A new approach to identify the economic effects of disclosure: Information content of business risk disclosures in Japanese firms

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ABSTRACT
We empirically examine the economic effects of disclosure by focusing on mandatory textual business risk disclosures in Japan. A unique feature of this study is the construction of a *new* risk measure, which enables us to isolate economic disclosure effects (i.e., information risk) from fundamental value effects (i.e., fundamental risk). We find that there is a positive association between the number of items within business risk disclosures and information risk. We also find that the results are more pronounced for firm-level disclosure that deviates from that of other firms in the same industry and year. This indicates that business risk disclosures affect investors' risk perceptions and thus increase the information component in the cost of capital.

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I. Introduction

The purpose of this paper is to empirically examine the economic effects of disclosure by focusing on mandatory textual business risk disclosures in Japan. Business risk disclosures can increase the amount of available information about a firm's risk but it is unclear whether this decreases or increases the information component of the cost of capital; this is because textual business risk disclosure is unique in the sense that all the information relates to "unfavorable" conditions and to the uncertainty of a firm's future performance. Thus, showing that disclosure affects the cost of capital, and by how much, is still a challenging topic.

Textual business risk disclosure in Japan is equivalent to the risk factor disclosures contained in the 10-K filings by firms in the U.S[1]. However, it is worth noting that partly considered business risks appeared in the Management Discussion and Analysis section (MD&A) in the U.S. before the inception of risk factor disclosures (e.g., comments letter 9 on proposed rules, SEC 1999). In contrast, Japanese business risk disclosure is a new, independent disclosure, which began in the fiscal year ending March 2004. By taking advantage of this institutional feature in Japan, we examine whether mandatory business risk disclosure increases or decreases investors' assessment of firms' risk.

More generally, an important but unanswered question is identifying the causal relationship between firms' disclosures and the economic disclosure effects on decreasing

[1] In the United States, business risk disclosures have been required since 2005 under the section "Risk factors" in annual reports. Regulators in some other countries have mandated this type of disclosure particularly against a background of increased interest in business risk reporting after the United States experienced large accounting scandals such as those of Enron and WorldCom (Deumes 2008). For example, the International Accounting Standards Board published IFRS Practice Statement Management Commentary in December, 2010, and it requires disclosure of an entity's principal risk exposures and changes in those risks.

information asymmetry between a firm and its investors or among its investors and on the information aspect of cost of capital. This is because the disclosure effects reflect both the disclosure content and the fundamental values of a firm (i.e., the omitted variable problem). To address the identification challenge, this paper constructs a new risk measure that aims to isolate economic disclosure effects from fundamental value effects (hereafter, real effects). We expand an idea by Armstrong and Vashishtha (2012) and try to identify directly the economic effects of a firm's disclosure from real effects. Armstrong and Vashishtha (2012) calculate imputed monthly stock returns to estimate a firm's risk measures using operating segment information and the book value of assets in those segments. We define this risk component (i.e., real effects) as the fundamental risk. We also calculate fundamental returns of Japanese listed firms based on daily imputed returns.

To isolate disclosure effects from real effects, we subtract the fundamental risk (standard deviation of imputed stock returns) from the standard total risk, which we calculate from the realized (i.e., *ex post*) stock returns (standard deviation of realized stock returns). The difference between these two risk measures presumably reflects the "firm's disclosures, information trade in the firm's share, and other features of the firm's information environment" (Armstrong and Vashishtha 2012, pp.77). Thus, we define this risk component (i.e., disclosure effects) as information risk. Note that we do not consider information risk (i.e., 40% of total risk in our estimation) to be standard idiosyncratic risk (i.e., 82% of total risk in our estimation). In other words, we presume that we can also decompose standard idiosyncratic risk into the information and fundamental components of idiosyncratic risk (details in section 7). Thus, information risk consists of the information component of both idiosyncratic and systematic risks.

Using our new risk measures, we investigate the criticism that firms make boilerplate risk disclosures just to conform to regulations, and that company financial reporting thus lacks useful information about risks and uncertainties (Johnson 2010). The risk exposures of many firms may not change over time, and so a firm may often repeat the description of its risk factors over consecutive annual filings. To evaluate the boilerplate criticism, this study isolates disclosure effects from real effects.

We then examine the contents of business risk disclosures to evaluate investor reaction to this information. In theoretical arguments, such as the capital asset pricing model (CAPM), there are two sources of risk depending on whether the risk components are diversifiable: idiosyncratic (i.e., firm-specific) and systematic risk. Business risk disclosures are also separated into two subcategories: idiosyncratic (i.e., firm-specific) risk disclosures and systematic risk disclosures. We separate textual business risk disclosures into these two subcategories. We use our category keywords and unique rules to categorize risk content and thus reduce risk categorization errors.

In addition, we investigate whether business risk disclosures also have real effects on a firm's real decisions using our new risk measures. As Lambert et al. (2007) argue in their theoretical paper, accounting information has both "direct" and "indirect" effects. Direct effects (i.e., disclosure effects) are where accounting information, per se, does not affect a firm's cash flow but affects an investor's assessment of expected cash flow. Indirect effects (i.e., real effects) are where accounting information can also influence a firm's real decisions. Kanodia (2006) also suggests taking a new theoretical approach by considering the "real effects of accounting disclosure": he argues that how accountants measure and report firms' economic transactions, earnings, cash flows, and capital markets strongly

affects a firm's real decisions and resource allocation in the economy. Kanodia (2006) argues that we should think of the simultaneous determination of market prices and corporate decisions and how both are affected by disclosures. This real effect can be difficult to identify just by examining the association between accounting disclosure and standard economic risk/return measures such as standard total risk. Nonetheless, we attempt to identify real effects by using fundamental risk.

We find that there is a positive association between our new risk measure (i.e., information risk) and the number of business risk disclosures (i.e., number of items, sentences or words). This indicates that business risk disclosures affect investors' risk perceptions (i.e., they affect investors' assessment of expected cash flow) and increase the information component of the cost of capital. The results are more pronounced for firm-level disclosure that deviates from that of other firms in the same industry and year. This indicates that business risk disclosures are useful especially for firm-level information. In this sense, the results are in contrast to those for the United States in Kravet and Muslu (2013). Thus, Japanese business risk disclosures increase the information content of a firm's risks; thus, this does not amount simply to boilerplate information.

We also find that disclosure of firm-specific business risks increases risk perceptions (i.e., information risk); however, it is, interestingly, negatively associated with fundamental risk. This indicates that there may be real effects that affect a firm's real decisions, as Lambert et al. (2007) and Kanodia (2006) point out. Our result implies that firm managers may have changed their real decisions to reduce their fundamental risks through disclosure and risk management processes presumably to reflect their awareness of the firm's future

prospects. Overall, our empirical evidence rejects the criticism that business risk disclosures suffer from boilerplate characteristics.

Our paper relates to the stream that explores the effects of textual business risk disclosures upon investors[2]. Campbell et al. (2014) find that firms facing greater risk disclose more risk information. The risk disclosures are positively associated with standard risk measures such as total risk. Kravet and Muslu (2013) show that risk disclosures reveal unknown contingencies and increase the market's perception of risk and uncertainties. However, they also find and conclude that firm-level disclosures are more likely to be boilerplate. Linsely and Shrives (2006) argue that the association between risk levels and risk disclosure levels can be positive or negative. Tang (2011) uses a unique Chinese institutional setting to isolate disclosure practices from disclosed fundamentals and finds that information asymmetry has no effect on the cost of capital in the Chinese market. Overall, the usefulness of risk disclosure should be empirically examined.

The remainder of this paper is organized as follows. Section 2 discusses the relevant institutional background. Section 3 describes our identification strategy, section 4 develops testable hypotheses. Section 5 explains the data, research methodology and the variables used in our empirical study. Sections 6 and 7 present our empirical findings and check robustness, respectively. Section 8 provides concluding remarks.

[2] Our paper also relates to the stream that looks at the links between accounting information and the cost of capital for firms. Previous theoretical studies, including Diamond and Verrecchia (1991), Easley and O'Hara (2004), and Kelly and Ljungqvist (2012), show that the more information a firm discloses, the more its cost of capital decreases. Previous empirical studies indicate a generally negative association between a firm's disclosure and the cost of capital. This result is interpreted as evidence of the usefulness of disclosures by firms (e.g., Campbell et al. 2014; Leuz and Verrecchia 2000; Botosan and Plumlee 2002; Kothari et al. 2009).

2. Institutional background

In this section, we briefly discuss the institutional features of Japanese business risk disclosure. A revision of the *Cabinet Office Ordinance on Disclosure of Corporate Affairs*—effective as of the fiscal year ending March 2004—requires Japanese public firms are required to disclose information regarding their business risks in their annual reports. Business risk disclosures are intended to enable investors to assess a firm's business risk (FSA, 2003; SEC, 2005). They are narrative in nature and included in the "Business Risk, etc." section of annual reports.

This disclosure is equivalent to the risk factor disclosures contained in the 10-K filings by firms in the United States[3]. However, it is noteworthy that partly considered business risks appeared in the Management Discussion and Analysis section (MD&A) in the United States before the inception of risk factor disclosures (e.g., comments letter 9 on proposed rules, SEC 1999). In contrast, Japanese business risk disclosure is a new, independent disclosure regime, which began in the fiscal year ending March 2004.

3. Empirical approach-identification strategy

It is usual to regress some risk measure, such as the standard total risk on the proxy of the level (or change) in business risk disclosures, and other control variables (e.g., Campbell et al. 2014, Krave and Muslu 2013):

$$Risk_{i,t+1} = \alpha + \beta_1 Risk\_Disclosure_{i,t} + \beta \cdot Control\ variables_{i,t} + \varepsilon_{i,t}. \quad (1)$$

[3] In the United States, business risk disclosures have been required since 2005 under the section "Risk factors" in annual reports. Regulators in some other countries have mandated this type of disclosure particularly against a background of increased interest in business risk reporting after the United States experienced large accounting scandals such as those of Enron and WorldCom (Deumes 2008). For example, the International Accounting Standards Board published IFRS Practice Statement Management Commentary in December, 2010, and it requires disclosure of an entity's principal risk exposures and changes in those risks.

Then, we evaluate the informativeness of risk disclosures by evaluating the statistical significance of the coefficient of β_1. However, we should note two points here. (a) We could have omitted variable bias even if we include control variables related to risk factors in this specification. In other words, the coefficient of β_1 may reflect both the changes in disclosure content and in the fundamental values of a firm (i.e., omitted common risk factors). (b) The reverse causality problem could occur: the real risk factors increase, and the level of business risk disclosures should increase. In both cases, we usually have to look for the appropriate instrumental variables to obtain a consistent estimator for β_1. However, finding the appropriate instruments is always a challenge.

We expand the idea of Armstrong and Vashishtha (2012). The basic idea comes from the following:

"Realized volatility reflects not only the outcome of a CEO's risk-taking decisions, but also the firms' disclosures, information trade in the firms' shares, and other features of the firm's information environment."

Intuitively, our identification strategy is close to the event study approach in the sense that we try to isolate the information risk (*Info_risk*) from the fundamental risk (*Fun_risk*). That is, the following relationship holds:

$$Risk_{i,t+1} = Fun\_risk_{i,t+1} + Info\_risk_{i,t+1} . \quad (2)$$

However, we do not consider information risk to be standard idiosyncratic risk. In other words, we presume that the abnormal return in the event study approach includes both the fundamental and information components of idiosyncratic factors (details in section

7.1). In addition, we assume that information risk also includes the information component of standard systematic risk[4].

