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What Drives Quality of Firm Risk Disclosure?

The Impact of a National Disclosure Standard and Reporting Incentives under IFRS

by

Antti Miihkinen^{a,*}

^aAalto University School of Economics
Department of Accounting
P.O. Box 21220, FIN-00076 Aalto, Finland
Email: antti.miihkinen@aalto.fi
Telephone: +358 50 5469573
Fax: +358 431 38678

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* Established in 2010, the Aalto University is a new university with centuries of experience. The Aalto University was created from the merger of three Finnish universities: The Helsinki School of Economics, Helsinki University of Technology, and The University of Art and Design Helsinki.

What Drives Quality of Firm Risk Disclosure?

The Impact of a National Disclosure Standard and Reporting Incentives under IFRS

Abstract: This paper examines the impact of a detailed national disclosure standard on the quality of firms' overall risk reviews under IFRS. We use data from a sample of listed Finnish firms around the introduction of the standard and find that national regulatory bodies have been able to raise the quality of risk disclosure on several dimensions even under IFRS. We find increases in the quantity of risk disclosure with more extensive and more comprehensive information. We do not, however, find a corresponding increase in quantitative disclosures and therefore there is some question regarding the influence of the standard on the substance of the risk information provided. In addition to the coercive effect of the standard, several important reporting incentives, such as firm size, profitability, and foreign listing status are documented. We also find some evidence that the impact of the standard on quality is more pronounced among less profitable firms. Additional findings are that larger firms and firms reporting under the requirements of the SEC disclose more quantitative risk information, and that the quality improvements are permanent in the subsequent years. The findings have implications for standard-setters evaluating different strategies with the aim to increase the quality of the narratives in annual reports.

JEL classification: M41, M48

Keywords: Risk reporting, Disclosure quality, Regulation, Reporting incentives

1. Introduction

High-quality narrative communication in the non-financial statement sections of annual reports is important to making company reporting more useful to investors. However, standard-setters face a taxing challenge in deciding on how these sections could most effectively be regulated. Standard-setting is very much concerned with making correct decisions about the right level of detail in the disclosure standards (Schipper, 2003). If standard-setters set out disclosure requirements that are too directive, they receive highly comparable information which includes mostly boilerplate discussion that lacks relevance to investors. In contrast, if standard-setters do not require any disclosure on a specific issue, some firms will not voluntarily disclose anything.

Accounting literature demonstrates that there is a significant risk information gap between firms and their stakeholders (Roulstone, 1999; Kajüter, 2001; Linsley & Shrives, 2006). However, to date, there is little, if any, research evidence concerning the impact of risk disclosure regulation on quality (see Beretta & Bozzolan, 2004). Studies examining this issue are needed because it is difficult otherwise to evaluate the effectiveness of detailed risk guidance in an environment in which firms have several disclosure motives. The extant research documents the importance of reporting incentives as a determinant of accounting quality (e.g., Ball et al., 2003; Leuz, 2003; Ball & Shivakumar, 2005; Dobler, 2008; Dobler et al., 2011). Given this background, this paper examines whether a detailed national risk disclosure standard can improve the quality of firms' overall risk reviews under IFRS.

In order to examine this question we exploit the unique regulatory change in Finland. In 2006 the Finnish Accounting Practice Board published a new detailed risk disclosure standard which describes how firms should assess their significant risks in their operating and financial reviews. It provides a comprehensive view on the expected quality of risk reporting and also includes illustrative disclosure examples. The standard specifies the risk disclosure

requirements of the Finnish Accounting Act, which are given on a very general level without any implementation guidance. However, it is still principles-based because it allows firms latitude in deciding on their risk disclosure policies. Finnish listed firms follow IFRS but are obliged to publish an operating and financial review according to the Finnish Accounting Act. Consequently, the new disclosure standard also influences the risk reporting of those Finnish listed firms that prepare their financial statements according to IFRS. Miihkinen (2011) documents that the quality of Finnish listed firms' risk disclosure is negatively associated with information asymmetry around the introduction of the standard.

Roulstone (1999) demonstrates that firms' market risk disclosures improved after the introduction of FRR No. 48 in the US. The Finnish standard differs from FRR No. 48 because it stipulates the *overall* risk reviews of firms, i.e. disclosures on strategic risks, operational risks, financial risks, damage risks, and risk management. The Finnish standard is six pages long, whereas FRR No. 48 is in excess of 100 pages. Furthermore, FRR No. 48 lacks the illustrative risk disclosure examples which have an essential role in the Finnish standard.

From December 2005 onwards the SEC requires overall risk reviews in annual and quarterly reports. However, compared to that found in Finland, this standard is clearly shorter, much vaguer, and lacks disclosure examples. It is not surprising that after the first wave of the global financial crisis in 2010, the SEC warned companies about risk disclosures that are too broad and generic. SEC Chairman Mary Schapiro said that the commission is working on revising risk disclosure requirements (CFO.com, 2010). Concurrent working papers on risk disclosures in US have provided evidence that the mandatory risk disclosures are informative to investors despite the reporting deficiencies (Campbell et al., 2011; Huang, 2011; Kravet & Muslu, 2011).

Another motivating reason for examining the effectiveness of the standard in Finland is that empirical literature finds high compliance and disclosure ratios for Finnish firms (King,

1999; Dargenidou et al., 2006). Therefore, if improvements to quality of risk disclosure are unable to be documented in this setting, regulatory bodies will likely encounter similar problems in other countries. This is relevant information for standard-setters when they consider how to mandate narrative risk reporting in the non-financial statements of firms' annual reports.

Our empirical indicators of quality of risk disclosure are quantity of disclosure (cf., Abraham & Cox, 2007), coverage of disclosure (cf., Beattie et al., 2004), and the semantic properties of disclosure (cf., Beretta & Bozzolan, 2004; Cerbioni & Parbonetti, 2007; Beretta & Bozzolan, 2008). We ensure the overall validity and reliability of disclosure quality measurement by using factor analysis to summarize the quality indicators into a composite measure of quality.

The results of a regression analysis point to the following main findings. First, the risk disclosure standard increases firms' quality of risk disclosure on several dimensions. After the release of the standard, the risk reviews of the firms are more extensive and also provide more evenly distributed information across risk topics. Moreover, firms give more detailed qualitative descriptions of the economic impact of the identified risk on future performance and provide more information on actions taken and programs planned to face their risks. We also document an increase in firms' willingness to provide quantitative risk information although the effect of the standard is weaker compared to other quality dimensions. The reluctance of firms to provide monetary assessments of risk information is consistent with the findings of Beretta & Bozzolan (2004), Linsley & Shrives (2006), and Dobler et al. (2011).

Second, we find that the *coercive effect* of the standard drives increases in the overall quality of risk disclosure. Other important drivers of quality are firm size, profitability, and listing on NYSE. We also find some evidence that the impact of the standard on quality is more pronounced among less profitable firms, which may suggest that the coercive effect of

the standard forces these firms to reconsider their threshold level of disclosure. It is also found that a less profitable firm discloses more on its risks if it has a high business risk. Third, the results demonstrate that the risk disclosure standard has a strong impact on the location of the risk information provided. After the release of the standard, 81.9 per cent of risk disclosure is provided in the operating and financial reviews. In the previous year the comparable number was 57.5 per cent. Additional findings are that larger firms and firms reporting under the requirements of the SEC disclose more quantitative risk information, and that the quality improvements are permanent in the subsequent years.

This study contributes to the accounting literature by demonstrating that detailed risk disclosure guidance can be used to improve the quality of firms' overall risk reviews. In addition, we add to prior literature by providing evidence on the importance of several reporting incentives as a determinant of risk disclosure quality. The results benefit the FASB and the IASB, the SEC, and national regulatory bodies by demonstrating how risk reporting under IFRS can be influenced through a detailed national disclosure standard.

The remainder of the paper is organized as follows. The literature review and development of hypotheses are described in section 2, followed by the research design in section 3. Thereafter, sample, data, and descriptive statistics are discussed in section 4, and empirical results reported in section 5. Section 6 provides detail of robustness checks and section 7 provides a summary and conclusion.

2. Literature review and hypothesis development

Risk disclosure regulation and quality of risk disclosure

In recent years scholars have showed an increasing research interest in risk disclosure (e.g., Roulstone, 1999; Solomon et al., 2000; Beretta & Bozzolan, 2004; Lajili & Zéghal 2005; Linsley & Shrivess, 2006; Abraham & Cox, 2007; Dobler, 2008; Dobler et al., 2011). However, risk disclosure is still one of the most ambiguous and unexplored areas of corporate disclosure. In particular, we do not know enough about quality of risk disclosure.

Risk management is essential for the maximization of shareholders' wealth because it aims to maximize profitability while at the same time reducing the probability of financial failure (Solomon et al., 2000). In addition, employees, customers and other stakeholders benefit from risk disclosure. One common criticism of financial reporting is that it does not provide a detailed description of risks and uncertainties. Academics, practitioners, and standard-setters have noticed this problem and asked whether regulatory bodies should develop specific standards for the disclosure of risk in annual reports.

Previous literature reports that firms react to new disclosure requirements and recommendations (Inchausti, 1997; Roulstone, 1999; Miihkinen, 2008). Roulstone (1999) demonstrates that FRR No. 48 is effective in improving market risk disclosures of US listed firms.¹ However, academic research has not provided evidence about the effectiveness of regulation in improving the overall quality of risk disclosure within a single country. For this reason, Beretta & Bozzolan (2004) suggest that future research should examine whether the

¹ FRR No. 48 was issued by the Securities and Exchange Commission (SEC) in 1997 to improve market risk disclosures encouraged, but not required, under SFAS No. 119. One of the guiding principles the SEC followed in formulating the proposed standard was that disclosure requirements about market risk should be flexible enough to accommodate different types of registrants, different degrees of market risk exposure, and alternative ways of measuring market risk (Linsmeier & Pearson, 1997). Consequently, the standard was principles-based and allowed firms considerable latitude in the presentation of disclosure.

quality of risk disclosure is influenced by the degree of regulation imposed by the external environment in which firms operate.

