Master Thesis

Enterprise Risk Management: the effect on internal control quality.

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Track:	Accounting and Control
Date:	18-6-2017

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Abstract

Enterprise risk management (ERM) is a holistic risk management approach. Prior literature has largely focused on the value enhancing effect of ERM (Kraus and Lehner, 2012). In this study I will make an attempt to prove the positive relation between ERM and internal control quality. I use the existence of both a Chief Risk Officer (CRO) and a risk committee as a proxy for ERM. Using a sample of 13,682 firm year observations of firms located in the United States, I observe 511 firms with a hypothesized ERM framework. The majority of the firms with a hypothesized ERM framework operate in the financial services industry. For this reason I perform additional analyses, both on the sample consisting of only financial firms and the sample of only non-financial firms. I investigate the relation of ERM on both the amount of material weaknesses and the amount audit fees by performing an OLS regression. The results of the regression analysis show there is no relation between ERM and material weaknesses. Next, the results of the regression analysis on the relation between ERM and audit fees are inconsistent among the different samples and not robust. For these reasons I conclude there is no relation between ERM and internal control quality.

Acknowledgement

I would like to thank several people for their support and guidance. Without them completing this Master Thesis would not have been possible. A special thanks to my coach Dr. Sander Renes for providing me with professional feedback and guidance in such a timely manner. Also, I would like to thank my family and friends for their help and constant support.

1. Introduction and Contribution

In recent years, Enterprise Risk Management (ERM[1]) has become an increasingly popular issue amongst firms and media outlets; however, limited academic literature currently exists (Liebenberg and Hoyt, 2003; Pagach and War, 2010). In 2004 the Committee of Sponsoring Organizations of the Treadway Commission (COSO), introduced the Enterprise Risk Management-Integrated Framework stating the various implications of ERM for organizations. ERM provides a more integrated approach for risk management where it assesses which risks should be mitigated and which should be accepted according to the firm's risk appetite and strategy. In this paper I will answer the following research question:

Does the existence of an ERM framework improve internal control?

To examine the relation between ERM and internal control quality I am studying cross-sectional differences in the amount of material weaknesses and the amount of audit fees for firms in the United States. Firstly, I hypothesize a positive relation between ERM and internal control quality. Internal control quality is measured by the amount of material weaknesses, hence I expect a negative relation between ERM and the amount of material weaknesses. Secondly, I hypothesize a negative relation between ERM and audit fees. I extract data from the Compustat, Audit Analytics and Capital IQ database to construct the sample I use in this study.

To identify ERM framework I use both the presence of a Chief Risk Officer (CRO) and a risk committee, as a proxy for ERM (e.g. Beasley, Clune and Hermanson, 2005). By means of search strings, I identify hypothesized ERM activity. The final sample comprises of 13,662 firm year observations, of which 510 firm year observations have an identified ERM framework. The observations of firms with an ERM framework are largely clustered in the financial sector and, for this reason, I perform additional separate analyses on the financial and non-financial samples.

First, the results of the OLS regression used to identify the relation between ERM and the amount of reported material weaknesses presents no significant coefficient for the ERM variable. This means for the sample I used there is no significant relation between ERM and the amount of material weaknesses. In the separate analyses where I study a sample of financial firms I again

[1] ERM is an acronym for integrated risk management, holistic risk management, enterprise-wide risk management, and strategic risk management. Throughout this paper I will use ERM for consistency (Hoyt and Liebenberg, 2011).

find no significant coefficient for the ERM variable. For the regression using a sample of non-financial firms I find a significant negative coefficient for the ERM variable, meaning for the sample of non-financial firms there is a significant negative relation. The relation is in accordance to my hypothesis stating that ERM positively affect internal control quality. However, due to the limited number of non-financial firms reporting material weaknesses, this result should be interpreted with caution.

Secondly, I study the relation between ERM and audit fees. I find a negative significant relation between ERM and audit fees. This is in accordance to my second hypothesis, where I state a negative relation between ERM and audit fees. Again, I perform a separate analysis where I study a sample using only financial firms and a separate analysis using a sample of non-financial firms. For the sample of financial firms I find no significant relation between ERM and audit fees. For the sample of non-financial firms I find a weak significant positive relation between ERM and audit fees. This means, for the sample of non-financial firms, ERM is expected to increase the amount of audit fees. This result is against the hypothesized relation where ERM decreases the amount of audit fees. Due to the inconsistency in my results regarding the relation between ERM and audit fees the negative relation between ERM and audit fees has to be interpreted with caution.

Additionally, I perform a series of robustness checks where I determine if my regression results are robust. I, for instance, check if the manipulations I made to the data do not significantly harm the results. The regression results specifying the relation between ERM and internal control quality are robust to changes. The regression results specifying the relation between ERM and audit fees are not robust to changes.

In prior empirical literature various determinants and implications of ERM have been studied and documented. Baxter, Bedard, Hoitash and Yezegel (2013), for instance, find that firms with high-quality ERM programs perform better and have a greater market valuation. However, there is a lack of empirical literature studying the relation between ERM and internal control quality. Since ERM is hypothesized to increase the audit committee's effort in monitoring the internal control I expect a positive relation between ERM and internal control quality (Krishnan, 2005).

