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Social and Environmental Disclosures: Substitutes or Complements?

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Abstract

Most prior research on corporate social responsibility (CSR) disclosure considers environmental and social components as additive or complementary. In this paper, we extend the existing literature on CSR by investigating the substitution effect of social disclosure and environmental disclosure in reducing information asymmetry between managers and investors. We also attempt to study the association between different environmental disclosure sources and information asymmetry. Our results suggest that social disclosure and paper-based environmental disclosure substitute each other in reducing stock market asymmetry. 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 might fruitfully distinguish between social and environmental disclosure as well as communication devices. Moreover, as expected, we observe that environmental performance is negatively associated with environmental disclosure. Our results also show that environmental news exposure and firm size are key drivers of environmental disclosure.

Key words: Social disclosure, governance attributes, environmental disclosure, information asymmetry.

L'information sociale et l'information environnementale :

Substituts ou compléments ?

Résumé

La plupart des études en divulgation de la responsabilité sociale des entreprises considèrent l'information sociale et environnementale comme additive ou complémentaire. Dans la présente étude, nous analysons l'effet de substitution du discours social et environnemental dans la réduction de l'asymétrie informationnelle sur les marchés boursiers. Nous analysons également le lien entre les différents médias de communication environnementale et l'asymétrie informationnelle. Nos résultats montrent que la divulgation sociale et la divulgation environnementale dans le rapport annuel agissent comme substituts dans la réduction de l'asymétrie informationnelle alors que l'information environnementale communiquée sur le web ou par des communiqués de presse n'a pas d'impact sur l'asymétrie informationnelle. Ces résultats nous portent à croire que les recherches futures en divulgation de la responsabilité sociale devraient distinguer le volet social du volet environnemental de même que le mode de communication. Nos résultats montrent également que le discours environnemental est associé à la performance environnementale, à l'exposition médiatique et à la taille de la firme.

Mots-clés : Divulgation sociale, divulgation environnementale, gouvernance, asymétrie d'information.

Introduction

An unresolved research issue in corporate social responsibility (CSR) disclosure research is the role played by social disclosure in stakeholders' interpretation of environmental disclosure. There is anecdotal and empirical evidence suggesting that investors are attracted by 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). While most prior research on CSR disclosure considers environmental and social components as additive or complementary (e.g. Ingram, 1978; Patten, 1991), Neu, Warsame and Pedwell (1998) treat social disclosure as a determinant of environmental disclosure. They argue that social disclosure helps to frame the interpretation of environmental disclosures. The current study investigates 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 attempt to assess which of the environmental disclosure medium is more associated with a reduction in information asymmetry in the stock markets. Environmental disclosure is collected 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 communicated on the web page or press releases is not related to a reduction in information asymmetry. These observations suggest that future research in CSR disclosure might fruitfully distinguish between social and environmental disclosure as well as communication devices.

As expected, we observe that environmental performance is negatively associated with environmental disclosure. Finally, concerning the determinants of disclosure, our results show 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 by showing that voluntary social disclosure as well as environmental disclosure provides different insights into how a firm creates value, information deemed useful by investors (e.g., Bushman, Chen, Engel and Smith, 2003). 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.

To the best of our knowledge, our study is the first to investigate the 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 Disclosure and information asymmetry

Social capital, relying on 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 capital facilitates various important organizational actions such as inter-unit and inter-firm learning, thus contributing to their success. Moreover, by building up of social capital, 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 social capital 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 with extensive social capital exhibit a competitive advantage in the new global marketplace

Shane and Cable (2002) show how direct and indirect network ties between entrepreneurs and potential investors, especially venture capitalists, bridge the information gap and facilitate the financing of new ventures. However, 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 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 might 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).

Press releases can be used in a more timely, more elaborate and focused fashion and with more expressive language than annual report disclosures to confront sensitive environmental issues. They may also be more effective in signalling commitment. In this vein, their use will be more tactical than that of the more comprehensive and longer-term characteristic of annual report disclosures (Aerts and Cormier, 2009). Moreover, in concert with the main theme of the strategic legitimacy perspective on environmental reporting, Aerts and Cormier (2009) show that negative media legitimacy is a significant driver of environmental press releases, which is not the case for annual report environmental disclosures.

2.2 Hypotheses

Prior research documents a negative relationship between environmental disclosure and information asymmetry (Barth and McNichols, 1994; Clarkson, Li and Richardson, 2004; Cormier and Magnan, 2007; Aerts, Cormier and Magnan, 2008). With respect to social disclosure, Richardson and Welker (2001) find, contrary to expectations that more disclosure

translates into higher cost of capital. One potential explanation for this finding is that they do not control for endogeneity between disclosure and firm attributes.