One of the problems in developing disclosure standards has been that direct empirical evidence about the effects of risk disclosures has been nonexistent (Schrand & Elliot, 1998). Nowadays we have some evidence on the information content of risk disclosures to analysts and investors (Rajgopal, 1999, Jorion, 2002; Thornton & Welker, 2004; Campbell et al., 2011; Huang, 2011; Kravet & Muslu, 2011; Miihkinen, 2011). However, behavioral accounting studies demonstrate that often risk information is not effective in helping investors to form risk judgments (Koonce et al., 2005a, 2005b). These arguments are supported by the empirical findings of Beretta & Bozzolan (2004), Lajili & Zéghal (2005), Linsley & Shrives (2006), Linsley & Lawrence (2007), and Dobler et al. (2011).

Beretta & Bozzolan (2004) suggest that although Italian firms voluntarily disclose some risk information, they tend to be oriented towards a policy of ‘formal disclosure but substantial nondisclosure’ of the expected impact of risk factors on future performance. In the Canadian institutional setting, Lajili & Zéghal (2005) show that the analytical power of risk disclosures, as captured by risk assessment analysis, appears to lack uniformity, clarity, and quantification, thus potentially limiting their usefulness. Linsley & Shrives (2006) examine risk disclosure in the UK and report that it is uncommon to find monetary assessments of risk information, and that there is lack of coherence in risk narratives, implying that a gap in risk information exists; as a consequence, stakeholders are unable to adequately assess the risk profile of the firms. Linsley & Lawrence (2007) analyze the writing style of risk disclosures by UK companies and demonstrate that these disclosures lack readability. Finally, Dobler et al. (2011) examine the attributes of corporate risk disclosures internationally. They find a consistent pattern where risk disclosures are most prevalent in management reports, concentrate on financial risk categories, and comprise little quantitative and forward-looking

disclosure across sample countries (US, Canada, UK, Germany). They conclude that cross-country variation in risk disclosure attributes can only partly be linked to domestic disclosure regulation, suggesting that risk disclosure incentives play an important role.

Managers' disclosure incentives and firms' corporate governance structures

Risk reporting incentives also influence risk disclosure in regulated environments (Dye, 1990; Marshall & Weetman, 2007; Dobler, 2008; Dobler et al., 2011). Marshall & Weetman (2007) demonstrate that mandatory disclosure of foreign exchange risk management leaves a substantial amount of non-disclosure compared to the full extent of information known to managers. Firm disclosure decisions, and thereby also their risk disclosures, are likely to be influenced by a number of fundamental factors that have been examined in related literatures. These include firm size (Cooke, 1989; Eng & Mak, 2003; Cahan et al., 2005; Brammer & Pavelin, 2006), profitability (Lang & Lundholm, 1993; Leuz, 2000; Prencipe, 2004), prospects for growth (Kanto & Schadewitz, 1997; Miihkinen, 2008), the need for external financing (Lang & Lundholm, 1993), and listing status (Cooke, 1989).²

Moreover, some firms have higher exposure to risks and consequently have more potential risk information to disclose to the capital markets. High leverage increases firms' bankruptcy risk and makes these firms more vulnerable to risks (cf., Dobler et al., 2011). Business risk (volatility of the yearly cash-flows and globalization) is another factor that may influence managers' risk disclosure behavior (Jorgensen & Kirschenheiter, 2003; Cahan et al., 2005). In addition, high sensitivity to systematic risk in the stock markets may motivate managers to risk disclosure (Linsley & Shrives, 2006).

² Analytical research suggests that the reduction of adverse selection problems and agency costs are the primary motives for voluntary disclosure (e.g., Akerlof, 1970; Spence, 1973; Jensen & Meckling, 1976).

Finally, the corporate governance structures of firms may also influence their risk disclosures (Abraham & Cox, 2007). High ownership concentration probably decreases firms' willingness to provide high quality risk disclosure. In addition, the ratio of foreign owners to domestic owners may influence managers' risk reporting decisions.

Hypothesis: the quality impact of the standard

Roulstone (1999) provides evidence on the coercive effect of FRR No. 48 on the reporting of firms' market risks. FRR No. 48 is extensive and very detailed; typical for the rules-based accounting tradition in US. He documents that market risk disclosures, encouraged but not required under FAS No. 119, improved greatly under FRR No. 48 but varied widely in detail and clarity. This finding supports the notion that the comprehensive standard had a significant coercive effect on the reporting of the firms.

The Finnish standard has characteristics of FRR No. 48 because it is detailed. In addition, the Finnish standard is supplemented with illustrative disclosure examples which should increase its coercive effect. Through these examples the standard provides a versatile view on the characteristics of high-quality risk reporting such as the importance of qualitative and quantitative risk descriptions, and disclosure on all risk topics. The Finnish Accounting Practice Board emphasizes in the guidance that one of its main objectives is wide coverage of the provided risk information. From December 2005 onwards the SEC requires overall risk reviews in annual and quarterly reports. However, compared to that found in Finland, this standard is clearly shorter, much vaguer, and lacks disclosure examples, which probably reduces its coercive effect. Not surprisingly, in 2010 the SEC warned firms about low-quality overall risk reviews.

We propose that before the publication of the new standard Finnish firms may have been unwilling to report their risks in fear of proprietary costs and/or litigation costs

(Verrecchia, 1983). In addition, bad news firms may have been willing to withdraw from risk disclosures because of their negative impact on valuation (Akerlof, 1970). We argue that the coercive effect of the standard is strong enough to influence firms' risk disclosure choices (cf., FRR No. 48), and test the following hypothesis:

H1. The coercive effect of the risk disclosure standard leads to improved quality of firms' risk reporting.

3. Research design

Definition of risk disclosure and risk disclosure framework

We define risk disclosure as all information that firms provide in the risk reviews presented in their annual reports. Risk disclosure is information that describes firms' major risks and their expected economic impact on future performance. This information includes among others, forward-looking information that helps external investors to build up a point estimate of future cash flows, information on the sources of uncertainty surrounding forecasts of the firm's future cash flows, and information on the sources of non-diversifiable risk that should be included in cost of capital. In addition, historical information about the actions taken to face risks, and forward-looking information on programs planned to face risks are taken into account.

The risk disclosure standard of the Finnish Accounting Practice Board forms the basis of the applied risk disclosure framework. This standard defines the following risk categories typical of all firms: strategic risks, operational risks, financial risks, damage risks, and risk management. Several examples of the risk items belonging to the defined categories are offered in the standard. In addition, it provides exemplary risk disclosure formats. Because the standard does not give an exhaustive description of all subtopics in the risk categories, the risk

disclosure framework applied in this study has been made more comprehensive by adopting some of the risk disclosure subtopics found in the risk disclosure framework presented by Linsley & Shrives (2006).³ Finally, a subsample of annual reports has been pre-tested in order to identify missing subtopics from the examined risk categories. Appendix A describes the detailed risk disclosure framework.

Empirical indicators of quality of risk disclosure

Previous literature reports various disclosure-measurement frameworks as an attempt to best capture differences in the quality of financial reporting. Botosan (2004) contends that all of these frameworks implicitly maintain the hypothesis that quantity and quality are positively related. She states that the IASB and FASB conceptual frameworks provide good guidance regarding generally accepted notions of information quality (Botosan, 2004: 290). However, it is very difficult to apply these requirements in the analyses of accounting narratives without researcher's subjective assessment.

While recognizing the inherent conceptual difficulties of measuring disclosure quality in a complete, valid, and reliable manner, the present study contends that certain quality indicators developed in the existing related literature may provide useful approximations of some important aspects of quality of risk disclosure (see Beattie et al., 2004; Beretta & Bozzolan, 2004). As discussed below, these indicators relate to the quantity and coverage of risk disclosure, as well as to certain semantic properties of the risk information disclosed.⁴

³ Linsley & Shrives (2006) use a risk disclosure categorisation that was developed by a professional accountancy firm and subsequently used by Kajüter (2001) within a risk disclosure study.

⁴ The measures presented below are crude proxies for the qualitative characteristics of financial reporting information provided in the IASB conceptual framework (see the IASB exposure draft of an improved conceptual framework for financial reporting, 2008). In this framework, relevance and faithful presentation go with the fundamental qualitative characteristics of financial reporting information. Enhancing qualitative characteristics (comparability, verifiability, timeliness, and understandability) are complementary to the fundamental qualitative characteristics. They distinguish more useful information from less useful information.

Risk disclosure quantity

The first proxy for quality of risk disclosure is measured by the number of risk disclosure words provided by the firm. Consequently, the empirical indicator of risk disclosure quantity is as follows:

$$QUANTITY = \ln (\text{total number of risk disclosure words}) \quad (1)$$

Risk disclosure coverage

A balanced description of the major risks of the firm is important to investors in order to build a comprehensive view of firm value.⁵ This study applies the disclosure metric described by Beattie et al. (2004) to measure the coverage of the risk information provided. In this metric the Herfindahl index is used to measure the concentration of corporate disclosures across risk topics. The coverage of information is calculated at the main topic level of the risk disclosure framework. The empirical indicator for risk disclosure coverage is as follows:

$$COVERAGE = [(1/H)/\text{the number of main risk topics}], \quad (2)$$

where H represents Herfindahl measure of concentration across risk topics calculated as $H = \sum_{i=1}^n p_i^2$, where p_i is the proportion of risk disclosure words on topic i . The inverse of H will be used to make a greater Herfindahl index value reflect more extensive disclosure coverage. This value has been scaled by dividing it with the number of main risk topics.

⁵ This objective was also made explicit in the Finnish risk disclosure standard.