Using both equations (1) and (2) and rewriting:

(a) Omitted variable bias

$$Fun\_risk_{i,t+1} + Info\_risk_{i,t+1} = \alpha + \beta_1 Risk\_Disclosure_{i,t} + \beta \cdot Control\ variables_{i,t} + \varepsilon_{i,t}. \quad (3)$$

(b) Reverse causality

We note the fact that both confounding effects generally come from the changes in real risk factors (i.e., *Fun_risk*). Thus, instead of looking for the appropriate instruments, we attempt to strip the fundamental changes in firms' risks from the standard risk measures; then the association between the stripped risk measure (i.e., information risk) and business risk disclosures presumably does not reflect the real risk changes.

In this paper, we do not use the abnormal return for constructing information risk. This is because business risk disclosures are expected to disclosure the potential risk factors that can change a firm's risk profile across years. However, the market model used in the even study approach assumes a stable linear relation across years between the market return and the security return for the firm.

To construct our risk measures, we use the imputed daily returns for each firm. Following the argument of Armstrong and Vashishtha (2012), "a firm is considered as a portfolio of industries the CEO chooses to achieve his desired level of systematic and idiosyncratic risk[5]. The CEO can alter the firm's risk profile by investing in new industries,

[4] See also Appendix A for an alternative interpretation.

[5] Of course, as Armstrong and Vashishtha (2012) point out, managers can alter their exposure to their firm's risk through personal hedging. However, several previous researchers such as Jagolinzer et al. (2007) identify this as a small effect.

divesting from existing industries, and altering the weight of the firm's existing industry segments."

Therefore, we gather information about the operating segments and book value of assets and define $\hat{r}_{i,t}$ as the imputed daily return for firm *i* in the following equation:

$$\hat{r}_{i,t} \equiv \sum_{j=1}^{n_j} \frac{A_i^j}{A_i} r_t^j, \tag{4}$$

where A_i^j is the book value of the assets of the *j* th segment of firm *i* (see also Hann et al. 2013; Beger and Ofeck 1995). A_i is the book value of the total assets of firm *i*. n_i is the number of segments of firm *i* [6]. r_t^j is the index of the daily *t* return for the *j* th industry segment. We adopt the Tokyo Stock Price Index (TOPIX; the capitalization-weighted index of all firms that are categorized in the same industry of the Tokyo Stock Exchange) industrial index returns as a return from each industry segment[7]. For the new segment of a smaller observation, we adopt the daily-adjusted risk free rate as a proxy of the industry return.

[6] There are some observations where the sum of total segments does not equal that of total assets. This is because the quantitative criteria of accounting standards require disclosed segment sizes to be greater than 10% of total assets (the materiality principle). Therefore, we adjust the segment size of assets as follows. In observations with a sum of total segments smaller than the size of total assets (hereafter, smaller observations), we set a new segment defined as the difference between the two totals. In observations with a sum of total segments larger than the total assets (hereafter called larger observations), we downsize all the segments equally so that their sum is equal to the size of total assets. Book value weights of the segments are assumed to be constant during each fiscal year. However, these weights can and do vary across fiscal years.

[7] The Japanese database only contains information about industry segments based on the Japanese Standardized Industrial Classification (SIC). However, the Japanese stock market index does not use this classification. Therefore, we re-categorized the Japanese SIC into the Tokyo Stock Exchanges' industrial classification, which is based on the Japanese SIC. The Japanese SIC was revised in November 2007 (the 12th revision) during our sample period, and we also matched the old classification to new rules.

In our samples, the average of n_i is 2.6, and the standard deviation is 1.6. The range is not so great, but the maximum is 12. Thus, these differences also characterize each firm's returns. In other words, we assume that both the number of segments (n_i) and the shares of each segment (A_i^j / A_i) reflect the fundamental risk at the firm level. One concern with this approach is the case of a firm that operates in only one segment or industry. This fact partially explains why our risk measure (discussed later in this section) takes a negative number for some firms.

We then calculate the daily volatility of imputed returns $\hat{r}_{i,t}$ for each firm in each fiscal year. The standard deviation $\sigma(\hat{r}_{i,t})$ is defined as our fundamental risk (*Fun_risk*). This captures the real value component of total risk. We denote $r_{i,t}$ as the realized return of firm *i* on day *t*. We then subtract $\sigma(\hat{r}_{i,t})$ from the standard total risk $\sigma(r_{i,t})$ calculated from realized daily stock returns. The difference in these two risk measures, i.e., $\sigma(r_{i,t}) - \sigma(\hat{r}_{i,t})$, presumably reflects the effects of a "firm's disclosures, information trade in the firm's share, and other features of the firm's information environment" (Armstrong and Vashishtha 2012, pp.77). Thus, the difference can be considered as our information risk (*Info_risk*)[8]. Figure 1 represents the distribution of the information risk. Based on Figure 1, information risk calculated from the imputed returns appears to be successful in the sense that they are wide ranging and differ among firms; however, we do have to admit some limitations about using index returns as a proxy for the segment returns of each firm. From Figure 1, *Info_risk* can be negative.

[8] We also try to construct an alternative of risk measures of *Info_risk*. See Appendix A in detail.

In this respect, it should be noted that the mean (median) of the segment numbers of these negative firms is 1.2 (1), and this number is much smaller than the average of all sample firms. Thus, firms that operate in one segment or industry (75% of negative *Info_risk*) explain why *Info_risk* can be negative, and we will check whether these firms affect our main result as a robustness test.

Insert Figure 1 around here

4. Development of hypotheses

4.1. Economic disclosure effects of business risk disclosures

To evaluate the informativeness of business risk disclosures, it is necessary to evaluate the criticism that firms make boilerplate risk disclosures just to conform to regulations and that company financial reporting thus lacks useful information about risks and uncertainties (Johnson 2010). In addition, the risk exposures of many firms may not change over time, and a firm may tend to repeat the description of its risk factors over consecutive annual filings. If this is true, investors would not react to the disclosures: investors would not regard them as useful because they contain little information to cause revision of those investors' *ex-ante* beliefs about business risks. To evaluate the boilerplate criticism, our risk measure (i.e., information risk) is applied to isolate disclosure effects from real effects.

Theoretically, the economic effect of disclosures of a firm's risk indicates that an increase in disclosures reduces a firm's cost of capital (e.g., Diamond and Verrecchia 1991; Easley and O'Hara 2004; Kelly and Ljungqvist 2012). If this were true, then we would expect business risk disclosures to be negatively correlated with the information risk (the

convergence argument). However, an increase in the quality of information may affect cash flow expectations. Textual business risk disclosures are unique because all information relates to "unfavorable" conditions, and the information risk relates to the uncertainty of a firm's future performance[9]. Thus, if business risk disclosures were informative and investors incorporated the information into their risk assessments (i.e., the investor's assessment of information about the second moment of expected performance) and thus changed their risk perceptions toward a higher cost of capital, e.g., Lambert et al. (2007), Proposition 1 (c), then we would expect a positive relationship between increased business risk disclosures and information risk (the divergence argument). If business risk disclosures introduced unknown contingencies (Kravet and Muslu 2013), then investors would diverge in their predictions of future performance and thus increase the cost of capital—even though the information asymmetry between a firm and investors, or between informed and uninformed investors, decreases.

Overall, whether business risk disclosures convey additional information for investors and how that information affects risk perceptions are important empirical questions. In light of the above discussion, we support the latter view and state our hypothesis as follows:

H1: Increased business risk disclosures are positively associated with information risk.

[9] In this regard, Kravet and Muslu (2013) argue that "rather than guiding users about the level of future performance, risk disclosures guide users about the range of future performance." There are two competing explanations of business risk disclosures being bad news in academic literature. The first is that business risk information is withheld unless its disclosure is mandated. This is because bad news generally reduces a firm's market value, and managers are thus reluctant to disclose this information (Verrecchia 2001). This behavior can also be explained by managers' incentives relating to their careers and compensation (Kothari et al. 2009). Alternatively, managers may have an incentive to disclose business risk; if managers bear larger costs (i.e., litigation and/or reputational costs) then they may disclose bad news promptly and voluntarily (Skinner 1994).

4.2. Economic effects of different business risk contents

In identifying the economic effects of business risk disclosures, it is also useful to examine the content of business risk disclosures. Traditionally, there are two sources of risk factors depending on whether the risk components are diversifiable. Business risk disclosures are also separated into two subcategories: idiosyncratic (i.e., firm-specific) risk disclosures and systematic risk disclosures. In Section 5.2 we explain in detail the list of business risk categories.

From our first hypothesis, we expect a positive relationship between increases in idiosyncratic risk disclosures and information risk if the disclosures are informative and investors incorporate the information into their risk assessments. In contrast, with respect to systematic risk disclosures, we expect no relationship between increases in systematic risk disclosures and information risk: presumably because, the information of systematic risk disclosures has already been incorporated into their risk assessments. Thus, systematic risk disclosures provide little additional new information for investors.

From these arguments, our hypotheses are as follows:

H2-1: Increased idiosyncratic business risk disclosures are positively associated with information risk.

H2-2: Increased systematic business risk disclosures are not associated with information risk.

4.3. Real effects of business risk disclosures

Lambert et al. (2007) argue in their theoretical paper that there are two effects of accounting information: direct and indirect. Direct effects (i.e., disclosure effects) are where accounting information per se does not affect cash flow. Indirect effects (i.e., real effects) are where accounting information can also influence a firm's real decisions, for example,

with respect to production or investment. Kanodia (2006) suggests a new theoretical approach in considering the real effects of accounting disclosure: he argues that how accountants measure and report firms' economic transactions, earnings, cash flows, and capital markets strongly affects a firm's real decisions and the resource allocation in the economy.

On the basis of these arguments, the quality of business risk disclosures can also have real effects on a firm's real decisions. In the business risk disclosure context, firm managers may change the firm's risk profile as a risk management process by altering the weight of the firm's existing industry segments, thereby reducing their fundamental risk through the disclosure of idiosyncratic risks—presumably to reflect their awareness of the firm's future prospects. With respect to systematic risk disclosures, we expect a positive relationship between increases in systematic risk disclosures and increases in fundamental risk. This presumably because an increase in systematic risk mechanically affects the firm's risk level—even if systematic risk disclosures provide little additional new information to investors.

Overall, whether these real effects exist is an empirical question. However, it is generally difficult to identify the effects only by examining the association between accounting disclosures and standard economic risk or return measures, such as standard total risk. Fortunately, our risk measure is decomposed into fundamental (real) and information (disclosure) components. We thus examine the above hypothesis using the real component of our risk measure (i.e., fundamental risk) even though the identification problems discussed in Section 2 remain in this part of the analysis. Our third set of hypotheses is as follows:

H3-1: Increased idiosyncratic business risk disclosures affect a firm's real risk decisions and thus decrease fundamental risk.

H3-2: Increased systematic business risk disclosures are positively associated with fundamental risk.

