disclosure and environmental disclosure substitute or complement each other in reducing information asymmetry between managers and investors, taking into account a firm's environmental performance, and governance attributes. In addition, we assess which of the environmental disclosure medium is more closely associated with a reduction in information asymmetry in the stock markets.

Our study focuses on a sample of large Canadian firms. Share price volatility is the measure of information asymmetry. Social disclosure reflects information on a firm's web site, either directly or indirectly (e.g., linked sustainability report). Environmental disclosure is from three complementary sources: paper-based annual/environmental report, web page and press releases.

Our results suggest that social disclosure and paper-based environmental disclosure substitute each other in reducing stock market asymmetry. However, when we consider social disclosure, environmental information conveyed on the web page or through press releases does not translate into a reduction in information asymmetry. These observations suggest that future research in CSR disclosure may fruitfully distinguish between social and environmental disclosure as well as communication devices. As expected, we observe that objective measures of environmental performance are negatively associated with environmental disclosure. Our results show also that environmental news exposure and firm size are key drivers of environmental disclosure.

We contribute to the literature on the determinants of information asymmetry between managers and investors. First, we show that voluntary social-related CSR disclosure reinforces the information value of environmental disclosure, even substituting for it under certain conditions. In that sense, we extend prior findings that social disclosure (e.g. Cormier, Ledoux and Magnan, 2009) and environmental disclosures (e.g. Barth and McNichols, 1994; Aerts, Cormier and Magnan, 2008) do influence capital markets' participants.

We also document that a firm's governance influences the extent of its environmental disclosure and, ultimately, affects information asymmetry between managers and investors.

These findings are consistent with those reported by Bushman, Chen, Engel and Smith (2003) for the determination of financial reporting.

Our study also provides some insights for managers wishing to enhance the efficiency of the message that they convey to investors and other stakeholders. Currently, there is much emphasis on just increasing the number of disclosed information items, without much consideration as to their incremental or substitute effect on investors' decision-making. For example, the GRI reporting framework is gaining recognition around the world but its scope is continuously being revised and augmented. However, such disclosures are not cost-free for organizations. Furthermore, investors must gauge, assess and retain an increasing flow of information: a more efficient disclosure strategy becomes critical if firms want investors to get the right picture of their CSR performance. In that regard, to the best of our knowledge, our study is the first to investigate the joint effect of social and environmental disclosure on information asymmetry between managers and investors, taking into account environmental performance and governance attributes.

The remainder of the paper is organized as follows. Section 2 contains a theoretical background. The study's methodology is described in section 3. Results are presented in section 4. Finally, section 5 provides a discussion of results' potential implication.

2. Environmental and social disclosures: Background and hypotheses

2.1 Corporate Social Responsibility

Corporate Social Responsibility (CSR) can be broadly understood as the way firms integrate social, environmental and economic concerns into their values, culture, decision making, strategy and operations. CSR is an evolving concept and its underlying construct has changed over time (Carroll, 1999). Such integration must be accomplished in a transparent and accountable manner, thereby leading to the implementation of better practices within the firm, creating wealth and improving society (Industry Canada, 2006). The World Business Council for Sustainable Development describes CSR as the business contribution to sustainable economic development. Beyond complying with legislation and regulations, CSR typically includes commitments and actions related to (not an all-inclusive list):

- corporate governance and ethics;
- health and safety;
- environmental stewardship;
- human rights (including core labour rights);
- human resource management;
- community involvement, development and investment;
- involvement of and respect for Aboriginal peoples;
- corporate philanthropy and employee volunteering
- anti-bribery and anti-corruption measures;
- accountability, transparency and performance reporting;
- supplier relations, for both domestic and international supply chains.

These elements of CSR are frequently interconnected and interdependent, and apply to firms wherever they operate. CSR has recently emerged as a critical concern for management. Integrating its actions within a clear CSR strategy helps organizations position themselves to proactively manage risks and take advantage of opportunities, especially with respect to their corporate reputation and broad engagement of stakeholders. The latter can include shareholders, employees, customers, communities, suppliers, governments, non-governmental organizations, international organizations and others affected by a company's activities.

2.2 Corporate Social Responsibility and Capital Markets

Ultimately, CSR is about performance, i.e., moving beyond words on a page to effective and observable actions and societal impacts. In that regard, there is extensive evidence that CSR efforts often translate into improvements in a firm's financial performance (see, among others, McWilliams et al., 2006; Margolis and Walsh, 2003; Roman et al., 1999; Griffin and Mahon, 1997; Pava and Krausz, 1995; Wood and Jones, 1995; Orlitzky et al., 2003; Richardson and Welker, 2001; Cormier, Ledoux and Magnan, 2009).

However, the impact of a firm's CSR actions or initiatives can be analyzed more precisely by dividing into them two broad categories: social-related and environmental-related. Social-related CSR emerges from relationships between an organisation and its employees, business partners and other stakeholders, provides opportunities to create value (Burt, 1992). In that regard, Adler and Kwon (2002) note that social-related CSR facilitates various important organizational actions such as inter-unit and inter-firm learning, thus contributing to their success. Moreover, by building up its social dimension, a firm is able to effectively reduce its

market-based risk profile (Orlitzky and Benjamin, 2001). For example, Waddock and Graves (1997) suggest that stable relations with various stakeholder groups facilitate a firm's access to equity markets. Improvements in the social facets of CSR also build trust in contracting relationships with external stakeholders, thus enabling the firm to lower transactions costs (Hill, 1990) and subsequent monitoring and coordination costs (Milgrom and Roberts, 1992). Hitt, Lee and Yucel (2002) show that multinational firms engaging in social-related activities acquire a competitive advantage in the new global marketplace.

Over the past few years, the environmental dimension of CSR has become quite important and more visible. The emergence of various stock market indices (e.g., Dow Jones Sustainability Index) that list firms that are perceived to be “green” and of sustainable development investment funds are two illustrations of that trend. Environment-related CSR reflects how a firm, through its actions or initiatives, is becoming “green”, i.e., with minimal ecological impact (e.g., Feier and Haskell, 2008). Overall, prior research suggests that the value implications from adopting a greening strategy are generally positive, albeit with some context-specific conditions or aspects (see, among others, Ambec and Lanoie, 2008).