The semantic properties of risk disclosure

Recently, scholars have been increasingly interested in the semantic properties of the information provided in corporate communications (Beretta & Bozzolan, 2004; Cerbioni & Parbonetti, 2007; Beretta & Bozzolan, 2008). The analysis of the semantic properties of text focuses on examining what is disclosed and how. Text that includes semantic quality properties allows external users to look at firms ‘through the eyes of management’ (Cerbioni & Parbonetti, 2007). Similar to Beretta & Bozzolan (2004), the semantic properties considered in the present study are *depth* and *outlook profile*.

Depth concerns the content of information disclosed with regard to the expected economic impact of identified risks on future performance. The depth dimension consists of two components which are the qualitative and quantitative description of the economic impact of the risk. The empirical indicators for these components are as follows:

$$DEPTH_QUALITATIVE = \ln \sum_{j=1}^{k_j} qualitative_j \quad (3)$$

where k_j = the number of risk information sentences disclosed by the firm; $qualitative_j=1$ if the risk information sentence j of the firm contains qualitative information about the expected economic impact of the identified risk on future performance, otherwise $qualitative_j=0$.⁶

$$DEPTH_QUANTITATIVE = \ln \sum_{j=1}^{k_j} quantitative_j \quad (4)$$

where k_j = the number of risk information sentences disclosed by the firm; $quantitative_j=1$ if the risk information sentence j of the firm contains quantitative information about the expected economic impact of the identified risk on future performance, otherwise $quantitative_j=0$.^{7, 8}

⁶ Observations with zero sentences were awarded 0 points. Consequently, observations with zero or one risk disclosure sentence have the same disclosure scores on this dimension.

⁷ This study interprets broadly the sentences which contain quantitative information relating to the expected economic impact of identified risk on future performance. Because very few firms provided any direct values for risks, all risk disclosure sentences which contained some quantitative information were accepted. A stricter

Outlook profile concerns the way management communicates the approach adopted to face the identified risks (Beretta & Bozzolan, 2004). The empirical measure for this dimension is the following:

$$OUTLOOK_PROFILE = \ln \sum_{j=1}^{k_j} acp_j \quad (5)$$

where k_j = the number of risk information sentences disclosed by the firm; $acp_j=1$ if the risk information sentence j of the firm contains information about actions taken or programs planned to face identified risk, otherwise $acp_j=0$.⁹

Composite quality of risk disclosure

Factor analysis can be utilized to examine the underlying patterns or relationships of a number of variables and to determine whether the data can be condensed into a smaller set of factors or components (Hair et al., 1995). The method is used here to summarize the quality indicators considered above to form a composite measure of quality of risk disclosure.¹⁰ The following composite measure of individual quality indicators is expected to improve the overall validity and reliability of the measurement of quality of disclosure:

$$COMPOSITE = \text{the score of the principal component with the highest eigenvalue} \quad (6)$$

Case examples illustrating the use of individual quality indicators in this study are given in Appendix B.

approach has been applied in the robustness checks section of this study by awarding only sentences which provide sensitivity analyses about the impact of the identified risk on net income.

⁸ For observations with zero sentences, see footnote 6.

⁹ For observations with zero sentences, see footnote 6.

¹⁰ Factor analysis is a generic name given to common factor analysis and principal component analysis. A factor score is a composite measure created for each observation on each factor extracted in the factor analysis. The factor weights are used in conjunction with the original variable values to calculate each observation's score. The factor score can then be used to represent the factor(s) in subsequent analyses (Hair et al., 1995). The analysis method used in this study is principal component analysis and consequently, all prior communality estimates are set to one.

Reliability and validity of the risk disclosure quality indicators

In this study, the reliability of coding is assured by coding a pilot sample in order to create clear decision rules. At this juncture discussions with other scholars help to decide the most effective and reliable rules for risk disclosure coding. The main data set are coded after the coding decisions relating to a pilot sample reach an acceptable level of reliability. Finally, we analyze the inter-rater reliability of coding by dual coding two subsamples, and demonstrate that the reliability of the coding is sufficiently high.¹¹

Independent variables and regression models

The main test variable in the study is an indicator variable for the year 2006 which is an empirical measure for the risk disclosure standard. Moreover, the impact of the relevant reporting incentives (e.g., profitability and risk sensitivity), corporate governance structures (e.g., ownership concentration), and industry are controlled in the regression models. The main tests in the study involve the estimation of the following multivariate regressions for different disclosure quality indicators (in equation 7, β represent the regression parameters to be estimated¹², e represents the regression residual, subscripts i and t refer to the firm and year, respectively):

(7)

$$\begin{aligned} \text{Quality indicator}_{it} = & \beta_0 + \beta_s \text{Risk disclosure standard}_{it} + \sum_r \beta_r \text{Reporting incentives}_{it} \\ & + \sum_g \beta_g \text{Corporate governance structures}_{it} + \sum_c \beta_c \text{Industry controls}_{it} + e_{it} \end{aligned}$$

¹¹ Two measures of inter-coder reliability are calculated: the first is the simple coefficient of agreement, and the second the alpha coefficient of agreement proposed by Krippendorff (1980). Taken together the coding of the subsamples, the simple coefficient of agreement is 0.90, and the alpha coefficient of agreement is 0.87. The extant literature suggests a threshold level of 0.75 for the alpha coefficient of agreement (Milne & Adler, 1999).

¹² P-values of parameter estimates are computed from the heteroscedasticity robust standard errors clustered at the firm level (see Petersen, 2009).

Table 1 presents a more detailed description of the variable definitions.

(table 1 about here)

4. Sample, data, and descriptive statistics

The target population comprises 129 firms listed at the OMX Helsinki during the research period. The firms follow IFRS but are obliged to publish operating and financial review according to the Finnish Accounting Act.¹³ Some firms are excluded from the analysis. First, 13 firms that are part of the financial services industry are excluded from the target population because their accounting practices, financial statements, and related disclosure requirements differ from the rest of the population. Second, ten firms which have been initially listed or restructured between 2005 and 2006 are omitted. Third, three firms are omitted because of their differing fiscal periods. Finally, four firms are discounted due to the lack of data for some variables. After these eliminations, the study sample consists of 99 firms. In the empirical analyses the observations are pooled across 2005 and 2006, thus there are 198 firm-year observations in the final sample. The matched paired sample design (i.e., disclosure of the 99 sample firms before and after the new standard) makes it possible to effectively control that the results are not driven by potentially omitted factors such as the effects of the economic environment that are not attributable to the financial reporting system.¹⁴ The approach is similar to that employed by Barth et al. (2008).

¹³ The Finnish Accounting Act stipulates that all listed firms shall incorporate an operating and financial review section (OFR) into their financial statements. Conceptually, this is similar to the management discussion and analysis section (MD&A) regulated by the SEC in the United States, and the management commentary (MC) section suggested by the IASB. However, the OFR is given by the board of directors whereas the MD&A and MC are given by the management. Both disclosure standards require firms to provide a narrative explanation of company performance, financial condition, and future prospects. The intent is to assist investors to interpret the firm's financial statements (Scott, 2009).

¹⁴ The economic environment includes volatility of economic activity and the information environment.

The risk disclosure data are collated from two sources of 2005 and 2006 annual reports.¹⁵ The first source is the operating and financial review sections of the firms (subscript *ofr* in the tables). The second is the overall risk reviews of the annual reports which are published in separate risk sections, notes to the financial statements, and corporate governance sections (subscript *other* in the tables). Annual report risk disclosure (subscript *tot* in the tables) includes risk disclosures collated from both sources. The values for the accounting variables and stock market data are retrieved from the *Thomson One Banker Financial* database.

Table 2 reports the descriptive statistics of the variables for fiscal years 2005 and 2006. The mean and median statistics of QUANTITY and COVERAGE are fairly close to each other in both years which suggests that these variables are distributed symmetrically. The distributions of DEPTH_QUALITATIVE and DEPTH_QUANTITATIVE are skewed in 2005 which implies that during the pre-standard period some firms have used several sentences to describe the expected economic impact of identified risk on future performance, whereas the median firms have not provided this kind of information at all. The release of the new standard makes DEPTH_QUALITATIVE more normally distributed. DEPTH_QUANTITATIVE remains skewed.

Interestingly, the mean values of QUANTITY_*ofr* (3.130 and 4.945 in 2005 and 2006, respectively) and QUANTITY_*tot* (5.441 and 6.037 in 2005 and 2006, respectively) demonstrate that before the publication of the standard 57.5 per cent of the risk information is provided in the operating and financial reviews of the firms. The new standard increases this ratio to 81.9 per cent.¹⁶

¹⁵ The new disclosure standard was published on September 2006. Consequently, its impact on reporting can be seen first time in 2006 annual reports which were published until May 2007.

¹⁶ Entwistle (1999) uses content analysis to examine the location of the R&D disclosures contained in 113 Toronto Stock Exchange-listed firms' annual reports. He documents that 22.7 per cent of total R&D disclosure is located in the management discussion and analysis section.

Overall, in line with the hypothesis, we demonstrate that there has been a significant improvement in firms' disclosure quality indicators in 2006 compared to 2005.¹⁷ The results consistently show that improvement in the indicators derives from the quality increases in firms' operating and financial reviews. In contrast, quality has remained invariable in the other sections of the annual reports.¹⁸ The values for every indicator of risk disclosure quality in firms' operating and financial reviews are higher after the release of the standard. For example, the mean (median) value of the composite measure of quality of risk disclosure in the operating and financial reviews of the firms has increased from 0.532 (0.417) to 1.059 (1.059) in 2006 (see COMPOSITE_ofr in table 2).¹⁹

For comparison, we also code the illustrative risk disclosure examples which are given in the disclosure standard. The index values for QUANTITY, COVERAGE, DEPTH_QUALITATIVE, DEPTH_QUANTITATIVE, and OUTLOOK_PROFILE are 6.967, 0.676, 2.944, 2.303, and 3.045, respectively. Index values for the best discloser of the sample after the release of the standard are 6.966, 0.929, 2.996, 2.079, and 3.555 respectively. Hence, the risk disclosure example ranks high in the quality comparison against the best risk reports. This finding provides evidence that our indicators of quality capture those issues that are emphasized in the standard.