This paper contributes to the existing literature by adding more evidence to the study of the implications of ERM. The ERM literature in still in an early stage of development where

additional research in required. Secondly, I study the relation between ERM and internal control quality, an implication of ERM that until now has not been investigated. Thirdly, prior ERM literature has mostly focused on the financial industry, since ERM is more common in this industry; however, I study the effects of ERM on the whole industry including non-financial firms. This is valuable information for studies that investigate loosely the financial industry due to data availability and try to make a general statement about these results.

Although further research is required to make a definite statement about the relation between ERM and internal control quality, this is a first indication that ERM has no potentially beneficial effect on the internal control quality. With the increasing media attention and the amount of firms embracing ERM, empirical results on establishing what the potential benefits are is important. In the next section I will present the prior literature and hypothesis development.

2. Prior literature and hypothesis development

The adoption of Section 404 of the SOX act of 2002 (Sarbanes Oxley Act, 2002), mandated the identification of material weaknesses in financial statements and sparked the interest of firms towards ERM developed (McShane, Nair and Rustambekov, 2011). In 2004, the COSO released the Enterprise Risk Management-Integrated Framework, which elaborates on an ERM approach. COSO (2004, p.12) defines ERM as follows:

> "Enterprise risk management is a process, effected by an entity's board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of the entity objectives."

It further provides a guideline for management when implementing an ERM framework. It guides management to effectively deal with the uncertainties, aids in determining the level of uncertainties a firm faces, recognizes that uncertainty presents both risks and opportunities, and provides guidance in the challenge firms face in determining how much uncertainty they should accept. The main purpose of COSO Enterprise Risk Management-Integrated Framework (2004) is to help management achieve companies' strategic, operational, reporting, and compliance objectives. Although, COSO (2004) does not make ERM mandatory, it did create public pressure for a more systematic risk management system (Liebenberg and Hoyt, 2003).

COSO (2004) further explains that ERM incorporates and deals with enterprise-wide risks by combining both current and aggregated information from internal and external sources of risk. This information is then included in a risk portfolio containing risks across all departments that is used for the recognition of interrelated impacts of risks, which facilitates a more effective response to risks. Aside from this, ERM is involved in the alignment of a firm's risk appetite in the context of its business strategy (COSO, 2004). For example, if a car manufacturer's strategy involves supplying the market with high-end quality cars, then the risk a firm faces regarding its labor recruitment of mechanics should be aligned with the appropriate quality of mechanics.

2.1 Literature on determinants of ERM adoption

The empirical literature on ERM is two-fold with one field of research reflecting the factors associated with ERM adoption and the other focusing on the implications of ERM adoption (Baxter et al., 2013).

Liebenberg and Hoyt (2003) are among the first academics to investigate the different determinants of ERM using the appointment of a CRO as a proxy for ERM. They state the main responsibility of a CRO is the implementation and coordination of ERM, although an additional important task involves the communication of risk management objectives and strategy to outside stakeholders. In their study, Liebenberg and Hoyt (2003) test if different firm characteristics have a relation to ERM adoption, including earning volatility, stock price volatility, leverage and market-to-book ratio. The only significant relation of those variables to ERM adoption is the positive relation between leverage and ERM, meaning more leveraged firms, ceteris paribus, are more likely to adopt an ERM framework.

Beasley et al. (2005) also investigate the implementation of ERM by analyzing survey data from a group of 123 firms. By surveying chief audit executives, they constructed a five-point scale of ERM implementation, ranging from 1 if no ERM plans exist for implementation to 5 if an ERM implementation was complete. Beasley et al. (2005), test the effect of different corporate governance and other firm characteristics on ERM implementation. They conclude that having a Big Four auditor firm, more independent board members and an appointed CRO has a positive influence on the implementation stage of ERM. The positive significant effect of an appointed CRO on the stage of ERM implementation is especially valuable evidence to justify using the presence of a CRO as a proxy for ERM.

2.2 Literature on implications of ERM

Besides the determinant of ERM adoption, the majority and more recent empirical literature focuses on the implications of ERM, and especially the effects on shareholder value. Kraus and Lehner's (2012) literature review of 25 articles compares the results of different studies on the relation of ERM on shareholder value, showing that this relation differs greatly between articles. Kraus and Lehner (2012) conclude that there is a lack of knowledge regarding

the value enhancing effect of ERM on making a possible general statement. They additionally state that ERM literature regarding value creation is in a pre-paradigm state[2] (Kuhn, 1963).

Pagach and War (2010), studied the effect of ERM on firm performance, by performing a time series analysis. They note that the benefits of ERM are dependent on a firm's exposure to lower tail risks. Pagach and War (2010) compare firms before and after the appointment of a CRO regarding various key firm variables such as leverage, size, research & development (R&D) expenditure, market-to-book ratio, ROE, and others. Surprisingly, when comparing the averages over two years prior and two years after CRO appointment, Pagach and War (2010) find a small and significant increase in leverage to be the only significant result. Stulz (1996, 2003) hypothesizes that ERM is only beneficial for firms that face lower tail risk; therefore, Pagach and War (2010) reduce the sample to firms who are hypothesized to benefit from ERM adoption, measured by a positive cumulative abnormal returns around the announcement of the CRO appointment. Using this sample, Pagach and War (2010) find a significant reduction in earnings volatility as being the only beneficial change for firms when compared pre- and post-CRO appointment data. They considered that the result could be explained by the fact that ERM takes an extended period of time before its benefits are observable or too much noise exists in the data. Additionally, Pagach and War's (2010) hypothesis that the limited evidence found regarding increased firm performance could be explained by the fact that ERM has no significant effect on firm performance, at least as measures by financial statement items. They therefore stress the importance of not only providing guidance for ERM implementation, but also examining proper metrics to test the benefits of ERM adoption and especially the effect of ERM adoption in the longer term (Pagach and War, 2010).