2.3 Corporate Social Responsibility Disclosure

In an attempt to be transparent and accountable toward their stakeholders, many organizations now issue CSR reports or disclose extensive information about CSR issues in their annual report or in a complementary report. The Global Reporting Initiative (GRI) provides a broad-based framework for the development of CSR disclosure strategies, with guidance on

report content, the type of indicators to be selected or the CSR facets (environmental, human rights, etc.) to be discussed (<http://www.globalreporting.org/ReportingFramework>). There is an extensive literature that reviews and synthesizes CSR reporting by organizations, most specifically its characteristics as well as determinants (e.g., Gelb and Strawser, 2001).

However, the relevance and credibility of a firm's overall CSR disclosure can still be questioned. For example, there is considerable potential for problems when stakeholders perceive that a firm is just engaging in a public relations exercise and cannot demonstrate concrete actions that lead to real social and environmental benefits. In that regard, Gray and Bebbington (2007) highlight that a relatively small proportion of firms that are listed worldwide provide CSR disclosure. Moreover, they argue that, even among those firms showcasing their CSR activities, the average quality of disclosure is so uneven as to be useless for meaningful analyses and comparisons.

In addition, the impact of a firm's social disclosure on information asymmetry between managers and investors can only be effective if the firm's social capital traits are visible and salient in the market, for example through social performance reputation ratings (Fombrun and Shanley, 1990). In this vein, a corporate disclosure policy is important in supporting lasting effects of its social capital on market-based risk and performance measures. In that regard, Cormier, Ledoux and Magnan (2009) show that social disclosure reduces a firm's cost of equity capital. With respect to environmental disclosure, Aerts, Cormier and Magnan (2008) find that it is associated with a decrease in analysts' forecast dispersion both in continental Europe and in North America.

Moreover, it is likely that the mapping between CSR disclosure and its appreciation by capital markets participants is more subtle than just assuming that more is better. Findings from two studies provide tentative frameworks to consider the issue. On the one hand, Neu, Warsame and Pedwell (1998) treat social disclosure as a determinant of environmental disclosure. The authors argue that social disclosure enhances environmental disclosures credibility by constructing the image of socially responsible organizations harmonizing with environmental disclosure. On the other hand, Godfrey et al. (2008) find that a firm's participation in institutional CSR activities (i.e., that benefit society at large) provide an insurance-like benefit when it faces legal/regulatory actions. In other words, these CSR activities help build up capital for the firm and minimize negative market implications, thereby reducing information asymmetry for investors for these specific firms. Both findings suggest that CSR disclosure may affect the level of information asymmetry between a firm and investors through an interaction between social-related CSR disclosure and environmental-related CSR disclosure. This view contrasts with the current practice of considering both as complementary.

2.4 Hypotheses

There is anecdotal and empirical evidence that both social disclosure (e.g. Downing, 1997; Cormier, Ledoux and Magnan, 2009; Cormier, Aerts, Ledoux and Magnan, 2009; Richardson and Welker, 2001) and environmental disclosure (e.g. Cormier, Magnan and Morard, 1993; Barth and McNichols, 1994; Li and McConomy, 1999; Aerts, Cormier and Magnan, 2008) affect investors' appreciation of a firm's underlying risk. For example, Cormier, Ledoux and Magnan (2009) show that web-based social disclosure is associated with larger earnings multiple, i.e. a lower cost of capital. However, in the absence of empirical evidence to the effect

that social and environmental disclosures substitute or complement each other in reducing information asymmetry between managers and investors, our research attempts to test the following alternative hypotheses:

H1a: There is a substitution effect between social and environmental disclosures in reducing the information asymmetry.

H1b: There is a complementary effect between social and environmental disclosures in reducing the information asymmetry.

Cho and Patten (2007) argue that the legitimizing nature of different types of environmental disclosures is not identical and that it is important to distinguish different types of information when assessing legitimization effects. They primarily distinguish between litigation related and non-litigation related disclosure. This dichotomous split of disclosure types resembles the distinction made by Clarkson, Li, Richardson and Vasvari (2008) between soft and hard environmental disclosures, with hard disclosures reflecting factual, objective information that cannot easily be mimicked by poor environmental performers.

With respect to environmental disclosure, Aerts, Cormier and Magnan (2008) find that print environmental disclosure is associated with a decrease in analysts' forecast dispersion both in continental Europe and in North America. However, in North America, it appears that the impact of analyst forecast dispersion on a firm's environmental disclosure differs depending on the diffusion media being used. Their results suggest that web-based environmental disclosure is only relevant in continental Europe. This may be attributable to the large sources of

environmental information available in North America. Market participants in North America can rely on various alternative sources of information that are potentially perceived as more credible than the web (e.g. MD&A, 10K, etc).

Since we expect more hard disclosure on paper-based than on web-based or press releases media (Aerts and Cormier, 2009) and that environmental information contained in the annual report is likely to be seen as more credible than information disclosed on the web page or by press releases, we anticipate the relation between annual report environmental disclosure and share price volatility to be higher than for web-based disclosure or press releases. Hence, the following hypothesis, which holds irrespective if the relation between social and environmental CSR disclosures are substitute or complementary:

H2: The reduction in information asymmetry is higher for paper-based annual/environmental report than for disclosure on the web or by press releases.

3. Method

3.1 Sample

The sample comprises 137 observations of web disclosure for the year 2005. We initially collected web disclosure in the Summer of 2002 for an international study (Aerts, Cormier and Magnan, 2007). All non-financial firms represented on the Toronto Stock Exchange S&P/TSX Index were identified (the total index comprises 220 firms in summer 2002). The resulting 2002 sample comprised 189 non-financial firms. Mergers and acquisitions, bankruptcies and delistings reduced our sample to 157 in 2005. The final sample comprises 137 firms since, out of the initial sample of 157 firms, there are missing data for board size and board independence, and share

volatility. Sample firms represent more than 80% of the Toronto Stock Exchange capitalization for non-financial firms and 46% of total capitalization. Sample firms operate in the following industries: Metals and mines; Gold and precious metals; Oil and gas; Paper and forest products; Consumer products; Industrial products; Real estate; Utilities; Communication and media; Merchandising. Financial data was collected from the Stock Guide and data about governance attributes was collected from 2004 proxy statements, those available in Spring 2005.