There is anecdotal and empirical evidence suggesting that investors are attracted by 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). 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.

While most prior research on corporate social responsibility reporting (CSR) considers environmental and social components as additive or complementary (e.g. Ingram, 1978; Patten, 1991), 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. Hence, the role played by social disclosure in stakeholders' interpretation of environmental disclosure, and vice versa, remains an unresolved issue.

In absence of empirical evidence whether 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 hypothesis:

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

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

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 legitimation effects. They primarily distinguish between litigation related and non-litigation related disclosure. Although our coding grid does not incorporate a clear distinction between litigation related and non-litigation related information, we can distinguish between hard disclosure (economic-based) more present in paper-based annual report and soft environmental disclosure (more current on the web and press releases), with soft environmental disclosure being more incentive-consistent than economic-based 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.

Aerts, Cormier and Magnan (2008) find that the value relevance underlying a firm's environmental disclosure differs depending on the diffusion media being used. Paper-based environmental disclosure, containing more hard disclosure, leads to a reduction in analysts' forecast dispersion while web-based environmental disclosure does not affect analysts' forecast dispersion. 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, we propose our second hypothesis:

> *H2: The negative relationship between environmental disclosure and information asymmetry between managers and investors will be higher for paper-based annual/environmental report than for disclosure on the web or by press releases.*

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.

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. To ensure that our sample comprised firms with active information dynamics and investors interest, we selected firms that were followed by at least two financial analysts. 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. The sample firms represent more than 60% of the Toronto Stock Exchange stock market capitalization for non-financial firms. 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.

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 (i.e. with employees) (e.g. Dess and Shaw, 2001; Pastoriza, Arino and Ricart, 2008). Our measure of social disclosure comprises only information that is on a firm's Web site and provided in an HTML format.[1] Social indicators are based on balance scorecard literature and performance measurement practices (e.g. Pirchegger and Wagenhofer, 1999; Marston and Polei,

1 Twenty-two firms published a distinct environmental/sustainability report in 2005. For those firms, we observe a larger mean score of social disclosure on the web page (near 50% in average). Therefore, we argue that our disclosure scores capture the overall social disclosure.

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.[2]

We also 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 the details of collection of environmental news exposure).

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 structural equations summarize the approach adopted in the empirical analysis (we will use trading volume in place of share price volatility as a sensitivity analysis):

2 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).

Dependent variable

Share price volatility $_{it}$ =

$f(\delta_0 + \delta_1$ Systematic risk $+ \delta_2$ Free float $+ \delta_3$ Analyst following $+ \delta_4$ Environmental disclosure $+ \delta_5$ Environmental disclosure*Social disclosure $+ \delta_6$ Social disclosure $+ \delta_7$ Board independence $+ \delta_8$ Board size $+ \delta_9$ Board size squared $+ \delta_{10}$ Audit committee size$)_{it}$

Instrumented

Environmental Disclosure $_{it}$ =

$f(\delta_0 + \delta_1$Environmental performance $+ \delta_2$ Free float $+ \delta_3$ Analyst following $+ \delta_4$ Leverage $+ \delta_5$ Profitability $+ \delta_6$ Firm Size $+ \delta_7$ Board independence $+ \delta_8$ Board size $+ \delta_9$ Board size squared $+ \delta_{10}$ Audit committee size $+ \delta_{11}$ Environmental news exposure$)_{it}$

For the data concerning 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.

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' 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. Goilden and Zajac, 2001; Vafeas, 1999) assume the relationship between board size and information asymmetry to be an inverted "U" shaped, with and 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 and 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 (Clarkson, Li, Richardson and Vasvari, 2008). Environmental performance is computed by summing toxic release inventory (TRI) 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 while Elijido-Ten (2004) does 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.[3] 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; 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

[3] 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.