5. Data and specifications

5.1. Sample and data

Our sample includes Japanese listed companies from 2004 to 2010. Japanese business risk disclosure began in the fiscal year ending March 2004, and we therefore use 2004 as our start point. The Accounting Standards Board of Japan (ASBJ) issued a revision of the *Accounting Standard for Disclosures about Segments of an Enterprise and Related information* (ASBJ Statement No. 17) which took effect in the fiscal 2011. This revision changed the segmentation rule and its associated disclosures. We calculate the fundamental risk according to industry segment (see Section 3), and our sample period ends in fiscal 2010. This is to exclude any possible effects as a result of the segment disclosure rule[10].

We selected companies listed on the first section of the Tokyo Stock Exchange. We excluded those whose fiscal year did not end on March 31 so as to eliminate any possible differences arising from various year-ends. In addition, we excluded finance-related companies (i.e., banking, securities, insurance and other financial businesses) because those industries are highly regulated, and substantial differences exist between them and other industries (Kim and Fukukawa 2013). Finally, we eliminated observations that lacked the

[10] The revision of accounting standards is based on the so-called management approach. This requires disclosures about segments of an enterprise, and related information should properly describe the nature of various business activities in which the enterprise engages and the economic environments in which it operates (ASBJ Statement No. 17). Since segment disclosure based on the management approach more directly links real management activities, a study from 2010 may be plausible. This will constitute our future study.

necessary data for our analyses. Our final sample comprised 7,258 observations. We collected financial data from the NEEDS Financial QUEST and NEEDS Corporate Governance Evaluation System (NEEDS-Cges) databases. We obtained daily stock return data from the ASTRA manager database.

5.2. Collection of business risk data

We hand-collected business risk variables from the text found in the "Business Risk, etc." sections of annual reports. Prior studies using textual information calculate the number of words, keywords, sentences, or their conjugated form as a proxy for qualitative information[11]. For example, Li (2006) and Nelson and Pritchard (2007) count the number of risk-related keywords. Abraham and Cox (2007) use both the number of risk-related keywords and the number of risk-related sentences in annual reports. Kravet and Muslu (2013) calculate the change in the total number of sentences with at least one risk-related keyword in 10-K filings. Campbell et al. (2014) investigates the informativeness of business risk disclosure by focusing only on the "Risk Factors" section in 10-K, which is the counterpart of "Business Risk, etc." in Japan. Most research relevant to the present study (e.g., Kravet and Muslu 2013; Campbell et al. 2014) counts the number of words and keywords related to their unique risk categories.

[11] Li et al. (2013) use the proportion of the net number of occurrences of competition words to the total number of words in a 10-K as a proxy for the competition based on management disclosures in its 10-K filings. Li (2008), You and Zhang (2009), and Miller (2010) calculate the total number of words in annual reports as a measure of complexity or readability.

We use the number of business risk items as a measure to indicate business risk disclosure[12]. Although we have to admit that there may be a better measure, unique difficulties with the Japanese language, such as the absence of spacing between words, prevent us from directly applying the text-analysis method employed in English (see Tables B1 and B2 in Appendix B).

Table 1 shows the business risk disclosure levels. *N_Risks* is the number of risk items as disclosed in the annual report's "Business Risk, etc." section. Table 1 shows that on average during the sample period, the sample firms disclose 7.56 business risk items. The minimum value of *N_Risks* is 1 and the maximum is 74. Table 1 also indicates that business risk disclosures have increased.

Insert Table 1 around here

Insert Figure 2 around here

To examine the effects of business risk disclosure contents on a firm's risk, we recategorize the contents of business risk items into idiosyncratic and systematic risk disclosures. Figure 2 provides the content category of business risk disclosures. With regard to the categorization, many studies adopt the so-called dictionary approach, which is a mapping algorithm based on a keyword list (Loughran and McDonald; 2011; Feldam et al. 2010; Kothari et al. 2009; Tetlock et al. 2008; Campbell et al. 2014). However, Li (2012b) points out the limitations of the dictionary approach. First, there is no readily available dictionary that is built for the setting of corporate filings. Second, the dictionary-based approach does not take into consideration the context of a sentence. Though some studies

[12] To consider the potential risk differences under the same risk item numbers, we also use the word count and sentence count in a robustness check. The new results are qualitatively similar to the results discussed below.

overcome the first problem by developing their own unique word list for corporate filings (Loughran and McDonald 2011; Campbell et al. 2014), the second problem remains unsolved. To overcome the limitation of the dictionary approach, Li (2010a) employs a Naïve Bayesian machine learning algorithm, which is a statistical approach typically used to validate classification efficiency by means of training data.

On the basis of these arguments, we make a keyword list for 24 risk categories based on the disclosure regulations and guidelines (FSA, 2003) to categorize risk content[13]. However, we also set original rules, which enables categorization that includes necessary keywords while excluding unnecessary keywords in considering the content. This procedure is justified because keywords are sometimes used in discussions about completely unrelated business risks. With this unique category rule, we can mitigate the above context problem in keyword-based categorization.

5.3. Research design

To investigate the economic effects of business risk disclosures on information and fundamental effects, we adopt the following specification:

$$Risk_{i,t+1} = \alpha + \beta_1 Risk\_Disclosure_{i,t} + \beta_2 Size_{i,t} + \beta_3 MB_{i,t} + \beta_4 ROA_{i,t} + \beta_5 Past\_return_{i,t} + \beta_6 Leverage_{i,t} + \beta_7 Inst\_ownership_{i,t} + \beta_8 Dir\_ownrship_{i,t} + \varepsilon_{i,t-1}. \quad (5)$$

Risk is a variable indicating the firm's risk measure. As discussed above, we use two risk measures: information risk and fundamental risk. We calculate risk measures using daily

[13] Idiosyncratic risk disclosures relate to the quality of goods and services, strategy, organizational structure, relationships with critical suppliers, financial conditions, information security, R&D investment, operations, intellectual property, litigation, human resources, consolidated companies, brand value, relationships with other companies, related parties and on-going concerns. Items relating to economic conditions or systematic risk comprise the business environment, regulations, purchase of raw materials, geopolitical conditions, natural disasters, accounting standards and environmental issues.

stock returns. This is based on three estimation windows, each beginning 2 days after annual report filing and ending 184, 61, and 11 days after filing for each fiscal year without overlapping the event date.

Risk_Disclosure is a variable that indicates the textual business risk disclosure volume. We use the number of risk items (*N_Risks*) disclosed in the "Business Risk etc." section of annual reports. We also include control variables that indicate any possible effects on a firm's risk. *Size* is the natural log of total assets. A firm's size is expected to be negatively associated with its risk level. *MB* is the total market value of equity and book value of debt deflated by total assets. A higher market-to-book ratio (or its equivalent, in the form of a simple Tobin's q ratio) is a broad indicator of better technology and human capital. Thus, we expect a positive association between the market-to-book ratio, as a proxy of a firm's growth, and riskiness. *ROA* is the ratio of business income to total assets. *Past_return* is daily stock returns (including dividends) for each fiscal year. Profitability is generally expected to have a negative association with riskiness. *Leverage* is the total assets deflated by the book value of equity. We predict a positive association between the leverage ratio and risk level. *Inst_ownrship* and *Dir_ownrship* are the ratios of institutional ownership and executive ownership, respectively.[14] With respect to institutional ownership, block holders are generally regarded as playing an active monitoring role. In contrast, if institutional investors are regarded as stable shareholders in a Japanese context, we cannot expect them to play a monitoring role; they may even promote further risk-taking by the firm. Thus, we cannot predict the sign of the coefficient, and the sign should be empirically

[14] The practice of disclosing business risk can also be affected by firm ownership and governance structures. Abraham and Cox (2007) found this with narrative risk information in the United Kingdom, and Campbell et al. (2014) found institutional ownership to be associated with risk factor disclosures in the United States.

confirmed. However, we expect a positive association between executive ownership and firm risk as a result of reduced agency conflict between a manager and shareholders.

To examine the effect of business risk content on information and fundamental effects (H2), we decompose the number of risk items (*N_Risks*) in equation (5) into two components: *N_Idio_Risks* is the number of idiosyncratic risk items and *N_Sys_Risks* is the number of systematic risk items disclosed. Because boilerplate disclosures are likely to be similar across time or homogenous across firms in the same industry, we include industry and year fixed effects in our specifications. Table 2 lists the variables and their definitions.

Insert Table 2 around here

6. Empirical results

6.1. Summary statistics

Panel A of Table 3 and Figure 3 present descriptive statistics for our risk measures and the ratio of disclosure effects to total risk across our sample periods, depending on the estimation window for the total risk measures. Panel B of Table 3 provides descriptive statistics for our risk measures and a firm's characteristics; Panel C is a correlation matrix of variables in a firm's characteristics.

Insert Table 3 around here

Insert Figure 3 around here

Figure 3 and Panel A of Table 3 indicate the average share of the information risk as an effect of disclosure, which is about 40% (i.e., 60% derives from real effects). Note that we do not consider information risk to be standard idiosyncratic risk. Actually, in our sample, standard idiosyncratic risk is about 82% of total risk, which is much higher than our

information risk. The lowest share of information risk (corresponding to the highest share of fundamental risk) is about 30%, which occurred in 2008 in the middle of the global financial crisis (GFC). This indicates that the GFC damaged Japanese firms' fundamental values.

Panels B and C of Figure 3 show the cases for two different estimation windows beginning 2 days after filing and ending 61 and 11 days after filing. The share of disclosure effects in total risk increases as the estimation window narrows; this is presumably because market reactions are more likely to be reflected in the short term. For example, in Panel C of Figure 4, the average share of information risk is about 45%. This tendency supports the idea that information risk is more reflected in stock prices in the short term. From the next section, we present only the results of the risk measures obtained with the estimation window of 2–184 days for each fiscal year after filing as being representative; but the results are the same for all estimation windows[15].

6.2. Regression results

6.2.1. Information risk and fundamental risk

Table 4 shows the effects of business risk disclosures on information risk, according to our risk measures: *Info_risk* and *Fun_risk*. Columns 1 to 3 show the results of pooled Ordinary Least Squares (OLS) with year and industry dummies. We compute robust standard errors of the estimates clustered at the firm level.

[15] Given the length of annual report filings, investors may not promptly update their predictions (You and Zhang 2009). Thus, we expect the investors' reaction to risk disclosures to be sluggish, and we take the estimation period as being long enough for investors to interpret the risk disclosure.

Column 1 is our representative result, for which *Info_risk* is the dependent variable. The coefficient of business risk disclosures (*N_Risks*) is positive and statistically significant at the 1% level. The results indicate that information risk increases with additional textual business risk disclosures, and thus the increase in total risk mainly arises from the changes in risk perceptions by investors. Our result indicates that an increase of one business risk item raises information risk by about 0.015%. A one-standard-deviation increase in business risk disclosures increases information risk by about 0.11% (i.e., 1.74% per year; $0.011 \times \sqrt{250}$) if everything else is constant. The results support the idea that business risk disclosures convey additional information to investors and change risk perceptions toward a higher cost of capital. In this sense, Japanese business risk disclosures increase the information content of a firm's risks, and they are therefore not simply boilerplate information.

As discussed at the end of Section 3, we are aware that *Info_risk* can be negative. To reduce the measurement error problem, we check the results when we drop the data if *Info_risk* is less than zero (which actually restricts our sample firms that have multiple segments). In addition, given *Info_risk* is left-censored at zero, we also estimate a Tobit regression model to check the robustness of the main results (results not shown). For all these cases, we confirm that the results are qualitatively the same.