3.2 *Empirical model*

This study attempts to provide an integrated analysis of firms' social and environmental disclosure strategy. We posit that this strategy affects simultaneously information asymmetry and disclosure. Based on prior literature, we use share price volatility as a proxy for information asymmetry. The following simultaneous equations model summarizes the approach adopted in the empirical analysis (we will use trading volume in place of share price volatility as a sensitivity analysis):

Dependent variable

Share price volatility_{it}=

$$f(\beta_0 + \beta_1 \text{Systematic risk} + \beta_2 \text{Free float} + \beta_3 \text{Analyst following} + \beta_4 \text{Environmental disclosure} + \beta_5 \text{Environmental disclosure} * \text{Social disclosure} + \beta_6 \text{Social disclosure} + \beta_7 \text{Board independence} + \beta_8 \text{Board size} + \beta_9 \text{Board size squared} + \beta_{10} \text{Audit committee size})_{it}$$

Instrumented variable: Environmental disclosure

Instruments: Environmental performance, Free float, Analyst following, Leverage, Profitability,

Firm Size, Board independence, Board size, Board size squared, Audit committee size, Environmental news exposure.

Several approaches to assess a firm's information asymmetry coexist. Francis, Khurana and Pereira (2005), Leuz and Verrecchia (2000), Healy Hutton and Palepu (1999) and Welker (1995) show that the extent of information asymmetry – proxied by bid-ask spread, share price volatility or stock liquidity (trading volume) – is negatively associated with disclosure. In the current study, we will use share price volatility and trading volume to assess the relation between information asymmetry and social and environmental disclosures.

Environmental disclosure is measured using a coding instrument in a manner similar to Wiseman (1982), Cormier and Magnan (2003), Al-Tuwaijri, Christensen and Hughes (2004) and Aerts and Cormier (2009). The grid comprises 39 items measuring environmental disclosure quality where the items are grouped into six categories as follows:

- Expenditures and risk;
- laws and regulations;
- pollution abatement;
- sustainable development;
- land remediation; and
- environmental management.

The rating is based on a score from one to three. Three points are awarded for an item described in monetary or quantitative terms, two are awarded when an item is described

specifically, and one is awarded for an item discussed in general. The information is coded according to the grid presented in appendix 1.

We believe that the use of a coding scale to qualify a firm's environmental disclosure is appropriate for the following reasons. First, it allows for some integration of different types of information into a single figure that is comparable across firms in terms of relevance. Second, while other disclosure studies rely on word counts to measure environmental disclosure (e.g., Neu, Warsame and Pedwell, 1998; Williams and Ho Wern Pei, 1999), a qualitative scale allows the researcher's judgment to be utilized in rating the value or quality of the disclosures made by a firm. While this process is more subjective, it ensures that irrelevant or redundant generalities are not considered strategic environmental disclosures.

We collected environmental disclosure from three media: paper-based disclosure (annual reports and environmental reports), web sites (HTML) and press releases related to environmental information. We searched for press releases using the same keywords used for articles pertaining to environmental issues. Two research assistants identified 37 firms that issued 111 press releases related to environmental issues in 2005.

The social disclosure grid comprises 17 items collected from web sites in 2005. Social capital refers to features of social organization, such as networks, norms and social trust that facilitate co-operation for mutual advantage (Industry Canada, 2008). Social disclosure items relate to interactions between the firm and society (e.g., alliances, clients) and within the firm itself (e.g. Dess and Shaw, 2001; Pastoriza, Arino and Ricart, 2008). Our measure of social disclosure comprises information that is published on a firm's Web site: Web page and sustainability report. Social indicators are based on balance scorecard literature and performance measurement practices (e.g. Pirchegger and Wagenhofer, 1999; Marston and Polei, 2004). We

measure social disclosure using a coding instrument that is consistent with Wiseman (1982), Cormier and Magnan (2003), Aerts, Cormier and Magnan (2007) and Cormier, Ledoux and Magnan (2009). Like the environmental disclosure grid, three points are awarded for an item described in monetary or quantitative terms, two are awarded when an item is described specifically, and one is awarded for an item discussed in general (see appendix 1).

To ensure consistency across firms, two persons reviewed all individual scores independently. All disagreements were subsequently reviewed by one of the co-researchers.¹

Concerning the environmental news exposure, we searched for articles related to environmental issues contained in the ABI/Inform Global database using the keywords mentioned above. 59 relevant stories were identified for 2004 (See appendix 2 for details).

For the data regarding governance attributes, we rely to 2004 proxy statements since we collected governance disclosure web sites during Spring 2005, i.e. in line with information available from the more recent proxy statement available at that time, namely 2004. Share price volatility is defined as the standard deviation of percentage changes in daily stock prices for 2005.

1 A coding manual documenting coding instructions as well as standardized coding worksheets were prepared beforehand. Each coder then applied the following coding sequence: (1) independent identification of the occurrence of items relative to the different coding categories; (2) independent coding of the items according to quality level of content and (3) timed reconciliation on a subset of company reports. The coders were intensively trained in applying coding instructions and in using the coding worksheets. They were unaware of the research hypotheses. Initial differences in identifying grid items accounted for, on average, 7% of the maximum number of items identified. Of the information quality level coding, less than 10% had to be discussed for reconciliation. Disagreement between coders mostly occurred at the beginning of the coding process (essentially the first 5 firms by industry). A researcher reconciled coding disagreements exceeding 5% of the highest total score between the two coders. Smaller disagreements were resolved by the two coders themselves. Overall, we think that this coding process provides a reliable measure of environmental reporting. Internal consistency estimates (Cronbach's alpha on score components) show that the variance is quite systematic (from alpha 0.72 for environmental disclosure-Press releases to 0.82 for paper-based environmental disclosure).

3.2.1 *Determinants of share price volatility*

Prior studies on the determinants of information asymmetry between managers and investors suggest numerous determinants other than voluntary disclosure (Leuz and Verrecchia, 2000). Based on that literature, we use systematic risk, free float and analyst following as determinants of share price volatility.