Since 2007, Standard & Poor's (S&P) included an ERM rating as a component of its risk management rating of insurance companies by assessing the risk management culture, systems, processes, and practice. This rating has become another common measure of ERM (e.g. McShane et al., 2011; Seik, Yu and Li, 2011; Baxter et al., 2013). The S&P ERM rating

[2] The pre-paradigm state, as explained by Kuhn (1963) entails a state with lack on census, as he refers to it as an 'immature science'. For the ERM literature, to Kraus and Lehner (2012, p.2), this entails "the mentioned quantitative approaches are too early and may miss some important mediator and moderator variables (Edmondson and Mcmanus, 2007)".

distinguishes between different qualities of ERM, which makes it possible to study the effects of an increase in ERM quality, rather than comparing firm's implementation, or lack of, ERM.[3]

Baxter et al. (2013) investigate both the determinants as the implications of ERM quality by using this S&P ERM rating. First, they test if different company characteristics are associated with variations in ERM quality. The researchers concluded that size and complexity are positive determinants of ERM quality. Moreover, they found that leverage is negatively related to ERM, providing evidence supporting the argument that less distressed firms have more available resources to invest in high-quality ERM. This stands in contrast to the theory that argues firms with more financial distress are in demand of a higher ERM quality in order to decrease the risk associated with this distress (e.g. Liebenberg and Hoyt, 2003). Secondly, Baxter et al. (2013), test different implications associated with ERM quality, including firm value and performance. Here, they find a positive significant result for both firm value and performance, and they test if a higher ERM quality results in a greater market reaction to earnings surprises. Measured by the earnings response coefficient, they argue that firms with a high-quality ERM framework should have more persistent earnings, and thus greater earnings credibility (Baxter et al., 2013). They find a positive significant relation, concluding that investors perceive earnings to be more credible for firms with a higher ERM quality.

McShane et al. (2011), studied the relation of ERM on firm value using a sample of firms with an identified S&P ERM rating. They found that an increase in the ERM quality is expected to be associated with a positive significant increase in firm value. However, McShane et al. (2011) hypothesize the first three of five S&P rating categories of ERM to measure Traditional Risk Management (TRM)[4] and the top two S&P rating categories of ERM to measure ERM. They separates the S&P ERM ratings in TRM and ERM and study the effect on firm value, finding no significant relation for the top two ratings measuring ERM quality, concluding the significant increase in firm value initially found is expected to be the result of an increase in TRM.

[3] Although it would be interesting to study ERM using the S&P ERM rating, this data is currently unavailable to students of the Erasmus School of Economics.

[4] TRM's view on risk management largely entails minimizing risk exposure by means of hedging and decreasing the expected costs related to tax payments, financial distress, underinvestment, asymmetric information, and undiversifiable stakeholders (McShane et al., 2011).

Additionally, Ellul and Yerramilli (2013) studied the implications of ERM adoption by performing a cross-sectional analysis exploring what contributed to the large cross-sectional differences in the risk-taking behavior among banks during the Financial Crisis. Ellul and Yerramilli (2013) hypothesize that these differences are due to the specific characteristics of risk management. By constructing their own risk management index, they study the effects of risk management in the year prior to the crisis, 2006, on the risk exposure during the crisis, 2007 and 2008. Their risk management index is composed of three indicator variables to measure the importance of a CRO within a firm and two indicator variables measuring the quality of risk oversight of the risk committees. For example, they use variable CRO-Top5, indicating if the CRO is amongst the top five highest paid executives. Using this risk management index, Ellul and Yerramilli (2013) identify the effects of risk management on different risk measures, concluding that firms with stronger risk management in the prior crisis years had a lower level of risk exposure during crisis years.

There are multiple empirical studies investigating the effects of ERM on value creation, albeit with mixed results (Pagach and War, 2010; Hoyt and Liebenberg, 2011; McShane et al., 2011; Baxter et al., 2013). Few empirical studies focus on internal control. In this study, I will investigate the effect of ERM on internal control and audit fees. In the next section, I will explain the theory behind the relation of ERM to internal control and audit fees.

2.3 Hypothesis development

In previous ERM literature, little attention has been devoted to the effects of ERM on internal control quality. ERM and internal control are inherently connected, as ERM is commonly built upon and strengthens the internal control framework (COSO, 1992, 2004). Risk management, in general, involves identifying a firm's threats and opportunities and internal control help in countering these threats and seizing these opportunities.