We reproduce the representative results of column 3 by dividing *N_risks* into *Industry_level_N_Risks* and *Firm_level_N_Risks*. The former is the Japanese SIC industry and year mean of *N_Risks*. The latter is defined as *N_Risks* net of *Industry_level_N_Risks*. Column 4 provides the result for regressions where *Info_risk* is the dependent variable. The coefficient of *Industry_level_N_Risks* is not statistically significant. In contrast, the

coefficient of *Firm_level_N_Risks* is positive and statistically significant, indicating that disclosure of firm-level business risks increases risk perceptions (i.e., the information risk). This indicates that business risk disclosures are useful, especially for firm-level information. As Kravet and Muslu (2013) argue, the economic impact is also important. In this respect, we estimated equation (5) using standardized coefficients to examine the impact of firm-level business risk disclosures on the level of information risk compared with that of industry-level business risk disclosures. The estimation result is as follows:

$$Risk_{i,t+1} = 0.082 + 0.025 Industry\_level\_N\_Risks_{i,t} + 0.097 Firm\_level\_N\_Risks_{i,t} + \cdots$$

The coefficient of *Firm_level_N_Risks i*s about four times larger than that of *Industry_level_N_Risks*. Thus, the result indicates that the impact of firm-level business risk disclosure is quantitatively stronger than industry-specific business risk. Overall, the current results contrast with those of Kravet and Muslu (2013) where the results are *less* pronounced for firm-level disclosure that deviates from that of other firms in the same industry and year.

One potential concern of the plausibility of our results is that managers would not voluntarily disclose information-even through a non-boilerplate mandatory disclosure-about the firm that would increase the cost of capital and thus destroy firm value. Thus, we also examine the effects of the GFC in 2008 on investors' perceptions of business risk disclosures. This is because the GFC was an exogenous shock for Japanese firms, and thus using the change of items in business risk disclosures may be useful in identifying the economic disclosure effects on investors. We define a dummy variable (*Financial_Crisis*), which equals 1 if the sample year is between 2008 and 2010. We add an interaction term between *Financial_Crisis* and *N_Risks* to equation (5).

Column 3 of Table 4 presents the results of the effects of the GFC on the sensitivity of our risk measures to business risk disclosures. Row 2 of column 3 implies that the impact on total risk and informational risk becomes much higher—by about 0.013%—after the GFC shock. This result agrees with the idea that managers still have an incentive to disclose (exogenous) bad news even if negative business risk disclosures destroy firm value.

Column 4 presents the results when we use *Fun_risk* as the dependent variable. Interestingly, the coefficient of *N_Risks* is not statistically significant. This indicates that fundamental risk is not associated with textual business risk disclosures. At this point, the indirect effects (i.e., real effects) cannot be confirmed just using the number of risk items.

To compare with the previous studies, we also use the standard total risk (*Total_risk)* as the dependent variable. Column 5 indicates an increase of one item of *N_Risks*, which raises the total risk by about 0.013% on a daily basis (i.e., 0.21% per year; $0.013 \times \sqrt{250}$). The result is qualitatively consistent with that of Campbell et al. (2014).

Overall, these results indicate that the business risk disclosures significantly changed the investors' reactions to business risk disclosures.

Insert Table 4 around here

Almost all control variables are statistically significant in column 1 of Table 4. From a comparison of the control variables among the risk measures, the characteristics of each risk measure emerge. For example, the coefficients of *Size*, *MB*, and *ROA* are statistically significant in column 3 but not in column 2. The results indicate that the control variables are an important source of information for investors. Thus, there is no correlation between these variables and fundamental risk. In contrast, the coefficient of *Past_return* is statistically associated with the fundamental risk. This result indicates that past stock returns

can have real effects on a firm's future risk. *Leverage* is statistically significant in both columns 2 and 3, and the leverage ratio thus increases a firm's risks in terms of both real and disclosure effects.

It is interesting to note the ownership variables in Table 4. With respect to the variable *Ins_ownership*, the results indicate that institutional ownership, including stable shareholders in a Japanese context, can have economic effects that are not real effects but disclosure effects. In contrast, the coefficient of *Dir_ownership* is significant only for fundamental risk. These results are consistent with agency theory, whereby ownership structures affect real decisions made by a firm's managers.

6.2.2. Change effects of business risk disclosure

We also test to see whether the change in business risk disclosures is associated with the change in information risk (e.g., Kravet and Muslu 2013). This test partially alleviates concerns that firms are copying and pasting the previous year's risk disclosures. Table 5 presents the results of the effects of the change in business risk disclosures on the change in our risk measures (i.e., the change in total risk, change in fundamental risk, and change in information risk).

Insert Table 5 around here

To consider the difference between an increase from one to two risk items and an increase from six to seven risk items, we define the change in business risk items (*Change_N_Risks*) as the change ratio of risk items from the previous year. Column 1 of Table 5 shows that the change in business risk items (*Change_N_Risks*) is positively but weakly associated with the change in information risk (*Change_Info_risk*). One additional

item of business risk disclosure increases the information risk by about 0.04% on a daily basis (i.e., 0.63% per year). These results still support the idea that business risk disclosures are informative and that investors incorporate the information into their risk assessments, thereby increasing the information component within the cost of capital.

Column 2 shows that the change in business risk items (*Change_N_Risks*) is negative but marginally associated with the change in fundamental risk (*Change_Fun_risk*).

6.2.3. Information content of business risk Disclosure

Table 6 presents the results of analyses that separate textual business risk disclosures into idiosyncratic and systematic risk disclosures. Columns 1 and 2 in Table 6 are the results when we use *Info_risk* as the dependent variable. The coefficient of *N_Idio_Risks* is positive and statistically significant. In contrast, the coefficient of *N_Sys_Risks* is statistically insignificant. These results imply that information risk increases with idiosyncratic risk disclosures but not with systematic risk disclosures. In column 4, one additional item of idiosyncratic risk disclosure increases the information risk by about 0.014% (i.e., 0.63% per year). The results support the idea that business risk disclosures are informative and that investors incorporate the information into their risk assessments, thereby increasing the information component within the cost of capital.

Insert Table 6 around here

Columns 2 and 3 present the results when we use *Fun_risk* as the dependent variable. It is notable that the coefficient of *N_Idio_Risks* is negative but the coefficient of *N_Sys_Risks* is positive. Both variables are statistically significant. These results indicate that the fundamental risk decreases with increases in idiosyncratic risk disclosure. Column 2

indicates that an increase in one item of idiosyncratic risk disclosure decreases fundamental risk by about 0.008% (i.e., 0.13% per year). It is necessary to admit the potential endogenous problems discussed in Section 2 when estimating fundamental risk[16]. Nonetheless, this finding agrees with those of Lambert et al. (2007) and Kanodia (2006) regarding the existence of real effects. The negative coefficient also causes difficulty for the interpretation of reverse causality: if fundamental risk rises, mandatory risk disclosure should increase (i.e., the positive association should appear in our results). If this interpretation is correct, firm managers change their real decisions to reduce their fundamental risks through disclosure and risk management processes, which presumably reflects their awareness of their firm's future prospects.

Row 2 of column 2 in Table 6 indicates that one additional item of systematic risk increases the fundamental risk by about 0.008% on a daily basis. This is consistent with standard finance theory, such as the CAPM, in the sense that managers cannot decrease the systematic risk component of fundamental values—even if there are real effects for idiosyncratic risk disclosures. The impacts of idiosyncratic risk and systematic risk disclosures on fundamental risk are similar, which indicates that these effects appear to offset each other.

7. Robustness check

7.1. Endogenous variation in business risk disclosures

Textual business risk disclosures have a discretionary characteristic—even if they are mandatory: firm managers may make strategic choices regarding business risk

[16] To alleviate the problem, we take a year lag between the fundamental risk variable and the risk disclosure variable as a robustness check. The qualitative results remain the same.

disclosures. Thus, our results may still suffer from endogenous problems. Accordingly, estimations via instrumental variables could be warranted. In addition, another compelling reason for using instrumental variables is that some of the omitted variables—such as other news that may correlate with risk disclosures, which are compounded in the disturbance term in equations (5) and (6)—are also likely to affect the dependent variable for the same firm. This would apply even if the economic disclosure effects were stripped from the real effects by our risk measure. Hence, we may still need to strip *N_Risk* of its correlation with the disturbance via an instrumental variable.

Although Miihkinen (2013) also uses IV estimation as a robustness check, he uses firm leverage, beta, earnings-to-price ratio, and idiosyncratic risk as instruments. These variables are intrinsically related to firms' risk characteristics, and thus might suffer from the correlation problem with error terms, at least in our specifications. As our key instruments, we use *Industry_level_N_Risk_1* and *Filing volume*. *Industry_level_N_Risks_1* is one year lag of the Japanese SIC industry and year mean of *N_Risks*. *Filing_volume* is defined as the number of pages of annual reports. We expect that these two instruments are correlated with the level of *textual* business risk disclosures, but have little correlation with error terms of information risk. We also include each of the right-hand variables other than *N_Risks* in equation (5).

Column 1 of Table 7 shows the estimated result of *N_Risks*, which is the first stage of the IV regression. It should be noted that the coefficients of the key instruments (i.e., *Industry_level_N_Risk_1* and *Filing volume*) are positive and statistically significant, which indicates that they are appropriate instrument variables for *N_Risks*.

Column 2 of Table 7 presents the estimated result of *Info_risk*, which is the second stage of the IV regression. Row 1 of Table 7 shows that information risk increases with additional textual business risk disclosures. Our result indicates that an increase of one business risk item raises information risk by about 0.07%. The results still support the idea that business risk disclosures convey additional information to investors and change risk perceptions toward a higher cost of capital—even if we control the potential estimation problems.

Insert Table 7 around here

7.2. Alternative information risk: Idiosyncratic component of disclosure effects

One concern with the results of Table 4 is that we may have failed to isolate precisely the disclosure effects from real effects (i.e., measurement error problem). For our previous empirical results in Table 4, we define the information risk as the difference between total risk and fundamental risk. As a robustness check, we use an alternative information risk measure.

To refine our risk measure of the information-effect component, we focus on firm-specific information; this is because risk disclosures primarily come under criticism for the lack of such information. We define the alternative information risk (*Info_F_risk*) as the difference between the standard idiosyncratic risk and the idiosyncratic component of fundamental risk. In concrete terms, we decompose our risk measure into an idiosyncratic risk component and systematic risk component using the single index model[17]:

[17] We also used the Fama–French three-factor model and confirmed that the qualitative results are the same.

$$\sigma_{TOTAL\_RISK} = \sigma_{IDIOSYNCRATIC\_RISK} + \sigma_{SYSTEMATIC\_RISK}. \quad (6)$$

After decomposing both the standard total risk and fundamental risk, we calculate the difference between them. In other words, the information risk can be decomposed into two components:

$$\sigma_{INFO\_RISK} = \underbrace{\left(\sigma_{IDIOSYNCRATIC\_RISK} + \sigma_{SYSTEMATIC\_RISK}\right)}_{\text{Total risk}} - \underbrace{\left(\hat{\sigma}_{FUN\_IDIOSYNCRATIC\_RISK} + \hat{\sigma}_{FUN\_SYSTEMATIC\_RISK}\right)}_{\text{Fundamental risk}}$$

$$= \left(\sigma_{IDIOSYNCRATIC\_RISK} - \hat{\sigma}_{IDIOSYNCRATIC\_FUN\_RISK}\right) + \left(\sigma_{SYSTEMATIC\_RISK} - \hat{\sigma}_{SYSTEMATIC\_FUN\_RISK}\right)$$

$$= \sigma_{INFO\_RISK\_IDIOSYNCRATIC} - \sigma_{INFO\_RISK\_SYSTEMATIC}. \quad (7)$$

The first term ($\sigma_{INFO\_RISK\_IDIOSYNCRATIC}$) is the idiosyncratic component of disclosure effects and the second term ($\sigma_{INFO\_RISK\_SYSTEMATIC}$) is the systematic risk component of disclosure effects. We use the first term as the estimated proxy of *Info_F_risk*.