Systematic risk. The higher a firm's systematic risk, the more difficult it is for investors to precisely assess a firm's value and the more likely they are expected to incur information costs to assess its risk drivers. Prior research shows that investors charge a higher cost of equity for firms with higher systematic risk (e.g. Leuz and Verrecchia, 2000; Hail and Leuz, 2006; Botosan and Plumlee, 2005; Mikhail, Walther and Willis, 2004; Gebhardt, Lee and Swaminathan, 2001; and Botosan, 1997). A positive relation is expected between systematic risk and share price volatility.

Free float. We use free float as an inverse proxy for the presence of insiders since control blocks have generally superior access to private information (Leuz and Verrecchia, 2000). Hence, we expect a negative association between free float and share price volatility.

Analyst following. Prior studies (Atiase and Bamber, 1994; Imhoff and Lobo, 1992; Marquardt and Wiedman, 1998) argued that analyst following proxies for a firm's information that is publicly available. More specifically, Roulstone (2003) documents results that are consistent with analysts reducing information asymmetry by providing public information to market participants, while there is no support for analyst following functioning as a proxy for privately held information. A firm's analyst following is often used as a proxy for the level of other disclosures and the extent of a firm's communication with financial analysts (Leuz, 2003). Hence, we expect a negative relation between analyst following and share price volatility.

Environmental and social disclosures. For testing our substitution hypothesis, we use Environmental disclosure in interaction with a binary variable Social disclosure greater than the sample median.

Three variables are introduced to capture the impact of corporate governance attributes as a monitoring factor: Board independence; Board size; and Audit committee.

Board independence. We expect board independence, measured as the proportion of outside directors, to be associated with share price volatility. Another aspect of board independence is the separation of the roles of Chair and Chief Executive Officer. Rechner and Dalton (1991) show that an independent leadership structure in which two different persons are posted as Chair and CEO monitors the top management effectively. Our variable takes the value of zero (0) when the majority of directors are not independent, one (1) when the majority of directors are independent and two (2) when the majority of directors are independent, and the function of CEO and Chair of the board is separate. We expect a negative relationship between this variable and share price volatility.

Board size. Some prior studies (e.g. Golden and Zajac, 2001; Vafeas, 1999) assume the relationship between board size and information asymmetry to be an inverted “U” shaped, with an optimal board size existing midway. Below this optimal or the most efficient board size, there is a positive relation between board size and information asymmetry followed by a negative relationship. To account for the possible non-linear relationship between board size and information asymmetry, we will include board size as well as board size squared in our models. Hence, we expect board size to be negatively associated with share price volatility.

Audit committee size. In Canada, audit committees must comprise at least three independent members. We can argue that three is a small number for the audit committee to play

effectively its monitoring role and that adding a few more members could be beneficial in that regard. Hence, we expect audit committee size to be negatively associated with share price volatility.

3.2.2 *Determinants of environmental disclosure*

Environmental performance. Many authors examine the association between environmental disclosure in annual reports and a firm's environmental performance. Results are mixed. Ingram and Frasier (1980), Jaggi and Freedman (1982), Wiseman (1982), Rockness (1985), Freedman and Wasley (1990), and Fekrat, Inclan and Petroni (1996) do not find a significant association between environmental disclosure (in the annual report or in the 10K report) and the CEP index of environmental performance while Patten (2002a) establishes a negative relationship. Some recent works document a positive association between environmental performance and the extent of discretionary environmental disclosures (Clarkson, Li, Richardson and Vasvari, 2008; Al-Tuwaijri, Christensen and Hughes II, 2004). According to Al-Tuwaijri, Christensen and Hughes (2004), a positive relationship conjectures that prior literature's mixed results describing their interrelations may be attributable to the fact that researchers have not jointly considered Environmental disclosure, Environmental performance, and Economic performance. Legitimacy theory predicts a negative association between environmental performance and environmental disclosure. This relationship suggests that environmental disclosure is a function of social and political pressures facing firms (Aerts and Cormier, 2009). Environmental performance is computed by summing Canada's *National Polluting Release Inventory* (NPRI) of all facilities for an individual company in pounds deflated by \$1,000 of sales (Clarkson, Li, Richardson and Vasvari, 2008; Aerts and Cormier, 2009). To

facilitate the interpretation of the results, we reverse the sign of this variable. In other words, the larger this measure is, the better the environmental performance. Consistent with prior studies on legitimacy theory (e.g. Patten, 2002a; Aerts and Cormier, 2009), we expect a negative relation between environmental disclosure and environmental performance.

Free float. Ownership structure can determine the level of monitoring and, thereby, the extent of disclosure (Eng and Mak, 2003). Firms with widely-held ownership are expected to be responsive to public investors' information costs since no dominant shareholders typically have access to the information they need (Hope, 2003) and do want or need to share it with other stakeholders such as employees (Roe, 2003). Therefore, a positive relation is expected between free float and disclosure.

Analyst following. Lang and Lundholm (1996) and Healy, Hutton and Palepu (1999) find a positive relation between analyst following and the quality of a firm's disclosure. Hence, we expect a positive relationship between analyst following and the extent of disclosure.

Leverage. Roberts (1992), Richardson and Welker (2001) and Elijido-Ten (2004) do not find any significant relationship between leverage and social disclosure while Clarkson, Li, Richardson and Vasvari (2008) find a positive relationship between leverage and environmental disclosure based on Global Reporting Initiative Guidelines. Conversely, Cormier and Magnan (2003) document a negative relationship between leverage and environmental disclosure.² Since the actual impact of leverage on environmental disclosure is unclear, no directional predictions are made for the variable.

Profitability. Many studies document a positive association between a firm's level of disclosure and its financial performance (Mills and Gardner, 1984; Cochran and Wood, 1984;

²

An explanation for the inverse relationship (positive association for social disclosure and negative association for environmental disclosure) could be that social disclosure is more likely to be good news than environmental disclosure.

McGuire, Sundgren and Schneeweis, 1988; Cormier and Magnan, 2003). Firms with superior earnings performance have a higher propensity to reveal their “good news”. Hence, Murray, Sinclair, Power and Gray (2006) document that firms with consistently higher returns tend to have higher levels of total and voluntary social and environmental disclosure. In this vein, we expect a positive relationship between profitability and environmental disclosure.

Firm Size. Prior evidence is consistent in showing a positive relation between the extent of corporate disclosure and firm size (Scott, 1994; Neu, Warsame and Pedwell, 1998). Firm size proxies also other factors, such as the extent of monitoring by analysts. Firm size, measured as $\ln(\text{Assets})$, is introduced with an expectation of a positive relation with disclosure.