In this regard, a common approach to ERM is to create a risk committee. This stand-alone committee is fully in charge of risk oversight and the communication of risk appetite to stakeholders. A risk committee differs from an audit committee whose responsibility regarding risk management mainly involves compliance with law and regulation and informal strategic decision making (McKinsey & Company, 2012). As a firm's risk management evolves to an

ERM approach where risk aggregation[5] becomes part of risk management, firms upgrade the mindset and capabilities of the audit committee by growing its mandate to a full-risk committee or establishing a separate risk committee. The internal control quality benefits from ERM, because a risk committee takes over the responsibility of risk management. By relieving the audit committee from the responsibility of risk management the effectiveness of the audit committee in monitoring the internal control quality of a company increases. Krishnan (2005) studied the relation between audit committee quality and internal control quality and concluded that audit committee quality significantly benefits internal control quality.

Additionally, McShane et al. (2011) indicate the differences between ERM and TRM[6] by stating that the fundamental concept of ERM is the aggregation of risks into a risk portfolio. The approach used by TRM where each risk is individually hedged is commonly referred to as a silo-based approach to risk management, whereas the approach used by ERM is referred to as a holistic approach. The holistic approach of ERM is described in COSO (2004) as follows: First the different risks each different business unit or department faces are considered by their respective manager. These different risks are put together in a risk portfolio which gives an overview of all the different risks a firm faces. With the risk portfolio of all the risks for each business unit, senior management then determines the firm's risk residual[7]. The risk residual of the risk portfolio is then hedged, according to the firm's risk appetite, instead of hedging every individual risk at its own. I argue that ERM deals more effectively with controlling risks, since the risk portfolio will simplify the process of monitoring internal control risks. I therefore hypothesize that firms which implemented an ERM framework have a higher internal control quality, hence hypothesis 1:

H1: ERM is positively related to the quality of internal control.

[5] Risk aggregation or risk data aggregation means gathering and processing risk data. This data is then used to accurately measure a firm's performance against its risk appetite (Bank for International Settlements, 2013). Aggregating data on risk and defining a firm's risk appetite are common practices in ERM.

[6] For further explanation on TRM, I refer to Footnote 2.

[7] The risk residual is defined as the risk remaining after internal controls have been implemented and the management's responses have been developed (COSO, 2004).

Besides the relation between ERM and internal control quality, audit fees and internal control quality are naturally linked and empirical studies have proven that an increase in the quality of internal control is expected to decrease audit fees (Hoitash, Hoitash and Bedard, 2008). Audit fees are defined as the fees a firm pays to its external auditor for performing an audit service. Hay, Knechel and Wong (2006) stress the importance of the demand effect of audit fees, which states independent directors demand more extensive auditing to protect their reputation and have less responsibility in the case of due diligence. More specifically, Hay et al. (2006) state that the amount of audit fees is increasing in accordance to the set of risks faced and decreasing for the set of control mechanisms available for mitigating those risks. Since ERM is hypothesized to decrease internal control risk, I expect ERM to decrease the amount of audit fees. Additionally, ERM implementation is costly, although a decrease in audit fees could be a direct benefit resulting from ERM implementation. I am interested in the relation between ERM and audit fees. I hypothesize that the existence of ERM decreases the amount of audit fees, hence hypothesis 2:

H2: ERM is negatively related to the amount of audit fees.

To provide more clarity surrounding my hypothesis development and research design I have included Figure A in Appendix A depicting a Libby Box, which illustrates the relation between independent and dependent variables as well as that between the different constructs and proxies used in this thesis. In the next section, I will elaborate on the motivation behind the variables used in this study and the different models used to test the two hypotheses.

3. Methodology

The primary objective of this study is to determine the relation between ERM and internal control, along with the relation between ERM and the amount of audit fees. Below, I will explain the motivation behind the measures for ERM and my dependent variables. Additionally, I will present the model I will use to test my hypotheses. Finally, I will discuss the steps I have taken in my sample selection.

3.1 Variable motivation and research design

ERM

A CRO is a managerial position whose main responsibility is the implementation and coordination of ERM. A well-developed ERM framework, according to Beasley et al. (2005), is argued to be accompanied by the presence of a CRO. Although an ERM framework might be put in place together in the absence of an appointed CRO, one cannot directly observe the existence of an ERM framework since it is not mandatory for firms to state the use of ERM (Liebenberg and Hoyt, 2003). Several other papers also used the appointment of a CRO as a proxy for ERM (e.g.; Liebenberg and Hoyt, 2003; Beasley, Pagach and Warr, 2007; Gordon, Loeb and Tseng, 2009; Grace, Leverty, Phillips and Shimpi, 2015).

Although the relation between the appointment of a CRO and implementation of ERM has been documented, using CRO as proxy for the implementation of ERM can be problematic. Firstly, type I and type II errors could occur where a type I error exists when an ERM framework is implemented in a company where a CRO is absent, for instance when an ERM framework is implemented before the assignment of a CRO. Additionally, a type II error might exist when a CRO is present, but an ERM framework is absent. This might occur when an ERM framework is still in the process of being implemented and a CRO is appointed to supervise this implementation. For the type I error, the effect of an appointed CRO has little effect on the benefits received from ERM. For the type II error, the benefits received from ERM are only observed in the time after the first year of appointing the CRO.

Besides the appointment of a CRO, the presence of a risk committee is also believed to be a valid indicator for ERM. This standalone risk committee is fully in charge of risk oversight. Since the presence of a risk committee means the risk oversight is assigned to one committee, and therefore indicates a holistic approach to risk management, this can be seen as a valid indicator of ERM. In a survey conducted by Kleffner, Lee and McGannon (2003) amongst

Canadian firms, the respondents agreed that ERM should be overseen by a risk committee. Similarly, Hoyt and Liebenberg (2011) used the term Risk Committee, together with Chief Risk Officer, in a detailed search of financial reports and other media services in their attempt to identify ERM. Similar to using CRO as a measure of ERM, the identification of a risk committee is vulnerable to type I and type II errors.