We reproduce the representative results of Tables 4 and 6 using this risk measure instead of *Info_risk*, and the new results are presented in Table 8. The new results are qualitatively similar to the earlier results. For example, in column 1, the coefficient of business risk disclosures (*N_Risks*) is positive and statistically significant. In column 3, the coefficient of *N_Idio_Risks* is positive and statistically significant. By contrast, the coefficient of *N_Sys_Risks* is statistically insignificant. The results imply that the information component of idiosyncratic risk increases with idiosyncratic risk disclosures but not with systematic risk disclosures.

Insert Table 8 around here

7.3. Alternative measures of risk disclosure

As our second robustness check, we use as the proxy of *Risk_Disclosure* the natural word count log (*N_Words*) and natural sentence count log (*N_Sentences*) instead of the number of risk items (*N_Risks*). We reproduce the results of Table 4 using these alternative risk disclosure measures and the new results are presented in Table 9.

Insert Table 9 around here

Again, the new results are qualitatively similar to the earlier results. Thus, regardless of our business risk disclosure measure, we confirm that our empirical evidence rejects the criticism that business risk disclosures suffer from being boilerplate information.

8. Conclusion

We empirically examined the economic effects of disclosure focusing on Japanese textual business risk disclosures. We expanded the idea of Armstrong and Vashishtha (2012) into the field of accounting economics and attempted to isolate the economic effects of a firm's disclosures from the real values of the firm.

We can summarize this paper's empirical evidence as follows. We found that there is a positive association between the number of textual business risks disclosed (the number of items listed) and our new risk measure. This indicates that business risk disclosures affect investors' risk perceptions (i.e., an investor's assessment of expected cash-flow changes) and thus increase the information component within the cost of capital. In this sense, Japanese business risk disclosures generally increase firms' risk information and are therefore not just boilerplate information. We also found that disclosure of business risks

relating to firm-specific factors increases risk perceptions (information risk) but that it is negatively associated with fundamental risk. This indicates the possibility of indirect effects on a firm's real decisions, as Lambert et al. (2007) and Kanodia (2006) highlight.

Overall, our empirical evidence rejects the criticism that business risk disclosures suffer from possessing a boilerplate nature. A unique feature of this paper is the construction of the information risk, and this idea may be generally applied to confirm or refute our empirical findings in other countries, such as the United States. We believe that this paper offers insights into the field of business disclosures and that it has policy implications for financial reporting and disclosure regulation.

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Appendix A

Alternative approach for capturing disclosure effects

As an alternative approach, we also regress *ex post* realized returns on a set of fundamental part of equity returns:

$$r_{i,t} = \alpha_0 + \alpha_1 \hat{r}_{i,t} + \varepsilon_{i,t}. \tag{A1}$$

We assume that the fitted value from the regression captures the fundamental part of equity returns. In other words, the residual should reflect the information shock and thus capture the information content of accounting disclosures, rather than reflecting the real value changes.

On the other hand, we assume that the imputed returns, based on the argument of Armstrong and Vashishtha (2012) are as follows:

$$\hat{r}_{i,t} = \beta_0 + \beta_1 r_{M,t} + \hat{\varepsilon}_{i,t} \tag{A2}$$

where $\hat{\varepsilon}_{i,t}$ and $r_{M,t}$ are uncorrelated.

Therefore, the ex post realized returns are

$$r_{i,t} = \alpha_0 + \alpha_1 \hat{r}_{i,t} + \varepsilon_{i,t} = \alpha_0 + \alpha_1 \left(\beta_0 + \beta_1 r_{M,t} + \hat{\varepsilon}_{i,t}\right) + \varepsilon_{i,t}$$

$$= \left(\alpha_0 + \alpha_1 \beta_0\right) + \alpha_1 \beta_1 r_{M,t} + \alpha_1 \hat{\varepsilon}_{i,t} + \varepsilon_{i,t}. \tag{A3}$$

We can rewrite the coefficient to obtain

$$r_{i,t} = \gamma_0 + \gamma_1 r_{M,t} + u_{i,t} \tag{A4}$$

where $u_{i,t} = \alpha_1 \hat{\varepsilon}_{i,t} + \varepsilon_{i,t}$ holds.

This equation corresponds to the traditional market model, which is typically used for estimates in the literature. Normally, we define the daily volatility of realized equity

returns $r_{i,t}$ for each firm in each fiscal year as the standard total risk (*Total_risk*). Thus, the following relationship holds based on equation (A4) no correlation with one another.

$$\sigma^2(r_{i,t}) = \gamma_1^2\sigma^2(r_{M,t}) + \sigma^2(u_{i,t}) = \overbrace{\gamma_1^2\sigma^2(r_{M,t})}^{\text{(a) Systematic risk}} + \overbrace{\underbrace{\alpha_1^2\sigma^2(\hat{\varepsilon}_{i,t})}_{\text{(b1) Real effects}} + \underbrace{\sigma^2(\varepsilon_{i,t}) + 2Cov(\alpha_1\hat{\varepsilon}_{i,t}, \varepsilon_{i,t})}_{\text{(b2) Disclosure effects}}}^{\text{(b) Idiosyncratic risk}}. \quad \text{(A5)}$$

Note that the first term is (a) the standard systematic risk and the second term is (b) the standard idiosyncratic risk. In this specification, we can further decompose (b) standard idiosyncratic risk into (b1) the idiosyncratic component of real effects and (b2) the idiosyncratic risk component of disclosure effects. Thus, this approach illustrates how it is possible to isolate the real and informational effects within this framework. We also empirically confirm that the qualitative results remain the same as those in Table 4 and Table 6.

Appendix B

Summary of textual analysis of business risk disclosure

In this section, we discuss the textual analysis of business risk disclosure applied in our study.

B.1. Example of business risk disclosure

To explain the style of business risk disclosures in Japan and compare those with risk factor disclosures in the United States, we use the example of Panasonic Corporation, an electronics firm in Japan. Panasonic is also listed on the New York Stock Exchange: thus, it submits the 20-F filing because the Securities and Exchange Commission require

that foreign private issuers file their annual reports on form 20-F. Tables B1 and B2 show typical examples of business risks disclosed in the "Risk Factors" section of 20-F in the United States and the "Business Risk, etc." section of annual report (Form-3 in Japan), respectively. For our analysis, we manually count the number of risk items (*N_Risks* in text) found in the "Business Risk, etc." as a measure of the level of business risk disclosure. We consider all the text including the heading and explanation as one risk item.

Table B1.
Example of business risk in 20-F by Panasonic

Risks Related to Economic Conditions Continued or further weakness in Japanese and global economies may cause reduced demand for Panasonic's products Demand for Panasonic's products and services may be affected by general economic trends in the countries or regions in which Panasonic's products and services are sold. Economic downturns and resulting declines in demand in Panasonic's major markets worldwide may thus adversely affect the Company's business, operating results and financial condition. For fiscal 2013, ending March 31, 2013, the Company continues to anticipate that the business environment will remain sluggish due to various factors including the negative impact of the yen's appreciation and ever-intensified global competition as well as possible slowdown in the global economy due to the European debt crisis. (abbreviation) (Filing Data: 2012-06-28, Period of Report: 2012-03-31, Type: 20-F)

Table B2.
Example of business risk in Form-3 by Panasonic

経済環境に関するリスク 経済状況の変動 当社グループの製品・サービスに対する需要は、それらの販売を行っている国または地域の経済状況の影響を受けるため、世界の市場における景気後退、およびこれに伴う需要の減少により、当社グループの事業、業績および財政状態が悪影響を受ける可能性があります。平成 24 年度につきましても、円高やグローバルな競争激化に加え、欧州債務危機による世界の景気減速懸念など、厳しい経営環境が続くものと思われます。 （省略） (Filing Data: 2012-06-28, Period of Report: 2012-03-31, Type: Form-3)

B.2. Data collection and file processing

Prior studies using the non-financial information of firms listed on the U. S stock market basically downloaded the 10-K filings from the SEC Edgar database and then extracted testable text data using a file-processing technique (Campbell et al., 2014; Kravet and Muslu, 2013). Because Japanese regulations do not require firms to submit their Form-3 (equivalent to 10-K) in a text format, the data of those text files are not available on an electronic data basis. Therefore, we manually created text files for all our sample firms. The procedures were as follows. First, we copied all the text found in the "Business Risk, etc." section of Form-3 and pasted the text into Excel files for each firm and each year. Thus, the precision of our business risk extraction is 100%. Second, we converted formatted text, such as boldface fonts, to plain text. Finally, we excluded extra spaces because written Japanese does not use them.

B.3. Measure of the level of business risk disclosures

For our analysis, we compute measures of the level and content of business risk disclosures. We manually count the number of risk items (*N_Risks* in text) found in the "Business Risk, etc." as a measure of the level of business risk disclosure. We consider all the text including the heading and explanation as one risk item. For example, *N_Risks* of Table B2 is calculated as 3.

With regard to alternative measures of the level of business risk disclosure, we calculate the total words and sentences in the "Business Risk, etc." section. If we find graphs in the description, we count each graph as 100 words because graphs are generally

difficult to count as text. For example, calculate the total number of words and sentences in Table B2 as 814 and 10, respectively.

B.4. Measure of the content of business risk disclosures

To examine the effects of business risk disclosure contents on firm risk, we categorize the risk items into idiosyncratic and systematic risk disclosures. For this, we use IBM SPSS Text Analytics for Surveys 4.0.1 software. This software allow us to categorize our text into 24 predefined categories (24 for idiosyncratic business risk and 8 for systematic business risk), listed in Tables B3 and B4. We adopt two approaches in this study: (1) categorization based on a keyword list; and (2) categorization using category rules. Tables B3 and B4 list, respectively, the risk subcategories and the main keywords for idiosyncratic and systematic risk disclosures.