Governance and media monitoring. Three variables are introduced to capture the impact of corporate governance as a monitoring factor affecting governance disclosure: Board independence; Board size; and Audit committee size. We expect a positive relationship between board effectiveness and disclosure. As for board size, to control for non-linearity in the relationship between board size and disclosure, we will include board size and board size squared in our models. Hence, we expect board size to be positively related to disclosure.

Environmental news exposure. A number of studies document that higher levels of media exposure relative to environmental issues increase public concerns and thus public policy pressure, to which companies react through greater environmental disclosure (Brown and Deegan, 1998; Deegan, Rankin and Voght, 2000; Patten, 2002b; Li, Richardson and Thornton, 1997; Bewley and Li, 2000). Hence, a positive relationship is expected between environmental media coverage and environmental disclosure as well as social disclosure.

3.2.3 Variable measurement

Variable	Measure
Systematic risk	Beta
Free float	The percentage of shares that are not closely held (total shares outstanding minus control blocks of 10% or more).
Analyst following	Number of analysts following a firm.
Leverage	Long term debt / Total assets
Profitability	Return on assets
Firm size	Ln(Total Assets) as of year-end
Board independence	(0) if a majority of directors are not independent; (1) if a majority of directors are independent; (2) if a majority of directors are independent and if the function of CEO and Chair of the board is separated.
Board size	Number of directors on the board.
Audit committee size	Number of audit committee members.
Environmental performance	Toxic release inventory (TRI) of all facilities for an individual company in pounds deflated by \$1,000 of sales.
Environmental news exposure	Articles related to environmental issues in 2004.

4. Results

4.1 Descriptive statistics

Table 1 provides some descriptive statistics about sample firms' financial and governance variables. Sample firms are relatively large (total assets averaging 5 billion dollars) and followed by seven analysts on average. About 78% of sample firms are free float. Systematic risk is close to the stock market risk, averaging 1.10 suggesting that our sample is a good representation of the Toronto Stock Exchange. Our sample firms have independent directors in a proportion of 36% while CEO and board chair duality in 20%.

[Insert table 1]

As illustrated in Table 2A, environmental disclosure in annual/environmental reports (22.29) is on average twice as web-based disclosure (11.03) while the mean score reach 4.13 for

environmental press releases. On average, social disclosure score is close to annual/environmental report disclosure with a mean score of 16.62. Internal consistency estimates (Cronbach's alpha on score components) show that the variance is quite systematic (alpha varying from 0.72 to 0.82 for different components). This is slightly higher than Botosan (1997) who finds an alpha of 0.64 for an index including five categories of disclosure in annual reports. Cronbach's alpha estimates the proportion of variance in the test scores that can be attributed to true score variance. It can range from 0 (if no variance is consistent) to 1.00 (if all variance is consistent). According to Nunnally (1978), a score of 0.70 is acceptable.

Aerts and Cormier (2009) distinguish between hard (economic-based) and soft environmental information, with soft environmental disclosure being more incentive-consistent than economic-based disclosure. Economic-based types of information focus on the financial, legal and operational consequences of corporate environmental activities. This type of information is mainly comprised within the following four components of our content grid: expenditure and risk; compliance with laws and regulations; pollution abatement; and land remediation and contamination, whereas soft information relates to the 'sustainable development' and 'environmental management' grid captions. Disclosure about sustainable development and environmental management is likely to be more discretionary, less factual and objective, and easier to imitate even without substance to support the claims made. In table 2B, we observe higher economic-based environmental information in paper environmental reports compared with the web and press releases. Finally, among social disclosure components, the highest mean scores are observed for employment opportunities (2.04), gifts and sponsorships (2.84), and community involvement (4.13).

[Insert table 2]

Table 3 presents correlations. Paper-based environmental disclosure (-0.12), Social disclosure (-0.22), Board size (-0.36), Profitability (-0.45) and Firm size (-0.46) are negatively and significantly correlated with Share price volatility. Environmental performance is correlated with Paper-based environmental disclosure (-0.36), Web-based environmental disclosure (-0.18), Press releases environmental disclosure (-0.66), and Social disclosure (-0.26), indicating that poor environmental performers are inclined to communicate more environmental information. This result is consistent with prior research arguing that environmental disclosure is a function of social and political pressures facing firms (Patten, 2002a). Environmental news exposure is positively associated with Environmental disclosure (Paper: 0.33, Web: 0.34, Press releases: 0.34) and Social disclosure (0.35).

Finally, Social disclosure is correlated with Environmental disclosure (Paper, 0.40; Web, 0.46; Press releases, 0.34). Interestingly, results (not tabulated) show that those correlations are essentially explained by hard social disclosure components (regional development, accidents at work, health and safety programs, products development and environment).

[Insert table 3]

4.2 *Multivariate analyses*

Since we posit that a firm's information dynamics affect environmental disclosure and share price volatility simultaneously, we first assess whether or not endogeneity exists between these variables using a Hausman test. Using this procedure, we reject the null hypothesis of no endogeneity with respect to Share price volatility and Paper-based environmental disclosure ($t=3.49$; $p < 0.00$). Therefore, environmental disclosure variables are treated as endogenous

variables. In light of this diagnostic, we rely on a two-stage estimation procedure for a system of simultaneous equations. The software being used is STATA.

Table 4 reports results of a two-stage least square estimation. First, we discuss results for the model including the three environmental media disclosures. Consistent with substitution hypothesis (H1a), the interaction term Paper-based environmental * Social is positive and significant (0.006; $p < 0.05$), suggesting a substitution effect between social disclosure and environmental disclosure in reducing stock market asymmetry. Results show a negative and significant relationship between share price volatility and the extent of paper-based environmental disclosure (-0.007; $p < 0.01$). Concerning environmental information communicated by press releases, we observe that, in absence of social disclosure, it increases asymmetry in the stock markets (0.064; $p < 0.01$). However, we observe that for highly social disclosing firms, social disclosure cancels out the effect of environmental press releases (0.064; -0.063) on share price volatility.

Coefficients for variables Web-based environmental disclosure are not significant. An explanation for this result might be that firms use the web to communicate less factual information, perceived less credible by market participants. For our sample, on average, 76% of web scores and 74% of press release scores are soft disclosure (sustainable development and environmental management).