Lastly, since 2007 S&P has provided an ERM rating for the insurance industry ranking insurance companies in one of five quality measures.[8] This measure allows for the distinction between different qualities of ERM and has been used to study the effects of higher ERM quality on shareholder value (McShane et al., 2011; Lin, Wen and Yu, 2012; Baxter et al., 2013). This measure has, however, obvious limitations, since only the insurance industry is observed. Moreover, an ERM quality index in likely to include some measure of internal control. Also, as mentioned in the prior literature section, McShane et al. (2011) note that only the top two ERM measures accounts for an increase in ERM quality and the remaining three measures account for an increase in Traditional Risk Management (TRM).

In this study I will use the presence of a CRO and risk committee as a proxy for ERM. By performing different search strings on a list of the executive's function titles for each firm, I identify if a firm has a hypothesized ERM framework. Examples of such search strings, following Hoyt and Liebenberg (2011), include "Enterprise Risk Management", "Chief Risk Officer", "Risk Committee" and "Strategic Risk Management". The dummy variable ERM equals one for firms who have an executive where the function title matches a search string or parts of it, and zero otherwise. Table B of Appendix B presents an overview of all the different search strings used with the respective amount of matched executives in panel A. Some firm year observations have more than one identified executive matched with the search string, with a maximum of three. I included an overview of how many firms have one, two or three identified executives matched with the search string in panel B of Table B.

Throughout the text, I will refer to firms for which dummy variable ERM equals one as ERM firms, and those firms for which dummy variable ERM equals zero as non-ERM firms. Consequently, I refer to ERM observation as those observations where dummy variable ERM equals one and non-ERM observations as those observations where dummy variable ERM equals zero.

[8] S&P recently changed their scale to six point scale, although for older samples a five point scale was used.

Internal Control Quality

Hypothesis 1 predicts a positive relation between ERM and internal control quality. The quality of internal control can be explained by the efficiency of internal controls. Material weaknesses in internal controls are a common measure for internal control quality (Doyle, Ge and McVay, 2007). Material weaknesses in internal control are defined as "a significant deficiency, or combination of significant deficiencies, that results in more than a remote likelihood that a material misstatement of the annual or interim financial statements will not be prevented or detected'' (PCAOB, 2004 p.10). Since the SOX act in 2002, firms are required to publicly disclose any material weaknesses of internal control in their annual report, which has sparked an interest among researchers in studying the relation between material weaknesses and internal control quality (e.g. Bedard, 2006; Doyle et al., 2007). In conjunction with Doyle et al. (2007), I will use the variable MAT WEAK, equal to the amount of material weaknesses, as a proxy for internal control quality. In the attempts to justify hypothesis 1, I will test against null hypothesis $H1_0$:

$H1_0$: ERM and the amount of material weaknesses have no relation

Model 1 was used to test $H1_0$ and controls for variables found to explain differences in internal control quality. Following Doyle et al. (2007), I control for a number of firm characteristics. First, I control for firm SIZE measured by the firm's total assets. Large firms tend to have relatively less internal control weaknesses, because they enjoy economies of scale and have greater resources to spend on internal audit and consultancy fees. However, empirical evidence is mixed, as opponents claim larger firms intuitively have more financial reporting processes. Since I will not control for firm complexity, as explained later in this section, I expect a positive relation between SIZE and MAT WEAK. In the regression model, presented in section 4, I will use the natural logarithm of SIZE following prior literature (Gordon et al., 2009; McShane et al., 2011). Doyle et al. (2007) also argue that AGE is negatively related to internal control, because over time, firms have 'ironed out the kinks'. I also control for firm LEVERAGE, measured by the leverage ratio, equal to the total liabilities divided by total assets. I do not follow Doyle et al. (2007), in this approach as they use debt-to-equity ratio; however, a considerable portion of firms report an extremely low level of shareholder equity. This resulted

in high leverage ratios, which could potentially harm the regression results. More leverage implies a firm is exposed to more risk and has a higher demand for internal control, hence I expect a positive relation between leverage and internal controls. Furthermore, I control for auditor type using dummy variable BIG 4 equal to one if the auditor of the current fiscal year is a Big Four auditor and zero otherwise. Firms audited by a Big Four audit firm generally have a higher internal control quality and therefore I expect a negative relation between BIG 4 and the amount of material weaknesses. I also control for corporate governance measured by integer variable GOVERNANCE equal to the amount of independent board members. Increased corporate governance effectiveness results in more effective monitoring of internal control quality. Krinsnan (2005) found a negative relation between the effectiveness of the audit committee and material weaknesses. I argue the amount of independent board members positively relates to the objectivity of the audit committee, controlling for industry effects. Additionally, Bates and Leclerc (2009) stress the involvement of the board of executives in the audit and risk committee. Next, I control for growth by constructing indicator variable GROWTH equal to one if the sales growth over the past two years is in the highest quintile of sales growth for their industry (Doyle et al, 2007). I expect rapid sales growth to have a negative impact on internal control quality, since the internal controls growth might not cope with the rapid sales growth. Finally, I control for the firm's financial health by constructing dummy variable LOSS equal to one if the firm's sum of income before extraordinary items in year *t* and *t-1* is negative. Firms with good internal controls require adequate financial resources and time management, which might be lacking in loss-making firms. Moreover, Krishnan (2005) found that firms who reported losses are positively associated with internal control problems and a change of audit firm.