Table B3.
Keywords by categories of idiosyncratic business risk

Risk subcategory	Main keywords
1. Quality of goods and services	defect, food poisoning, side effect, product, recall, claim, quality, item, service, safety
2. Strategy	strategy, restructuring, reconstruction, project, equity participation, expansion, M&A, alliance, acquisition, partnership, merger, joint
3. Organizational structure	business model, organization, structure, internal control, risk management, control surface, quality control, budget management, corporate governance

4. Relationship with critical suppliers	OEM, contract, client, supplier, commission, outsourcing, vendor
5. Financial condition	financing, working capital, fund, capital, liability, debt , loan, covenants, financial risk, syndication, credit risk, bankruptcy, deposit, default
6. Information security	information, data, secret, leakage, bug, cyber-terrorism, customer information, security
7. R&D investment	obsolescence, technology, evolution, progress, innovation, invention, R&D, development, trial
8. Operation	asbestos, trouble, accident, failure, damage, blackout, delay, stagnant, pause, break, stop, injuries, human error
9. Intellectual property	royalty, intellectual property, license, copyright, patent, counterfeit goods, imitation , copy
10. Litigation	litigation, plaintiff, defendant, criminal charges, disposal, administrative punishment, site inspections, compliance, illegal, violation
11. Human resources	human resource, key person, chairperson, president, director, skilled technician, staff, engineer, workers, labor , manager, employees, strike
12. Consolidated companies	parent, subsidiary, affiliate, consolidated, group companies, special purpose company
13. Brand value	brand, image, awareness, reliability, credibility, corporate value, rating, rumor
14. Relationship with other companies	relationship, deal

15. Related parties	related parties, major shareholder, founder, preferred stock
16. Going concern	going concern

Table B4.
Keywords by categories of systematic business risk

Risk subcategory	Main keywords
1. Economic conditions	interest rate, economic conditions, economy, market risk, external environment, external factors, exchange rate, foreign currency
2. Business environment	competition, demand, industry, consumer, supply and demand
3. Regulations	regulation , rules, law, authorized, register, certification, administration, tax
4. Purchase of raw materials	raw materials, fuel, crude oil, raw material price
5. Geopolitical situation	import, export, overseas trade, foreign, global, international, world, country, war, country risk, geopolitical risk
6. Natural disasters	natural disaster, earthquake, hazard, weather, climate, season, infection, disease, BSE
7. Accounting standards	accounting, pension accounting, impairment accounting, market valuation, stock option accounting
8. Environmental issues	pollution, waste, warming, greenhouse gas, emission, exhaust, environment

To consider the content of disclosure, we make category rules for categorization, including necessary keywords but also simultaneously excluding unnecessary keywords. Thus, based on the additional rules based in Table B5, we try to mitigate the misallocation problem. For this procedure, we use a function of category rules in the software: this enables us to make a categorization that includes necessary keywords while excluding unnecessary keywords. Using these unique category rules, we can mitigate the context problem of keyword-based categorization. Table B5 gives typical examples of category rules.

Table B5.
Examples of category rules

Category rule	Example of category rule
A ∧ B **（A and B）**	Category: Business environment Rule: *Include* both “product” and “price” Heading: Price of product To reduce categorization errors induced by “product,” which is a keyword in the “Quality of goods and services” category
A∧（¬B） **（A but not B）**	Category: Strategy Rule: *Include* “development” but *exclude* “business” Heading: Risk of new business development To reduce categorization errors induced by “development,” which is a keyword in “R&D investment”
（A∧B）∧（¬C） **(A and B, but not C)**	Category: Business environment Rule: *Include* both “supply and demand” and “trends” but *exclude* “raw material” Heading: Trends of supply and demand

	To reduce categorization errors induced by “raw material,” which is a keyword in “Purchase of raw materials”

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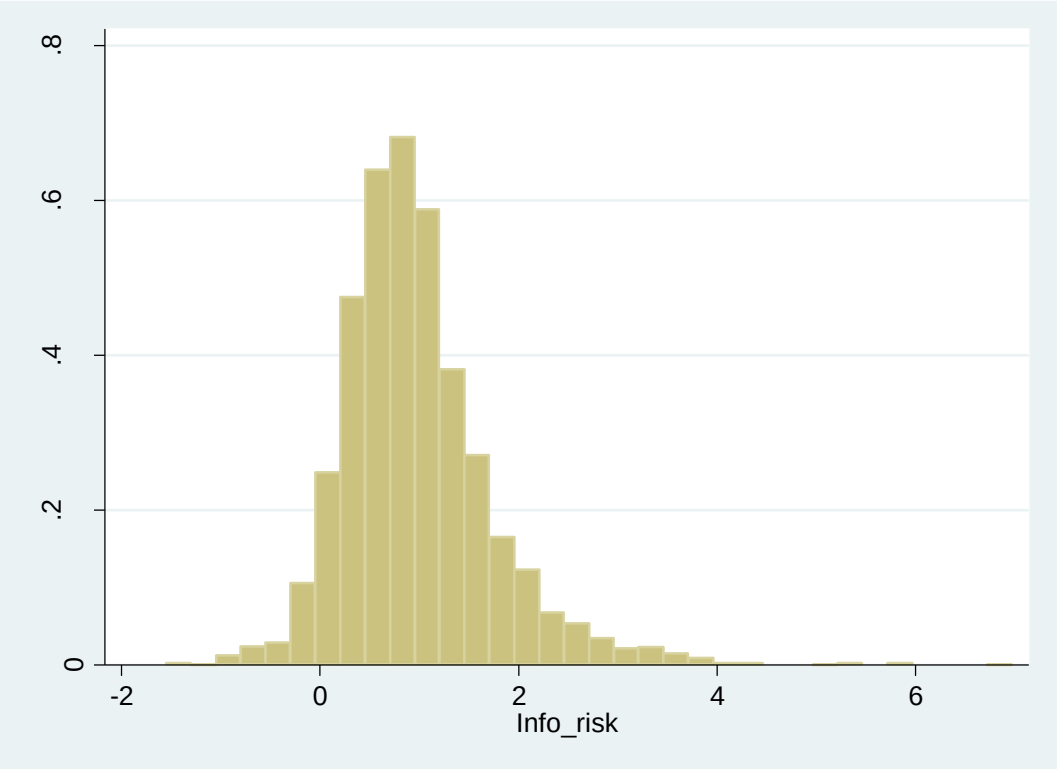
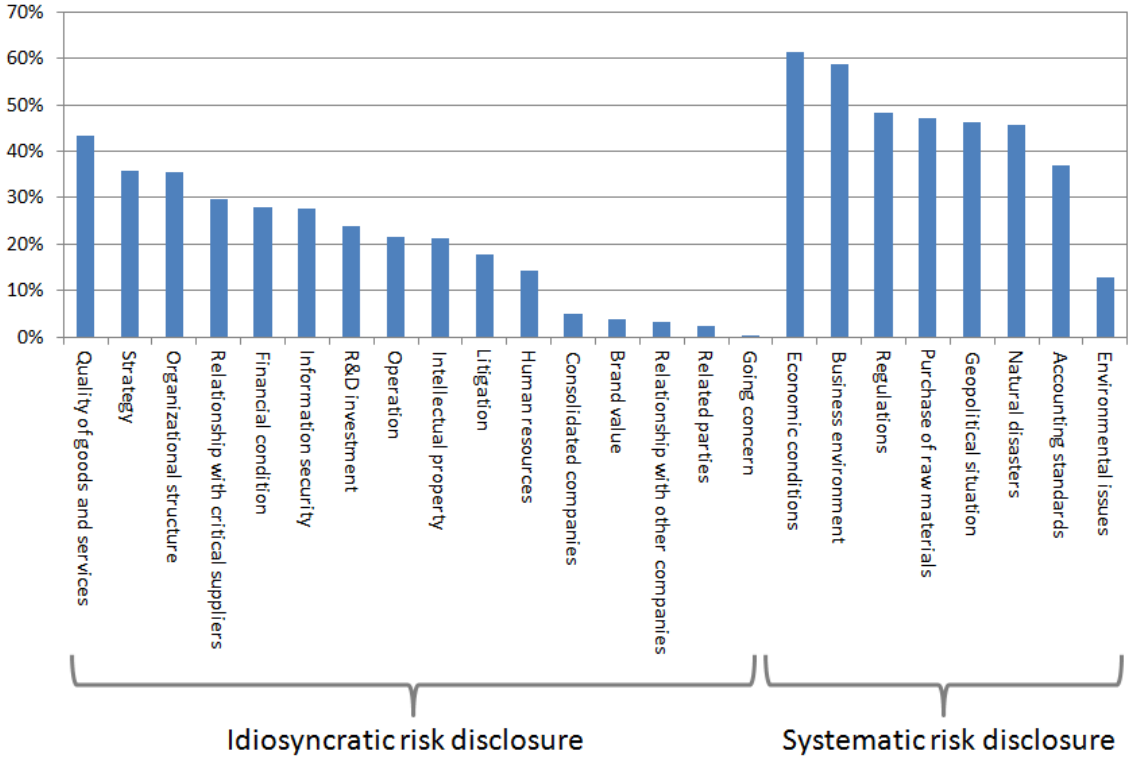
Figure 1.
Distribution of information risk



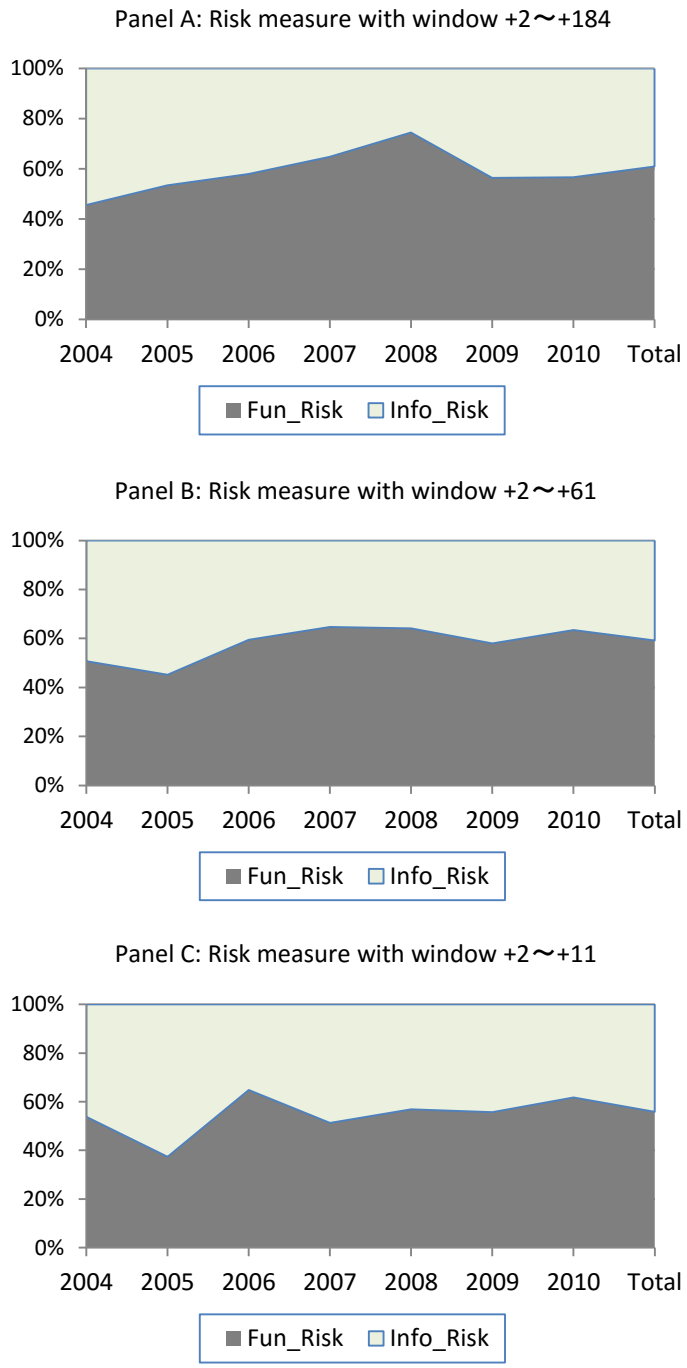
Information risk is defined as the difference between the standard total risk (standard deviation of realized stock returns) and fundamental risk (standard deviation of imputed stock returns)

Figure 2.
Contents of Business Risk Disclosure



Business risk disclosures are separated into two categories: idiosyncratic (i.e., firm-specific) risk disclosures and systematic risk disclosures. We separate textual business risk disclosures into these two categories. We use a unique keyword list for 24 risk subcategories based on the disclosure regulations and guidelines (FSA, 2003) to categorize risk contents. We also use original rules, which allow categorization that includes necessary keywords while excluding unnecessary keywords to consider the contents.