Results also suggest that audit committee size is associated with a reduction of share price volatility (-0.167; $p < 0.01$). This suggests that a larger audit committee may play effectively its monitoring role and that adding a few more members could be beneficial in reducing stock market asymmetry.

Results remain similar when we include only one environmental disclosure medium at a time in the regressions. Moreover, if we drop social disclosure from our models, keeping only environmental disclosure in the regressions, both Paper-based environmental (-0.015; $p < 0.01$) and Web-based environmental (-0.030; $p < 0.01$) are associated to a reduction in share price volatility, while Press-releases environmental is still positively related with share price volatility (0.006; $p < 0.05$). This suggests that web disclosure replicates to large extent environmental information contained in the annual/environmental report.³

[Insert table 4]

Concerning the determinants of environmental disclosure, we observe from table 5 that environmental performance, environmental news exposure, analyst following and firm size are key drivers of environmental disclosure. To a lesser extent, leverage and board size are related to environmental disclosure.

[Insert table 5]

As a first sensitivity analysis, we estimate our model keeping only soft disclosure as expressed by the two following disclosure components: sustainable development, and environmental management. Results presented in table 6 show that the coefficients for variable Paper-based environmental disclosure (-0.013; $p < 0.25$ two-tailed) and Web-based environmental disclosure (0.001; $p < 0.85$ two-tailed) are not significant while the coefficient for the variable Press

³ A principal component factor analysis shows that two factors emerge (explaining 66% of the cumulative variance): (1) Press releases environmental disclosure (0.87), environmental performance (0.92); (2) Paper-based environmental disclosure (0.68), Web-based environmental disclosure (0.82), social disclosure (0.69) and Environmental news exposure (0.68). This suggests that environmental disclosure (paper and web) and social disclosure are part of an integrated reporting strategy. This might explain why we observe a substitution effect between social disclosure and environmental disclosure in reducing the information asymmetry between managers and investors.

releases (0.058; $p < 0.01$) remains significant. This result suggests that only hard environmental disclosure is associated with a reduction in asymmetry between managers and investors. This is consistent with the hypothesis regarding the medium for disclosure (H2) since we observe a substitution effect between social disclosure and environmental disclosure in reducing the information asymmetry only for paper-based disclosure.

[Insert table 6]

As a second sensitivity analysis, we replace share price volatility by trading volume as a proxy for asymmetry in stock markets. Trading volume is defined as shares traded for 2005 divided by shares outstanding at year-end. The model is the following:

Dependent variable

Trading volume_{it} =

$$f(\beta_0 + \beta_1 \text{Free float} + \beta_2 \text{Share price volatility} + \beta_3 \text{Environmental disclosure} + \beta_4 \text{Environmental disclosure} * \text{Social disclosure} + \beta_5 \text{Social disclosure} + \beta_6 \text{Board independence} + \beta_7 \text{Board size} + \beta_8 \text{Board size squared} + \beta_9 \text{Audit committee size})_{it}$$

Instrumented variable: Environmental disclosure

Instruments: Share price volatility, Environmental performance, Free float, Analyst following, Leverage, Profitability, Firm Size, Board independence, Board size, Board size squared, Audit committee size, Environmental news exposure

Results shown in table 7 support those presented in table 4. Paper-based environmental is associated with an increase in trading volume (0.006; $p < 0.01$). Consistent with hypothesis 1a, the interaction term Paper-based environmental * Social is negative and significant (-0.004; $p < 0.05$), suggesting a substitution effect between social disclosure and environmental disclosure in reducing stock market asymmetry (increasing trading volume). Concerning environmental information communicated by press releases, we observe that, in absence of social disclosure, it leads to reduction of trading volume, i.e. an increase in asymmetry in the stock market (-0.017; $p < 0.01$).

[Insert table 7]

5. Conclusion

Most prior research on corporate social responsibility (CSR) disclosure has considered environmental and social components as additive or complementary. In this paper, we explore the substitution effect between social disclosure and environmental disclosure in reducing information asymmetry between managers and investors. In addition, we attempt to show the association between different environmental disclosure sources and information asymmetry. We code environmental disclosure from three complementary sources: annual/environmental report, web page and press releases.

Our results show that social disclosure and paper-based environmental disclosure substitute each other in reducing stock market asymmetry. Moreover, environmental information communicated on the web page is not related to a reduction in information asymmetry when we consider social disclosure. Hence, it appears that the use of the web as a disclosure platform is more tactical than that of the more comprehensive and longer-term oriented

annual/environmental report disclosures. With regard to environmental information communicated by press releases, we observe that, in absence of social disclosure, it increases asymmetry in the stock markets.

Two approaches coexist in the measurement of CSR disclosure. On the one hand, starting with Wiseman (1982) and continuing with Cormier and Magnan (2003), Aerts and Cormier (2008) and Clarkson, Richardson and Vasvari (2008), disclosure is arrived by coding the nature of the information being provided. In other words, the information being disclosed is weighted according to its perceived relevance. On the other hand, there is a considerable body of research in which content is inferred by counting the number of words or sentences contained in annual or social responsibility reports (e.g., Neu et al., 1998; Richardson and Welker, 2001). Our results strongly indicate that investors assess the nature of the information being provided and distinguish more words from more substantive disclosures (e.g., hard disclosure vs. soft disclosure). In addition, future research in CSR disclosure may fruitfully distinguish between social and environmental disclosure as well as communication devices.

We also show that audit committee size is associated with a reduction in information asymmetry. This suggests that a larger audit committee may play effectively its monitoring role and contribute to reduce stock market asymmetry.

Regarding the determinants of environmental disclosure, our results show that environmental performance, environmental news exposure, leverage, and firm size are key drivers of disclosure. More specifically, we find that a firm's environmental performance directly affects its environmental disclosure, with high polluting firms disclosing more than low polluting firms. This result is in stark contrast with the evidence by Clarkson, Richardson and Vasvari (2008) that poor (good) environmental performance translates into less (more) disclosure. Our

finding corroborates prior research that relies on legitimacy theory (Cho and Patten, 2007; Aerts and Cormier, 2009). Hence, the issue is still unresolved and warrants further research.