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(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 freefloat. 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 Nunnaly (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 endogeneous

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. Results show a negative and significant relationship between share price volatility and the extent of paper-based environmental disclosure (-0.007; $p < 0.01$) as well as Social disclosure (-0.398; $p < 0.01$). Consistent with hypothesis 1a, the interaction term Paper-based environmental disclosure * 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. Concerning environmental information communicated by press releases, we observe that, in absence of social disclosure, it increases asymmetry in the stock markets (0.059; $p < 0.01$), and social disclosure substitutes for environmental press releases (0.059; -0.059). Moreover, consisted with hypothesis 2, 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 and keep only environmental disclosure in the regressions, both Paper-based environmental disclosure (-0.015; $p < 0.01$) and

Web-based environmental disclosure (-0.030; $p < 0.01$) are associated to a reduction in share price volatility while Press-releases environmental disclosure 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.[4]

[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 releases (0.058; $p < 0.01$) remains significant. This result suggests that only

4 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.

hard environmental disclosure is associated with a reduction in asymmetry between managers and investors. This is consistent with hypothesis 2.

[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 $_{it}$ =

$f(\beta_0 + \beta_1$ Free float + β_2 Share price volatility + β_3 Environmental disclosure + β_4 Environmental disclosure*Social disclosure + β_5 Social disclosure + β_6 Board independence + β_7 Board size + β_8 Board size squared + β_9 Audit committee size) $_{it}$

Instrumented

Environmental Disclosure $_{it}$ =

$f(\beta_0 + \beta_1$ Share price volatility + β_2 Environmental performance + β_3 Free float + β_4 Analyst following + β_5 Leverage + β_6 Profitability + β_7 Firm Size + β_8 Board independence + β_9 Board size + β_{10} Board size squared + β_{11} Audit committee size + β_{12} Environmental news exposure) $_{it}$

Results shown in table 7 support those presented in table 4. Environmental disclosure-Paper is associated with an increase in trading volume (0.006; $p < 0.01$). Consistent with hypothesis 1a, the interaction term Paper-based environmental disclosure* 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 reporting (CSR) 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. Environmental disclosure is coded from three complementary sources: 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, environmental information environmental information communicated on the web page is not related to a reduction in information asymmetry when we consider social disclosure. This suggests that the use of the web as a disclosure platform is more tactical than that of the more comprehensive and longer-term characteristic of 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.

These findings suggest that future research in corporate social responsibility reporting might fruitfully distinguish between social and environmental disclosure as well as communication devices.

We also show that 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 that adding a few more members could be beneficial in reducing 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.

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). A second potential limitation is that for social disclosure, the paper focuses solely on voluntary web-based disclosure, as such, excluding hyperlinked documents such as annual reports or sustainability report. However, we think that our social disclosure scores capture a firm's overall social disclosure since we observe substantially larger scores of social disclosure on the web page for firms publishing a distinct sustainability report. Finally, 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
Independent directors	0	0.860	0.360	0.178
Board chair duality	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 disclosure	0	134	22.293	31.749	0.82
Web-based environmental disclosure	0	105	11.027	17.895	0.75
Press releases environmental disclosure	0	99	4.127	13.567	0.72
Social disclosure	0	71	16.620	15.568	0.77

Table 2B
Descriptive statistics
Environmental and social disclosures by components

N: 137	Paper-based environmental disclosure	Web-based environmental disclosure	Press releases environmental disclosure	Social disclosure
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 disclosure								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
10	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
12	Environmental performance												1	0.07	-0.07	*-0.22	-0.09
13	Leverage													1	0.07	*0.29	0.01
14	Profitability														1	*0.29	0.07
15	Firm size															1	*0.23
16	Environmental news exposure																1

Table 4
2SLS Estimation of the Determinants of
Environmental and social disclosures and Share Price Volatility

		Share price volatility			
		Environmental disclosure-Paper-Web-Press releases	Paper-based environmental disclosure	Web-based environmental disclosure	Press releases environmental disclosure
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 disclosure (without Social disclosure)			***-0.015	***-0.030	**0.006

Table 5
OLS Estimation of the Determinants of
Environmental and social disclosures and Share Price Volatility

		Paper-based environmental disclosure	Web-based environmental disclosure	Press releases environmental disclosure
Environmental performance	-	***-2.809	0.195	***-3.582
Information costs and benefits				
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
Governance and media monitoring				
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 Determinants of
Environmental and social disclosures and Share Price Volatility
Soft environmental disclosure (Sustainable development and environmental management)

		Share price volatility		
		Paper-based environmental disclosure	Web-based environmental disclosure	Press releases environmental disclosure
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 disclosure (without Social disclosure)		**-0.007	**0.018	**0.007

Table 7

2SLS Estimation of the Determinants of Environmental and social disclosures and Trading Volume

		Trading Volume		
		Paper-based environmental disclosure	Web-based environmental disclosure	Press releases environmental disclosure
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 disclosure (without Social disclosure)		**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".