Figure 3.
Descriptive Statistics of Risk Measures



The figure shows the ratio of disclosure effects (fundamental effects) to the total risk for each year and the total period.

Table 1.
Business risk disclosure statistics

	mean	s.d.	min.	med.	max.	obs.
N_Risks						
2004	5.959	3.932	1.000	5.000	37.000	900
2005	6.737	4.069	1.000	6.000	38.000	975
2006	7.286	4.483	1.000	6.000	52.000	1,000
2007	7.549	4.568	1.000	7.000	56.000	1,022
2008	7.945	4.934	1.000	7.000	71.000	1,082
2009	8.324	5.067	1.000	7.000	74.000	1,102
2010	8.603	5.189	1.000	8.000	74.000	1,112
Total	7.545	4.731	1.000	7.000	74.000	7,193

N_Risks is the number of risk items disclosed in the "Business Risk, etc." section of the annual report for each firm.

Table 2.
Variables, their definitions, and data sources

Variables	Descriptions	Data sources
Risk measures		
Info_risk	*Total_risk* －*Fun_risk*: Information risk (%)	Astra Manager
Fun_risk	Standard deviation of past one year daily "*imputed*" stock returns of Armstrong et al. (2012): Fundamental risk (%)	Astra Manager
Business risk related variables		
N_Risks	Number of risk items disclosed in the "Business Risk etc." section	Annual Report
N_Words	Natural log of the word count disclosed in the "Business Risk etc." section	Annual Report
N_Sentences	Natural log of the sentence count disclosed in the "Business Risk etc." section	Annual Report
N_Idio_Risks	Number of idiosyncratic risk items disclosed in the "Business Risk etc." section	Annual Report
N_Sys_Risks	Number of systematic risk items disclosed in the "Business Risk etc." section	Annual Report
Firm's characteristics		
Size	Natural log of the total assets	NEEDS-FQ
MB	Total value of market value of equity and book value of debt / the total assets	NEEDS-FQ
ROA	Business income/ the total assets (%)	NEEDS-FQ
Past_return	Daily stock returns (including dividend) for each year	NEEDS-Cges
Leverage	Total assets / the book value of equity	NEEDS-Cges
Inst_ownership	Ratio of institutional ownership (%)	NEEDS-Cges
Dir_owhership	Ratio of executive ownership (%)	NEEDS-Cges

Table 3.
Summary statistics

Panel A: Descriptive statistics of risk measures

		mean	s.d.	min.	med.	max.	obs.
2004	*Info_risk*	0.956	0.706	-0.238	0.801	5.338	900
	Fun_risk	0.801	0.185	0.145	0.817	1.488	900
2005	*Info_risk*	0.979	0.641	-0.809	0.926	3.584	975
	Fun_risk	1.124	0.309	0.204	1.091	2.330	975
2006	*Info_risk*	0.782	0.584	-0.547	0.724	4.953	1,000
	Fun_risk	1.077	0.254	0.188	1.089	1.812	1,000
2007	*Info_risk*	0.952	0.791	-1.505	0.912	4.194	1,022
	Fun_risk	1.751	0.510	0.302	1.692	2.975	1,022
2008	*Info_risk*	0.999	1.014	-1.650	0.978	5.721	1,082
	Fun_risk	2.913	0.723	0.619	2.904	4.668	1,082
2009	*Info_risk*	0.929	0.734	-0.716	0.833	4.914	1,102
	Fun_risk	1.202	0.325	0.282	1.214	2.324	1,102
2010	*Info_risk*	1.097	0.890	-0.653	0.957	6.968	1,112
	Fun_risk	1.434	0.288	0.367	1.479	2.256	1,112
Total	*Info_risk*	0.958	0.788	-1.650	0.868	6.968	7,193
	Fun_risk	1.495	0.774	0.145	1.286	4.668	7,193

Panel B: Descriptive statistics of firm's characteristics

	mean	s.d.	min.	1Q	med.	3Q	max.	Obs.
Size	11.717	1.429	7.547	10.730	11.481	12.512	17.299	7,193
MB	1.197	1.068	0.256	0.909	1.048	1.263	58.592	7,193
ROA	5.698	5.998	-31.045	2.389	4.609	8.039	86.465	7,193
Past_return	0.018	0.181	-1.291	-0.093	0.022	0.130	1.011	7,193
Leverage	2.924	2.697	1.020	1.640	2.230	3.310	107.530	7,193
Ins_ownership	24.108	15.611	0.010	11.090	21.570	34.690	74.880	7,193
Dir_ownership	3.750	8.232	0.000	0.127	0.428	2.610	100.000	7,193

Panel C: Correlation matrix of firm's characteristics

	1	2	3	4	5	6	7
1 *Size*		-0.053	-0.109	-0.015	0.181	0.523	-0.302
		(0.000)	(0.000)	(0.200)	(0.000)	(0.000)	(0.000)
2 *MB*	0.110		0.549	0.156	-0.031	0.103	0.074
	(0.000)		(0.000)	(0.000)	(0.008)	(0.000)	(0.000)
3 *ROA*	-0.067	0.539		0.145	-0.220	0.271	0.167
	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)
4 *Past_return*	0.001	0.313	0.128		0.046	0.020	-0.011
	(0.929)	(0.000)	(0.000)		(0.000)	(0.083)	(0.372)
5 *Leverage*	0.266	0.042	-0.391	0.037		-0.149	-0.088
	(0.000)	(0.000)	(0.000)	(0.002)		(0.000)	(0.000)
6 *Ins_ownership*	0.558	0.280	0.333	0.038	-0.176		-0.119
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)		(0.000)
7 *Dir_ownership*	-0.577	-0.058	0.142	-0.003	-0.276	-0.281	
	(0.000)	(0.000)	(0.000)	(0.770)	(0.000)	(0.000)	

Panels B and C provide descriptive statistics and a correlation matrix for dependent variables, respectively. The lower-left corner row of Panel C is the Spearman correlation coefficient, and the upper–right corner row of Panel C is the Pearson correlation coefficient. The values in parentheses of Panel C are *p* values. For the definition of each variable, see Table 2.

Table 4.
Results of the effects of business risk disclosures on the information risk

			Pooled OLS				
			Info_risk			*Fun_risk*	*Total_risk*
	Explanatory Variable	*Predicted Sign*	(1)	(2)	(3)	(4)	(5)
1	*N_Risks*	+	0.015		0.008	-0.002	0.013
			(4.29) ***		(1.98) **	(-1.07)	(4.73) ***
1a	*Industry_level_N_Risks*			0.030			
				(1.38)			
1b	*Firm_lelvel_N_Risks*			0.015			
				(4.23) ***			
2	*N_Risks×Financial_Crisis*				0.013		
					(3.57) ***		
3	*Size*	-	-0.552	-0.155	-0.154	0.008	-0.148
			(-9.55) ***	(-9.54) ***	(-9.48) ***	(0.98)	(-9.82) ***
4	*MB*	+	0.095	0.095	0.100	0.001	0.096
			(2.30) **	(2.30) **	(2.46) **	(0.22)	(2.58) ***
5	*ROA*	-	-0.022	-0.022	-0.022	0.002	-0.019
			(-5.09) ***	(-5.08) ***	(-5.24) ***	(1.33)	(-4.98) ***
6	*Past_return*	-	-0.090	-0.091	-0.091	-0.150	-0.240
			(-1.09)	(-1.11)	(-1.11)	(-5.08) ***	(-2.78) ***
7	*Leverage*	+	0.061	0.061	0.061	0.008	0.097
			(3.84) ***	(3.84) ***	(3.84) ***	(2.84) ***	(3.84) ***
8	*Ins_ownership*	+/-	0.008	0.008	0.008	0.001	0.008
			(5.92) ***	(5.92) ***	(5.91) ***	(1.32)	(6.81) ***
9	*Dir_ownership*	+	-0.002	-0.002	-0.002	0.003	0.002
			(-0.66)	(-0.66)	(-0.68)	(3.35) ***	(0.84)
	constant	?	1.936	1.873	1.749	1.013	2.949
			(5.81) ***	(5.30) ***	(5.14) ***	(10.81) ***	(8.50) ***
	year fixed effects		*yes*	*yes*	*yes*	*yes*	*yes*
	industry fixed effects		*yes*	*yes*	*yes*	*yes*	*yes*
	R-squred		0.17	0.17	0.18	0.81	0.58
	LR		19	19	19	889	228
	[p-value]		[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
	Obs.		7,193	7,193	7,193	7,193	7,193

This table presents the results from pooled ordinary least squares with the year and industry dummy estimation of equation (5) for the cases when the information risk (*Info_risk*) and fundamental risk (*Fun_risk*) are used as the dependent variable. We present the results of the risk measures obtained with the estimation window of 2–184 days for each fiscal year after filing. *N_Risks* is the number of risk items disclosed in the "Business Risk, etc." section of annual reports. *Industry_level_N_Risks* is the Japanese SIC industry and year mean of *N_Risks*. *Firm_level_N_Risks* is defined as *N_Risks* net of *Industry_level_N_Risks*. *Financial_Crisis* is a dummy that equals 1 if the sample year is between 2008 and 2010.We also include control variables, which indicate any possible effects on a firm's risk. *Size* is the natural log of total assets. *MB* is the total market value of equity and the book value of debt deflated by total assets. *ROA* is the ratio of business income to total assets. *Past_return* is the daily stock returns (including dividends) for each fiscal year. *Leverage* is total assets deflated by the book value of equity. *Inst_ownrship* and *Dir_ownrship* are the ratios of institutional ownership and executive ownership, respectively. We compute robust standard errors of the estimates clustered at the firm level. The values in parentheses are *t* statistics. ***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level.

Table 5.
Change effects of business risk disclosure

			Pooled OLS	
			Change_Info_risk	*Change_Fun_risk*
	Explanatory Variable	*Predicted Sign*	(1)	(2)
1	*Change_N_Risks*	+	0.044	-0.010
			(2.40) **	(-1.60)
2	*Change_Size*	-	-0.070	0.190
			(-0.82)	(6.42) ***
3	*Change_MB*	+	-0.018	0.005
			(-1.58)	(0.81)
4	*Change_ROA*	-	-0.009	0.010
			(-2.65) ***	(6.75) ***
5	*Change_Past_return*	-	-0.218	-0.074
			(-3.23) ***	(-3.05) ***
6	*Change_Leverage*	+	-0.002	-0.009
			(-0.37)	(-0.72)
7	*Change_Ins_ownership*	+/-	0.005	0.000
			(2.31) **	(0.17)
8	*Change_Dir_ownership*	+	0.004	-0.001
			(1.00)	(-0.83)
	constant	?	0.027	0.321
			(0.26)	(27.67) ***
	year fixed effects		*yes*	*yes*
	industry fixed effects		*yes*	*yes*
	R-squred		0.05	0.91
	LR		11	698
	[p-value]		[0.000]	[0.000]
	Obs.		6,011	6,011

This table presents the results of the effects of the change ratio of business risk disclosures (*Change_N_Risks*) on the change in risk measures: *Change _Info_risk* and *Change_Fun_risk*. We present the results of the risk measures obtained with the estimation window of 2–184 days for each fiscal year after filing. The explanatory variables are the change in each control variable in equation (5). We compute robust standard errors of the estimates clustered at the firm level. The values in parentheses are *t* statistics. ***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level.