Additionally, fixed effects for industry and fiscal years are included. I omit restructuring charges and complexity, measured by the number of reported business segments, because the inclusion of these control variables would significantly reduce the sample size. Table 1 presents a list of all variable used in models 1 and 2.

Table 1
Variable definition

Variable	Predicted effect on dependent variables	Description (Source)
MAT WEAK (1)	NA	**Definition:** The number of reported material weaknesses **Source:** Audit Analytics
AUDIT FEE (2)	NA	**Definition:** The total amount of reported audit fees **Source:** Audit Analytics
ERM	(1) - (2) +	**Definition:** Dummy variable equal to one for firm year observations who have an identified ERM framework **Source**: Capital IQ
BIG 4	(1) - (2) +	**Definition:** Dummy variable equal to one if the auditor of the current fiscal year is a Big Four auditor and zero otherwise **Source:** Audit Analytics
LEVERAGE	(1) + (2) +	**Definition:** Leverage ratio calculated by dividing total liabilities by total liabilities **Source:** Compustat
AGE	(1) - (2) -	**Definition:** The difference between the current fiscal year and the year founded **Source:** Capital IQ
SIZE	(1) + (2) +	**Definition:** The amount of reported total assets in thousands **Source:** Compustat
LOSS	(1) + (2) +	**Definition:** Dummy variable equal to one for firm year observations for which the sum of income before extraordinary items in year *t* and *t-1* is negative and zero otherwise **Source:** Compustat
GROWTH	(1) + (2) +	**Definition:** Dummy variable equal to one for firm year observations which current sales divided by last year's sales is in the higher quintile of that industry **Source:** Compustat
GOVERNANCE	(1) - (2) -	**Definition:** The amount of independent board members **Source:** Capital IQ

Note: the table depicts the different variables used in this research in the first column, the predicted effect of the variable in the first column on MAT WEAK is indicated by (1) in the second column and the predicted effect of the variable in the first column on AUDIT FEE is indicated by (2) in the second column. The third column presents the variable definition and the source of the data for the variable.

The regression specification is presented in model 1:

$$MAT\ WEAK_{i,t} = \alpha + \beta_1 * ERM_{i,t} + \beta_2 * \log(SIZE)_{i,t} + \beta_3 * BIG\ 4_{i,t} + \beta_4 * AGE_{i,t} + \beta_5 * LEVERAGE_{i,t} + \beta_6 * LOSS_{i,t} + \beta_7 * GROWTH_{i,t} + \beta_8 * GOVERNANCE_{i,t} + \beta_9 * YEAR\ FE_{i,t} + \beta_{10} * INDUSTRY\ FE_{i,t} + \varepsilon_{MAT\ WEAK} \quad (1)$$

where,

i : indicates the firm i;

t : indicates year t;

α : equals the constant term;

$\varepsilon_{MAT\ WEAK}$: equals the error term.

The variable of interest is beta coefficient β_1 which measures the relation between ERM and MAT WEAK.

This model is subject to possible endogeneity concern, since the selection for the sample of firms who implemented ERM is unlikely to be random. To illustrate, firms do not randomly choose to implement ERM, as has been proven in previous empirical literature (e.g. Liebenberg and Hoyt, 2003). Firms have a, possibly unobservable, motivation to implement ERM, which might also have an effect on the internal control quality. This possible endogeneity concern is referred to as endogeneity, where an unobservable variable is related to both the ERM variable and internal control quality. This unobservable variable is partly responsible for the relation measured by the ERM coefficient; hence the ERM coefficient is biased. ERM and the amount of reported material weaknesses have a negative hypothesized relation, therefore, the omitted variable bias in likely to negatively bias the ERM coefficient. The result of the omitted variable bias is that I cannot conclude the changes in internal control quality measure by the ERM coefficient of the OLS regression is the result of the implementation of an ERM framework

Furthermore, a firm's internal control quality could be the reason for firms to implement ERM. In this case the hypothesized relation between ERM and internal control quality holds both ways. This is referred to as a simultaneity bias, where the independent variable causes the dependent variable, but simultaneously the dependent variable also causes the independent variable. This is not to be mistaken with reverse causality, where the dependent variable causes the independent variable, but there is no causal relation in the opposite direction. Since ERM is hypothesized to increase internal control quality, it is most likely that also the relation partially holds the other way around. Internal control quality has not been documented as a determinant of ERM in prior empirical literature, although one could easily argue that firms with weak internal controls might be more inclined to implement ERM to improve their internal control quality. The result of a possible simultaneity bias is that I cannot conclude on the direction of the relation.

The simultaneity bias results in a biased ERM coefficient; since part of the relation explained by the ERM coefficient is the results of the hypothesized effect internal control quality has on ERM implementation.

