

# CORPORATE COMMUNICATION AS A GOVERNANCE MECHANISM: A CONTENT ANALYSIS OF CORPORATE PUBLIC DISCLOSURES

Sam Kolahgar<sup>\*</sup>, Azadeh Babaghaderi<sup>\*\*</sup>, Harjeet S. Bhabra<sup>\*\*\*</sup>

<sup>\*</sup> Faculty of Business, University of Prince Edward Island, Canada

<sup>\*\*</sup> Odette School of Business, University of Windsor, Canada

<sup>\*\*\*</sup> Corresponding author, Sobey School of Business, Saint Mary's University, Canada

Contact details: Sobey School of Business, Saint Mary's University, Halifax, NS, B3H 3C3, Canada



## Abstract

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Corporate communication efforts have mainly been viewed as a by-product of governmental regulations and board of directors' oversight. In this paper, we examine the role of corporate communication as a stand-alone governance mechanism. We introduce a new business-related dictionary and conduct automated textual analysis of over 150,000 electronic documents filed by a sample of firms listed on the S&P/TSX Composite Index from 1999 to the end of 2014. Our findings demonstrate the governing role of corporate communication by documenting the adverse market effects of deviations from the expected level of communication. Moreover, as a governance mechanism, corporate communication shows substitution/complementary relationships with other established governance mechanisms. In addition, we find a non-linear relationship between a firm's communication efforts and its value and risk levels. Results are robust after controlling for major corporate events (M&A, spin-offs, financial distress and bankruptcy, and significant lawsuits). These findings contribute to corporate governance literature and the understanding of agency theory predictions of communications and disclosures' economic effects.

**Keywords:** Corporate Governance, Corporate Communications, Content Analysis, Bundles of Governance Mechanisms, Non-Linearity, Dictionary

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## 1. INTRODUCTION

This study examines corporate communications' governing role (Amel-Zadeh & Serafeim, 2018; Brammer & Pavelin, 2008; Shahab et al., 2020) and investigates its impact on the firm's value and risk, and studies the substitution-complementary relationship between corporate communication and other governance attributes. Our investigation is guided by three interrelated research questions: 1) *Does corporate communication have a governing attribute?* 2) *If so, does it have a substitution or complementary relationship with other governance attributes in the bundle of governance mechanisms,* and 3) *Does it impact the firm monotonically?*

Wide-ranging communication is what major investors are willing to pay a premium for and is crucial in investors' minds when evaluating a company's prospect (PWC, 2017). To satisfy stakeholders' demand for transparency, firms are continuously contemplating what and when to disclose. Higher transparency mitigates the agency problem, and therefore, significantly improves a firm's value and risk (Agarwal, Taffler, Bellotti, & Nash, 2016; Healy, Hutton, & Palepu, 1999; Jensen & Meckling, 1976; Kothari, Li, & Short, 2009). The literature of corporate disclosures and transparency relies on the premise that rules and regulations set by regulatory authorities determine the level and quality of the mandatory disclosures, and requirements set by the board of directors determine the level and quality of the voluntary disclosures. This picture reflects only part of the reality; it lacks a third element — the role of communication culture (In this paper, we do not equate communication with disclosure and instead consider communication to be a broader concept that illustrates a firm's commitment to connecting with its stakeholders).

We draw on several streams of the disclosure and transparency literature: 1) market manipulation (Lang & Lundholm, 2000); 2) information proprietary costs (Clinch & Verrecchia, 1997; Darrough, 1993; McKinnon, 1984; Verrecchia, 1983, 2001); 3) signaling theory (Darrough & Stoughton, 1990; Hassan & Marston, 2010; Hirshleifer & Teoh, 2003; McKinnon, 1984; Verrecchia, 1983, 2001); and 4) bundles of governance mechanisms (García-Castro, Aguilera, & Ariño, 2013; Oh, Chang, & Kim, 2018; Schiehl, Ahmadjian, & Filatotchev, 2014; Ward, Brown, & Rodriguez, 2009; Yoshikawa, Zhu, & Wang, 2014), to examine whether corporate communication provides self-governing attributes. This study is the first to focus on the disciplinary role of corporate communication and consider it as a stand-alone governance mechanism.

To study corporate communication's disciplinary role<sup>1</sup>, we test the impact of deviations from the expected transparency on deviations from the expected firm value. Controlling for major events, such as mergers and acquisitions, spin-offs,

lawsuits, and financial distress is a necessary step. When firms are going through major changes, an influx in the volume of communication followed by a drop is expected (Botosan, 1997). Our results show a significant association between deviations from expected transparency and deviations from the expected value. Findings assert that market participants discount the value of a firm if it chooses to deviate from the long-run level of communication without a specific reason. This reaction of the market is the disciplinary power of corporate communications.

Like any other governance mechanism, corporate communication comes in a package of costs and benefits. While a firm initially profits from providing information to the market, these benefits are offset by the increasing costs of disclosure beyond a certain threshold. The trade-off between benefits and costs brings about an optimum level of disclosure that maximizes firm value and minimizes risk. In terms of value, the benefit of corporate communication is to reduce information asymmetry and thereby positively impact the value. However, too much information dissemination is detrimental, as it unintentionally releases some proprietary information, which leads to loss of competitive advantage. In terms of risk, the benefit of communication is to resolve ambiguity surrounding the firm's prospect. Yet, too much information increases the noise, especially in the presence of investors' limited attention. Our findings assert that there is an optimum point for communication over which marginal costs overcome the marginal benefits. This optimum point is specific for each firm, and therefore firms need to determine the level of engagement in communication with regards to their particular conditions. These findings are robust after controlling for managerial ownership, capital structure, management quality, size, and age of the firm while including industry and year fixed effects.

Consequent to establishing the governing role of corporate communication, we focus on bundles of governance mechanism theory. This theory postulates that firms employ governance mechanisms in bundles, and it is the overall effect of the bundle that matters (García-Castro et al., 2013; Oh et al., 2018; Schiehl et al., 2014; Ward et al., 2009; Yoshikawa et al., 2014). Inside a bundle, mechanisms have a substitution-complimentary relationship, meaning that the effectiveness of a mechanism depends on the other mechanisms' level and effectiveness. We find that communication effectiveness in disciplining managers changes according to the level and effectiveness of other governance attributes. To limit and control the endogeneity between communication and other governance mechanisms, we utilize the 2SLS methods. We demonstrate that corporate communication<sup>2</sup> has a substitution-complementary relationship with board size, board independence, board education, board expertise, CEO duality, frequency of board meetings, board gender diversity, institutional ownership, and product market competition. These significant associations

<sup>1</sup> Communication is a culture that comprises of numerous public disclosures of information over a long time that shapes firms' transparency reputation. A corporate disclosure is just an instance when a firm disseminates a piece of information. Studies of corporate disclosures are mainly short-term and focus on a specific type of disclosure tool or information category. In this study, we use a large number of corporate disclosure channels as well as topics over a long period of time to reflect the long-run communication culture of a firm.

<sup>2</sup> This is the exogenous part of communication resulted from the 2SLS models that is not influenced by board attributes and other established governance mechanisms.

suggest that corporate communication is part of the governance bundle and the firm's unique governance configuration influences its optimal communication level.

The remainder of the paper is structured as follows. Section 2 presents the theoretical background and hypothesis development. The data collection and research methods are then described in Section 3, followed by the empirical results and robustness checks in Section 4. The final section summarizes the findings and contributions.

## 2. LITERATURE REVIEW

### 2.1. Corporate communication as a governance mechanism

Agency theory postulates that conflicts of interests and information gap between shareholders, creditors, and managers lead to poor decisions by all parties, resulting in more ambiguity about the firm's prospects and thus deteriorating its value. Governance mechanisms are processes to monitor managerial decisions to lower agency issues (Donnelly & Mulcahy, 2008; Jensen & Meckling, 1976).

Higher transparency and communication mitigate agency problems and, therefore, significantly improves firm value (Agarwal et al., 2016; Hassan & Marston, 2010) and firm risk (Akhigbe & Martin, 2008; Elshandidy, Fraser, & Hussainey, 2013; Healy et al., 1999; Kothari et al., 2009). The critical role of corporate communication in reducing information asymmetry and agency issues has motivated numerous studies to find how communication practices are determined. Despite consistent evidence of the effects of regulations and the board of directors' decisions (or attributes) on the level of communications and transparency, the question of whether the communication is a self-governing mechanism remains largely unanswered.

The long-run level of communication forms a specific transparency culture and sets outsiders' expectations for transparency. Such expectation is the missing element among the forces that shape communication practices. Empirical studies show that the market is highly sensitive to negative surprises in transparency. There is evidence that non-persistent and temporary increases in corporate disclosure (i.e., an increase followed by a reduction in the disclosure) are considered manipulation and punished by the market (Jo & Kim, 2007; Lang & Lundholm, 2000). Decision-makers of communication efforts, top managers, tend to maintain the long-run level of transparency, as any reduction in transparency signals a negative message about the agency problem. There are three established facts that bring top managers into the picture: 1) top managers have enough power to effectively make any strategic decision (Bebchuk & Fried, 2005; Finkelstein, 1992; Schwartz-Ziv & Weisbach, 2013), 2) based on agency and signaling theories, managers communicate to signal about the quality (Hassanein & Hussainey, 2015; Lopes & Rodrigues, 2007; Patten, 1992; Ross, 1977), and 3) managers' reputation is a significant factor in job security and compensation package (Milbourn, 2003). Moreover, investors believe that the level and quality of corporate disclosure reflect the personal quality of the top managers (PWC, 2017).

For communication to be a governance mechanism, it needs to influence managers' personal benefits. There is a strand of literature that provides evidence for the relationship between managers' interests to shape their reputation and the level of corporate disclosure practices (Fama, 1980; Gibbons & Murphy, 1992; Park & Yoo, 2016; Verrecchia, 2001). The information dissemination helps managers update outsiders' understanding of their skills in improving the firm's performance, which affects their job opportunities and compensation packages. According to a survey of top executives, one of the primary purposes of voluntary disclosure is to create a good reputation (Graham, Harvey, & Rajgopal, 2005). Monetary incentives (compensation packages) and non-monetary incentives (career concerns) feed into managers' desire to be perceived as successful leaders in the managerial labor market, which creates a link between corporate communication practices and personal benefits.

Overall, the combination of managers' reputation and future career concerns and the potential backlash they could face for the lack of consistent transparency create pressure on the management to maintain or enhance the firm's existing communication culture. The continuous pressure of the existing transparency level is a self-sustaining process that controls managerial decisions and limits agency issues.

Since a manager's personal benefits are tied to their reputation, which is in turn influenced by the firm's performance (Francis, Huang, Rajgopal, & Zang, 2008; Garay, González, & Molina, 2007; Johnson, Young, & Welker, 1993; Lines, 2004), we consider a firm's performance as the proxy for managerial benefits. To test the disciplinary role of communication culture, we hypothesize that unjustified deviations from expected communication are positively associated with deviations from the expected value. Our first hypothesis reads:

*H1: Deviation from the expected level of corporate communication significantly affects the firm's value.*

Following Botoson (1997), we identified and excluded firm-year observations that a firm is involved in mergers and acquisitions, spin-offs, major lawsuits, and financially distressed situations. These significant events cause firms to temporarily deviate from their long-run communication cultures and have an influx in the level of communication. The market expects such fluctuations and considers them as a justifiable change in transparency.

We calculate the expected levels of communication and value using a simple moving average procedure (SMA) over the previous three years. The expected communication level is set based on the firm's communication culture, which does not follow a random walk. SMA is a simple yet practical method for time-series forecasting to smooth out the data and mitigate the impacts of short-term fluctuations that bias our understanding of the current trends (Bamiatzi, Bozos, & Nikolopoulos, 2010; Johnston, Boyland, Meadows, & Shale, 1999; Kilgallen, 2012). Depending on the model specification, SMA results in lower forecast errors compared to other more sophisticated forecasting models (Nau, 2014) and is less costly than adaptive moving average methods (Ellis &

Parbery, 2005). We choose a three-year window for the SMA time frame as it is not just a reflection of the immediate past nor too far stretched in the past that loses the current touch.

## 2.2. Non-linear relationship between communication and the firm's value and risk

Like any other governance mechanism, corporate communication comes in a package of costs and benefits. While a firm may initially profit from providing information to the market, these benefits are offset by the increasing costs of disclosure beyond a certain threshold. The theory of information proprietary cost argues that extensive information disclosure is costly as it could erode a firm's competitive advantage (Clinch & Verrecchia, 1997; Darrough, 1993; McKinnon, 1984; Verrecchia, 1983, 2001). Additionally, signaling theory predicts that in the presence of investors' limited attention, too much information disclosure increases the noise injected into a firm's valuation (Darrough & Stoughton, 1990; Hassan & Marston, 2010; Hirshleifer

& Teoh, 2003; McKinnon, 1984; Verrecchia, 1983, 2001). In a recent paper, Dawd and Charfeddine (2019) examine the non-linear relationship between accounting performance and disclosure, using a sample of 51 firms listed on the Kuwait Stock Exchange in 2010. Their findings show a U-shaped association between aggregate disclosure and return on assets (ROA), as well as return on equity (ROE). The dynamic between marginal costs and marginal benefits at different corporate communication levels determines whether an increment of information disclosure is value-enhancing or wealth deteriorating. The trade-off between benefits and costs suggests an optimum disclosure level that maximizes firm value and minimizes its risk. We, therefore, hypothesize and test that:

*H2: Corporate communication has a non-linear relationship with the firm's value.*

*H3: Corporate communication has a non-linear relationship with the firm's risk.*

Table 1 summarizes the costs and benefits of corporate communication regarding a firm's value and risk profile.

**Table 1.** Effects of corporate communication on the firm's value and risk

<i>Effect on</i>	<i>Benefits</i>	<i>Costs</i>
<b>Value</b>	Reduces asymmetry of information and agency costs → Increases value	Increases probability of proprietary information loss → Decreases value
<b>Risk</b>	Resolves ambiguity and uncertainty about prospects of the firm → Decreases risk	Induces noise → Increases risk

## 2.3. Substitution and complementary relationship with other governance attributes

Bundles of governance mechanisms theory (Schiehl et al., 2014) proposes that the effectiveness of each element in the bundle depends on its inter-relationship with other mechanisms. Empirical studies show that some governance mechanisms substitute each other (Agrawal & Knoeber, 1996; Dalton, Daily, Certo, & Roengpitya, 2003; Demsetz, 1983; Zajac & Westphal, 1994). On the other hand, some mechanisms act as complements (Aguilera, Filatotchev, Gospel, & Jackson, 2008; Tosi & Gomez-Mejia, 1994; Tosi, Katz, & Gomez-Mejia, 1997). Such substitution-complementary relationship predicts that the impact of communication on firms' value and risk is not linear and should be determined dynamically according to the rest of the governance mechanisms' configurations. Becher and Frye (2011) and Oh et al. (2018) show that the substitution-complementary relationship needs to be tested in a model that incorporates different pairs of governance mechanisms to gauge their combined impact on some corporate outcome (Becher & Frye, 2011; Oh et al., 2018). Firm's value (Boyd, 1995; Carter, Simkins, & Simpson, 2003; Coles, Daniel, & Naveen, 2008; Conger, Finegold, & Lawler, 1998; Cremers & Nair, 2005; Erhardt, Werbel, & Shrader, 2003; Gabaix & Landier, 2008; Griffith, 1999; Hall, Hutchinson, & Michaelas, 2004; Jensen & Murphy, 1990; McConnell & Servaes, 1995; Mehran, 1995; Tong, 2008; Vafeas, 1999; Yermack, 1996) and firm's risk (Carpenter, 2000; DeYoung, Peng, & Yan, 2013; Faccio, Marchica, & Mura, 2016; Gande & Kalpathy, 2017; Sila, Gonzalez, & Hagendorff, 2016; Tan, Zhu,

Zeng, & Gao, 2014; Wiseman & Gomez-Mejia, 1998) are the two most used outcome variables in empirical studies on the impact of governance mechanisms on firms. Thus, hypotheses four and five read:

*H4: Corporate communication has a substitution-complementary relationship with other governance mechanisms with respect to the firm's value.*

*H5: Corporate communication has a substitution-complementary relationship with other governance mechanisms with respect to the firm's risk.*

## 3. RESEARCH METHODOLOGY

### 3.1. Research setting: Corporate communication and governance in Canada

As discussed above, corporate communication is an overarching set of activities and materials to manage and orchestrate all internal and external communications to provide transparency among all stakeholders. Organizations communicate to all stakeholders to transmit coherence, credibility, and ethics (Van Riel & Fombrun, 2007). Corporate communication is a more comprehensive phenomenon than merely disclosure practices. It is an integrative structure linking stakeholders to the organization. Any research on corporate communication needs to consider all disclosure types through every channel a firm uses to connect to its audiences — i.e., investors, employees, customers, media, and the general public. Accordingly, in this paper, we consider every type of document filed by sample firms and draw our conclusions regardless of the nature of

the information — i.e., voluntary vs. mandatory. In other words, this paper does not aim to examine the incremental value of voluntary information compared to mandatory disclosure, and therefore, we do not separate the two. Such separation would not deliver a clear-cut picture of communication practice employed by firms. Canadian capital market has a particular requirement that firms must file their press releases with the regulatory authorities (SEDAR<sup>3</sup>). This feature integrates the mandatory and voluntary disclosures of listed firms and warrants accessibility of the disclosures to all market participants (Toronto Stock Exchange [TSE], 2010).