(table 2 about here)

¹⁷ One should note that while the median values of some variables (e.g., DEPTH_QUANTITATIVE_tot) are zero for both years 2005 and 2006, the Wilcoxon test between the years nevertheless suggests that the pairwise differences are not symmetrically distributed. The reason for these apparently contradictory results is that observations with zero differences between the years are eliminated from the Wilcoxon test.

¹⁸ There are altogether four firms that do not provide any risk information in 2005 annual reports. One of these does not give any risk information in the 2006 annual report either. More interestingly, there are altogether 30 firms that do not provide any risk information in their 2005 operating and financial reviews (OFR) but 26 of them begin to report their risks in OFR after the release of the new rule. The (untabulated) results of the logistic regression analysis (dependent variable: a firm discloses risks in OFR = 1, a firm does not disclose risks in OFR = 0) demonstrate that the most significant driver behind this policy change is STANDARD. P/B, GLOBE, and BETA also increase the probability of risk disclosure in OFR whereas FOROWN decreases it.

¹⁹ The level of the reporting incentives has remained relatively stable during the sample period. However, the results suggest that the sample firms are significantly larger, more highly valued, and more extensively owned by foreign owners in 2006.

5. Empirical results

Correlation analysis

The correlation coefficients between the quality indicators (computed from all risk reviews) and STANDARD are provided in table 3. The results demonstrate that QUANTITY correlates positively and significantly with the other empirical indicators of risk disclosure quality. This finding is consistent with the view that quality of risk disclosure is at least partly a function of risk disclosure quantity. QUANTITY and COVERAGE are highly correlated, which suggests that those firms that provide more risk information also discuss several risk topics. With reference to the semantic properties of risk disclosure, QUANTITY is most strongly correlated with OUTLOOK_PROFILE. This implies that a firm disclosing a high level of risk information releases more information on its actions to reduce the risks than on the economic impact that the identified risk could have on future performance.

COMPOSITE has a high positive correlation with the quality indicators. This is consistent with the results of the factor analysis, which showed that all disclosure quality indicators have relatively high positive factor loadings.²⁰ Hence, it appears evident that if the objective is to analyze quality of risk disclosure comprehensively, all of them should be taken into consideration. STANDARD correlates positively and significantly with most disclosure quality indicators. However, DEPTH_QUALITATIVE and DEPTH_QUANTITATIVE have non-significant positive Pearson correlation coefficients.²¹

²⁰ The factor loadings for Quantity, Coverage, Outlook_profile, Depth_qualitative, and Depth_quantitative are 0.942, 0.932, 0.958, 0.881, and 0.748, respectively. The first factor explains 80.2 per cent of the total variance of the individual disclosure quality indicators.

²¹ The (untabulated) correlation analysis of the independent variables of the regression equations reveals that the highest Pearson correlation coefficient is between EXFIN and LEVERAGE (0.734). Although the corresponding Spearman rank correlation is much lower (0.310), the result suggests a possible multicollinearity problem. Hence, we conduct a multicollinearity analysis and document the highest variance inflation factors (VIF) for LEVERAGE, DEV(CF.), and EXFIN (3.041, 2.925 and 2.801, respectively). Other variables have clearly lower VIF-values. Hence, multicollinearity cannot be expected to be a serious problem in the reported regressions.

(table 3 about here)

Impact of the standard on quality of risk disclosure

Table 4 depicts the regressions results for the determinants of different quality dimensions in the annual reports of the firms. In terms of F-values, the overall findings indicate that all five regressions are statistically highly significant. The adjusted R-squares range from 10.8 per cent to 33.1 per cent.²²

Consistent with the hypothesis, the results demonstrate that the new risk disclosure standard has increased firms' quality of disclosure. STANDARD has a positive and significant regression coefficient in every regression model. However, in the DEPTH_QUANTITATIVE model the coefficient is less significant than in the other models. The results provide evidence that the risk reviews of the firms have been more extensive and also provided more evenly distributed information across risk categories during the post-standard period. Furthermore, firms have disclosed more qualitative and quantitative information on the economic impact of the identified risk on future performance. Firms have also provided more information about actions taken and programs planned to face their risks. The existing literature documents that firms are reluctant to provide monetary assessments of risk information (Beretta & Bozzolan, 2004; Linsley & Shrives, 2006; Dobler et al., 2011). We find that the impact of the standard on firms' disclosure quality is weaker when it comes to the reporting of quantitative information on risks.

(table 4 about here)

²² In Beretta & Bozzolan (2004), the adjusted R-square of the quality model is 14.4 per cent. In Abraham & Cox (2007), the adjusted R-square of the overall risk disclosure model is 42.0 per cent.

Dobler (2008) and Dobler et al. (2011) suggest that disclosure incentives play a significant role even in regulated risk disclosure environments. Table 4 shows several significant reporting incentives for risk disclosure. SIZE is significantly and positively associated with every disclosure quality dimension. This finding provides evidence that larger firms do not only focus on providing a high level of risk information but also consider its substance with regard to investors. The positive association between size and disclosure is consistent with the prior corporate disclosure literature in general (e.g., Cooke, 1989; Lang & Lundholm, 1993; Brammer & Pavelin, 2006), and the risk disclosure literature in particular (Linsley & Shrives, 2006; Dobler et al., 2011).²³ Larger firms are expected to suffer more from political costs (Watts & Zimmerman, 1978), which may increase their responsiveness to new disclosure standards.

Poorly performing firms (ROA) are documented to outperform more profitable firms in risk disclosure. They provide much information on actions taken and programs planned to face their identified risks (OUTLOOK_PROFILE model). In addition, the coverage of information is better and risk reports include more information provided in monetary terms (COVERAGE and DEPTH_QUANTITATIVE models). Previous literature provides contradictory interpretations for the impact of profitability on corporate disclosure (e.g., Leuz, 2000; Prencipe, 2004; Troberg et al., 2010). This study is the first to provide evidence on this relationship in a risk disclosure context.

Firms with high growth prospects (P/B) provide a high level of risk information, and this is also evenly distributed across different risk categories.²⁴ Our conjecture is that

²³ Beretta & Bozzolan (2004) document a non-significant regression coefficient for firm size in their risk-disclosure quality study. One explanation for this result may be that the Italian institutional setting differs from the Finnish one.

²⁴ P/B becomes slightly non-significant in the QUANTITY model after we replace the four negative observations of the variable with 0. In the COVERAGE model the variable remains positive and significant.

investors have high future growth expectations for firms with high price-to-book ratios. This increases pressures to meet these expectations and motivates firms to avoid adverse selection problems through high quality risk reports (cf., Kanto & Schadewitz, 1997).

Interestingly, listing on NYSE (F_LISTING) has a strong positive impact on the firms' descriptions of the economic impact of the identified risks on future performance (DEPTH_QUALITATIVE and DEPTH_QUANTITATIVE). Cooke (1989) has shown that listing status influences corporate disclosure levels. Our findings suggest that firms listed on the NYSE outperform domestically listed firms with regard to the substance of the provided information. This could be explained by higher capital market pressures for high quality disclosures by firms that have been forced to provide disclosures under the reporting requirements of the SEC.

Capital structure (LEVERAGE) relates negatively to risk disclosure quantity. One interpretation for the reluctance of the highly leveraged firms to be risk transparent is that leverage increases risk of bankruptcy. By providing little risk information to investors and lenders, the manager of the highly leveraged firm may well be trying to conceal the vulnerability of the firm to the realization of strategic, operational, financial, or damage risks. Another explanation is that highly leveraged firms do not want to reveal their proprietary information. The negative association between corporate disclosure and financial leverage is in line with the prior literature (e.g., Verrecchia, 1983; Healy & Palepu, 1993; Gary et al., 1995; Eng & Mak, 2003; Troberg et al., 2010; Dobler et al., 2011).

The positive and significant regression coefficient of BETA in three of the five models demonstrates that firms with higher systematic risk provide more risk information. They also transparently disclose the actions taken and programs planned to face their risks and also provide qualitative information on the impact of these risks.²⁵

²⁵Following Linsley & Shrives (2006), the analysis computes beta from the returns of the preceding 12 months before the publication of the risk information. The risk-free return has been subtracted from the share return

Comparison between the standard, managers' reporting incentives, and firms' corporate governance structures as a determinant of risk disclosure quality

In table 5 we reduce our disclosure quality indicators to a composite measure which reflect firms' overall quality of risk disclosure. The adjusted R-square of the model is 27.7 per cent. STANDARD, SIZE, ROA, and F_LISTING are the most significant variables in that model. The standardized regression coefficients for those variables are 0.173, 0.423, -0.135, and 0.332, respectively.²⁶ This finding provides evidence that firm size and listing on NYSE are the most significant determinants of the quality of risk disclosure.²⁷ Interestingly, the results for the (untabulated) yearly samples demonstrate that ROA becomes highly significant in 2006, which suggests that the impact of the new disclosure standard on firms' reporting may be partly determined by firms' profitability.²⁸

and market index return. The risk-free return is the monthly return computed from the three month Euribor rate taking into account the effects of compound interest. The MSCI Europe Index has been used as the market index. Morgan Stanley Capital International Europe Index is a weighted benchmark index made up of equities from 15 European countries. We obtain qualitatively similar results when OMXH Cap is used as the market index. OMXH Cap is a benchmark index made up of equities listed at the OMXH Helsinki in which the highest weight for a share is ten per cent. However, the time series applied in the computation of BETA influences the results. The positive sign of the variable is no longer significant if it is computed starting from the beginning of 2002. The beginning of 2002 has been selected as the starting point because the stock markets were very volatile in 2000-2001 after the crash of the information technology bubble. Consequently, the results provide some evidence that firms react to increases in their short-term systematic risk. If the systematic risk increases, the managers may be motivated to pacify their shareholders by providing additional risk information in the capital markets. The results supplement the findings of Linsley & Shrive (2006) who do not find any relation between market beta and risk disclosure.