Audit fees

Hypothesis 2 predicts a negative relation between ERM and audit fees. I construct the variable AUDIT FEE equal to the amount of audit fees as reported by Compustat in fiscal year *t*. In the effort to justify hypothesis 2 I will use model 2, as presented below:

$$\begin{aligned}\log(AUDIT\ FEE)_{i,t} = {} & \alpha + \beta_1 * ERM_{i,t} + \beta_2 * \log(SIZE)_{i,t} + \beta_3 * BIG\ 4_{i,t} + \beta_4 * AGE_{i,t} \\ & + \beta_5 * LEVERAGE_{i,t} + \beta_6 * LOSS_{i,t} + \beta_7 * GROWTH_{i,t} \\ & + \beta_8 * GOVERNANCE_{i,t} + \beta_9 * YEAR\ FE_{i,t} \\ & + \beta_{10} * INDUSTRY\ FE_{i,t} + \varepsilon_{AUDIT\ FEE} \end{aligned} \quad (2)$$

To test to reject null hypothesis $H2_0$:

$H2_0$: ERM and the amount of audit fees are not related.

Where, all subscripts are specified as in model 1.

Hay et al. (2006) summarized a large body of empirical literature on audit fees and evaluated different independent variables used as determinants of audit fees. Model 2, as presented above, controls for variables as concluded, following the literature review by Hay et al. (2006), to be most likely the main explanatory variables for the variation in a firm's amount of audit fees.[9] The majority of the arguments for using control variables are based on the positive relation to audit risk. Since people are generally risk averse, audit firms want to be compensated for the risk to which they are exposed and therefore the amount of audit fees is positively related to audit risk.

[9] Hay et al. (2006) additionally provide auditor and engagement variables influencing audit fees. I will not use the methodology provide on these two types of variables, since they are too specified and therefore out of the scope for this research. Examples of these variables are; auditor locations and a dummy measure controlling for the 'busy season' in which time the majority of companies have their fiscal year-end.

First, I control for SIZE, measured by total assets, as this is the most common determinant of external audit fees (Hay et al., 2006). One can easily argue that larger firms are more time consuming for an audit firm to audit. Secondly, I control for a firm's financial health by including an LOSS dummy variable equal to one if a firm's sum of income before extraordinary items for years *t* and *t-1* is negative. Reporting losses increases the risk the auditor faces, since loss-making firms are more likely to have internal control problems that an auditor needs to identify. The higher the risk the auditor faces, the higher the amount of audit fees, hence a negative relation between financial health and audit fees. In addition, I control for LEVERAGE measured by dividing total debt by total assets. More levered firms are more likely to fail and therefore not able to pay the outstanding amount of audit fee. For this reason, LEVERAGE is positively related to audit risk, hence the amount of audit fees. The quality of the auditor is naturally linked to the amount of audit fees. Big Four audit firms are generally classified as high-quality audit firms; therefore, I control for audit quality by including a BIG 4 dummy variable equal to one if the firm is audited by a Big Four audit firm and zero otherwise. Moreover, corporate governance is likely to affect audit fees, since improved corporate governance implies more effective internal control monitoring reducing internal control risk or audit risk (Hay et al., 2006). However, empirical evidence is mixed. In his review of empirical literature on audit fees, Hay et al. (2006) found only one variable with sufficient studies that used them, namely the amount of independent directors. For this reason I expect a negative relation between GOVERNANCE, measuring the number of independent board members, and audit fees.

I additionally add industry and year fixed effects similar to model 1 to control for differences in results caused by the variable's behavior over different industries and years. Similar to model 1 this model is likely to be subject to an omitted variable bias, where the omitted variable has a hypothesized effect on both the ERM implementation and the amount of audit fees. Furthermore, model 2 is subject to a possible simultaneity bias where the hypothesized relation between ERM and internal control quality goes both ways, as explain previously in this section.

3.2 Sample selection

The sample consists of firms located in the United States with observations for the years 2010 to 2014. The beginning of the time frame was deliberately chosen after the Financial Crisis of 2007 and 2008 to avoid biased results caused by the Financial Crisis. Although the effects of

the crisis continued beyond 2008 I initially included 2009 to 2016 in my sample selection. Ultimately, the final time period of 2010 to 2014 resulted naturally through data availability.[10] For the entire sample selection I use databases available through Wharton Research Data Service (WRDS).

From Audit Analytics I obtained data on AUDIT FEE, MAT WEAK and BIG 4. By performing a search for the names of all Big Four audit firms in the variable current auditor name I generated dummy variable BIG 4. The initial sample extracted from Audit Analytics contained 62,629 firm year observations. A total amount of 21,102 duplicate observations were deleted. I also deleted an additional 22,011 observations because of missing or zero data on the AUDIT FEE variable. From the Fundamental Annual section of the Compustat database I extracted data on SIZE, LOSS, GROWTH and LEVERAGE for the North America region. I winsorized GROWTH at the bottom and top 1% level to deal with extreme outliers. LEVERAGE is measured by the leverage ratio, hence total liabilities are divided by total assets. 688 observations were deleted because of unmatched data and an additional 511 observations were deleted because of missing or negative balance sheet items. From the People Intelligence section of the Capital IQ database I obtained data on executives' function name and the number of independent directors. I used the data on executive's function name to identify ERM activity. GOVERNANCE is measured by the sum of independent board members. Additionally, the People Intelligence section of the Capital IQ database provided data on the year the company was founded. By subtracting this year from the current fiscal year I obtained the value for the firm's AGE variable. I winsorized AGE at the top 1% level to deal with extreme outliers. Table 2 depicts the sample selection, including the amount of firm year observations for each procedure. The amount of firm year observation of the final sample equals 13,682. The sample has 3,352 unique firms and the amount of ERM observations is equal to 511 which accounts for 3.7% of the total amount of firm year observations.