Another particularity of the Canadian capital market is its unique corporate governance environment somewhere between the Anglo-American model (such as the US and the UK) and the European model (such as Germany and France). As Gedajlovic and Shapiro (1998) point out, Canadian firms have high ownership concentration, a significant level of family owners, and relatively moderate levels in aspects such as the board of directors composition, shareholder power, external financing, and the market for corporate control. The ownership characteristics of Canadian firms make them an interesting group to examine regarding corporate communication practices. In addition, Canada follows a principles-based approach towards corporate governance where firms disclose whether they follow the “best practices” guidelines or not. This approach differs from the “rules-based” one employed in the U.S. that follows mandatory compliance with the governance rules (Buhr & Freedman, 2001; Li & Broshko, 2006). Canada’s unique governance and disclosure environments create an exciting research setting to examine the governing role of the firm’s overall communication practices.

### 3.2. Sample and data

Our target sample includes all of the documents and reports published and filed by Canadian firms listed on the S&P/TSX Composite Index from 1999 to

the end of 2014. This body of documents includes approximately 600,000 filings by 520 firms at SEDAR. The total market capitalization of these firms in 2014 represents 70% of the total market capitalization on the Toronto Stock Exchange (TSE). Accessing public filings through the SEDAR website requires a manual downloading of each document for each firm each year. Therefore, because of time constraints, we restrict the sample to a quarter of the target sample. We randomly selected a sample of 148 firms and downloaded all their filings, consisting of over 150,000 documents with more than 100 different types<sup>4</sup>. Fundamental data is from Compustat, market data from CRSP, ownership structure data from Thomson Reuters and FactSet (13-f filings), and corporate governance data from BoardEx. CEO Ownership, CEO equity remuneration, and meeting frequencies are hand-collected from Proxy Statements and Management Information Circulars.

Due to missing data on some financial and non-financial variables, the final sample consists of 96 firms, translating into 1123 firm-year observations. Table 2, Panel A, summarizes the sampling procedure leading to our final sample of firm-year observations. Table 2, Panel B, presents the sectors covered in our sample: Energy, Material, Financials, Industrials, Consumer Discretionary, Utilities, Information Technology, Real Estate, Consumer Staples, and Telecommunication Services. We use the GIC<sup>5</sup> rather than the SIC classification system because part of the financial data comes from the StockGuide dataset, which uses the GIC for sector classification. Table 2, Panel B presents the distribution and market capitalization by sector, showing that the final sample represents the S&P/TSX Composite Index except for the Financial and Health Care sectors. Because our sample spans the period from 1999 to 2014 (inclusive), we acknowledge that stock prices and their volatility were likely to be influenced by the financial crisis of 2008, especially for financial firms.

<sup>3</sup> The System for Electronic Document Analysis and Retrieval (SEDAR) is an electronic filing system that allows listed companies to report their securities-related information with the securities regulation authorities in Canada. SEDAR is the Canadian equivalent of the Securities and Exchange Commission (SEC) EDGAR, the US electronic system for filing securities information. SEDAR is administered by the Canadian Securities Administrators.

<sup>4</sup> Please refer to Appendix B for the complete list of all document types used in this study.

<sup>5</sup> The Global Industry Classification Standard (GICS) was developed in 1999 by MSCI and Standard & Poor’s (S&P) for the global financial community. The GICS structure consists of 11 sectors, 24 industry groups, 69 industries, and 158 sub-industries. GICS is a registered trademark of McGraw Hill Financial and MSCI Inc.

**Table 2.** Sample selection (Panel A: Target and final sample)

<i>Sampling strategy and steps</i>	<i>Unique firms</i>
Target population	520
Random selection	148
Loss of firms	(52)
Final sample	96
<i>Firm-year observations</i>	<i>1123 filings</i>
<i>Total number of documents in the corpus</i>	<i>150,000</i>

**Table 2.** Sample selection (Panel B: Final sample distribution among sectors and comparison with the target sample)

<i>Sector</i>	<i>% in final sample</i>	<i>% in target sample</i>
1) Energy	28%	26%
2) Materials	22%	26%
3) Financials	17%	6%
4) Industrials	8%	8%
5) Consumer Discretionary	7%	7%
6) Utilities	6%	3%
7) Information Technology	4%	8%
8) Real Estate	4%	5%
9) Consumer Staples	2%	3%
10) Telecommunication	1%	4%
11) Health Care	0%	4%
Sum	100%	100%

### 3.3. Variable measurement

#### 3.3.1. Corporate communication measures

We use automated textual analysis to capture the scope and content of the firm's communications. We apply the bag-of-words method, which is a version of the corpus annotation approach. This approach uses a predetermined set of labels (or tags) to automatically classify the communicated information into subject matter categories by frequency (El-Haj, Alves, Rayson, Walker, & Young, 2019; Garside, Leech, & McEnery, 1997; Kothari et al., 2009; Loughran & McDonald, 2011). The advantages of this approach over manual content analysis include a uniform and systematic process across all documents, all years, and all sample firms (Hackston & Milne, 1996; Kothari et al., 2009; Wang & Hussainey, 2013).

To capture the phenomenon under investigation, we first need to build a dictionary with *ex-ante* selected keywords and multi-word expressions that are relevant and domain-specific. To satisfy the "word sense disambiguation" condition (El-Haj et al., 2019, p. 267), the content analysis algorithm must account for the conceptual context and the sequence of words in the text. Loughran and McDonald (2016) suggest that methods that consider the context and word sequence add more signal than noise to the empirical analyses. Hence, our custom-made dictionary includes business-related and multi-word phrases (El-Haj et al., 2019).

The significant growth of information dissemination in business, accounting, and finance over the years intensifies the necessity of some level of automated content analysis techniques. Dyer, Lang, and Stice-Lawrence (2017) show that throughout 1996-2013, the median length of US registrants' 10-K annual reports increases by 113 percent. In this study, we also observe a similar trend even with a steeper slope (4 to 7 folds) over 1999 to 2014 (Please refer to Table 5, Panels A and B). The manual

content analysis benefits from more granular analysis and accurate coding while suffers from data collection costs and the researcher's subjectivity. Data collection costs result in small sample sizes that may lower the generalizability and statistical power of findings. Moreover, the researcher's subjectivity could bias the results and prevent replicability. The advantage of automated text analysis is that it solves both of the problems mentioned above<sup>6</sup>.

Our methodology includes a corpus annotation (automated tagging) procedure that begins with manual annotation of a smaller set of documents called "training corpus". Some prior studies employ the manual annotation process in textual tone analysis (Huang, Teoh, & Zhang, 2014; Li, 2010), risk (Kravet & Muslu, 2013), CEO integrity (Dikolli, Keusch, Mayew, & Steffen, 2020), and strategy-related disclosures (Athanasakou, El-Haj, Rayson, Walker, & Young, 2018). After creating the "training corpus", the software replicates the selected annotations for the larger corpus under analysis.

To satisfy generalizability and to avoid selection bias, we analyze all parts of all types of communication sources that originated from the firm. El-Haj et al. (2019) discuss that the tendency to lower extraction costs causes observational bias as studies limit their source of data. A significant number of accounting and finance studies only focus on 10-Ks or MD&As, using basic content analysis methods (e.g., readability algorithms such as Fog index), generic dictionaries (e.g., negative/positive keywords from Harvard-IV-4 TagNeg), or mass-produced word count tools. Applying the wordlist from one source (e.g., annual reports) to study the content of another source reduces its

<sup>6</sup> The importance of context can be illustrated by this example: if the word "bank" is extracted from a sustainability report, it is highly likely to mean the land alongside a river, while if extracted from an analysis report, it could mean the financial organization. An example of the importance of sequence is the phrase "loss decreased." If only single words are captured without the sequence, it is likely for the researcher to classify this phrase as a negative sentence due to the presence of words such as loss and decreased, even though the sentence is positive. These two features represent word sense disambiguation, which is critical for an effective computer-based content analysis method.

validity. Moreover, using a generic dictionary does not correctly reflect the idiosyncratic content and context-specific jargon of a business-related communication. Our study examines more than 100 types of corporate filings and press releases as the input source of the natural language processing (NLP) procedure, which supports a multi-domain scoring system.

As this study entails measuring corporate communication practices addressing all types of stakeholders related to different aspects of business, manual intervention by domain experts is required to consider the context and sequence of the disclosed words carefully. To satisfy objectivity and hence replicability, we use two human coders with a validated inter-coder agreement for the scoring algorithm. Then, an automated scoring process applies to all filings without any human input.

In this paper, we use three different measures of communication: 1) *Length*, 2) *Dictionary*, and 3) *Communication Index (CI)*. Our first measure, *Length*, is the total word count of all filings and press releases in each firm year as a proxy for the level of corporate communication. Numerous studies use the total count of words as a proxy for the level of corporate disclosure in different contexts, such as earnings quality (Li, 2008), risk analysis (Campbell, Chen, Dhaliwal, Lu, & Steele, 2014), securities' law (Bozanic, Choudhary, & Merkley, 2019), investor composition (Lawrence, 2013), and investor litigation (Bourveau, Lou, & Wang, 2018). *Length* captures the volume of all publicly disclosed information regardless of its information content. Despite its wide usage, this measure does not reflect the information content or meaningfulness of disclosed material.

As alternative measures for robustness purposes and to reflect the information content of communication in addition to its quantity, we construct two new measures: *Dictionary* and *CI*. These are direct measures, free from third-party opinions that use a list of 608 relevant business words and phrases<sup>7</sup>. *Dictionary* measures the information content of communication where we calculate the total count of our business-related words and phrases across all filings for every firm year. *CI* is the score representing the information content of 91 business topics (sub-categories) when a firm's communication is compared to the median of its own industry. Similar dictionary-based measures used in prior studies either incorporate third-party opinions (Kothari et al., 2009) or focus on the tone of the communication (Henry, 2008; Loughran & McDonald, 2011).

*Length* and *Dictionary* differ as the former merely captures the volume of disclosure regardless of the meaning of the words, but the latter provides

a proxy for the volume of informative disclosure. *Dictionary* and *CI* are different as *CI* captures the diversity of communicated topics compared to industry peers and the volume of relevant content. The importance of industry comparison in *CI* is backed by the signaling theory, according to which the competitive pressure influences a firm's disclosure behavior (Lopes & Rodrigues, 2007).

Table 3 provides a simple example to show the distinct benefit of *CI* over *Dictionary* and *Length* measures. In this example, two firms in the same industry, A and B, disclose information about different aspects of their businesses. Their communication measures are provided based on the volume of informative words and phrases in different sub-categories, namely 1, 2, 3. Firm A discloses only one business aspect (perhaps the only aspect that is beneficial to the firm). In contrast, firm B chooses to disclose all other aspects that are necessary for that industry. According to *Dictionary*, firm A is considered more transparent as it has 50 informative words, while firm B has only 30. But according to *CI*, firm B is more transparent because of its higher *CI* score. Since both companies are from the same industry, investors and stakeholders must know a similar set of information. As a result, *CI* provides a different perspective in comparing the communication activities of firms<sup>8</sup>.

We need to reemphasize that we do not aim to examine the incremental value of voluntary information other than the mandatory one, and therefore, we do not separate the two. Such separation, in our view, would not deliver a clear-cut picture of communication practices employed by firms. It is prevalent that firms disclose voluntary information in different parts of mandatory filings. In other words, managers exert a considerable amount of discretion in preparing their reports, regardless of their legal nature. As Beyer, Cohen, Lys, and Walther (2010) point out, even in studies that try to focus on voluntary disclosures, a mix of voluntary and mandatory information gets evaluated. Also, Holder-Webb, Cohen, Nath, and Wood (2008) show that 30.3% of voluntary governance disclosures are disseminated via mandatory filings and assert that voluntary and mandatory disclosures are practically intertwined. To correctly measure the voluntary and mandatory disclosures, an in-depth text analysis must divide each filing into voluntary and mandatory portions/paragraphs. As we aim to examine the overall communication culture, such separation is not the focus of our study.

<sup>7</sup> For detailed explanations on the construction of *Dictionary* and *CI*, as well as their validity and reliability analyses, please refer to Appendix A.

<sup>8</sup> If no firm in an industry disseminates information in regard to a certain sub-category, then the median for that sub-category will be zero, and that aspect will be removed automatically from the computation of *CI* score for firms in that industry.

Table 3. An exemplary comparison between CI and Dictionary

Sub-categories and scores	Company A		Industry median	Company B	
	Dictionary	CI		Dictionary	CI
Sub-category 1	50	2	20	10	1
Sub-category 2	0	0	20	10	1
Sub-category 3	0	0	20	10	1
Total	50	2		30	3
Transparent firm (Dictionary count)	A				
Transparent firm (Communication index)					B

### 3.3.2. Governance attributes measures

Literature shows that board attributes have significant associations with a firm's financial performance and risk level. Prior studies focus on CEO duality (Boyd, 1995; Donaldson & Davis, 1991; Rechner & Dalton, 1991), board size (Coles et al., 2008; Yermack, 1996), board independence (Baek, Johnson, & Kim, 2009; Donnelly & Mulcahy, 2008; Eng & Mak, 2003), board education (Carpenter & Westphal, 2001; Reeb & Zhao, 2013), board expertise (Kor & Misangyi, 2008; Rajagopalan & Datta, 1996; Tian, Halebian, & Rajagopalan, 2011), meeting frequency (Conger et al., 1998; Lipton & Lorsch, 1992; Vafeas, 1999), and gender diversification (Carter et al., 2003; Erhardt et al., 2003; Faccio et al., 2016; Huang & Kisgen, 2013) as influential board attributes.

Similar to the prior studies, we select a set of major governance measures. *Duality* is a dummy variable equal to one when the CEO is also the chairman of the board. *Board Size* is the total number of board members in each firm year. *Board Independence* reflects the percentage of non-executive directors (NEDs). *Board Education* is the average of qualifications for NEDs, which is the sum of the number of qualifications of NEDs divided by board size for each firm-year<sup>9</sup>. *Board Expertise* is the percentage of "expert" NEDs on the board, where "expert" is a director who has served on the board of more than one company in that specific sector until that year. *Gender Diversification (GenderDivers)* is the proportion of women on the board. *Meeting Frequency (MeetFreq)* is the number of meetings of the board of directors, including committee meetings, in each firm year.