²⁶ ForOwn has a relatively high negative standardized regression coefficient which is significant at the ten per cent significance level. This finding may imply that firms with high percentage of foreign owners prefer having mutual meetings with their shareholders to providing risk disclosure in annual reports.

²⁷ The (untabulated) results document that SIZE and F_LISTING are also the most important drivers of the reporting of quantitative risk information as measured by their standardized regression coefficients (see table 4).

²⁸ The F-value of the Chow test is 0.30 (sig. 0.997). Consequently, there is no structural change in the relationship between quality of risk disclosure and reporting incentives between the sample years. In 2005 the unstandardized (standardized) regression coefficient and its significance for ROA are -0.160(-0.053) and 0.514, respectively. In 2006 they are -1.218(-0.315) and 0.002, respectively. The sign and significance of the other variables remains qualitatively similar in both years. SIZE and F_LISTING are the most important drivers of the overall quality of risk disclosure also in the yearly samples. In addition, we augment our pooled regression with a continuous variable for percentage change in profitability (ChROA) between 2005 and 2006, and document that the regression coefficient of the variable is negative and non-significant (coef. -0.017, two-tail sig. 0.199). The main results remain unchanged. The result suggests that the level of profitability (ROA) is a more significant determinant of quality than change in profitability (ChROA).

To obtain further insight on the interaction between the reporting standard, incentives, and corporate governance factors we augment our COMPOSITE model with several interaction variables. The results demonstrate that the regression coefficient of ROA*STANDARD is negative and significant. Other interaction variables are non-significant.

(table 5 about here)

Finally, we conduct a subsample analysis to examine more in detail whether the relation between the quality of risk disclosure and standard varies linearly with profitability. Table 6 shows regression results for two subsamples: firms with high and low profitability.²⁹ The adjusted R-squares of the models are 14.9 per cent and 43.6 per cent, respectively. STANDARD is positive and significant among both subsamples, which is consistent with the view that the regressions results concerning the impact of the standard on quality are robust across firms' profitability. However, the high significance of STANDARD among the less profitable firms suggests that the impact of the standard on quality may be more pronounced among these firms.³⁰ Furthermore, the results suggest that the negative relation between profitability and the quality of risk disclosure may not be linear. This can be inferred from the negative and significant (non-significant) regression coefficient of ROA in the high (low) profitability subsample. Interestingly, the empirical measures of business risk (DEV(CF.) and

²⁹ The subsamples are formed based on firms' profitability at the end of 2005. This makes it possible to use paired data in the pooled regressions and hence, effectively control the impact of potentially omitted variables. High(low) profitability subsample consists of 49(50) firms that have highest(lowest) profitability in 2005. In the high-profitability subsample, the descriptive statistics for ROA are as follows: mean = 0.144, median = 0.125, standard deviation = 0.132, minimum = -0.181, maximum = 1.250. In the low-profitability subsample, the descriptive statistics for ROA are as follows: mean = 0.011, median = 0.048, standard deviation = 0.121, minimum = -0.759, maximum = 0.184.

³⁰ We also run the subsample regressions augmented with a continuous variable for percentage change in profitability (ChROA) between 2005 and 2006. The main results remain unchanged. The unstandardized regression coefficient of ChROA and its p-value for the high profitability subsample in 2005 are -0.105 and 0.225 (two-tail), respectively. In the low profitability subsample the corresponding values are -0.017 and 0.126 (two-tail), respectively. The result is consistent with the view that the level of profitability (ROA) is a more significant determinant of quality than change in profitability (ChROA).

GLOBA) are positively and significantly associated with the quality of risk disclosure only among the less profitable firms. This result suggests that high business risk may increase pressures for high-quality risk reporting, if the profitability of the firm is low (cf., Jorgensen & Kirschenheiter, 2003; Cahan et al., 2005).³¹

(table 6 about here)

Impact of the standard on the location of risk disclosure

To obtain further evidence on the quality impact of the new standard, we compare the determinants of different quality dimensions in the operating and financial reviews (OFR) and other sections (OTHER) of the annual reports. Considering the increase from 57.5 per cent to 81.9 per cent of the risk information provided in OFR after the release of the standard (see table 2), we can conclude that it became the main medium for risk disclosure. The (untabulated) results reinforce that STANDARD is a highly significant determinant of the quality of risk disclosure in every OFR model. On the contrary, the variable is non-significant in all OTHER models. This result suggests that the increase found in firms' quality of risk disclosure is driven by the quality changes in their operating and financial reviews.³²

In particular, the new standard has been effective at increasing smaller firms' risk disclosure in OFR. This can be inferred from the non-significant regression coefficients of SIZE in the OFR models. SIZE is positive and significant in every OTHER model which

³¹ We also conduct a subsample analysis for larger and smaller firms by using median as the cut-off point. The (untabulated) results show that the regression coefficient of SIZE is positive and significant in both models. In addition, STANDARD is positively and very significantly associated with the quality of risk disclosure among both subgroups. These findings are robust to those reported in tables 4 and 5. The positive relation between firm size and the quality of risk disclosure is linear, and the impact of the standard on quality is not dependent on firm size.

³² Interestingly, the adjusted R-square of DEPTH_QUANTITATIVE model is higher for disclosures released in OTHER than in OFR (cf., 14.80 vs. 9.70). This finding coupled with the significant regression coefficients of SIZE and F_LISTING in the OTHER model imply that larger firms and firms reporting under the requirements of the SEC prefer to provide quantitative risk information outside the operating and financial reviews.

suggests that the higher overall quality of risk disclosure of larger firms found in this study derives from the risk information provided outside their operating and financial reviews. In contrast, smaller firms have followed a policy of focusing on disclosing their risks for the large part in their operating and financial reviews.³³

To conclude, the results provide evidence that the new disclosure standard improves the quality of risk disclosure on several dimensions. Previous literature reports that the SEC was able to improve the quality of firms' market risk disclosures through a detailed and extensive disclosure standard FRR No. 48 (Roulstone, 1999). On the contrary, the SEC was not satisfied with firms' willingness to respond to their requirement to give overall risk reviews from 2005 onwards. We demonstrate that the Finnish Accounting Practice Board succeeded in influencing the quality of firms' overall risk reviews by releasing a detailed standard which was supplemented with illustrative disclosure examples. The results contribute the extant accounting literature by providing answers that narrow the research gap documented by Beretta & Bozzolan (2004): what is the impact of risk disclosure regulation on quality?

³³ An interesting case is a Finnish pulp industry company which provides in depth risk information for both years. In 2005 this information is provided in its operating and financial reviews. However, in 2006, after the release of the standard, the company changes the location of the information to the other sections of its annual report. The behavior of the firm is totally contrary what would be expected. The reason for this behavior was sought later from their investor relations manager. She replied that the firm wanted to increase the readability of its operating and financial review by removing a long risk disclosure section from it. Consequently, they provided different operating and financial review for the investors and authorities. The one sent to authorities included risk disclosures as required by the Finnish Accounting Act. However, next year the auditor of the firm required it to discontinue this policy.

6. Robustness checks

After conducting the primary tests reported above, some additional tests are performed. At the end of 2004 the Finnish Accounting Act was amended to include a requirement to give an extensive and balanced description of firms' significant risks in their operating and financial reviews (OFR). The requirement was one sentence in length and hence, did not provide any implementation guidance to firms. The new risk disclosure standard (examined in this paper) gave the needed guidance, and it was published on September 2006. Any further version of the new standard was not released before the actual date and hence, firms were unable to adopt it early. Some chief financial officers and auditors were aware of its preparation but they did not know its content.

The amendment of the Accounting Act probably influences some firms' risk reporting in 2005 OFR. Hence, we compare risk disclosures in 2004 and 2005 and find that in 2004 (2005) three (69) firms provide some risk information in OFR. The (untabulated) results of the logistic regression analysis (dependent variable: a firm discloses risks in OFR = 1, a firm does not disclose risks in OFR = 0) reinforce the finding that firms have significantly increased risk disclosures in 2005 OFR compared to 2004. This finding suggests that many firms react to the new but ambiguous risk disclosure requirement of the Accounting Act at some level. Next, we examine whether the quality of OFR risk disclosure of these 69 firms improves from 2005 to 2006. The (untabulated) results of the regression analysis show that STANDARD is positively and significantly associated with all quality dimensions examined in the main tests. This finding provides evidence that the new risk disclosure requirement of the Accounting Act does not improve the quality of firms' risk reports effectively. On the contrary, the new risk disclosure standard is very effective in increasing reporting quality.

In line with the approach applied by Abraham & Cox (2007), we check that our results are not driven by any sample selectivity biases.³⁴ We compute the Tobit model by using COMPOSITE as the endogenous variable. The lower bound is set at zero because altogether five observations obtain zero disclosure points. The results demonstrate that the positive impact of the standard on risk reporting is significant, as was documented in the main analyses. In addition, the significance of the other explanatory factors is qualitatively similar to the main tests.

In this study detailed analyses (untabulated) are conducted to take into account the impact on the results of possible outlier variables. First, all continuous independent variables are winsorized at the one per cent level at each tail of the distribution. Second, firm-years falling outside three standard deviations from the mean of any variable are eliminated. In both robustness models the economic significance of STANDARD increases from the results reported in table 5. ROA becomes slightly non-significant but ROA*STANDARD is negative and significant in both cases.