We also document that a firm's governance influences the extent of its environmental disclosure and, ultimately, affects information asymmetry between managers and investors. These findings are consistent with those reported by Bushman, Chen, Engel and Smith (2003) for the determination of financial reporting.

To the best of our knowledge, our study is the first to investigate the substitution effect of social disclosure for environmental disclosure, taking into account social disclosure, environmental performance and governance attributes.

The results of this study should be interpreted with caution at least for three reasons. First, our measure of social and environmental disclosures is based upon a coding instrument that makes some explicit assumptions about the value and relevance of information. However, such an approach is consistent with recent research efforts (e.g., Clarkson, Richardson and Vasvari, 2008). Second, sample size may be an issue. However, sample firms do represent a wide cross-section of Canada's industries as well as a significant proportion of the country's total stock market capitalization.

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Table 1
Descriptive statistics
Financial and governance variables

N: 137	Min.	Max.	Mean	Standard deviation
Share price volatility	0.818	8.828	2.135	1.228
Trading volume	0.001	3.733	0.769	0.588
Systematic risk	-0.200	2.800	1.101	0.577
Free float	0.098	1.000	0.777	0.225
Analyst following	0	35	7	5.892
Board independence	0	2	0.919	0.513
<i>Independent directors</i>	0	0.860	0.360	0.178
<i>Board chair duality</i>	0	1	0.200	0.401
Board size	4	18	10	2.718
Audit committee size	3	9	4	1.106
Leverage	0	0.99	0.232	0.203
Profitability	-1.151	0.387	0.025	0.139
Firm size (in million\$)	25	39 000	5 057	7 389

Table 2A
Descriptive statistics
Environmental and social disclosures

N: 137	Min.	Max.	Mean	Standard Deviation	Cronbach Alpha
Environmental news exposure	0	6	0.366	0.944	--
Environmental performance	0	25.78	0.735	2.530	--
Paper-based environmental	0	134	22.293	31.749	0.82
Web-based environmental	0	105	11.027	17.895	0.75
Press releases environmental	0	99	4.127	13.567	0.72
Social	0	71	16.620	15.568	0.77

Table 2B
Descriptive statistics
Environmental and social disclosures by components

N: 137	Paper-based environmental	Web-based environmental	Press releases environmental	Social
Expenditures and risks	3.227	0.246	0.180	
Laws and regulations conformity	2.040	0.206	0.173	
Pollution abatement	5.033	3.147	0.222	
Sustainable development	2.360	2.347	1.007	
Land remediation and contamination	5.060	0.940	0.313	
Environmental management	4.573	4.140	2.233	
Purchases of goods and services				0.047
Employment opportunities				2.040
Job creation				0.333
Equity programs				0.467
Human capital development				0.333
Regional development				0.393
Gifts and sponsorships				2.840
Accidents at work				0.387
Health and safety programs				0.953
Product-related-incidents				0.167
Products development and environment				1.280
Product safety				0.387
Business ethics				1.180
Strategic alliances				0.907
Community involvement				4.127
Social activities				0.447
Other				0.313
Total	22.293	11.027	4.127	16.620

Table 3
Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Share price volatility	1	*0.29	0.03	-0.08	*-0.12	-0.06	-0.07	*-0.22	-0.02	*-0.36	-0.31	-0.01	-0.07	*-0.45	*-0.46	-0.10
2 Systematic risk		1	*0.19	*0.24	0.02	*0.16	0.05	*0.15	0.05	-0.03	-0.01	-0.05	*-0.14	0.10	*0.13	-0.01
3 Free float			1	*0.12	-0.03	0.02	0.01	0.05	0.14	-0.08	0.05	0.01	*-0.30	-0.03	-0.06	0.01
4 Analyst following				1	-0.03	0.03	0.02	*0.18	-0.12	0.02	0.04	-0.02	*-0.29	0.10	*0.14	*0.13
5 Paper-based environmental					1	*0.52	*0.36	*0.40	-0.01	*0.13	*0.12	*-0.36	-0.01	*0.14	*0.40	*0.33
6 Web-based environmental						1	*0.19	*0.46	-0.05	*0.29	*0.27	*-0.18	0.02	*0.12	*0.43	*0.34
7 Press releases Environmental							1	*0.34	-0.02	*0.18	0.09	*-0.66	0.09	0.02	*0.29	*0.34
8 Social								1	0.01	*0.35	*0.35	*-0.26	0.05	*0.16	*0.53	*0.35
9 Board independence									1	0.09	0.07	-0.02	*-0.14	-0.10	-0.07	-0.08
1 Board size										1	*0.55	*-0.13	*0.17	*0.16	*0.54	0.8
11 Audit committee size											1	*-0.18	0.11	*0.19	*0.38	0.07
1 Environmental performance												1	0.07	-0.07	*-0.22	-0.09
2 Leverage													1	0.07	*0.29	0.01
3 Profitability														1	*0.29	0.07
4 Firm size															1	*0.23
5 Environmental news exposure																1
6																

Table 4
2SLS Estimation of the Relationship between
Environmental and Social Disclosures and Share Price Volatility

	Share price volatility				
	Environmental Paper-Web- Press releases	Paper-based environmental	Web-based environmental	Press releases environmental	
Share price volatility					
Systematic risk	+	***0.732	***0.762	***0.750	***0.781
Free float	-	0.330	0.204	0.194	0.279
Analyst following	-	**-0.030	**-0.031	**-0.031	**-0.031
Paper-based environmental	-	***-0.007	**-0.005	-	-
Web-based environmental	-	0.002	-	-0.002	-
Press releases environmental	-	***0.064	-	-	***0.059
Paper-based environmental*Social	?	**0.006	**0.005	-	-
Web-based environmental*Social	?	0.004	-	0.007	-
Press releases environmental*Social	?	***-0.063	-	-	***-0.059
Social	-	***-0.398	***-0.337	***-0.397	***-0.285
Board independence	-	0.182	0.184	0.192	0.177
Board size	-	-0.206	-0.222	*-0.252	-0.231
Board size squared	+	0.006	0.007	0.009	0.007
Audit committee size	-	***-0.167	***-0.159	***-0.171	***-0.156
Adjusted R ²		32.7%	30.3%	30.4%	31.2%
Chi2 (P value)		5.84(0.000)	5.56(0.000)	6.33(0.000)	6.99(0.000)
Environmental (without Social)			***-0.015	***-0.030	**0.006