*CEO Equity Remuneration Ratio (EquityRemun)* is equity-linked compensation, which is the ratio of the value of stocks and options granted to the CEO, divided by the total compensation. Total compensation includes salary, bonus, shares, option, long-term incentive plans, pension value, and all other perks (such as personal use of the company's aircraft, travel, and tax gross-ups). This information is hand-collected from Proxy Statements and Information Circulars. In cases where the values of stocks and options are not available in the proxy statement, we use the FactSet dataset and estimate the intrinsic value using the Black Scholes model, respectively. This method is one of the accepted and primarily used methods with which firms report and file the value of their options (Seward & Walsh,

1996). In cases where there is no information on the CEO, we consider the executive president instead. Literature shows that the equity-based portion of compensation incentivizes top managers to make value-maximizing decisions (Gabaix & Landier, 2008; Hall et al., 2004; Jensen & Murphy, 1990). While these studies provide evidence supporting the alignment of interests between management and shareholders, others point to the increase in risk-taking behavior with such compensation schemes (DeYoung et al., 2013; Gande & Kalpathy, 2017; Tan et al., 2014).

*Institutional Ownership (InstOwn)*, or the percentage of outstanding shares held by institutions, has also been the subject of extensive research concerning firm value and risk (Cuervo, 2002; McConnell & Servaes, 1995; Rubin & Smith, 2009; Shleifer & Vishny, 1986; Villalonga & Amit, 2006; Wei, Xie, & Zhang, 2005). For example, McConnell and Servaes (1990) find a positive association between Tobin's Q and the fraction of shares owned by institutional investors. On the other hand, Wei et al. (2005) find such a relationship to be convex. Regarding the impact of institutional investors on the firm's risk, Rubin and Smith (2009) show a positive relationship between institutional investors and stock volatility, especially for dividend-paying firms.

And finally, *HHI* reflects product market competition based on *Herfindahl Hirschman Index*, computed using SIC 4-digit codes in Compustat North American Universe. The empirical examination of the inter-relation of product market competition, firm disclosure, and firm value and risk is mixed and narrow. Theoretical papers predict that firms in competitive environments tend to withhold information to preserve their competitive advantage (Clinch & Verrecchia, 1997; Janssen & Roy, 2015; Teoh & Hwang, 1991). Whereas empirical studies such as Harris (1998) find that even firms in low-competitive environments tend to withhold information to preserve their abnormal high margins. Interestingly, empirical studies on the relationship between product market competition and firm value and risk show a negative association in both relations (Beiner, Schmid, & Wanzenried, 2011; Gaspar & Massa, 2006).

### 3.3.3. Firm's output variables

*Tobin's Q* is equal to the market value divided by the book value of total assets. The market value is the sum of market capitalization and the book value of total assets minus the book value of outstanding equity. *Risk Ratio*, following Ferreira and Laux (2007), we use *Risk Ratio*, which is the ratio of idiosyncratic volatility to total risk. This ratio makes firm-specific risks comparable among industries by removing their differences related to economy-wide shocks. Idiosyncratic volatility is the annualized

<sup>9</sup> Qualifications are certificates of higher education after high school diploma including Graduate, Doctorate and Post-Doctoral Degrees; Bachelor of Arts, Science, Engineering, Education, or Administration; Executive Program Diploma; Associate Degree (AA), and finally Industry Certificates and Designations (i.e., Chartered Financial Analyst – CFA, Chartered Professional Accountant – CPA, Certificate of Corporate Directorship, Financial Planner, Fraud Examiner, General Accountant, Managerial Accountant, Public Accountant, Accredited Appraiser, Information Security, Petroleum or Mining Geologist, Contracts Manager – CPCM, Professional Purchaser – CPP, etc.).



monthly standard deviation of residuals from the market model estimated from rolling regressions over two years. Total risk is the annualized standard deviation of monthly stock returns, from rolling regression of capital asset pricing model, adjusted for dividends and splits.

### 3.3.4. Control variables

*Mgt Quality* is the four-year growth rate of industry-adjusted operating income before interest, tax, depreciation, and amortization. *Debt Ratio* is a proxy for financial leverage and is the book value of total liabilities scaled by total assets, measured at the beginning of the fiscal year (Hutton, Marcus, & Tehranian, 2009). *P/B Equity Ratio* is the ratio of the market value of equity to the book value of equity, measured at the beginning of the fiscal year (Hutton et al., 2009). *Firm Size* is the natural log of the book value of total assets at the beginning of the fiscal year (Hutton et al., 2009). *Age from IPO* is the number of years between the IPO year and the year of the firm-year observation, inclusive. *CEO Ownership* is the ratio of CEO equity holding (of common shares) to total shares outstanding. Equity holding is the number of common shares owned, directly or indirectly, over which control or direction was exercised. This variable is hand-collected from firms' Proxy Statements and Information Circulars. It excludes the value of stocks and other equities using restricted, performance, or deferred share units (RSUs, PSUs, DSUs, respectively) to reflect the difference between equity ownership with and without complete control. While the latter can motivate better performance and align interests,

the former sets the stage for the CEO to believe in the future of the business. *CEO Ownership* controls for the effect of managerial ownership, founder CEO, and family businesses. Based on agency theory, if managers have personal incentives, they are motivated to make decisions in the best interests of shareholders (Beatty & Zajac, 1995; Rediker & Seth, 1995). Prior studies show positive relationships between CEO ownership and firm value, with some indication of an optimal ownership percentage (Griffith, 1999; Mehran, 1995; Tong, 2008). Also, stock ownership is positively related to CEO's risk-taking behavior (Carpenter, 2000; DeYoung et al., 2013; Gande & Kalpathy, 2017; Tan et al., 2014; Wiseman & Gomez-Mejia, 1998).

### 3.3.5. Empirical model

To examine the disciplinary role of corporate communication (*H1*), we provide both the univariate and multivariate analyses of the relationship between deviation from expected transparency and deviation from expected performance. Deviations are the percentage change of the actual value from the expected value. Expected values are simple three-year moving averages.

Univariate analysis is through pair-wise Pearson correlation, and multivariate analysis is OLS regression controlling for *firm's Risk, Management Quality, Capital Structure, CEO Ownership, Firm Size, and Firm Age*. As a robustness test, and to resolve the endogeneity in the relationship between corporate communication practices and firm value, we repeat the analysis with one-year lagged deviations of *Tobin's Q* and report the findings.

$$\text{Corr}(\text{Tobin's } Q \text{ Deviation}_{i,t} \& \text{Communication Deviation}_{i,t}) \quad (1)$$

$$\text{Tobin's } Q \text{ Deviation}_{i,t} = b_0 + b_1 \text{Communication Deviation}_{i,t} + b_2 \text{Risk Ratio}_{i,t} + b_3 \text{Mgt Quality}_{i,t} + b_4 \text{Debt Ratio}_{i,t} + b_5 \text{Firm size}_{i,t} + b_6 \text{Age from IPO}_{i,t} + b_7 \text{CEO Ownership}_{i,t} + \varepsilon_{i,t} \quad (2)$$

To test hypotheses *H2* and *H3*, non-linearity of the effect of communication on the firm's value and risk, we include  $\text{Communication}_{i,t}^2$  and to test hypotheses *H4* and *H5*, substitution-complementary relationships between communication and governance attributes, we use interaction terms of *Communication* and governance variables. The complementary relationship between different governance mechanisms exists when two costly initiatives exist together, and the combined benefits on a specific outcome surpass the combined costs. However, if combined costs outweigh the benefits, it implies that the two factors are competing for space, and therefore, they are substitutes for each other. In other words, the complementary effect suggests that different governance mechanisms increase shareholder wealth due to their positive synergy, while the substitution effect suggests that adopting multiple governance mechanisms may have wealth diminishing outcomes (Schepker & Oh, 2013; Zajac & Westphal, 1994). The same logic, but in an inverse

manner, is true with regard to risk. Basically, the complementary (substitution) effect is when two mechanisms together reduce (increase) the firm's risk.

Outcome variables are value (measured by *Tobin's Q*) and risk (measured by *Risk Ratio*), and the explanatory variables are *Communication* measures and governance variables. Governance variables are *Board Independence, Board Education, Board Expertise, Gender Diversity, Board Meeting Frequency, CEO Equity-linked Remuneration, Institutional Ownership, and Product Market Competition*. Control variables are *Risk Ratio, Management Quality, Debt Ratio, Firm Size, Firm Age, and CEO Ownership*. To control for endogeneity issues, we use exogenous portions of communication that are not related to any governance variables. *Exogenous Communication* results from a 2SLS procedure. In the first stage, total communication measures are regressed on internal and external governance variables (equation (3)):

$$\text{Total Communication}_{i,t} = b_0 + b_1 \text{Duality}_{i,t} + b_2 \text{Board Size}_{i,t} + b_3 \text{Board Independence}_{i,t} + b_4 \text{Board Education}_{i,t} + b_5 \text{Board Expertise}_{i,t} + b_6 \text{Gender Diversity}_{i,t} + b_7 \text{Meeting Frequency}_{i,t} + b_8 \text{CEO Equity remuneration}_{i,t} + b_9 \text{Institutional Ownership}_{i,t} + b_{10} \text{HHI}_{i,t} + \varepsilon_{i,t} \quad (3)$$

where, *Total Communication* measures are *Length*, *Dictionary*, and *CI*. The residual,  $\varepsilon_{i,t}$ , reflects the exogenous portion of the communication that is not under the influence of other governance

mechanisms. In the second stage, we use the exogenous portion of the communication called *ExogCommunication* in the following model:

$$\begin{aligned}
 Y_{i,t} = & b_0 + b_1 ExogCommunication_{i,t} + b_2 ExogCommunication_{i,t}^2 + b_3 Duality_{i,t} + \\
 & b_4 (ExogCommunication_{i,t} * Duality_{i,t}) + b_5 Board Size_{i,t} + b_6 (ExogCommunication_{i,t} * \\
 & Board Size_{i,t}) + b_7 Board Independence_{i,t} + \\
 & b_8 (ExogCommunication_{i,t} * Board Independence_{i,t}) + b_9 Board Education_{i,t} + \\
 & b_{10} (ExogCommunication_{i,t} * Board Education_{i,t}) + b_{11} Board Expertise_{i,t} + \\
 & b_{12} (ExogCommunication_{i,t} * Board Expertise_{i,t}) + b_{13} Gender Diversity_{i,t} + \\
 & b_{14} (ExogCommunication_{i,t} * Gender Diversity_{i,t}) + b_{15} Meeting Frequency_{i,t} + \\
 & b_{16} (ExogCommunication_{i,t} * Meeting Frequency_{i,t}) + b_{17} CEO Equity remuneration_{i,t} + \\
 & b_{18} (ExogCommunication_{i,t} * CEO Equity remuneration_{i,t}) + b_{19} Institutional Ownership_{i,t} + \\
 & b_{20} (ExogCommunication_{i,t} * Institutional Ownership_{i,t}) + b_{21} HHI_{i,t} + \\
 & b_{22} (ExogCommunication_{i,t} * HHI_{i,t}) + \sum_{b_{23}}^{b_{30}} Control Variables_{i,t} + e_{i,t}
 \end{aligned} \tag{4}$$

$Y_{i,t}$  is *Tobin's Q* and *Risk Ratio*, in different models. As mentioned above, the *ExogCommunication* variable is only the exogenous portion of *Length*, *Dictionary*, and *CI*.

Following Botosan (1997), we exclude the years in which a major event happened to the company, which controls for justified spikes in communication. Another method to control for major events is to include a dummy variable in the models for the event years. However, this method does not remove the decline in communication level after the event, which can bias the results. Major events in this study include corporate takeovers, corporate divestitures, major lawsuits, financial distress, and bankruptcy. Corporate takeover consists of acquisition transactions where the acquired firm is public. We do not include partial asset acquisitions as major events since they are more common and would not spark a significant change in corporate communication levels. Corporate divestitures include corporate spinoffs, sell-off, and carve-outs. Lawsuits are significant events if the settlement amount is equal to or more than two percent of the company's total sales in that year. Financial distress as a major event occurs when the company receives a court's protection order against its creditors. This data is hand-collected from annual reports, management analysis and discussions, and proxy circulars.

## 4. RESEARCH RESULTS

### 4.1. Descriptive statistics and univariate analysis

Table 4, Panel A, presents descriptive statistics of our dependent and explanatory variables. Our sample represents a diverse group of firms regarding communication policies, performance, size, age, capital structure, governance quality, and ownership structure. For example, *CI* ranges from 23 to 83, *Risk Ratio* from 28 up to 90 percent, *Institutional Ownership* from 0 to 100 percent, and *Age* from 5 to 139 years. Regarding governance attributes, such as *Board Size*, *Education*, *Expertise*, and *Meetings Frequency*, firms are approximately normally distributed over the spectrum. Interestingly, we have firms in our sample with zero to 100 percent *CEO equity compensation*. Panel B shows the time distribution of firm-year observations, where we note that firms' communication levels have increased substantially over the years. The sum of *Dictionary* word count in 2014 is 3.75 times more than that of 1999 after adjusting for the number of firms. This significant increase is due to two forces: 1) more regulated disclosure over the years, and 2) an increase in demand for transparency and voluntary disclosure of information.

**Table 4.** Descriptive statistics (Panel A: Description of variables)

Variable	Mean	St. Dev.	Min	Median	Max
<i>CI</i>	53.9281	14.1508	23	54	83
<i>Dictionary</i> (1,000)	13.0436	7.5658	0.058	11.579	32.024
<i>Length</i> (10,000)	49.2433	31.3729	0.1539	42.0675	133.4469
<i>Risk Ratio</i>	54.9635	12.4325	28.1069	55.1262	90.1566
<i>Tobin's Q</i>	2.6665	1.6689	0.2161	2.2916	10.0149
<i>Board Size</i>	10.0169	3.4588	3	9	24
<i>Independence</i>	0.7824	0.127	0.375	0.8	1
<i>Board Education</i>	2.0637	0.6074	0.5	2.1	4.78
<i>Board Expertise</i>	38.406	21.8243	0	36	89
<i>GenderDivers</i>	0.0985	0.1005	0	0.1	0.545
<i>MeetFreq</i>	25.1406	10.366	4	25	70
<i>EquityRemun</i>	0.3679	0.2477	0	0.37	1
<i>InstOwn</i>	0.4047	0.2175	0	0.4018	1
<i>HHI</i>	0.1314	0.0841	0.0101	0.1144	0.4243
<i>Mgt Quality</i>	0.8022	10.1685	-46.85	0	164.2
<i>CEO Ownership</i>	1.5588	3.5668	0	0.2364	39.237
<i>Debt Ratio</i>	0.2855	0.1769	0.001	0.266	0.681
<i>P/E Equity Ratio</i>	2.3	1.4	0.22	2	8.1
<i>Firm Size</i> (\$1,000,000)	2612.60	4.39	86.03	2454.06	92558.86
<i>Age</i>	30.3616	29.1282	5	20	139

**Table 4.** Descriptive statistics (Panel B: Time distribution of firm-year observations)

Year	Number of firms	%	Sum of CI	%	Sum of Dictionary	%	Sum of Length	%
1999	41	3.6%	1,383	2.3%	177,703	1.2%	8,405,474	1.5%
2000	43	3.8%	1,512	2.5%	183,987	1.3%	9,169,936	1.7%
2001	47	4.2%	1,818	3.0%	281,233	1.9%	13,168,180	2.4%
2002	50	4.4%	2,040	3.4%	355,644	2.4%	16,256,363	2.9%
2003	55	4.9%	2,412	4.0%	445,991	3.0%	19,565,484	3.5%
2004	58	5.1%	2,902	4.8%	673,702	4.6%	26,844,041	4.8%
2005	71	6.3%	3,596	5.9%	792,518	5.4%	32,998,036	5.9%
2006	74	6.6%	3,786	6.2%	858,268	5.8%	34,240,551	6.2%
2007	76	6.7%	4,115	6.8%	998,410	6.8%	37,078,097	6.7%
2008	76	6.7%	4,341	7.1%	1,081,879	7.4%	39,177,397	7.1%
2009	82	7.3%	4,904	8.1%	1,325,387	9.0%	50,809,459	9.2%
2010	84	7.5%	5,064	8.3%	1,316,594	9.0%	48,453,737	8.7%
2011	93	8.3%	5,732	9.4%	1,600,913	10.9%	56,857,172	10.2%
2012	92	8.2%	5,680	9.3%	1,574,825	10.7%	58,254,739	10.5%
2013	93	8.3%	5,790	9.5%	1,537,258	10.5%	52,919,634	9.5%
2014	92	8.2%	5,702	9.4%	1,495,793	10.2%	50,774,188	9.1%
Sum	1,127	100.0%	60,777	100.0%	14,700,105	100.0%	554,972,488	100.0%

Table 5 shows the level of communication efforts by a representative firm, separating press releases (purely voluntary) from all other filings in Panels B and A, respectively. The representative firm is the sample's median firm by size in 2014. Table 5 shows the sum of the *Length* and the *Dictionary* values and the average values of *Length* and *Dictionary* per document for each year. The mean annual numbers of mandatory and voluntary reports filed by this firm are 30 and 43, respectively. The distribution shows that the number of mandatory reports is relatively constant while there is a reduction in press releases over the years.