In addition, the robustness of the disclosure quality indicators applied is examined (untabulated). First, absolute values of risk disclosure words and sentences are used instead of using the logarithms.³⁵ STANDARD is a positive and significant determinant of risk disclosure in each of the four models. Second, the disclosure scores of the firms are scaled by dividing them with the maximum absolute value of the examined disclosure quality

³⁴ In the majority of corporate disclosure studies the empirical indicator for corporate disclosure is regressed on independent variables by applying ordinary least squares (OLS) estimations (e.g., Cooke, 1989; Botosan, 1997; Prencipe, 2004; Cahan, 2005; Zechman, 2010). The drawback of the approach is that the propensity to disclose is a censored variable in the sense that it cannot take a negative value (see Abraham & Cox, 2007, p. 238). In this situation ordinary least squares (OLS) estimations would introduce sample selectivity biases and therefore the use of a truncated regression technique is necessitated to avoid the biased and inconsistent parameter estimates that can be associated with OLS estimation. A common solution to the problem is to use a Tobit model.

³⁵ This has been done for QUANTITY, DEPTH_QUANTITATIVE, DEPTH_QUALITATIVE, and OUTLOOK_PROFILE (see table 4).

indicator.³⁶ In this case STANDARD is positive and significant in all models except the QUANTITY model.

Third, we examine whether the risk disclosure standard has increased the frequency of sentences which contain sensitivity analysis about the impact of risks on net income.³⁷ In this model STANDARD is positive and weakly significant (coef. 0.023, one-tail sig. 0.072). Consistent with the results reported in table 4 for DEPTH_QUANTITATIVE, firm size and listing on NYSE are the most important determinants of the number of sensitivity analyses. These findings support the interpretation that highly relevant risk information for investors is more likely to be determined by firm size and capital market pressures than the risk disclosure standard. However, the results of this paper suggest that the standard has had some role in improving the extent of quantitative risk information provided to investors.

Finally, risk disclosure quantity on strategic risks is used as an additional empirical indicator of quality of risk disclosure.³⁸ Strategic risks are interesting for investors because strategic issues largely determine the future potential of the firm. In addition, strategic risks differ from financial risks because they cannot be hedged. Table 7 reports regressions results for the determinants of disclosure on strategic risks. The results support the previous findings by showing that the risk disclosure standard has had a positive impact on firms' disclosure behavior. The standard has increased disclosure on strategic risks in firms' operating and financial reviews as can be seen from the significant regression coefficient of STANDARD in the OFR model. It is likely that in addition to the coercive effect of the standard, the detailed descriptions and examples on strategic risk disclosures given in the standard have helped firms to better understand the nature of this important disclosure topic. Moreover,

³⁶ This has been done for all variables reported in table 4.

³⁷ Every sentence and row in a table in which a firm provides some sensitivity analyses about the impact of the identified risk on net income is awarded 1 point. The natural logarithm of the number of disclosure points is used as the dependent variable in the OLS regression tests.

³⁸ Strategic risks are one of the five main risk topics analyzed in this study. Hence, reporting on strategic risks also influences the disclosure indicators examined in the main analyses.

F_LISTING is a significant variable in the regressions, which suggests that the reporting requirements of the SEC (20-F reports) have positive influence on firms' reporting on strategic risks. Other significant variables are SIZE, DEV(CF.), and FOROWN.

(table 7 about here)

Lastly, it is examined whether the quality improvements in risk disclosures around the introduction of the standard are permanent (results untabulated). We analyze risk disclosures in firms' 2007 and 2008 annual reports, and compute two empirical indicators for quality, QUANTITY and COVERAGE. The results of the t-tests for paired samples demonstrate that increases in the quantity of risk disclosure are significant in 2007 and 2008. On the contrary, the coverage of information is not significantly higher in 2007 and 2008 than in 2006.³⁹ We also test whether top ten per cent of firms in disclosure change (separately for both indicators) in 2006 remain the same disclosure level in 2007 and 2008. The results document that these firms continue improvements in QUANTITY but COVERAGE remains at the same level in the subsequent years. The findings reported above suggest that compliance with the new standard is a learning process for the firms. Changes in quality are permanent but in some dimensions quality improvements continue also after the initial introduction of the standard.

³⁹ The standard deviation of firms' yearly disclosures decreases from 2005 onwards but clear saturation point can be observed around 2007 and 2008. Yearly (2005, 2006, 2007, and 2008) values of standard deviation for QUANTITY are 1.526, 1.080, 1.018, and 1.015, respectively. For COVERAGE they are 0.224, 0.183, 0.146, and 0.159, respectively.

7. Summary and conclusions

This study examines whether a detailed national disclosure standard improves the quality of firms' overall risk reviews under IFRS. Quality of risk disclosure is examined along several dimensions by applying the disclosure quality indicators provided in Beattie et al. (2004) and Beretta & Bozzolan (2004). Finland offers a unique institutional setting for the study because in 2006 the Finnish Accounting Practice Board published a new detailed risk disclosure standard which describes how firms should assess their significant risks in their operating and financial reviews.

The empirical results demonstrate that the risk disclosure standard improves Finnish listed firms' quality of risk disclosure across several dimensions. During the post-standard period firms' risk reviews are more extensive and provide more evenly distributed information across risk categories. Firms also give more detailed qualitative descriptions of the economic impact of the identified risk on future performance and provide more information on actions taken and the programs planned to face their risks. Furthermore, the standard also increases firms' willingness to provide quantitative risk information albeit the effect is weaker than in the other quality dimensions.

Moreover, we construct a composite model for the overall quality of risk disclosure and find that the *coercive effect* of the standard drives increases in quality. Other important determinants of quality are firm size, profitability, and listing on NYSE. Interestingly, we find some evidence that the impact of the standard on quality is more pronounced among less profitable firms. It is also found that business risk is a significant determinant of reporting quality among these firms. Finally, it is demonstrated that the risk disclosure standard has a strong impact on the location of the risk information provided. After the release of the standard, 81.9 per cent of risk disclosure is provided in the operating and financial reviews whereas in the previous year the comparable number was 57.5 per cent. Additional findings

are that larger firms and firms reporting under the requirements of the SEC disclose more quantitative risk information, and that the quality improvements are permanent in the subsequent years.

This study contributes to the accounting literature by demonstrating that detailed risk disclosure guidance can be used to improve the quality of firms' overall risk reviews. In addition, we add to prior literature by providing evidence on the importance of several reporting incentives as a determinant of risk disclosure quality. The results have useful practical implications for standard-setters such as the FASB and the IASB, the SEC, and national regulatory bodies. They provide an example how the Finnish regulator has been able to increase the quality of risk reporting within a single country. In particular, the findings suggest that one clause of the law may not be effective enough to ensure transparent disclosure about abstract issues such as risks. Many firms might need detailed descriptions of the required disclosures with illustrative examples. In addition to the coercive effect of detailed risk disclosure standards, they may also have a guidance effect on firms' reporting. Most challenging is to influence firms' willingness to report quantitative risk information although many firms explicitly report that they have internally evaluated the impact of the risks and their probabilities.

The analyses and results reported here are based on observations in Finland which has a rules-based accounting tradition. Consequently, the results should be generalizable to other countries with similar legal roots. However, because existing research reports high compliance and disclosure ratios for Finnish firms, the results may not be generalizable to countries with low compliance and disclosure ratios. One challenge relating to narrative disclosures in annual reports is that it is difficult to document their usefulness to investors. However, future research could try to examine more comprehensively the economic consequences of risk information from equity and debt investors' perspective.

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Table 1
Variable definitions

Quantity	Ln (total number of risk disclosure words)
Coverage	The inverse of the Herfindahl index value divided by the number of main risk topics.
Depth_qualitative	Ln (number of risk information sentences containing qualitative information about the expected economic impact of identified risk on future performance)
Depth_quantitative	Ln (number of risk information sentences containing quantitative information about the expected economic impact of identified risk on future performance)
Outlook_profile	Ln (number of sentences containing information about actions taken or programs planned to face identified risk)
Composite	It is the score of the principal component with the highest eigenvalue computed from Quantity, Coverage, Depth_qualitative, Depth_quantitative, and Outlook profile.
Standard	Indicator variable = 1, if the disclosure index value describes risk disclosure published under the standard (i.e. in 2006 annual reports), otherwise 0.
Size	Is the natural logarithm of the net sales in million euros.
ROA	Is the return on assets ratio.
P/B	Is the ratio of year-end market capitalization to total common equity.
Exfin	Is the net cash flow from financing deflated by net sales.
F_listing	Indicator variable = 1, if the firm is listed on the New York Stock Exchange, otherwise 0.
Leverage	Is the financial leverage of the firm computed as follows: 1-(common equity/total assets).
Dev(Cf.)	Is the standard deviation of operating cash flow to assets ratio computed across five years.
Globa	Is the percentage of foreign sales.
Beta	Is the beta of the firm. It is computed from the share and market index returns of the preceding 12 months before the publication of the risk disclosure. MSCI Europe has been used as the market index.
Clshs	Is the percentage of shares owned by firm insiders.
ForOwn	Is the percentage of foreign owners.