Table 6.
Results of the effects of business risk contents on the information risk

			Pooled OLS			
			Info_risk		*Fun_risk*	
	Explanatory Variable	*Predicted Sign*	(1)	(2)	(3)	(4)
1	*N_Idio_Risks*	-/+	0.014	0.016	-0.008	-0.005
			(3.20) ***	(3.99) ***	(-3.02) ***	(-2.16) **
2	*N_Sys_Risks*	+	0.003		0.008	
			(0.51)		(2.41) **	
3	*Size*	-	-0.149	-0.147	0.003	0.009
			(-9.13) ***	(-9.16) ***	(0.44)	(1.16)
4	*MB*	+	0.099	0.099	0.002	0.003
			(2.43) **	(2.44) **	(0.42)	(0.51)
5	*ROA*	-	-0.022	-0.022	0.003	0.003
			(-5.23) ***	(-5.24) ***	(1.60)	(1.50)
6	*Past_return*	-	-0.094	-0.094	-0.154	-0.154
			(-1.15)	(-1.15)	(-5.24) ***	(-5.22) ***
7	*Leverage*	+	0.062	0.061	0.008	0.008
			(3.84) ***	(3.85) ***	(2.80) ***	(2.86) ***
8	*Int_ownership*	+/-	0.007	0.007	0.001	0.001
			(5.85) ***	(5.81) ***	(1.38)	(1.29)
9	*Dir_ownership*	+	-0.002	-0.002	0.004	0.004
			(-0.66)	(-0.67)	(3.52) ***	(3.45) ***
	constant	?	1.920	1.903	1.035	0.995
			(6.25) ***	(6.09) ***	(14.13) ***	(10.64) ***
	year fixed effects		*yes*	*yes*	*yes*	*yes*
	industry fixed effects		*yes*	*yes*	*yes*	*yes*
	R-squred		0.17	0.17	0.81	0.81
	LR		18	19	881	891
	[p-value]		[0.000]	[0.000]	[0.000]	[0.000]
	Obs.		7,193	7,193	7,193	7,193

This table presents the results from pooled ordinary least squares with the year and industry dummy estimation of equation (5) for the cases when we use *N_Idio_Risks* and *N_Sys_Risks* instead of *N_Risks*. We use the information risk (*Info_risk*) and fundamental risk (*Fun_risk*) as the dependent variable. We present the results of the risk measures obtained with the estimation window of 2–184 days for each fiscal year after filing. *N_Idio_Risks* is the number of idiosyncratic risk items and *N_Sys_Risks* is the number of systematic risk items disclosed in the "Business Risk, etc." section of annual reports. We include control variables, which indicate any possible effects on a firm's risk. *Size* is the natural log of total assets. *MB* is the total market value of equity and the book value of debt deflated by total assets. *ROA* is the ratio of business income to total assets. *Past_return* is daily stock returns (including dividends) for each fiscal year. *Leverage* is total assets deflated by the book value of equity. *Inst_ownrship* and *Dir_ownrship* are the ratios of institutional ownership and executive ownership, respectively. We compute robust standard errors of the estimates clustered at the firm level. The values in parentheses are *t* statistics. ***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level.

Table 7.
Results of the IV regressions of the effects of business risk disclosures

		OLS		IV
		First_Stage		*Second_Stage*
		N_risks		*Info_risk*
	Explanatory Variable	(1)	*Predicted Sign*	(2)
1	*N_Risks*		+	0.069
				(3.91) ***
2	*Filing_volume*	0.051		
		(4.32) ***		
3	*Industry_level_N_Risks_1*	0.202		
		(2.31) **		
4	*Size*	0.876	-	-0.227
		(6.18) ***		(-8.18) ***
5	*MB*	1.516	+	0.068
		(8.71) ***		(1.65) *
6	*ROA*	0.006	-	-0.024
		(0.16)		(-5.96) ***
7	*Past_return*	-2.098	-	-0.135
		(-4.99) ***		(-1.38)
8	*Leverage*	0.063	+	0.063
		(1.40)		(2.78) ***
9	*Ins_ownership*	-0.021	+/-	0.010
		(-1.61)		(6.16) ***
10	*Dir_ownership*	0.025	+	-0.004
		(1.43)		(-1.48)
11	*constant*	-9.947	?	2.912
		(-5.36) ***		(11.99) ***
	year fixed effects	*yes*		*yes*
	industry fixed effects	*yes*		*yes*
	F-statistics	19.14		
	[p-value]	[0.000]		
	Overidentfication Test			2.061
	[p-value]			[0.151]
	R-squred	0.81		0.63
	LR	12		17
	[p-value]	[0.000]		[0.000]
	Obs.	6,251		6,251

This table presents the results from instrumental variables methods with the year and industry dummy estimation of equation (5). The first-stage regression is the estimation of the determinants of *N_Risks*. *N_Risks* is the number of risk items disclosed in the "Business Risk, etc." section of annual reports. The key instruments at the first stage consist of *Filing volume* and *Industry_level_N_Risk_1*. *Filing_volume* is defined as the number of pages of annual reports. *Industry_level_N_Risks_1* is one year lag of the Japanese SIC industry and year mean of *N_Risks*. The second stage is exactly the same specification as column 3 in Table 4. We compute robust standard errors of the estimates clustered at the firm level.
The values in parentheses are *t* statistics. ***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level.

Table 8.
Results of the alternative information risk: The idiosyncratic component of disclosure effects

			Pooled OLS		
			Info_F_risk		
	Explanatory Variable	*Predicted Sign*	(1)	(2)	(3)
1	*N_Risks*	+	0.014		
			(4.67) ***		
2	*N_Idio_Risks*	+		0.015	0.015
				(4.50) ***	(3.94) ***
3	*N_Sys_Risks*	?			0.000
					(0.03)
4	*Size*	-	-0.195	-0.187	-0.188
			(-13.17) ***	(-12.83)	(-12.70) ***
5	*MB*	+	0.085	0.089	0.089
			(2.48) ***	(2.63) ***	(2.63) ***
6	*ROA*	-	-0.021	-0.022	-0.022
			(-5.57) ***	(-5.73) ***	(-5.74) ***
7	*Past_return*	-	-0.249	-0.253	-0.253
			(-3.25) ***	(-3.31) ***	(-3.31) ***
8	*Leverage*	+	0.057	0.058	0.058
			(3.76) ***	(3.77) ***	(3.76) ***
9	*Int_ownership*	+/-	0.01	0.01	0.01
			(6.02) ***	(5.93) ***	(5.95) ***
10	*Dir_ownership*	+	0.002	0.002	0.002
			(1.00)	(0.97)	(0.97)
	constant	?	2.356	2.329	2.329
			(10.74) ***	(11.44) ***	(11.31) ***
	year fixed effects		*yes*	*yes*	*yes*
	industry fixed effects		*yes*	*yes*	*yes*
	R-squred		0.29	0.29	0.29
	LR		48	48	47
	[p-value]		[0.000]	[0.000]	[0.000]
	Obs.		7,193	7,193	7,193

This table presents the results from pooled ordinary least squares with the year and industry dummy estimation of equations (5) for the case when the idiosyncratic information component of total risk is used as the dependent variable. *Info_F_risk* is the idiosyncratic component of disclosure effects. We present the results of the risk measures obtained with the estimation window of 2–184 days for each fiscal year after filing as being representative. *N_Risks* is the number of risk items disclosed in the "Business Risk, etc." section of annual reports. *N_Idio_Risks* is the number of idiosyncratic risk items and *N_Sys_Risks* is the number of systematic risk items disclosed in the "Business Risk, etc." section of annual reports. We also include control variables, which indicate any possible effects on a firm's risk. *Size* is the natural log of total assets. *MB* is the total market value of equity and the book value of debt deflated by total assets. *ROA* is the ratio of business income to total assets. *Past_return* is daily stock returns (including dividends) for each fiscal year. *Leverage* is total assets deflated by the book value of equity. *Inst_ownrship* and *Dir_ownrship* are the ratios of institutional ownership and executive ownership, respectively. We compute robust standard errors of the estimates clustered at the firm level. The values in parentheses are *t* statistics. ***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level.

Table 9.
Results of alternative measures of risk disclosure

			Pooled OLS			
			Info_risk		*Fun_risk*	
	Explanatory Variable	*Predicted Sign*	(1)	(2)	(3)	(4)
1	*N_Words*	+	0.069			-0.004
			(2.72) ***			(-0.35)
2	*N_Sentences*	+		0.075	-0.003	
				(2.77) ***	(0.26)	
3	*Size*	-	-0.147	-0.149	0.005	0.005
			(-9.04) ***	(-9.03) ***	(0.66)	(0.69)
4	*MB*	+	0.105	0.104	-0.001	-0.001
			(2.54) ***	(2.53) ***	(-0.14)	(-0.12)
5	*ROA*	-	-0.022	-0.022	0.002	0.002
			(-4.67) ***	(-4.66) ***	(1.27)	(1.27)
6	*Past_return*	-	-0.101	-0.101	-0.147	-0.147
			(-1.24)	(-1.24)	(-5.01) ***	(-5.02) ***
7	*Leverage*	+	0.062	0.062	0.008	0.008
			(3.87) ***	(3.86) ***	(2.83) ***	(2.83) ***
8	*Int_ownership*	+/-	0.007	0.007	0.009	0.001
			(5.74) ***	(5.73) ***	(1.36)	(1.36)
9	*Dir_ownership*	+	-0.002	-0.002	0.003	0.003
			(-0.70)	(-0.72)	(3.30) ***	(3.31) ***
	constant	?	1.427	1.732	1.040	1.059
			(4.46) ***	(5.68) ***	(10.93) ***	(9.18) ***
	industry fixed effects		*yes*	*yes*	*yes*	*yes*
	R-squred		0.72	0.17	0.81	0.81
	LR		18	18	893	893
	[p-value]		[0.000]	[0.000]	[0.000]	[0.000]
	Obs.		7,193	7,193	7,193	7,193

This table presents the results from pooled ordinary least squares with year and industry dummy estimation of equation (5) for the cases when the information risk and fundamental risk are used as the dependent variable. *N_Words* is the natural log of the word count and *N_Sentences* is the natural sentence count. We include control variables, which indicate any possible effects on a firm's risk. *Size* is the natural log of total assets. *MB* is the total market value of equity and the book value of debt deflated by total assets. *ROA* is the ratio of business income to total assets. *Past_return* is daily stock returns (including dividends) for each fiscal year. *Leverage* is total assets deflated by the book value of equity. *Inst_ownrship* and *Dir_ownrship* are the ratios of institutional ownership and executive ownership, respectively. We compute robust standard errors of the estimates clustered at the firm level. The values in parentheses are *t* statistics. ***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level.