However, the average length of the mandatory report has increased four-fold over this time, from 2,638 to 10,926 words.

Furthermore, the level of overall disclosure, as measured by the number of our dictionary words used in the reports, has gone up seven-fold, from 63 to 428 per report. Voluntary disclosure has also increased over time but by a much smaller percentage (3 times, 11 to 30). The data in Table 5 shows that both the amount and the information content of disclosure have increased substantially over time. Much of this increased communication is through mandatory filings.

**Table 5.** Annual distribution of the filings by a representative median firm

Year	Panel A: All types of filings excluding press releases					Panel B: Press releases (Purely voluntary)				
	Number of filings	Sum of Length	Average Length per report	Sum of Dictionary	Average Dictionary per report	Number of filings	Sum of Length	Average Length per report	Sum of Dictionary	Average Dictionary per report
1999	26	68,583	2,638	1,625	63	60	30,290	505	683	11
2000	29	73,233	2,525	1,611	56	48	29,317	611	730	15
2001	26	55,172	2,122	1,500	58	54	32,745	606	661	12
2002	25	71,082	2,843	2,048	82	93	45,207	486	854	9
2003	41	190,724	4,652	5,973	146	45	30,231	672	765	17
2004	38	178,702	4,703	4,744	125	79	36,394	461	748	9
2005	33	227,126	6,883	6,461	196	64	32,854	513	741	12
2006	39	208,649	5,350	7,368	189	31	29,490	951	1,007	32
2007	44	310,443	7,056	10,327	235	36	32,478	902	825	23
2008	29	252,704	8,714	8,006	276	42	39,607	943	1,019	24
2009	23	172,501	7,500	6,403	278	27	31,782	1,177	859	32
2010	29	269,093	9,279	10,469	361	29	32,388	1,117	959	33
2011	29	278,545	9,605	11,087	382	34	44,172	1,299	1,157	34
2012	25	295,867	11,835	11,870	475	31	33,318	1,075	925	30
2013	28	351,269	12,545	13,873	495	24	27,474	1,145	808	34
2014	29	316,862	10,926	12,408	428	25	28,000	1,120	742	30
Mean	30	203,562	6,855	7,172	244	43	32,751	864	823	23
Std. Dev.	6	96,950	3,489	4,179	157	19	5,501	299	151	10

Our analysis begins with the pairwise correlation of all continuous variables. The overall findings in Table 6 show that there is no major multicollinearity between variables. There are positive inter-relations between *Communication measures* and *Board Independence*, *Board Size*, *Board Education*, *Gender Diversity*, *Meeting Frequency*, *CEO Equity-linked Compensation*, and *Institutional Ownership*. In contrast, *Communication* is negatively

associated with *CEO Ownership*. Such pairwise correlations illustrate the natural relationship among all types of governance mechanisms which implies a substitution-complimentary effect among them. The magnitude of correlations and variance inflation factors (all VIFs being lower than 2.5) do not warrant concerns about multicollinearity among variables.

Table 6. Pearson correlation matrix (Part 1)

	1	2	3	4	5	6	7	8	9
1. <i>CI</i>	1								
2. <i>Dictionary</i>	0.884***	1							
3. <i>Length</i>	0.798***	0.920***	1						
4. <i>Risk Ratio</i>	-0.130***	-0.0725*	-0.0701*	1					
5. <i>Tobin's Q</i>	0.0846*	0.0884*	0.120***	-0.0491	1				
6. <i>Board Size</i>	0.253***	0.294***	0.326***	-0.0649	-0.00365	1			
7. <i>Independence</i>	0.241***	0.231***	0.237***	-0.0457	-0.0545	-0.00956	1		
8. <i>Education</i>	0.167***	0.132***	0.143***	-0.0722*	-0.0967**	0.248***	0.409***	1	
9. <i>Expertise</i>	0.0301	0.0304	-0.0286	-0.0272	-0.0717*	-0.147***	0.164***	0.144***	1
10. <i>GenderDivers</i>	0.170***	0.140***	0.175***	-0.0640	-0.0500	0.336***	0.0817*	0.305***	-0.159***
11. <i>MeetFreq</i>	0.341***	0.318***	0.285***	-0.0639	-0.0358	0.267***	0.168***	0.157***	-0.0708*
12. <i>EquityRemun</i>	0.239***	0.181***	0.155***	0.0423	0.133***	0.0687*	-0.0199	0.0815*	0.0795*
13. <i>InstOwn</i>	0.363***	0.323***	0.279***	0.00374	0.00882	0.0377	0.152***	0.0627	-0.0661
14. <i>HHI</i>	-0.0387	-0.0523	-0.0725*	-0.00203	-0.00726	0.156***	-0.147***	-0.0531	-0.242***
15. <i>Mgt Quality</i>	0.0238	0.00607	-0.0150	-0.0456	0.0447	-0.0333	0.0271	-0.0513	0.0197
16. <i>CEO Ownership</i>	-0.178***	-0.194***	-0.176***	0.0508	0.275***	-0.364***	-0.0525	-0.260***	-0.00267
17. <i>Debt Ratio</i>	0.112**	0.135***	0.214***	-0.0442	-0.0647	0.129***	0.195***	0.151***	-0.175***
18. <i>P/B Equity Ratio</i>	0.0933**	0.122***	0.154***	-0.0185	0.987***	0.0233	-0.0462	-0.0935**	-0.0615
19. <i>Firm Size</i>	0.509***	0.556***	0.553***	-0.0983**	-0.0322	0.585***	0.0961**	0.205***	-0.283***
20. <i>Age</i>	0.0668	0.127***	0.188***	-0.0446	0.0951**	0.310***	-0.0649	0.0393	-0.320***

Table 6. Pearson correlation matrix (Part 2)

	10	11	12	13	14	15	16	17	18	19	20
1. <i>CI</i>											
2. <i>Dictionary</i>											
3. <i>Length</i>											
4. <i>Risk Ratio</i>											
5. <i>Tobin's Q</i>											
6. <i>Board Size</i>											
7. <i>Independence</i>											
8. <i>Education</i>											
9. <i>Expertise</i>											
10. <i>GenderDivers</i>	1										
11. <i>MeetFreq</i>	0.153***	1									
12. <i>EquityRemun</i>	0.0994**	-0.00869	1								
13. <i>InstOwn</i>	0.0690*	0.00670	0.236***	1							
14. <i>HHI</i>	-0.143***	0.0791*	-0.0635	-0.0240	1						
15. <i>Mgt Quality</i>	0.0703*	-0.0594	-0.00428	0.0317	-0.0395	1					
16. <i>CEO Ownership</i>	-0.189***	-0.138***	-0.146***	-0.110**	-0.0135	0.0474	1				
17. <i>Debt Ratio</i>	0.210***	0.0409	-0.0278	-0.0346	-0.0255	-0.0514	-0.109**	1			
18. <i>P/B Equity Ratio</i>	-0.0432	-0.0297	0.137***	-0.00254	-0.00594	0.0459	0.272***	-0.0488	1		
19. <i>Firm Size</i>	0.350***	0.332***	0.154***	0.254***	0.000399	-0.0164	-0.407***	0.216***	-0.0231	1	
20. <i>Age</i>	0.147***	0.0698*	0.0427	-0.0697*	0.168***	-0.0213	-0.122***	0.177***	0.106**	0.312***	1

Note: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 7 provides univariate results to show the pair-wise correlation between deviations from the expected level of transparency (measured by *Length*, *Dictionary*, and *CI*) and deviations from the expected performance (measured by *Tobin's Q*). The deviations are in percentages, and the expected levels at  $t=0$  are set according to the average of the variable's actual levels over the last three years  $t=(-3, -1)$ . Significant and positive correlation coefficients for *Tobin's Q* and all the communication measures demonstrate a co-movement between deviation in expected transparency and deviation in expected performance. This evidence shows that when there is a negative deviation from the expected level of transparency, the market reacts negatively.

We see lower *Tobin's Q* values than the expected ones. The findings illustrate the importance of consistency in corporate communication practices for top managers as it affects their company's market value. The firm's market value's sensitivity to unexpected fluctuations in communication adds to the disciplinary role of long-run communication. These findings imply that when managers increase communication level, they set a new expected level of transparency that they need to maintain or otherwise suffer significant negative consequences. The force of the existing level of communication that shapes top management's decisions illustrates its governing power.

Table 7. Univariate analysis of deviations from expected transparency and deviation from expected performance — Pearson correlation coefficients and test of significance

Transparency measure	Dev. <i>Tobin's Q</i>	Observations
Dev <i>Length</i>	0.1524***	944
	(0.000)	
Dev <i>Dictionary</i>	0.0960***	944
	(0.006)	
Dev <i>CI</i>	0.0664*	944
	(0.058)	

Notes: P-values are in parentheses. Significant levels are: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

## 4.2. Regression analysis

Following the findings in Table 7, we expand the analyses in Table 8 to incorporate relevant control variables in a multivariate setting. We use the OLS regression on both the sign and the level of percentage deviation from the expected transparency as explanatory variables for the changes in *Tobin's Q*. Table 8, Panel A includes six models where Models 1, 2, and 3 only use the sign of the percentage deviation, while Models 4, 5, and 6 consider both the amount and the sign of the percentage deviations. The results support *H1* as they consistently show a positive and significant relationship between deviations from expected transparency and deviations from expected firm value, reinforcing our claim of the disciplining role of long-run corporate communication. Worthy to note that, compared to their counterpart, such

a relationship is stronger when the amount of deviation is added to the analysis (Models 4, 5, and 6), and when *Dictionary* and *CI* are the communication measures (Models 5 and 6). The strongest association occurs in Model 6 when the firm deviates from the expected level of industry-adjusted communication measure (*CI*). If such deviation is positive, the firm receives a significant boost in its market value, and if negative, it gets a severe punishment from the market.

The negative consequence of transparency reduction forces managers to maintain the existing communication practices at least. We refer to the force of the existing communication level as a new governance mechanism. To address the possibility of an endogeneity problem, we re-ran the analysis with one year lag of deviations from expected communications and observed similar results in Table 8, Panel B.

**Table 8.** OLS regression of deviation from expected Tobin's Q on deviation from expected transparency

Panel A						
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Dev Length	0.1242*** (3.604)			0.1709*** (5.234)		
Dev Dictionary		0.0941*** (2.645)			0.1732*** (4.547)	
Dev CI			0.0524 (1.449)			0.2254** (2.367)
Risk Ratio	-0.0020 (-0.743)	-0.0027 (-0.993)	-0.0032 (-1.175)	-0.0010 (-1.368)	-0.0012 (-1.591)	-0.0015* (-1.947)
Mgt Quality	-0.0030 (-1.001)	-0.0029 (-0.961)	-0.0026 (-0.879)	-0.0007 (-0.878)	-0.0007 (-0.905)	-0.0008 (-0.927)
Debt Ratio	0.6003*** (2.692)	0.6067*** (2.710)	0.6173*** (2.750)	0.1326** (2.164)	0.1340** (2.177)	0.1328** (2.137)
Firm Size	-0.0751** (-2.502)	-0.0765** (-2.537)	-0.0752** (-2.488)	-0.0150* (-1.816)	-0.0142* (-1.714)	-0.0149* (-1.774)
Age	0.0012 (0.923)	0.0012 (0.931)	0.0013 (1.000)	0.0003 (0.835)	0.0003 (0.792)	0.0003 (0.851)
CEO Ownership	0.0056 (0.484)	0.0043 (0.368)	0.0039 (0.338)	0.0016 (0.514)	0.0019 (0.592)	0.0018 (0.549)
Year/Industry FE, Cons.	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	799	799	799	799	799	799
Adj. R-Squared	0.17	0.17	0.16	0.23	0.22	0.20
Panel B						
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Lag Dev Length	0.1213*** (3.333)			0.0958*** (2.901)		
Lag Dev Dictionary		0.1201*** (3.186)			0.0824** (2.140)	
Lag Dev CI			0.0997*** (2.585)			0.2219** (2.262)
Risk Ratio	-0.0027 (-0.949)	-0.0028 (-0.983)	-0.0027 (-0.951)	-0.0013* (-1.713)	-0.0013* (-1.658)	-0.0012 (-1.559)
Mgt Quality	-0.0018 (-0.594)	-0.0024 (-0.775)	-0.0022 (-0.715)	-0.0008 (-0.954)	-0.0008 (-0.935)	-0.0007 (-0.914)
Debt Ratio	0.5312** (2.237)	0.5305** (2.233)	0.5594** (2.347)	0.1287** (2.012)	0.1285** (2.003)	0.1305** (2.035)
Firm Size	-0.0576* (-1.770)	-0.0575* (-1.765)	-0.0569* (-1.743)	-0.0184** (-2.093)	-0.0179** (-2.038)	-0.0181** (-2.062)
Age	0.0007 (0.478)	0.0006 (0.420)	0.0008 (0.592)	0.0002 (0.583)	0.0002 (0.595)	0.0002 (0.618)
CEO Ownership	0.0028 (0.216)	0.0023 (0.176)	0.0027 (0.209)	0.0006 (0.171)	0.0007 (0.201)	0.0008 (0.219)
Year/Industry FE, Cons.	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	706	706	706	706	706	706
Adj. R-Squared	0.18	0.18	0.17	0.22	0.22	0.22

Notes: Models 1, 2, and 3 consider the sign of the percentage deviation, and Models 4, 5, and 6 consider both the sign and the amount of percentage deviations. In Panel A, Communication measures and Value measures are contemporaneous. In Panel B, Communications measures are lagged for one period. Standard errors are robust to heteroscedasticity, T-stats are in parenthesis, and significant levels are: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

In the following analyses, we test the non-linearity hypotheses (*H2* and *H3*) and examine the substitution-complementary effects (*H4* and *H5*).

The non-linearity is put to the test by the rejection of linearity. That is, by the inclusion of squared terms of communication measures, we are trying to find evidence that the relationship is, in fact, not linear. We pair communication with other governance mechanisms in an interactive format to study the combined impact of communication and governance variables on the firm's value and risk ratio. The primary evidence of substitution (complementary) effect is when the coefficient of the interaction variable is negative and significant (positive and significant) for the firm's value. As for the firm's risk, the primary evidence of substitution (complementary) effect is when the coefficient of the interaction variable is positive and significant (negative and significant).