Table 2
Descriptive statistics of the variables (n=99)

	<u>Mean</u>			<u>Median</u>			<u>Std. Deviation</u>		<u>Min</u>		<u>Max</u>	
			<i>t-test</i>			<i>Wilcoxon</i>						
	2005	2006	(sig.)	2005	2006	(sig.)	2005	2006	2005	2006	2005	2006
<i>Disclosure quality indicators:</i>												
Quantity_tot	5.441	6.037	0.000	5.677	6.221	0.000	1.526	1.080	0.000	0.000	7.824	8.137
Quantity_ofr	3.130	4.945	0.000	3.989	5.231	0.000	2.230	1.412	0.000	0.000	7.564	6.966
Quantity_other	4.766	4.787	0.902	5.176	5.088	0.061	2.097	2.143	0.000	0.000	7.703	8.039
Coverage_tot	0.493	0.610	0.000	0.534	0.613	0.000	0.224	0.183	0.000	0.000	0.952	0.976
Coverage_ofr	0.273	0.519	0.000	0.300	0.574	0.000	0.243	0.221	0.000	0.000	0.906	0.929
Coverage_other	0.387	0.375	0.550	0.366	0.331	0.632	0.253	0.248	0.000	0.000	0.906	0.972
Depth_qualitative_tot	0.741	0.995	0.001	0.000	1.099	0.001	0.966	0.984	0.000	0.000	3.367	4.159
Depth_qualitative_ofr	0.218	0.531	0.000	0.000	0.000	0.000	0.517	0.748	0.000	0.000	2.639	2.996
Depth_qualitative_other	0.526	0.482	0.579	0.000	0.000	0.568	0.913	0.895	0.000	0.000	3.258	4.111
Depth_quantitative_tot	0.429	0.547	0.054	0.000	0.000	0.022	0.854	0.924	0.000	0.000	3.738	3.761
Depth_quantitative_ofr	0.106	0.219	0.056	0.000	0.000	0.007	0.467	0.502	0.000	0.000	3.738	2.079
Depth_quantitative_other	0.326	0.362	0.555	0.000	0.000	0.586	0.727	0.827	0.000	0.000	2.996	3.761
Outlook_profile_tot	1.602	2.085	0.000	1.792	2.079	0.000	1.352	1.160	0.000	0.000	4.394	4.543
Outlook_profile_ofr	0.503	1.299	0.000	0.000	1.386	0.000	0.841	0.963	0.000	0.000	3.367	3.555
Outlook_profile_other	1.283	1.199	0.383	1.099	0.000	0.856	1.363	1.401	0.000	0.000	4.304	4.489
Composite_tot	0.785	0.970	0.000	0.654	0.943	0.000	0.501	0.443	0.000	0.000	1.975	2.242
Composite_ofr	0.532	1.059	0.000	0.417	1.059	0.000	0.554	0.543	0.000	0.000	3.325	2.411
Composite_other	0.770	0.753	0.734	0.575	0.495	0.809	0.641	0.662	0.000	0.000	2.421	2.796
<i>Reporting incentives:</i>												
Size	5.481	5.585	0.000	5.278	5.397	0.000	1.955	1.978	0.205	0.112	10.440	10.624
ROA	0.082	0.071	0.426	0.081	0.080	0.914	0.166	0.114	-0.759	-0.387	1.250	0.334
P/B	2.571	2.743	0.235	2.237	2.478	0.008	2.007	2.161	-9.901	-9.686	8.727	7.742
Exfin	0.155	0.003	0.398	-0.023	-0.015	0.194	1.791	0.115	-0.742	-0.351	17.760	0.576
F_listing	0.040	0.040	---	0.000	0.000	---	0.198	0.198	0.000	0.000	1.000	1.000
Leverage	0.554	0.538	0.447	0.549	0.537	0.584	0.314	0.198	0.117	0.147	3.193	1.403
Dev(Cf.)	0.069	0.064	0.183	0.050	0.044	0.286	0.082	0.061	0.009	0.010	0.709	0.454
Globa	0.476	0.491	0.262	0.478	0.486	0.098	0.279	0.283	0.000	0.000	0.991	0.994
Beta	1.089	1.193	0.459	1.063	1.077	0.693	0.839	1.150	-1.140	-1.003	3.736	8.396
Clshs	28.593	28.778	0.836	27.759	26.379	0.005	17.710	18.920	0.024	0.000	71.237	82.237
ForOwn	22.027	23.677	0.009	14.966	15.386	0.002	22.053	23.041	0.026	0.016	90.982	90.785

This table provides the mean, median, standard deviation, and minimum and maximum values of the variables. Moreover, p-values for the t-test and Wilcoxon test for paired samples are reported. Subscript *ofr* refers to risk information provided in the operating and financial review section of the firm. Subscript *other* refers to risk information provided outside the operating and financial review of the firm. Subscript *tot* refers to all overall risk reviews which are provided in the annual report of the firm. For variable definitions, see table 1. Disclosure data is collected from the 2005 and 2006 annual reports of the firms. Other variable values are measured at the end of the fiscal year unless otherwise defined. The number of observations is 99 for both years. P-values significant at five per cent or better (two-tailed test) are shown in **boldface**.

Table 3
Correlation matrix

	1	2	3	4	5	6	7
1. Quantity		0.550*	0.698*	0.548*	0.875*	0.894*	0.219*
2. Coverage	0.637*		0.480*	0.289*	0.594*	0.686*	0.264*
3. Depth_qualitative	0.585*	0.448*		0.496*	0.606*	0.829*	0.148*
4. Depth_quantitative	0.475*	0.254*	0.522*		0.564*	0.705*	0.083
5. Outlook_profile	0.758*	0.609*	0.595*	0.557*		0.891*	0.177*
6. Composite	0.800*	0.658*	0.833*	0.775*	0.868*		0.227*
7. Standard	0.221*	0.276*	0.130	0.067	0.189*	0.194*	

Correlation coefficients between the disclosure quality indicators and Standard (n=198). Quality indicators are computed from all overall risk reviews which are provided in the annual report of the firm. The Pearson correlation estimates are presented below the diagonal and the Spearman rank correlation coefficients found above the diagonal. For variable definitions, see table 1. * denotes correlation coefficients significant at five per cent or better.

Table 4

Regression results for the different quality dimensions of risk disclosure (n=198)

	Predicted	Quantity		Coverage		Depth qualitative		Depth quantitative		Outlook profile	
		Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Intercept	?	4.479	0.000	0.449	0.000	-0.168	0.659	-0.600	0.135	0.270	0.678
<i>Regulation:</i>											
Standard	+	0.518	0.000	0.111	0.000	0.231	0.001	0.095	0.057	0.422	0.000
<i>Reporting incentives:</i>											
Size	+	0.315	0.001	0.019	0.088	0.174	0.001	0.141	0.021	0.267	0.001
ROA	?	-1.397	0.028	-0.160	0.059	-0.267	0.483	-0.792	0.077	-1.371	0.046
P/B	+	0.130	0.040	0.021	0.023	0.031	0.226	0.018	0.334	0.077	0.123
Exfin	+	0.145	0.136	0.003	0.452	0.041	0.243	-0.101	0.113	-0.042	0.659
F_listing	+	0.967	0.041	0.119	0.080	2.178	0.000	1.438	0.023	0.873	0.130
Leverage	-	-1.485	0.022	0.081	0.549	-0.373	0.198	0.285	0.460	-0.025	0.487
Dev(Cf)	+	1.832	0.155	0.019	0.479	0.604	0.324	1.195	0.226	1.725	0.189
Globa	+	0.512	0.119	0.117	0.069	0.009	0.489	0.205	0.228	0.400	0.198
Beta	+	0.247	0.013	0.018	0.187	0.081	0.087	-0.018	0.740	0.164	0.038
Clshs	-	-0.004	0.235	0.000	0.434	0.005	0.246	0.001	0.788	0.005	0.391
ForOwn	?	-0.010	0.321	-0.002	0.150	-0.006	0.179	-0.005	0.225	-0.010	0.118
Industry fixed effects											
Model F-value (prob)		Included		Included		Included		Included		Included	
		6.140 (.000)		2.490 (.002)		7.100 (.000)		3.640 (.000)		3.100 (.000)	
Adj. R-square		0.295		0.108		0.331		0.177		0.146	
No. of obs		198		198		198		198		198	

For variable definitions, see table 1. Quality indicators are computed from all overall risk reviews which are provided in the annual report of the firm. Regression coefficients significant at ten per cent or better are shown in **boldface**. One-tailed test is applied if there is a predicted direction and two-tailed test otherwise. P-values of parameter estimates are computed from the heteroscedasticity robust standard errors clustered at the firm level (see Petersen, 2009).

Table 5
Regression results for the overall quality of risk disclosure (n=198)

Dependent variable = Composite							
	Predicted	Unstand. coeff	Stand. coeff	P-value	Unstand. coeff	Stand. coeff	P-value
Intercept	?	0.245		0.228	0.336		0.115
<i>Regulation:</i>							
Standard	+	0.166	0.173	0.000	0.282	0.294	0.072
<i>Reporting incentives:</i>							
Size	+	0.104	0.423	0.001	0.112	0.457	0.002
ROA	?	-0.455	-0.135	0.014	-0.183	-0.054	0.416
P/B	+	0.030	0.131	0.096	0.034	0.149	0.105
Exfin	+	-0.009	-0.024	0.776	0.032	0.084	0.212
F_listing	+	0.809	0.332	0.001	0.815	0.335	0.003
Leverage	-	-0.040	-0.022	0.431	-0.218	-0.119	0.224
Dev(Cf.)	+	0.586	0.088	0.201	0.683	0.102	0.210
Globa	+	0.148	0.086	0.192	0.157	0.092	0.221
Beta	+	0.045	0.094	0.086	0.061	0.128	0.143
Clshs	-	0.001	0.050	0.494	0.002	0.069	0.432
ForOwn	?	-0.004	-0.198	0.098	-0.005	-0.218	0.124
Size*Standard	?	-----		-----	-0.011	-0.073	0.688
ROA*Standard	?	-----		-----	-0.946	-0.174	0.026
P/B*Standard	?	-----		-----	-0.006	-0.027	0.731
Exfin*Standard	?	-----		-----	-0.308	-0.052	0.282
F_listing*Standard	?	-----		-----	-0.027	-0.008	0.835
Leverage*Standard	?	-----		-----	0.130	0.082	0.605
Dev(Cf.)*Standard	?	-----		-----	-0.476	-0.053	0.592
Globa*Standard	?	-----		-----	0.043	0.028	0.778
Beta*Standard	?	-----		-----	-0.020	-0.042	0.742
Clshs*Standard	?	-----		-----	-0.001	-0.026	0.756
ForOwn*Standard	?	-----		-----	0.001	0.034	0.697
Industry fixed effects		Included			Included		
Model F-value (prob)		5.710 (.000)			3.410 (.000)		
Adj. R-square		0.277			0.248		
No. of obs		198			198		

For variable definitions, see table 1. Composite is computed from all overall risk reviews which are provided in the annual report of the firm. The unstandardized and standardized regression coefficients are reported. Regression coefficients significant at ten per cent or better are shown in **boldface**. One-tailed test is applied if there is a predicted direction and two-tailed test otherwise. P-values of parameter estimates are computed from the heteroscedasticity robust standard errors clustered at the firm level (see Petersen, 2009).