Table 5
OLS Estimation of the Determinants of
Environmental Disclosure

		Paper-based environmental	Web-based environmental	Press releases environmental
Environmental performance	-	***-2.809	0.195	***-3.582
<i>Information costs and benefits</i>				
Free float	+	-2.768	1.362	*4.399
Analyst following	?	***-0.875	-0.246	0.065
Leverage	?	*-22.551	*-12.238	***15.917
Profitability	+	1.683	-5.249	** -7.711
Firm size	+	***7.984	***3.742	-0.177
<i>Governance and media monitoring</i>				
Board independence	+	1.223	-1.415	0.213
Board size	+	***12.988	***5.608	1.463
Board size squared	-	***-0.693	** -0.247	-0.040
Audit committee size	+	1.519	**2.319	** -1.629
Environmental news exposure	+	***8.903	***4.790	***4.432
Adjusted R ²		37.9%	28.7%	59.9%
F statistic (P value)		5.74(0.000)	4.38(0.00)	12.1(0.00)

Table 6
2SLS Estimation of the Relationship between
Environmental and Social Disclosures and Share Price Volatility
Soft environmental disclosure (Sustainable development and environmental management)

		Share price volatility		
		Paper-based environmental	Web-based environmental	Press releases environmental
Share price volatility				
Systematic risk	+	***0.768	***0.757	***0.782
Free float	-	0.195	0.126	0.280
Analyst following	-	**-0.032	**-0.031	**-0.031
Paper-based environmental	-	-0.013	-	-
Web-based environmental	-	-	0.001	-
Press releases environmental	-	-	-	***0.058
Paper-based environmental*Social	?	0.013	-	-
Web-based environmental*Social	?	-	*0.012	-
Press releases environmental*Social	?	-	-	***-0.059
Social	-	***-0.332	***-0.428	***-0.281
Board independence	-	0.181	0.203	0.173
Board size	-	-0.230	*-0.262	-0.211
Board size squared	+	0.008	0.009	0.007
Audit committee size	-	***-0.161	***-0.166	***-0.156
Adjusted R ²		30.2%	30.7%	31.3%
Chi2 (P value)		5.42(0.000)	6.87(0.000)	6.98(0.000)
Soft environmental (without Social)		**-0.007	**0.018	**0.007

Table 7
2SLS Estimation of the Relationship between
Environmental and Social Disclosures and Trading Volume

		Trading Volume		
		Paper-based environmental	Web-based environmental	Press releases environmental
Share price volatility				
Free float	+	***0.686	***0.714	***0.656
Share price volatility	+	**0.088	**0.081	**0.086
Paper-based environmental	+	***0.006	-	-
Web-based environmental	-	-	-0.002	-
Press releases environmental	-	-	-	***-0.017
Paper-based environmental*Social	?	**-0.004	-	-
Web-based environmental*Social	?	-	0.005	-
Press releases environmental*Social	?	-	-	***0.015
Social	+	**0.156	**0.161	**0.181
Board independence	+	-0.108	-0.117	-0.119
Board size	+	-0.200	-0.167	-0.161
Board size squared	-	0.009	0.007	0.007
Audit committee size	+	*0.051	*0.052	*0.054
Adjusted R ²		19.1%	16.5%	16.8%
Chi2 (P value)		5.36(0.000)	5.30(0.000)	8.34(0.000)
Environmental (without Social)		**0.003	0.002	**-0.003

Appendix 1

Environmental disclosure grid

Expenditures and risks	Sustainable development
Investments	Natural resource conservation
Operation costs	Recycling
Future investments	Life cycle information
Future operating costs	Land remediation and contamination
Financing for investments	Sites
Environmental debts	Efforts of remediation
Risks provisions	Potential liability- remediation
Risks litigations	Implicit liability
Provision for future expenditures	Spills (number, nature, efforts of reduction)
Laws and regulations conformity	Environmental management
Litigations, actual and potential	Environmental policies or company concern for the environment
Fines	Environmental management system
Orders to conform	Environmental auditing
Corrective actions	Goals and targets
Incidents	Awards
Future legislation and regulations	Department, group, service affected to the environment
Pollution abatement	ISO 14000
Emission of pollutants	Involvement of the firm to the development of environmental standards
Discharges	Involvement to environmental organizations (industry committees, etc)
Waste management	Joint projects with other firms on environmental management
Installation and process controls	
Compliance status of facilities	
Noise and odours	

Rating scale:

3: Item described in monetary or quantitative terms; 2: Item described specifically; 1: Item discussed in general

Social disclosure

Purchases of goods and services
Employment opportunities
Job creation
Equity programs
Human capital development
Regional development
Gifts and sponsorships
Accidents at work
Health and safety programs
Product-related-incidents
Products development and environment
Product safety
Business ethics
Strategic alliances
Community involvement
Social activities
Other

Rating scale:

3: Item described in monetary or quantitative terms; 2: Item described specifically; 1: Item discussed in general

Appendix 2

News media content

News media content is extracted from the ABI/Inform Global database and from three distinct sources:

(1) *Business, Economics: local and regional business publications* (local and regional business news coverage of large corporations, privately held companies, local start-ups, executive profiles, marketing, finance, and industry news. ABI Inform provides access to business information not typically found in national news sources. It contains news and analysis, information on local markets, and more data gathered from major business tabloids, magazines, daily newspapers, wire services, and city, state, and regional business publications;

(2) *Business, Finance, Economics: journals, company profiles, Wall Street Journal* (most scholarly and comprehensive way to explore and understand business research topics. It includes nearly 1,800 worldwide business periodicals for in-depth coverage of business and economic conditions, management techniques, theory, and business practices, advertising, marketing, economics, human resources, finance, taxation, computers, and more. It constitutes extensive international coverage with quick access to information on more than 60,000 companies with business and executive profiles);

(3) *Canadian Newsstand*, which offers unparalleled access to the full text of Canadian newspapers (Montreal Gazette, National Post and Toronto Star). We extracted articles using a firm's name and the following keywords: "environment", "sustainable development", "recycling", "pollution", "toxic", "ISO14000", "conservation", "remediation", "spills", "waste management", "energy", "awards", "environmental audit".