Tables 9 to 14 report the results from multivariate fixed-effect regression analyses using value (*Tobin's Q*) and risk (*Risk Ratio*) measures. In all of these tables, Models 1 to 10 include one governance attribute at a time, while Model 11 incorporates all of them together to control the inter-relationships among different mechanisms. Tables 9, 10, and 11 have *Tobin's Q* as dependent variable and *Length*, *Dictionary*, and *CI* as communication measures, respectively. Tables 12, 13, and 14 have *Risk Ratio* as the dependent variable and *Length*, *Dictionary*, and *CI* as the communication measures. We would reiterate that to control for any endogeneity issues, we use 2SLS estimation and incorporate only the exogenous portion of communication in all models. Moreover, models control for industry and year fixed effects, and standard errors are robust to heteroscedasticity, using White heteroscedasticity standard errors.

Overall, results in Tables 9, 10, and 11 show significant and positive (negative) relationships between communication (communication squared) and *Tobin's Q*, which is evidence of the inverted U-shaped relationship and supports the non-linearity hypothesis *H2*. Using *Length* as the communication measure, Table 9 provides the evidence of substitution relationship with CEO duality, board independence, board education, and

gender diversity on the board, which supports *H2*. These findings show the importance of considering the bundle of governance mechanisms and imply that in general, if the existing governance bundle includes higher ratios of independent, educated, and female board members, adding to the volume of the communication might be more costly than beneficial from the investor's point of view. Table 10, where *Dictionary* is the communication variable, illustrates similar findings, while Table 11, in which *CI* is the main communication factor, only provides results for CEO duality. Among all the significant findings, the substitution relationship between CEO duality and communication is particularly interesting. Despite some agency-based views on the negative impact of CEO duality on a firm's performance (Pi & Timme, 1993; Rechner & Dalton, 1991), other researchers show significant evidence supporting stewardship theory and the positive impact of CEO duality on firm performance (Donaldson & Davis, 1991). Moreover, Yang and Zhao (2014) show the positive effects of CEO duality on firm performance by reducing information costs and increasing the speed of decision-making in corporations. Other reasons behind the positive impact of CEO duality include more efficient leadership (Baliga, Moyer, & Rao, 1996) and improved information flow (Dahya & Travlos, 2000). Based on the bundles of governance notion, the ultimate configurations of CEO duality, the level of communication, and other governance mechanisms are endogenously determined (Chen, Lin, & Yi, 2008).

Regarding complementary relationships, *HHI* is significantly associated with communication variables *Length* and *Dictionary* in Tables 9 and 10, and *Institutional Ownership* weakly complements communication when *CI* is the relative measure in Table 11. These results imply that when the product market is less competitive (higher *HHI*) or more institutional ownership exists, adding to the level of communication positively impacts firm value. Understandably, in markets with little competition and pressure to be transparent, firms that choose to disseminate more information are appreciated by the market.

**Table 9.** 2SLS regression results with *Tobin's Q* as the dependent variable and exogenous *Length* as the communication measure (Part 1)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/t- stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat
<i>Length</i>	0.0127*** (5.734)	0.0077** (2.294)	0.0320* (1.736)	0.0664*** (4.681)	0.0295*** (4.065)	0.0069* (1.709)	0.0150*** (2.897)	0.0144*** (4.571)	0.0100** (2.305)	0.0058* (1.717)	0.0822*** (3.220)
<i>Length</i> <sup>2</sup>	-0.0001* (-1.673)	-0.0001* (-1.647)	-0.0001** (-2.031)	-0.0001** (-2.399)	-0.0001** (-2.035)	-0.0001* (-1.787)	-0.0001** (-1.994)	-0.0001** (-1.981)	-0.0001 (-1.628)	-0.0001* (-1.767)	-0.0002*** (-2.778)
<i>Duality</i>	-0.3411** (-2.071)										-0.2865 (-1.562)
<i>Length</i> × <i>Duality</i>	-0.0107** (-2.441)										-0.0130** (-2.373)
<i>EquityRemun</i>		0.7784*** (3.079)									0.7404*** (2.853)
<i>Length</i> × <i>EquityRemun</i>		0.0102 (1.279)									0.0036 (0.398)
<i>Ln(Board Size)</i>			0.5925*** (2.983)								0.5777** (2.467)
<i>Length</i> × <i>Ln(Board Size)</i>			-0.0085 (-1.126)								-0.0076 (-0.958)
<i>Independence</i>				0.1580 (0.369)							0.3160 (0.588)

**Table 9.** 2SLS regression results with *Tobin's Q* as the dependent variable and exogenous *Length* as the communication measure (Part 2)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat
<i>Length</i> × <i>Independence</i>				-0.0676*** (-4.024)							-0.0484** (-2.452)
<i>Education</i>					-0.0248 (-0.276)						-0.0959 (-0.881)
<i>Length</i> × <i>Education</i>					-0.0087*** (-2.800)						-0.0083** (-2.384)
<i>Expertise</i>						-0.0032 (-1.140)					-0.0057* (-1.839)
<i>Length</i> × <i>Expertise</i>						0.0001 (1.306)					0.0001 (0.691)
<i>MeetFreq</i>							0.0099* (1.900)				0.0016 (0.282)
<i>Length</i> × <i>MeetFreq</i>							-0.0001 (-0.792)				0.0001 (0.281)
<i>GenderDivers</i>								-0.7595 (-1.316)			-1.1424* (-1.682)
<i>Length</i> × <i>GenderDivers</i>								-0.0346** (-2.017)			-0.0135 (-0.760)
<i>InstOwn</i>									-0.0775 (-0.264)		0.0815 (0.269)
<i>Length</i> × <i>InstOwn</i>									0.0017 (0.189)		0.0045 (0.509)
<i>HHI</i>										0.5811 (0.976)	0.2008 (0.310)
<i>Length</i> × <i>HHI</i>										0.0400* (1.676)	0.0159 (0.624)
<i>Risk Ratio</i>	-0.0050 (-1.282)	-0.0059 (-1.526)	-0.0038 (-0.940)	-0.0042 (-1.059)	-0.0046 (-1.152)	-0.0056 (-1.419)	-0.0051 (-1.281)	-0.0053 (-1.330)	-0.0053 (-1.334)	-0.0047 (-1.176)	-0.0034 (-0.861)
<i>Mgt Quality</i>	0.0046 (0.882)	0.0048 (0.936)	0.0049 (0.944)	0.0052 (0.988)	0.0056 (1.066)	0.0046 (0.876)	0.0050 (0.942)	0.0050 (0.958)	0.0046 (0.876)	0.0046 (0.885)	0.0067 (1.249)
<i>Debt Ratio</i>	0.1854 (0.479)	0.2209 (0.584)	0.2634 (0.694)	0.3018 (0.782)	0.2487 (0.653)	0.2092 (0.548)	0.3042 (0.801)	0.3382 (0.888)	0.3109 (0.793)	0.3115 (0.812)	-0.0099 (-0.025)
<i>Firm Size</i>	-0.0596 (-1.153)	-0.0757 (-1.463)	-0.1249** (-2.197)	-0.0732 (-1.404)	-0.0707 (-1.335)	-0.0793 (-1.472)	-0.0884* (-1.677)	-0.0528 (-0.978)	-0.0619 (-1.162)	-0.0597 (-1.136)	-0.1362** (-2.203)
<i>Age</i>	0.0089*** (4.121)	0.0076*** (3.651)	0.0081*** (3.706)	0.0078*** (3.548)	0.0086*** (3.973)	0.0079*** (3.659)	0.0084*** (3.944)	0.0085*** (3.874)	0.0081*** (3.721)	0.0081*** (3.806)	0.0079*** (3.622)
<i>CEO Ownership</i>	0.1018*** (4.360)	0.1033*** (4.337)	0.1079*** (4.289)	0.0937*** (3.954)	0.0929*** (3.908)	0.0960*** (4.087)	0.0969*** (4.020)	0.0959*** (4.041)	0.0987*** (4.061)	0.0988*** (4.058)	0.0981*** (4.428)
Year/Industry FE, Cons.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	916	916	916	916	916	916	916	916	916	916	916
Adj. R-Squared	0.19	0.20	0.19	0.20	0.19	0.19	0.19	0.19	0.19	0.19	0.22

Notes: Standard errors are robust to heteroscedasticity, using White heteroscedasticity standard errors. T-stats are in parenthesis. Significant levels are: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Table 10.** 2SLS regression results with *Tobin's Q* as the dependent variable and exogenous *Dictionary* as the communication measure (Part 1)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat
<i>Dictionary</i>	0.0379*** (4.147)	0.0294** (2.027)	0.0775 (1.077)	0.2119*** (3.967)	0.0935*** (3.161)	0.0309* (1.752)	0.0414* (1.923)	0.0376*** (2.874)	0.0199 (1.114)	0.0038 (0.267)	0.2509** (2.534)
<i>Dictionary</i> <sup>2</sup>	-0.0009 (-1.090)	-0.0011 (-1.209)	-0.0013 (-1.348)	-0.0017* (-1.797)	-0.0013 (-1.443)	-0.0010 (-1.131)	-0.0013 (-1.416)	-0.0011 (-1.203)	-0.0009 (-0.994)	-0.0013 (-1.332)	-0.0026** (-2.472)
<i>Duality</i>	-0.3342** (-2.011)										-0.3369* (-1.785)
<i>Dictionary</i> × <i>Duality</i>	-0.0465** (-2.517)										-0.0536** (-2.418)
<i>EquityRemun</i>		0.7823*** (3.010)									0.7310*** (2.789)
<i>Dictionary</i> × <i>EquityRemun</i>		0.0145 (0.421)									-0.0188 (-0.513)
<i>Ln(Board Size)</i>			0.5278*** (2.586)								0.4644* (1.904)
<i>Dictionary</i> × <i>Ln(Board Size)</i>			-0.0187 (-0.630)								-0.0115 (-0.371)
<i>Independence</i>				0.0642 (0.150)							0.1424 (0.263)

**Table 10.** 2SLS regression results with *Tobin's Q* as the dependent variable and exogenous *Dictionary* as the communication measure (Part 2)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat
<i>Dictionary</i> × <i>Independence</i>				-0.2233*** (-3.502)							-0.1493** (-2.012)
<i>Education</i>					-0.0324 (-0.362)						-0.0873 (-0.795)
<i>Dictionary</i> × <i>Education</i>					-0.0301** (-2.330)						-0.0288* (-1.959)
<i>Expertise</i>						-0.0022 (-0.785)					-0.0040 (-1.293)
<i>Dictionary</i> × <i>Expertise</i>						-0.0000 (-0.033)					-0.0001 (-0.271)
<i>MeetFreq</i>							0.0093* (1.809)				0.0048 (0.838)
<i>Dictionary</i> × <i>MeetFreq</i>							-0.0003 (-0.464)				-0.0001 (-0.068)
<i>GenderDivers</i>								-0.8108 (-1.395)			-1.2143* (-1.765)
<i>Dictionary</i> × <i>GenderDivers</i>								-0.0832 (-1.210)			-0.0497 (-0.712)
<i>InstOwn</i>									-0.1142 (-0.382)		0.1028 (0.322)
<i>Dictionary</i> × <i>InstOwn</i>									0.0200 (0.558)		0.0221 (0.621)
<i>HHI</i>										0.6941 (1.166)	0.4634 (0.713)
<i>Dictionary</i> × <i>HHI</i>										0.2011** (2.035)	0.1051 (0.992)
<i>Risk Ratio</i>	-0.0055 (-1.391)	-0.0062 (-1.575)	-0.0043 (-1.077)	-0.0042 (-1.063)	-0.0049 (-1.228)	-0.0055 (-1.390)	-0.0052 (-1.305)	-0.0056 (-1.399)	-0.0055 (-1.376)	-0.0047 (-1.178)	-0.0039 (-0.993)
<i>Mgt Quality</i>	0.0039 (0.759)	0.0042 (0.824)	0.0042 (0.831)	0.0043 (0.837)	0.0048 (0.929)	0.0040 (0.777)	0.0044 (0.845)	0.0043 (0.836)	0.0041 (0.789)	0.0040 (0.781)	0.0054 (1.070)
<i>Debt Ratio</i>	0.2562 (0.659)	0.2885 (0.758)	0.3405 (0.889)	0.4082 (1.048)	0.3294 (0.856)	0.3146 (0.819)	0.3708 (0.967)	0.3948 (1.026)	0.3832 (0.975)	0.3879 (1.009)	0.1944 (0.475)
<i>Firm Size</i>	-0.0483 (-0.928)	-0.0633 (-1.211)	-0.1045* (-1.832)	-0.0560 (-1.065)	-0.0500 (-0.938)	-0.0555 (-1.012)	-0.0722 (-1.361)	-0.0326 (-0.598)	-0.0464 (-0.858)	-0.0410 (-0.769)	-0.0981 (-1.558)
<i>Age</i>	0.0096*** (4.413)	0.0082*** (3.850)	0.0084*** (3.844)	0.0085*** (3.826)	0.0090*** (4.113)	0.0086*** (3.920)	0.0090*** (4.143)	0.0089*** (4.044)	0.0086*** (3.907)	0.0084*** (3.920)	0.0088*** (3.991)
<i>CEO Ownership</i>	0.1073*** (4.497)	0.1089*** (4.509)	0.1130*** (4.346)	0.1005*** (4.136)	0.1014*** (4.155)	0.1029*** (4.200)	0.1025*** (4.179)	0.1021*** (4.179)	0.1044*** (4.211)	0.1049*** (4.213)	0.1097*** (4.594)
<i>Year/Industry FE, Cons.</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	916	916	916	916	916	916	916	916	916	916	916
Adj. R-Squared	0.18	0.19	0.18	0.19	0.18	0.18	0.18	0.18	0.18	0.18	0.20

Notes: Standard errors are robust to heteroscedasticity, using White heteroscedasticity standard errors. T-stats are in parenthesis. Significant levels are: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Table 11.** 2SLS regression results with *Tobin's Q* as the dependent variable and exogenous *CI* as the communication measure (Part 1)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat
<i>CI</i>	0.0166*** (3.131)	0.0170* (1.921)	0.0571 (1.553)	0.0413 (1.480)	0.0336** (2.272)	0.0199** (2.092)	0.0193* (1.662)	0.0123* (1.722)	-0.0033 (-0.330)	0.0030 (0.371)	0.0934* (1.724)
<i>CF</i>	-0.0006** (-2.242)	-0.0006** (-2.359)	0.0007*** (2.600)	-0.0006** (-2.298)	-0.0006** (-2.244)	-0.0006** (-2.320)	-0.0007** (-2.545)	-0.0006** (-2.165)	-0.0004 (-1.528)	-0.0007** (-2.416)	0.0008*** (2.649)
<i>Duality</i>	-0.3508** (-2.101)										-0.3378* (-1.760)
<i>CI</i> × <i>Duality</i>	-0.0181* (-1.662)										-0.0196* (-1.765)
<i>EquityRemun</i>		0.7885*** (2.961)									0.7798*** (2.871)
<i>CI</i> × <i>EquityRemun</i>		-0.0020 (-0.102)									-0.0122 (-0.595)
<i>Ln(Board Size)</i>			0.4469** (2.214)								0.3469 (1.358)