Table 6

Regression results for the firms with high and low profitability (n=98 and 100, respectively)

Dependent variable = Composite		High profitability			Low profitability		
	Predicted	Unstand. coeff	Stand. coeff	P-value	Unstand. coeff	Stand. coeff	P-value
Intercept	?	-0.002		0.993	0.860		0.294
<i>Regulation:</i>							
Standard	+	0.106	0.117	0.023	0.206	0.205	0.000
<i>Reporting incentives:</i>							
Size	+	0.143	0.548	0.002	0.114	0.485	0.002
ROA	?	-0.530	-0.153	0.006	-0.156	-0.037	0.707
P/B	+	0.029	0.100	0.239	0.036	0.148	0.166
Exfin	+	-0.212	-0.049	0.529	-0.002	-0.009	0.956
F_listing	+	-0.134	-0.042	0.633	1.063	0.503	0.000
Leverage	-	0.269	0.084	0.485	-0.269	-0.168	0.159
Dev(Cf.)	+	0.006	0.001	0.498	1.921	0.345	0.015
Globa	+	0.038	0.022	0.436	0.422	0.244	0.042
Beta	+	0.055	0.102	0.168	0.037	0.083	0.175
Clshs	-	0.001	0.034	0.792	0.003	0.104	0.343
ForOwn	?	-0.006	-0.281	0.158	-0.003	-0.156	0.224
Industry fixed effects		Included			Included		
Model F-value (prob)		2.060 (.018)			5.780 (.000)		
Adj.R-square		0.149			0.436		
No. of obs		98			100		

For variable definitions, see table 1. Composite is computed from all overall risk reviews which are provided in the annual report of the firm. The unstandardized and standardized regression coefficients are reported. Regression coefficients significant at ten per cent or better are shown in **boldface**. One-tailed test is applied if there is a predicted direction and two-tailed test otherwise. P-values of parameter estimates are computed from the heteroscedasticity robust standard errors clustered at the firm level (see Petersen, 2009). The subsamples are formed based on firms' profitability at the end of 2005. High(low) profitability subsample consists of 49(50) firms that have highest(lowest) profitability in 2005.

Table 7
Regression results for the determinants of disclosure about strategic risks (n=198)

	Predicted	Strategic ofr		Strategic other		Strategic total	
		Coeff	P-value	Coeff	P-value	Coeff	P-value
Intercept	?	3.568	0.001	-2.369	0.023	1.698	0.131
<i>Regulation:</i>							
	ofr/total: +						
Standard	other: ?	1.506	0.000	0.089	0.674	1.165	0.000
<i>Reporting incentives:</i>							
Size	+	0.009	0.472	0.754	0.000	0.488	0.000
ROA	?	-0.180	0.881	-0.552	0.589	-0.334	0.835
P/B	+	-0.002	0.978	0.067	0.261	0.000	0.999
Exfin	+	-0.015	0.929	-0.203	0.212	-0.160	0.360
F_listing	+	2.366	0.001	1.738	0.076	2.728	0.000
Leverage	-	-0.862	0.205	0.501	0.642	-0.676	0.292
Dev(Cf.)	+	1.463	0.356	5.204	0.077	5.911	0.069
Globa	+	0.500	0.241	0.142	0.430	0.435	0.287
Beta	+	-0.026	0.859	0.113	0.252	0.061	0.338
Clshs	-	-0.009	0.126	0.005	0.617	-0.007	0.193
ForOwn	?	-0.017	0.128	-0.022	0.045	-0.028	0.010
Industry fixed effects		Included		Included		Included	
Model F-value (prob)		3.100 (.000)		3.540 (.000)		4.510 (.000)	
Adj.R-square		0.146		0.171		0.222	
No. of obs		198		198		198	

Strategic_ofr is the natural logarithm of the total number of risk disclosure words about strategic risks in the operating and financial review of the firm. *Strategic_other* is the natural logarithm of the total number of risk disclosure words about strategic risks outside the operating and financial review of the firm. *Strategic_tot* is the natural logarithm of the total number of risk disclosure words about strategic risks in the annual report of the firm. Other variables are defined in table 1. Regression coefficients significant at ten per cent or better are shown in **boldface**. One-tailed test is applied if there is a predicted direction and two-tailed test otherwise. P-values of parameter estimates are computed from the heteroscedasticity robust standard errors clustered at the firm level (see Petersen, 2009).

APPENDIX A

Risk Disclosure Framework

This appendix summarizes the main topics and subtopics examined for risk disclosure. The basis for the classification of every subtopic derives from the Finnish risk disclosure standard. The risk disclosure framework applied has been made more comprehensive by adding a number of risk disclosure subtopics from the risk disclosure framework presented by Linsley & Shrives (2006). Finally, a subsample of annual reports has been pre-tested to uncover any missing subtopics for the examined risk categories.

1. Strategic risks

- a. Market competition
- b. Market areas
- c. Position in the production chain
- d. Dependence on customers
- e. Dependence on suppliers
- f. Changes in customer preferences
- g. Technological development (e.g. threat of competing commodities)
- h. Regulatory changes
- i. Political changes
- j. Economical changes
- k. Mergers and acquisitions
- l. Pricing
- m. Industry specific changes
- n. Launch of new products
- o. Business portfolio
- p. Life cycle (growth and profitability)
- q. Management
- r. Research and development

2. Operational risks

- a. Dependence on the know-how of the personnel
- b. Uncommon business fluctuations in demand
- c. Interruptions in the delivery chain
- d. Price fluctuations of the factors of production (e.g. raw materials)
- e. Patents and other industrial property rights
- f. Customer satisfaction
- g. Information technology risks
- h. Reputation and brand name development
- i. Stock obsolescence and shrinkage
- j. Product and service failure
- k. Environmental
- l. Health and safety
- m. Project deliveries
- n. Quality controls

- 3. Financial risks
 - a. Interest rate
 - b. Exchange rate
 - c. Liquidity
 - d. Credit
 - e. Commodity
- 4. Damage risks
 - a. Insurances
 - b. Significant legal actions
- 5. Risk management
 - a. Risk management policy
 - b. Risk management organization

APPENDIX B

Risk Disclosure Examples

This appendix demonstrates the scoring of the risk disclosure quality indicators. More detailed scoring principles are available from the authors upon request.

1) Quantity = $\ln$ (total number of risk disclosure words)

A firm provides 500 words risk information

$$\rightarrow \text{Disclosure score} = \text{Quantity} = \ln(500) = 6.21$$

2) Coverage = $[(1/H)/\text{the number of main risk topics}]$

The risk information provided by Nokia Corporation in its 2006 operating and financial review can be divided across risk topics as follows:

Strategic risks: 415 words
Operational risks: 398 words
Financial risks: 51 words
Damage risks: 68 words
Risk management: 0 words
(Total 932 words)

$$\rightarrow \text{Herfindahl index} = H = (415/932)^2 + (398/932)^2 + (51/932)^2 + (68/932)^2 + (0/932)^2 = 0.389$$

$$\rightarrow \text{Disclosure score} = \text{Coverage} = (1/0.389)/5 = 0.51$$

3) The semantic properties of risk disclosure

A) Depth_qualitative = $\ln$ (number of risk information sentences containing qualitative information about the expected economic impact of identified risk on future performance)

B) Depth_quantitative = $\ln$ (number of risk information sentences containing quantitative information about the expected economic impact of identified risk on future performance)

C) Outlook_profile = $\ln$ (number of sentences containing information about actions taken or programs planned to face identified risk)

Ponsse Plc provides the following risk information in its 2006 operating and financial review: “Ponsse faces substantial risks relating to raw materials, components, and supplier network. To control these risks, the company has begun in 2005 a supplier network development program.”

The expression “substantial risks” provides qualitative information about the expected economic impact of risks relating to raw material, components, and supplier network on future performance. Consequently, the firm is awarded 1 point in the scoring of Depth_qualitative indicator.

The expression “supplier network development program” provides information about actions taken to face identified risk. Consequently, the firm is awarded 1 point in the scoring of Outlook_profile indicator.

Scanfil Plc discloses the following risk information in its 2006 operating and financial review: “About 80 per cent of the revenues come from the sales to the six biggest customers from which the share of the biggest customer is significant.”

The expressions “80 per cent of the revenues” and “six biggest customers” provide quantitative information about the expected economic impact of the risk (high dependence on customers) on future performance. Consequently, the firm is awarded 1 point in the scoring of Depth_quantitative indicator.

The expression “the share of the biggest customer is significant” gives qualitative information on the expected economic impact of the risk on future performance. Consequently, the firm is awarded 1 point in the scoring of Depth_quantitative indicator.

Stora Enso Corporation is awarded scores based on the quality of its overall risk reviews in 2006, as follows:

Depth_qualitative = 14 sentences $\rightarrow$ Disclosure score = $\ln(14) = 2.64$

Depth_quantitative = 42 sentences $\rightarrow$ Disclosure score = $\ln(42) = 3.74$

Outlook_profile = 29 sentences $\rightarrow$ Disclosure score = $\ln(29) = 3.37$