**Table 11.** 2SLS regression results with *Tobin's Q* as the dependent variable and exogenous *CI* as the communication measure (Part 2)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat
<i>CI</i> × <i>Ln(Board Size)</i>			-0.0189 (-1.240)								-0.0198 (-1.210)
<i>Independence</i>				-0.0770 (-0.179)							-0.1840 (-0.342)
<i>CI</i> × <i>Independence</i>				-0.0367 (-1.075)							-0.0301 (-0.710)
<i>Education</i>					-0.0438 (-0.484)						-0.0503 (-0.457)
<i>CI</i> × <i>Education</i>					-0.0102 (-1.586)						-0.0077 (-0.990)
<i>Expertise</i>						-0.0014 (-0.500)					-0.0028 (-0.902)
<i>CI</i> × <i>Expertise</i>						-0.0002 (-0.948)					-0.0001 (-0.555)
<i>MeetFreq</i>							0.0098* (1.928)				0.0071 (1.279)
<i>CI</i> × <i>MeetFreq</i>							-0.0002 (-0.521)				-0.0000 (-0.091)
<i>GenderDivers</i>								-0.7936 (-1.390)			-1.2822* (-1.882)
<i>CI</i> × <i>GenderDivers</i>								-0.0061 (-0.165)			0.0272 (0.671)
<i>InstOwn</i>									-0.1535 (-0.517)		-0.0308 (-0.096)
<i>CI</i> × <i>InstOwn</i>									0.0378* (1.788)		0.0294 (1.315)
<i>HHI</i>										0.8253 (1.370)	0.4326 (0.667)
<i>CI</i> × <i>HHI</i>										0.0711 (1.346)	0.0543 (0.908)
<i>Risk Ratio</i>	-0.0043 (-1.095)	-0.0048 (-1.238)	-0.0031 (-0.777)	-0.0040 (-1.002)	-0.0041 (-1.024)	-0.0043 (-1.068)	-0.0040 (-0.995)	-0.0047 (-1.166)	-0.0045 (-1.127)	-0.0041 (-1.037)	-0.0034 (-0.861)
<i>Mgt Quality</i>	0.0037 (0.710)	0.0040 (0.782)	0.0041 (0.793)	0.0041 (0.807)	0.0043 (0.838)	0.0039 (0.768)	0.0043 (0.825)	0.0040 (0.771)	0.0036 (0.701)	0.0041 (0.802)	0.0043 (0.828)
<i>Debt Ratio</i>	0.2248 (0.573)	0.2617 (0.681)	0.3298 (0.853)	0.3758 (0.949)	0.3266 (0.835)	0.3262 (0.846)	0.3549 (0.920)	0.3631 (0.936)	0.4048 (1.024)	0.3478 (0.897)	0.2197 (0.527)
<i>Firm Size</i>	-0.0418 (-0.822)	-0.0511 (-0.991)	-0.0769 (-1.360)	-0.0384 (-0.741)	-0.0361 (-0.688)	-0.0384 (-0.717)	-0.0601 (-1.160)	-0.0197 (-0.368)	-0.0343 (-0.647)	-0.0337 (-0.646)	-0.0609 (-1.026)
<i>Age</i>	0.0099*** (4.525)	0.0082*** (3.815)	0.0085*** (3.884)	0.0087*** (3.896)	0.0088*** (4.059)	0.0086*** (3.927)	0.0090*** (4.145)	0.0088*** (4.020)	0.0086*** (3.882)	0.0086*** (3.983)	0.0086*** (3.943)
<i>CEO Ownership</i>	0.1054*** (4.400)	0.1070*** (4.408)	0.1103*** (4.258)	0.1013*** (4.093)	0.0991*** (4.044)	0.1017*** (4.053)	0.1007*** (4.065)	0.0998*** (4.023)	0.1040*** (4.131)	0.1021*** (4.096)	0.1088*** (4.491)
Year/Industry FE, Cons.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	916	916	916	916	916	916	916	916	916	916	916
Adj. R-Squared	0.18	0.19	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.19

Notes: Standard errors are robust to heteroscedasticity, using White heteroscedasticity standard errors. T-stats are in parentheses. Significant levels are: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Tables 12, 13, and 14 focus on the *Risk Ratio* as the dependent variable with *Length*, *Dictionary*, and *CI* as the communication measure, respectively. Supporting *H3*, the non-linear association between corporate communication and risk is evident from the results of Models 3 and 11 in Table 12, where the coefficient of *Length* ( $Length^2$ ) is significantly negative (positive). Similar and stronger relationships are evident in Tables 13 and 14, which support our hypothesis of non-linearity regarding the firm's risk (*H3*). Such a U-shaped relationship suggests that increasing information dissemination to the public reduces the firm's risk up to a point. The additional information is considered noise that adds to the firm's risk level.

Supporting *H5*, the overall results in Tables 12, 13, and 14 show the complementary relationship between *Communication* and product market competition and substitution relationship between communication and *Board Size*, *Independence*, *Education*, *Expertise*, *Meeting Frequency*, and

*Institutional Ownership*. The interpretation of the substitution-complementary relationship with regards to the firm's risk is different from the value. For example, the complementary relationship between product market competition and communication in Tables 12 and 13 suggests that in industries with low competition, where companies often have low transparency, the extra effort in communication lowers the ambiguity and risk of the company. Building on the basic definition of complementary relationships, these findings imply a higher need for communication in situations where there is high uncertainty around a firm (associated with low product market competition).

On the other hand, the nature of substitution relationships suggests that additional communication has more costs than benefits with respect to the firm's risk profile in firms with specific board and governance configurations. The substitution findings on *Board Independence* and *Board Education* in Tables 12, 13, and 14 are inherently

similar to those in Tables 9, 10, and 11, where *Tobin's Q* is the dependent variable. Supported by prior research (Berger, Kick, & Schaeck, 2014; Younas, Klein, Trabert, & Zwergel, 2019), our findings imply that firms with more independent and educated members have lower ambiguity and, therefore, releasing more and more information will be more costly than beneficial to these firms.

Our results also support substitution relationships between communication and *Board Size*, *Board Expertise*, *Board Meeting Frequency*, and *Institutional Ownership*. The significantly positive coefficient of the interaction variable between *Board Size* and *Length* in Table 12 shows that lengthier communications with the market add to risk level in firms with larger boards. The findings of the study by Cheng (2008) show lower performance variability in firms with larger boards which implies that firms with larger boards already have lower risk; so, they do not benefit much by adding more and more to their communication activities.

Prior literature also finds board expertise as an influential factor in reducing firms' stock returns volatility (Bernile, Bhagwat, & Yonker, 2018). Therefore, firms with already expert-packed boards may not benefit from more communication initiatives than firms lacking such board members. Prior studies also show a negative relationship between the risk profile of the firm and board meeting frequency (Anderson, Mansi, & Reeb, 2004). So, if a firm is lowering the information gap by holding a high number of meetings, there is less benefit in increasing the level of communication via other channels. Finally, we know from the literature that the ownership structure, particularly institutional ownership, has a significant positive impact on firms' risk-taking behaviors (Wright, Ferris, Sarin, & Awasthi, 1996). As a result, a firm with more prominent institutional owners experiences more costs than benefits from adding to its communication efforts, supporting a substitution relationship.

**Table 12.** 2SLS regression results with *Risk Ratio* as the dependent variable and exogenous *Length* as the communication measure (Part 1)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat
<i>Length</i>	-0.0112 (-0.521)	-0.0087 (-0.266)	-0.4650*** (-3.580)	-0.2378** (-2.039)	-0.0995* (-1.845)	-0.0395 (-1.123)	-0.0512 (-0.960)	-0.0231 (-0.843)	-0.0548 (-1.385)	0.0463 (1.586)	-0.6971*** (-3.363)
<i>Length</i> <sup>2</sup>	0.0004 (0.999)	0.0004 (0.998)	0.0010** (2.378)	0.0006 (1.400)	0.0005 (1.249)	0.0004 (1.007)	0.0005 (1.311)	0.0005 (1.235)	0.0005 (1.147)	0.0006 (1.371)	0.0013*** (2.805)
<i>Duality</i>	-0.0064 (-0.005)										-0.8802 (-0.651)
<i>Length</i> × <i>Duality</i>	0.0379 (0.866)										0.0617 (1.286)
<i>EquityRemun</i>		2.5054 (1.344)									3.1745* (1.653)
<i>Length</i> × <i>EquityRemun</i>		0.0124 (0.193)									-0.0039 (-0.056)
<i>Ln(Board Size)</i>			-5.9226*** (-3.200)								-5.8738*** (-2.810)
<i>Length</i> × <i>Ln(Board Size)</i>			0.1898*** (3.524)								0.1873*** (3.101)
<i>Independence</i>				-1.6376 (-0.455)							-3.0118 (-0.696)
<i>Length</i> × <i>Independence</i>				0.2813** (2.029)							0.0968 (0.568)
<i>Education</i>					-1.0863 (-1.468)						-0.2273 (-0.265)
<i>Length</i> × <i>Education</i>					0.0424* (1.819)						0.0417 (1.542)
<i>Expertise</i>						-0.0223 (-0.979)					-0.0167 (-0.672)
<i>Length</i> × <i>Expertise</i>						0.0009 (1.207)					0.0010 (1.146)
<i>MeetFreq</i>							-0.0181 (-0.382)				0.0608 (1.205)
<i>Length</i> × <i>MeetFreq</i>							0.0016 (0.942)				0.0007 (0.390)
<i>GenderDivers</i>								-6.3501 (-1.220)			-2.1419 (-0.353)
<i>Length</i> × <i>GenderDivers</i>								0.1181 (0.729)			-0.0739 (-0.370)
<i>InstOwn</i>									2.3154 (1.009)		0.4358 (0.184)
<i>Length</i> × <i>InstOwn</i>									0.1209 (1.546)		0.1725** (2.147)
<i>HHI</i>										-0.7105 (-0.126)	-1.2900 (-0.209)
<i>Length</i> × <i>HHI</i>										-0.4248** (-2.396)	-0.4487** (-2.181)

**Table 12.** 2SLS regression results with *Risk Ratio* as the dependent variable and exogenous *Length* as the communication measure (Part 2)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat
Mgt Quality	-0.0361 (-0.906)	-0.0346 (-0.859)	-0.0375 (-0.936)	-0.0374 (-0.926)	-0.0438 (-1.042)	-0.0348 (-0.876)	-0.0365 (-0.920)	-0.0373 (-0.930)	-0.0356 (-0.907)	-0.0346 (-0.867)	-0.0382 (-0.916)
Debt Ratio	-2.1187 (-0.759)	-2.3980 (-0.871)	-1.4920 (-0.546)	-2.0594 (-0.737)	-1.4958 (-0.540)	-2.8016 (-1.005)	-2.2097 (-0.800)	-2.0975 (-0.762)	-2.2219 (-0.798)	-2.5851 (-0.933)	-1.4807 (-0.518)
Firm Size	-0.2241 (-0.589)	-0.2490 (-0.655)	0.3446 (0.809)	-0.1718 (-0.450)	-0.0915 (-0.239)	-0.3246 (-0.828)	-0.1472 (-0.372)	-0.0350 (-0.087)	-0.3479 (-0.901)	-0.2373 (-0.620)	0.0883 (0.185)
Age	-0.0152 (-0.998)	-0.0176 (-1.208)	-0.0195 (-1.329)	-0.0148 (-1.005)	-0.0194 (-1.333)	-0.0178 (-1.205)	-0.0161 (-1.100)	-0.0166 (-1.138)	-0.0129 (-0.884)	-0.0151 (-1.030)	-0.0178 (-1.118)
CEO Ownership	-0.0499 (-0.362)	-0.0359 (-0.261)	-0.1452 (-1.051)	-0.0336 (-0.246)	-0.0638 (-0.454)	-0.0714 (-0.516)	-0.0439 (-0.320)	-0.0717 (-0.525)	-0.0541 (-0.394)	-0.0608 (-0.447)	-0.1052 (-0.725)
Year/Industry FE, Cons.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	916	916	916	916	916	916	916	916	916	916	916
Adj. R-Squared	0.02	0.03	0.04	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.05

Notes: All the models control for Industry and Year Fixed Effects. Standard errors are robust to heteroscedasticity, using White heteroscedasticity standard errors. T-stats are in parentheses, and significant levels are: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Table 13.** 2SLS regression results with *Risk Ratio* as the dependent variable and exogenous *Dictionary* as the communication measure (Part 1)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat
Dictionary	0.0106 (0.117)	-0.0582 (-0.417)	-1.7254*** (-3.342)	-1.2458*** (-2.721)	-0.4064* (-1.767)	-0.2269 (-1.434)	-0.3891 (-1.634)	-0.0500 (-0.440)	-0.1159 (-0.652)	0.2382* (1.909)	-3.0406*** (-3.716)
Dictionary <sup>2</sup>	0.0174** (2.382)	0.0180** (2.350)	0.0254*** (3.339)	0.0223*** (3.024)	0.0192*** (2.586)	0.0184** (2.558)	0.0214*** (2.834)	0.0184** (2.495)	0.0167** (2.239)	0.0198*** (2.753)	0.0349*** (4.022)
Duality	0.0494 (0.039)										-0.3681 (-0.274)
Dictionary × Duality	-0.0265 (-0.143)										0.0869 (0.451)
EquityRemun		2.7209 (1.454)									2.8464 (1.454)
Dictionary × EquityRemun		0.2148 (0.777)									0.1950 (0.629)
Ln(Board Size)			-5.8347*** (-3.202)								-5.6851*** (-2.738)
Dictionary × Ln(Board Size)			0.7145*** (3.360)								0.6714*** (2.773)
Independence				-2.0027 (-0.559)							-2.1947 (-0.517)
Dictionary × Independence				1.5335*** (2.797)							0.7191 (1.109)
Education					-0.9820 (-1.320)						-0.1251 (-0.144)
Dictionary × Education					0.1915* (1.923)						0.1053 (0.904)
Expertise						-0.0237 (-1.057)					-0.0232 (-0.964)
Dictionary × Expertise						0.0061* (1.831)					0.0064 (1.637)
MeetFreq							-0.0182 (-0.381)				0.0434 (0.842)
Dictionary × MeetFreq							0.0141* (1.778)				0.0102 (1.137)
GenderDivers								-6.1642 (-1.183)			-3.2451 (-0.542)
Dictionary × GenderDivers								0.3483 (0.511)			-0.4673 (-0.578)
InstOwn									2.3945 (1.025)		-0.2558 (-0.104)
Dictionary × InstOwn									0.3267 (0.961)		0.5934* (1.691)
HHI										-1.4162 (-0.250)	-3.2072 (-0.514)

**Table 13.** 2SLS regression results with *Risk Ratio* as the dependent variable and exogenous *Dictionary* as the communication measure (Part 2)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat
Dictionary × HHI										-1.8148**	-1.5829*
Mgt Quality	-0.0349 (-0.875)	-0.0338 (-0.844)	-0.0350 (-0.860)	-0.0359 (-0.880)	-0.0429 (-1.013)	-0.0354 (-0.894)	-0.0371 (-0.931)	-0.0363 (-0.900)	-0.0351 (-0.887)	-0.0337 (-0.849)	-0.0339 (-0.815)
Debt Ratio	-2.4687 (-0.890)	-2.6823 (-0.978)	-1.8701 (-0.684)	-2.5949 (-0.935)	-1.8565 (-0.674)	-3.2457 (-1.170)	-2.7953 (-1.019)	-2.4008 (-0.877)	-2.6546 (-0.957)	-2.9713 (-1.076)	-2.6054 (-0.908)
Firm Size	-0.3020 (-0.795)	-0.3589 (-0.947)	0.2331 (0.551)	-0.2509 (-0.660)	-0.2097 (-0.550)	-0.4641 (-1.187)	-0.1829 (-0.464)	-0.1377 (-0.343)	-0.4180 (-1.082)	-0.3580 (-0.937)	-0.0014 (-0.003)
Age	-0.0167 (-1.102)	-0.0188 (-1.285)	-0.0173 (-1.181)	-0.0162 (-1.110)	-0.0198 (-1.360)	-0.0173 (-1.179)	-0.0170 (-1.158)	-0.0168 (-1.149)	-0.0144 (-0.984)	-0.0139 (-0.934)	-0.0168 (-1.067)
CEO Ownership	-0.0509 (-0.368)	-0.0353 (-0.257)	-0.1656 (-1.189)	-0.0272 (-0.198)	-0.0726 (-0.518)	-0.0663 (-0.480)	-0.0300 (-0.220)	-0.0711 (-0.520)	-0.0529 (-0.385)	-0.0632 (-0.464)	-0.1439 (-0.987)
Year/Industry FE, Cons.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	916	916	916	916	916	916	916	916	916	916	916
Adj. R-Squared	0.03	0.03	0.05	0.04	0.04	0.03	0.03	0.03	0.03	0.04	0.05

Notes: All the models control for Industry and Year Fixed Effects. Standard errors are robust to heteroscedasticity, using White heteroscedasticity standard errors. T-stats are in parentheses, and significant levels are: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Table 14.** 2SLS regression results with *Risk Ratio* as the dependent variable and exogenous *CI* as the communication measure (Part 1)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat
CI	-0.0869* (-1.812)	-0.1389* (-1.863)	-0.8518*** (-3.211)	0.6869*** (3.081)	-0.2686** (-2.457)	-0.2013** (-2.463)	-0.3894*** (-3.443)	-0.0933 (-1.557)	-0.1296 (-1.475)	-0.0180 (-0.247)	-1.6908*** (-4.099)
CI <sup>2</sup>	0.0042* (1.790)	0.0045* (1.883)	0.0057** (2.360)	0.0054** (2.223)	0.0040* (1.728)	0.0047** (1.979)	0.0052** (2.229)	0.0042* (1.764)	0.0047* (1.849)	0.0047* (1.937)	0.0091*** (3.383)
Duality	0.4619 (0.367)										-0.0949 (-0.070)
CI × Duality	-0.0353 (-0.349)										0.0437 (0.429)
EquityRemun		2.1651 (1.140)									2.2979 (1.159)
CI × EquityRemun		0.1601 (1.017)									0.1687 (1.006)
Ln(Board Size)			-5.2551*** (-2.852)								-4.5154** (-2.125)
CI × Ln(Board Size)			0.3258*** (2.937)								0.3154** (2.481)
Independence				-1.7065 (-0.475)							-0.0355 (-0.008)
CI × Independence				0.7609*** (2.712)							0.4585 (1.343)
Education					-1.0519 (-1.426)						-0.0080 (-0.009)
CI × Education					0.0852* (1.723)						0.0316 (0.522)
Expertise						-0.0272 (-1.208)					-0.0271 (-1.110)
CI × Expertise						0.0028 (1.548)					0.0035* (1.706)
MeetFreq							-0.0242 (-0.511)				0.0077 (0.149)
CI × MeetFreq							0.0114*** (2.968)				0.0087* (1.851)
GenderDivers								-8.3267 (-1.597)			-5.9751 (-1.019)
CI × GenderDivers								-0.0549 (-0.154)			-0.6029 (-1.389)
InstOwn									1.7966 (0.779)		-0.5526 (-0.226)
CI × InstOwn									0.1242 (0.664)		0.2822 (1.429)
HHI										-0.7279 (-0.127)	-1.6835 (-0.270)
CI × HHI											-0.5372 (-1.242)

**Table 14.** 2SLS regression results with *Risk Ratio* as the dependent variable and exogenous *CI* as the communication measure (Part 2)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat	Coef/ t-stat
<i>Mgt Quality</i>	-0.0340 (-0.839)	-0.0341 (-0.845)	-0.0351 (-0.855)	-0.0371 (-0.890)	-0.0412 (-0.959)	-0.0341 (-0.847)	-0.0369 (-0.918)	-0.0336 (-0.827)	-0.0362 (-0.894)	-0.0344 (-0.850)	-0.0358 (-0.867)
<i>Debt Ratio</i>	-1.4622 (-0.528)	-1.7063 (-0.622)	-1.3452 (-0.492)	-1.7994 (-0.646)	-0.9163 (-0.332)	-2.2105 (-0.801)	-2.2002 (-0.798)	-1.3038 (-0.476)	-1.7249 (-0.622)	-1.8597 (-0.672)	-2.1421 (-0.746)
<i>Firm Size</i>	-0.1395 (-0.372)	-0.1939 (-0.520)	0.2718 (0.647)	-0.1253 (-0.335)	-0.0489 (-0.130)	-0.2503 (-0.654)	-0.0831 (-0.216)	0.0736 (0.186)	-0.2064 (-0.545)	-0.1444 (-0.384)	0.1496 (0.329)
<i>Age</i>	-0.0119 (-0.780)	-0.0115 (-0.770)	-0.0084 (-0.564)	-0.0116 (-0.781)	-0.0137 (-0.930)	-0.0114 (-0.770)	-0.0097 (-0.648)	-0.0108 (-0.735)	-0.0097 (-0.657)	-0.0102 (-0.690)	-0.0079 (-0.501)
<i>CEO Ownership</i>	-0.0057 (-0.042)	0.0097 (0.072)	-0.0989 (-0.712)	0.0160 (0.118)	-0.0200 (-0.144)	-0.0083 (-0.061)	0.0174 (0.130)	-0.0227 (-0.168)	0.0007 (0.005)	-0.0045 (-0.033)	-0.0539 (-0.373)
Year/Industry FE, Cons.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	916	916	916	916	916	916	916	916	916	916	916
Adj. R-Squared	0.03	0.03	0.05	0.04	0.04	0.03	0.04	0.03	0.03	0.03	0.05

Notes: All the models control for Industry and Year Fixed Effects. Standard errors are robust to heteroscedasticity, using White heteroscedasticity standard errors. T-stats are in parentheses, and significant levels are: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

## 5. CONCLUSION

In summary, the findings support the disciplinary role of communication culture (i.e., the expected transparency). The impact of this new governance mechanism on outputs such as firms' value and risk is non-linear and depends on the configuration of other governance mechanisms. The non-linear relationship between communication and market-based measures of performance and risk and the substitution-complementary relationships between communication and other governance mechanisms reflect the notion of "equifinality" where firms have strategic flexibility in choosing their governance configurations (Gresov & Drazin, 1997; Oh et al., 2018). We demonstrate that corporate communication has a substitution-complementary relationship with board size, board independence, board education, board expertise, CEO duality, frequency of board meetings, board gender diversity, institutional ownership, and product market competition. These significant associations suggest that communication should be part of the governance bundle, and the optimum level of communication should be according to the specific configuration for each firm. These findings point to the necessity of dynamic analysis of costs and benefits of communication in conjunction with governance measures. These findings for practitioners imply that the optimum level of involvement in communication practices depends on the long-run level of transparency and the specific configuration of firms' bundle of governance mechanisms. This study is the first to examine the independent role of communication as a governance mechanism that disciplines managers and, therefore, reduces agency issues. We analyzed the content of more than 150,000 mandatory and voluntary documents, consisting of press releases and more than 100 different types of filings published by 96 Canadian firms listed on the TSX/S&P Composite Index from 1999 to 2014. Our findings contribute to this literature and, in particular, to the ongoing discussion about the value relevance of voluntary information. As such, we deepen the understanding of agency theory predictions about the economic effects of communications and disclosures.

First, this study highlights the role of corporate communication as a governance mechanism. Our results show a significant relationship between

negative deviation from the expected level of transparency and the reduction in Tobin's Q. Second, it adds to our understanding of the importance of cost-benefit analysis in determining the optimum point of involvement in communication practices. We provide evidence that corporate communication has an inverted U-shaped association with Tobin's Q and a U-shaped relationship with risk. This curvilinear connection implies that improving communication adds to the firm's value (and reduces the risk) but at a declining rate. Third, it provides practical implications that the optimum level of involvement in communication practices depends on the long-run transparency and the specific configuration of firms' bundle of governance mechanisms. The substitution-complementary effect is based on the collective impact of communication and another governance mechanism on the firm's value (measured by Tobin's Q) and risk profile (measured by the ratio of idiosyncratic risk to total volatility). These findings point to the necessity of dynamic costs and benefits analysis of communication compared to other governance measures. Fourth, we introduce two new measures of communication that can quantify the information content of communication (*Dictionary*), as well as the diversity of communicated topics, compared to the industry median (*CI*). These measures are direct, reliable, and valid. Fifth, the sixteen-year sample period captures the firms' communication culture that is free from short-term biases. Sixth, this study provides some evidence on the Canadian governance environment. Finally, by removing firm-year observations with major events, we provide a clear picture that is not under the temporary influences of public relations activities and discussions.

Our results, however, are subject to some limitations that can be improved and further explored in future studies. First, our sample includes financial and utility companies with a higher proportion than the target companies listed on S&P/TSX Composite Index. It is therefore important to consider such over-representation when interpreting the findings. Nevertheless, we believe that the high volume of corporate filings analyzed in our sample still provides meaningful results. Second, the findings for practitioners imply that the optimum level of involvement in communication practices depends on the long-run level of

transparency and the specific configuration of firms' bundle of governance mechanisms. Third, the determination of the optimal level of corporate communication using the non-linear nature of its relationship with firm value and risk can be the focus of future studies. In addition, since our sample is restricted to Canadian firms, future studies can adapt our framework to conduct a cross-country analysis to compare the governing power of corporate communication in environments with

different institutional settings and stakeholder protections. Finally, the benefits and costs of self-constructed direct communication measures can be further examined and tested against indirect measures of transparency, such as analyst coverage and market liquidity. Overall, we hope that our study will inspire further research to extend our results, improve our methods, and ultimately broaden our understanding of the governing role of corporate communications.

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## APPENDIX A. DICTIONARY AND COMMUNICATION INDEX (CI)

### Measure construction

To construct the custom dictionary of 608 business-related words, we took the following steps:

In step 1, we randomly selected two large firms from each sector (11 sectors, 22 firms) — we chose large firms because the complete disclosure and the most variety of topics are expected to be discussed by large firms. We did not want to leave any topics unattended.

In step 2, we downloaded all filings made by these firms in 2014 (the last year of the sample). The number of filings downloaded is roughly around 1500 documents from 22 firms. There are more than 100 different types of documents that a firm may file at SEDAR over a fiscal year (Please refer to Appendix B for the complete list of all documents). These downloaded files are used to create the training corpus for the content analysis. As El-Haj, Rayson, Walker, Young, and Simaki (2019) explain, in computational linguistics, generalizable insight is obtained only when the diversity of reports under investigation reflects the target of the study. To have generalizable insight about corporate communication, instead of focusing on a specific filing such as an annual report, we incorporated all types of corporate filings. One of the features of Canadian data is that firms must file their press releases at SEDAR. By choosing our sample among Canadian firms, we made sure that we have included a major source of voluntary disclosure (i.e., press release).

In step 3, two graduate research assistants (coders) separately studied all downloaded files (Training Corpus) and created a list of communicated topics. We then combined the lists from the coders and double-checked their relevancy. The final list consists of 91 different topics (see Appendix C). We call these topics *sub-categories*. In the literature of computational linguistic, these sub-categories are called Named Entities or Classes (El-Haj et al., 2019). Without the classifications, the frequency of dictionary words and phrases in the filings only reflects the overall information content of the communication. The added categorization feature captures the diversity of topics discussed by each firm and compares firms' communication practices with that of industry peers. These 91 sub-categories belong to 8 main business areas: financial performance, risk management, investor relations, sustainability, environmental issues, governance mechanisms, labor policies, and strategic plans. We call these main business areas *categories*.

In step 4, the two coders went through the training corpus again. They selected words and phrases that contribute to the overall meaning of the specific sub-categories discussed in the document<sup>10</sup>.

In step 5, the authors compared the lists and kept words and phrases selected by both coders. Working with the overlap of the two lists is called "intercoder reliability" in the literature of contextual analysis. The final list is called a dictionary that has 608 informative words and phrases. The final list of words and phrases classified in related sub-categories is in Appendix C.

The process of in-depth manual extraction of meaningful words and phrases from a random sample of large firms representing all industries and all types of filings has several benefits. The largest firms in the most recent year provide a representative sample of high-level communication practices. Each industry has its dynamics, and therefore, by including different industries, we ensure that the wordlist is inclusive and is unbiased across sample firms. The human selection of informative words and phrases rather than automated methods used in natural language processing assures that the custom dictionary captures the informativeness and is context-relevant. El-Haj et al. (2019) point out that human judgment is necessary at some point during the content analysis to make sense out of the discourse even in the most sophisticated computational linguistics approaches. Moreover, using more sophisticated machine learning techniques or natural language processing methods is justifiable only if they bring in new insights or incrementally add to our understanding of the subject matter. Otherwise, non-sophisticated approaches are as practical.

To compute the value of the *Dictionary* measure, we count instances of the words and phrases from the custom dictionary in each document across all filings (Analysis Corpus, consisting of 150,000 documents) for each firm in a specific year. The total count of our wordlist across all filings for a firm in a specific year is the value of *Dictionary* for that firm year. To compute the value of the *Communication Index (CI)* measure, we count instances of words and phrases under each sub-category in each document across all filings (Analysis Corpus) for each firm in a specific year. Then for each sub-category, the total count is compared with the industry median in each year. A firm scores two if it is higher than the median count of words, one if it is lower than the median, and 0 if it has no words and phrases in that sub-category. Therefore, CI can range from a minimum of zero (below the median in all sub-categories =  $0 \times 91$ ) to a maximum of 182 (above the median in all sub-categories =  $2 \times 91$ ) for each firm in each year.

### Validity and reliability of communication measures

According to Botosan (2004), there are four characteristics for any piece of information that enhances its meaningfulness for economic decision-makers: 1) *Understandability*, 2) *Relevancy*, 3) *Reliability*, and 4) *Comparability*. The four mentioned characteristics are from the International Accounting Standards Board (IASB) framework for information quality. We need to emphasize that the only way to capture the quality of communication correctly is to cross-check the communicated information with the realized action, which is not the focus of this paper. First, our measures adhere to the *understandability* criterion. They reflect the communication efforts via more than 100 different types of documents directly filed by companies, ranging from commonly known annual reports to sophisticated underwriting agreements. Second, the measures comply with the *relevancy* criterion. They employ words and phrases derived directly from documents that firms published to address different business areas in their communication with

<sup>10</sup> As mentioned earlier, it is important to include phrases as opposed to just single words. For example, the count of "insider trading" expresses an entirely different meaning from the count of either "insider" or "trading." If we were to follow the "bag-of-words" methods used in many prior studies, we would have counted two separate words that capture a completely different meaning than "insider trading" as a whole. This problem is discussed by El-Haj et al. (2019).

shareholders, creditors, suppliers, customers, employees, unions, communities, and governmental agencies. Such diverse corporate areas are rarely present in disclosure studies where the applied dictionary of words is business-related (Henry, 2008; Henry & Leone, 2016; Li, 2010). Third, the measures conform to the *reliability* criterion. Reliability and Validity questions are often raised for self-constructed indices. We address the reliability concern with the “Inter-coder reliability” test (Hackston & Milne, 1996; Hussainey, Schleicher, & Walker, 2003), and the validity concern with “Criterion” and “Construct” validity tests (Hassan & Marston, 2010; Hope, Rotman, Street, & Ms, 2003). To meet the *reliability* criterion, two research assistants separately reviewed the same sample of filings and independently created two lists of informative words and phrases where the overlap shaped the dictionary. The annotation process is based on an annotation guide created by two experts using a small set of corporate filings. As El-Haj et al. (2019) explain, manual annotation is best performed when multiple coders annotate the same set of text autonomously, compare their results with each other and resolve any differences, and finally, create an annotation rule before moving on to the more extensive set of text. We are unaware of any published study where multiple coders annotate the same set of texts independently, and this feature departs us from prior research.

As for “Criterion validity,” we check if there is a significant correlation between our *CI* values and those of existing measures in the literature. The closest measure to Dictionary and *CI*'s nature is the length of the document used by Wang and Hussainey (2013). The correlations between *Dictionary* and *Length* are 0.91, and the correlation between *CI* and *Length* is 0.79. We also examine “Construct validity” to see whether empirical results from our measures are similar to those of already established measures (i.e., *Length*). In almost all models, we find consistent results among *Length*, *Dictionary*, and *CI*. And finally, our measures adhere to the *comparability* criterion, as they, by construct, capture the inter-temporal differences. Also, our measures incorporate deviations from industry norms, making them comparable across firms and years.

## APPENDIX B

Table B.1. Document types

Audited annual financial statements	Directors' circular	Minutes of last annual meeting of shareholders
Acceptance of Prospectus Supplement	Disqualification report	MRRS Decision Document
Alternative monthly report	Documents affecting rights of security holders	NI 44-101 Notice of intent to qualify
Amended & restated technical report	Documents incorporated by reference	Notice
Amendment to (or amended) final prospectus	Early warning report	Notice indicating result of issuer bid (QC)
Annual financial statements — letter from foreign issuer	Engineering report and certificate of qualification	Notice of Acceptance for Filing
Annual information form	Escrow agreement	Notice of change or variation
Annual Participation Fee for Reporting Issuers	Exempt issuer bid material	Notice of intention
Application letter	Exemption Order	Oil and gas annual disclosure filing
Asset and earnings coverage calculations	Exhibits and other supporting material	Oil and gas reports
Auditors' comfort letter	Filing statement	Other material contract(s) not previously filed
Auditors' negative assurance letter	Final exchange offering prospectus	Other security holders' documents
BC Form 51-901F	Final prospectus	Other supporting documents
Business acquisition report	Financial statements of operating entity	Other undertakings
Certificate/notice(s) re proceeds of distribution	First Response Letter	Press release
Certificate of POP eligibility	Form of proxy	Prior valuation
Certificate of qualified person	Formal valuation	Prospectus supplement
Certificate re-dissemination to shareholders	Information circular	Proxy/information circular
Certification of annual filings	Information circular for the solicitation of proxies	Qualification certificate
Certification of filings with voluntarily filed AIF	Information document	Report of exempt issuer bid
Certification of interim filings	IPO/RTO/Becoming non-venture issuer	Report of exempt take-over bid
Certification of refiled annual filings	Issuer bid circular	Report of proxy voting results
Certified resolutions approving final prospectus	Issuer's submission to jurisdiction and appointment of agent	Rights certificate
Certified resolutions approving offering documents	Letter concerning the addition of a recipient agency	Rights offering circular
Certified resolutions approving supplement	Letter from former auditor	Statement of Executive Compensation
Code of conduct	Letter from successor auditor	Stock exchange issuer bid notice
Confirmation re-review by audit committee or board of directors	Lock-up agreement (QC)	Summary of any changes in control
Consent letter	Management information circular	Take-over bid circular
Consent letter of issuer's legal counsel	Management proxy materials	Technical report
Consent letter of underwriters' legal counsel	Marketing materials	U.S. registration statement and exhibits
Consent letter(s) of expert(s)	Material change report	Undertaking re breakdown of sales and payment of fees (BC)
Consent of qualified person (NI 43-101)	Material contracts — Credit agreements	Undertaking re novel derivatives or asset-backed securities
Cross-reference sheet	MD&A	Underwriters' certificate
Decision Document (Final)	Mining reports	Underwriting or agency agreement

Note: This table shows different types of documents that were filed by firms and retrieved from SEDAR to be used in this study.

## APPENDIX C

Table C.1. Dictionary words in categories and sub-categories (Part 1)

<i>I. Business and Financials</i>		
<i>No.</i>	<i>Sub-category</i>	<i>Words &amp; Phrases</i>
1	Financial information	Financial issues, financial performance reviews, economic capital reviews, credit rating, security rating, performance report, performance assessment, segmented information, project updates, growth statistics, balanced-contract portfolio long-term contract portfolio, tax contingencies
2	Analyst report	Analyst report, analyst coverage, analyst opinion, analyst ranking
3	Awards	Awards, achievements, recognition, organization awards
4	Brands/trademarks description	Brand equity, brand description, trademark, patent
5	Changes in variables: sales, costs, inventory, market share	Changes in crucial variables, adjusted results, discontinued operation, adjusted variables
6	Company history	Company history, company background, who we are, company overview, about us
7	Current strategy	Current strategy, enterprise-wide strategy, corporate vision, core strategy
8	Customer analysis (by type/geographic area)	Customer analysis, customer demographics, customer breakdown, geographic distribution
9	General policie	Dividend policy, dividend reinvestment plan, accounting policies, supply agreement, guiding principles, vision, mission, investment policies, priorities, off-balance sheet arrangements, accounting standards, prospectus, company aspirations, operating philosophy, progress
10	Financing (debt & equity or capital structure)	Financing, liquidity, capital resources, capital structure, discounted future cash flow, cash flow requirements, debt, equity capital, property debt
11	Industry statistics	Industry statistics, market statistics, industry breakdown, market players
12	Internal control system	Internal control system, transactions with key management personnel
13	Key figures and ratios	Key figures and ratios, value measures, earnings coverage ratios, revenues reconciliation
14	Legal problems	Legal problems, proceedings, disputes, lawsuit, settlement
15	Letter from management	Letter from Management, management accountability, management responsibility
16	M&A/partnership	Merger, partnership, acquisition, business acquisitions, M&A, joint venture
17	Market capitalization	Market capitalization, share capital, largest shareholder
18	Markets share/competition analysis	Markets share, competition analysis, competitive condition, lead, seasonal, competitors, major players, market leader
19	Organizational chart/structure	Organizational chart, organizational structure
20	Products/services descriptions	Products descriptions, services descriptions, production history, product categories, service categories, lines of business, business structure, infrastructure, undeveloped reserves, oil & gas properties, exploration license, leases, discovery license, upstream, downstream, refinery, gross production, reservoir, qualification certificate, property operations, proactive leasing, redevelopment initiates, number of sites, asset under management, occupancy levels
21	R&D/innovation expenses	R&D expenses, innovation expenses, capital expenditure, capital improvement projects, research and development
22	Regulation affecting the business	Regulation affecting the business, regulation changes, statement of compliance, regulatory development, regulated power plants
23	Risk analysis	Risk analysis, contract expiry date, impairments, risk evaluation
24	Significant events of the year	Significant events of the year, subsequent events, major events, highlights of the year
25	Weighted average cost of capital	Weighted Average Cost of Capital, WACC, cost of capital, cost of debt, abandonment cost, reclamation cost, suspended exploratory wells costs
<i>II. Risk management</i>		
26	Information about risks related to the company's reputation	Reputational risk, environmental risk, social risk, reputational challenges, reputation management
27	Information about risks related to the competitive environment	Competitive environment risk, level of competition, market risk, currency rate risk, interest rate risk, liquidity risk, funding risk, energy commodity price risk
28	Information about risks related to the compliance with industry/antitrust regulations	Compliance with industry regulations risk, compliance with antitrust regulations risk, regulatory compliance practices
29	Information about risks related to the customers	Customers risk, general economic and market conditions in countries that we conduct business, customer demographic shift, market risk, market shift
30	Information about risks related to the frauds/crimes committed by employees	Frauds committed by employees, crimes committed by employees, legal proceedings, credit risk, counterparty risk
31	Information about risks related to the human resources/relationship with trade unions	Human resources risk, relationship with trade unions, union challenges, employee risk, union risk
32	Information about risks related to the impact of the firm's operations on the natural environment	Natural risk, environment risk, environmental instability, environmental damages
33	Information about risks related to the IT/information systems/data security	IT risk, information systems risk, data security risk, infrastructure risk, technological risk, technological challenges, information system security
34	Information about risks related to the economic scenario	Macro-economic scenarios, economic changes, economic shifts, micro-economic scenarios, economic instability, economic uncertainty
35	Information about risks related to the production/logistics	Production risk, logistics risk, operational risk, business risk, model risk, strategic risk, generation equipment and technology risk

Table C.1. Dictionary words in categories and sub-categories (Part 2)

<b>II. Risk management</b>		
<b>No.</b>	<b>Sub-category</b>	<b>Words &amp; Phrases</b>
36	Information about risks related to the reporting	Reporting risk, reporting consistency, reporting risk guidelines, reporting mandate
37	Information about the firm's risk management system	Risk management system, financial commitment, risk culture, risk governance, risk appetite, risk principles, risk review, risk monitoring, line of defense, stress testing, collateral management, risk management committee, risk management framework, approach to risk management
38	Other risk-related information	Sensitivity, sensitivity of assumptions, hedge, impaired, default risk, risk exposure, significant judgements, estimates and assumptions, material risks, material assumptions, significant factors, uncertainty, value at risk, risk that may affect future results, measurement inaccuracies, forfeiture, property related risk, financing risk, lease roll-over, tax risk, revenue recognition risk, preleased risk
<b>III. Investor communication</b>		
39	Accessibility (contact info)	Contact information, additional information, telephone, fax, email, supplementary information, Q&A, frequently asked questions
40	Calendar of events for investors	Calendar of events, upcoming events, future events, investor meeting
41	Consistency in information provided	Disclosure, disclosure policy, documents you can request, easy navigation, glossary of financial terms
42	Investor communication policy	Investor communication policy, communications executive, investor relations, social media channels, spokesperson, communication and escalation channels, information sharing
43	Investor rights	Investor rights, investor protection, investor activism, investor protection responsibilities, investor protection obligations
44	Shareholder engagement	Shareholder engagement, shareholder concerns, shareholder value
45	Shareholder information	Shareholder information, institutional investor, major shareholders
<b>IV. CSR, environmental and sustainability</b>		
46	Climate change policy and targets	Climate change policy, climate change targets, climate change, temperature change, weather change,
47	Community involvement (social activities)	Community, social activities, community membership, community involvement
48	CSR policy	Corporate social responsibility, CSR, CSR policy, CSR guidelines
49	CSR/Sustainability -SMART targets	Sustainability, corporate social responsibility, SMART targets, sustainability initiatives
50	Energy consumption	Energy consumption, energy efficiency, energy waste, energy inefficiency, sustainable energy
51	Environmental and sustainability policy	Environmental and sustainability policy, environmental matters, environmental footprint, air pollutant, emissions, emissions to the air, discharges to surface, discharges to surface and subsurface waters, waste products
52	Environmental sustainability performance indicators	Environmental sustainability performance indicators, energy footprint, renewable energy, energy consumption, energy efficiency, business sustainability performance report
53	Environmental legal issues	Environmental legal challenges, environmental protection laws, environmental safety issues
54	Product safety info/policy	Product safety, product safety policy, product testing, safe products
55	Social sustainability performance indicators	Social sustainability performance, social sustainability, social responsibility, sustainability criticism
56	Stakeholders map/info	Stakeholders data, stakeholders' names, stakeholder's description, stakeholders
57	Waste management	Waste management, waste avoidance, waste disposal
<b>V. Corporate governance</b>		
58	Anti-bribery and anti-corruption	Anti-bribery, anti-corruption, fraud policy, theft prevention, bribery prevention, corruption prevention, whistleblower policy, fraud detection
59	Board and management independence standards	Board and management independence standards, indebtedness, material transaction, independent auditor report, independence mechanism, independence of committees, election process, board diversity, reason for non-independent status, interlocking directorship
60	Board of directors structures and procedures	Board of Directors structures, Board of Directors selection procedures, leadership structure, board member biography, board meeting attendance, changes to board
61	Board member experience	Advisory firm, management solutions, board resource, governance resource guide, governance expertise, board expertise
62	Board orientation and education program	Board orientation, board education, board development, new board member education, board evaluation
63	Code of Conduct	Code of Conduct, Code of ethics, questionable activities, illegal, legal, violations, ethics hotline, bribes, kickbacks, unethical business practices, insider trading, lobby, misuse, conflict of interest, stealing, identity theft, forgery, fraud, discrimination, harassment, business conduct program, anti-fraud program, competition law compliance policy, mineral reserve and resource policy, political donation standards
64	Management/Committees details	Committees details, committee structure, committee responsibilities, committee reports, mandate, charter, executive officer information, management information, management stock ownership, positions held by officers, relevant education and experience, skills and experience, equity ownership, non-profit sector affiliation, age, government relations, PhD, Master, MBA, Bachelor, regional association, leadership, tenure, stewardship, director's at risk shareholdings
65	Governance guidelines	Governance guidelines, board level policies, board stock ownership, corporate governance policies, governance manual, corporate governance

Table C.1. Dictionary words in categories and sub-categories (Part 3)

<b>V. Corporate governance</b>		
<b>No.</b>	<b>Sub-category</b>	<b>Words &amp; Phrases</b>
66	Management compensation	Management compensation, fixed vs. variable compensation, executive compensation, director compensation, compensation changes, board compensation, relationship of executive compensation to risk, competitive benchmarking, benchmarking peer group, short term incentive plan, long term incentive plan, compensation components, fixed versus variable compensation
67	Management control system	Management control system, disclosure controls, disclosure procedures, internal control, financial reporting, enhanced disclosure task force, financial stability board, compliance functions, conflicts of interest, role of management in compensation decisions, role of independent advisor in compensation decisions
<b>VI. Labor practices</b>		
68	Number of employees	Number of employees, employee information
69	Accidents at work policy	Accidents at work, accidents, accidents policy, reporting accidents, workplace accident policy, incident reporting, safety policy
70	Employee ethics guidelines	Employee Ethics, Code of ethics, employee guidelines
71	Employee health and safety	Employee Health and safety, occupational health, workplace safety committee
72	Employee productivity	Employee productivity indicator, employee productivity, personnel productivity
73	Employee satisfactory survey/mechanism	Employee satisfactory, corporate citizenship, employee benefits, benefit plans, loyalty, employee agreement
74	Employee turnover	Employee turnover, rotation programs, turnover plans, rotation policy
75	Labour diversity policy	Labour diversity policy, gender diversity, workplace diversity, inclusion and diversity, inclusiveness policy, equality
76	Labour training and development	Labour Training, personnel training, professional program, Labour development, employee training, training program, active personnel
77	Labour-management communication	Labour-management communication, employee engagement, employee communication, human resource management, human resource communication
<b>VII. Forward-looking information</b>		
78	Future audit/non-audit fees	Audit fee changes, non-audit fees, expected audit fees, audit fees
79	Future capital expenditures and/or R&D expenditure	Capital expenditures forecast, R&D expenditure forecast, expansion projects
80	Future financial	Cash flow forecast, accounting estimates, production estimates, financial forecasts, tax changes, financing developments, contractual obligations, critical accounting estimates
81	Future dividend	Dividend forecast, future dividend, expected dividend
82	Future market share	Forecasted market share, expected market share, market share changes, future market share
83	Future strategy and LT objectives (>1 yr)	Future Strategy, long term objectives, strategic priorities, medium-term financial objectives
84	Impact of interest rate change on current results	interest rate change, interest rate impact, future interest rate, interest change impact
85	Impact of foreign currency change on current results	foreign currency change, exchange rate impact, future exchange rate, currency change impact
86	Impact of future strategy on current results	future strategy, future policy, upcoming strategy, future strategy impact, future policy impact
87	Future M&A/partnership plans	Partnership plans, M&A plans, strategic partnerships, mergers and acquisitions plans
88	New developments	New developments, economic developments, outlook, forecast, regulatory changes, growth, improvements, expansions
89	Profit/earning forecast	Profit forecast, earning forecast, future development costs, expected earnings
90	Sales forecast	Sales forecast, product sales forecast, service sales forecast, sales prediction, estimated sales revenue
<b>VIII. Other common informative words</b>		
91		Growth, compared, forecasted, expected, important information, diagram, accomplishments, present, communication, change, five-year average, improve, estimated, discounted, chart, achievements, disclosure, developed, trend, graph, realizations, focus, avoidance, adjusted, assumptions, table, review, ranked, transparency, impact, 5 year average, weakened, uncertainty, weighted average, benchmark, challenges, disclose, strengthened, progress, decade, results, outlook, discussion, decrease, 3 year average, increase, three-year average, comparison, projected