In the next section I will present the results, including the descriptive statistics of the variables of interest over different industries.

[10] The remainder of the sample selection is written as if initially only data for fiscal years 2010 to 2014 has been extracted from WRDS, in order that the reader can easily understand the sample selection process.

Table 2
Sample selection

Description	Nr. Firm year observations
Firm year observation in Audit Analytics database	62,629
Less duplicate observations	(21,102)
Less observations with missing or zero data on AUDIT FEE in Audit Analytics	(22,011)
Matched with Compustat - Fundamental Annual data	
Less unmatched observations with Compustat - Fundamental Annual data	(688)
Less observations with missing data on SIZE	(221)
Less observations with missing or negative data on LEVERAGE	(209)
Less observations with missing data on GROWTH	(61)
Less observations with missing data on LOSS	(20)
Matched with Capital IQ – People Intelligence data	
Less unmatched observations with Capital IQ – People Intelligence data	(4,116)
Less observations with missing data on AGE	(519)
Final sample	13,682
Number of unique firms	3,352
ERM observations	511

Note: Column one presents a description for the number of firm year observations presented in the second column. Column two indicates the number of firm year observations. Additionally, the sample size of the final sample, the number of unique firms and the number of observations for which ERM equals one are denoted in the bottom rows.

4. Results

In this section I will present the analysis. Firstly, I present the descriptive statistics comparing the ERM and non-ERM samples. Additionally, I provide a Pearson and Spearman correlation matrix to investigate notable correlations that could harm my results. Lastly, I present the results of the regression analysis.

4.1 Descriptive statistics

Material weaknesses and audit fees

The descriptive statistics are presented in Table 3. The mean, standard deviation, minimum and maximum of all variables are reported separately for ERM firms in column (1) and non-ERM firms in column (2). The asterisks indicated next to the mean values indicate at which significance level the mean value differs for the ERM sample and non-ERM sample, calculated by performing a two-sided t-test.

Around 7% of all firms in the entire sample report material weaknesses. In accordance to hypothesis 1, the average number of reported material weaknesses is lower for ERM firms. However, the difference in mean values between the ERM and non-ERM sample is not significant. The average amount of AUDIT FEES is significantly higher for the ERM firms, in contrast to that predicted by hypothesis 2. However, the mean of SIZE is also significantly higher for ERM firms, primarily due to the fact that ERM is costly to implement and most small firms do not have the necessary funds available. SIZE typically accounts for more than half of the variation for the reported amount of audit fees, as seen in prior empirical literature (Hay et al., 2006), and could therefore be the reason why AUDIT FEES are higher for ERM firms. Moreover, as explained later in this section, both ERM and SIZE differ greatly for different industries. In addition, the mean of LEVERAGE is higher for ERM firms. This could imply there is a self-selection bias of leveraged firms who implement ERM to decrease large risk exposure. However, this is likely caused by the fact that the ERM firm observations are principally clustered in the financial sector, as explained later in this section, and financial firms are generally more levered. Lastly, 24% of the non-ERM firms have a Big Four auditor, for ERM this is only 14%. This is, again, a result of the fact that the ERM observations are clustered in the financial services industry, where, in general, firms have less Big Four auditors.

Table 4 presents descriptive statistics of the ERM variables, both dependent variables and SIZE for different industries. The second and third columns show that the majority of the ERM

firms are operating in the financial services industry. Almost half of the ERM observations within the financial industry are classified as commercial banks.[11] This is largely due to the fact that risk committees are more common in more regulated industries such as financial services, insurance, healthcare, pharmaceuticals, gambling and utilities (Bates and Leclerc, 2009). Furthermore, the average number of material weaknesses in the financial industry is lower for ERM firms when compared to non-ERM firms, which is evidence supporting hypothesis 1. Lastly, the sample of non-financial firms with a hypothesized ERM framework has only 106 firm year observations in total of which only one firm year observation has reported material weaknesses greater than zero. Since there is only one firm reporting material weaknesses in the non-financial ERM sample, the relation of ERM on internal control quality will not have considerable explanatory power or external validity. Nevertheless, I will report the regression statistics in the regression analyses presented later in section 4.

Next to this, the mean of AUDIT FEE is higher for ERM firms, which suggests a positive relation between ERM and AUDIT FEE. However, since SIZE is also substantially higher for ERM and the most common determinant of external audit fees I cannot base any suggestion on the fact that AUDIT FEE is higher for ERM firms (Hay et al., 2006). The majority of the ERM observations are located in the financial services industry, however the majority of the entire sample of firm year observations is located outside of the financial services industry. To account for the possible effect this has on the regression results using the entire sample, I will perform separate analyses on a sample with only financial firms and a sample with only non-financial firms.

[11] Although not presented in Table 4, half of the ERM observations are indicated with Standard Industry Classification (SIC) code 6020, which represents a commercial bank.

Table 3
Descriptive statistics comparing ERM and non-ERM observations

	(1) ERM = 0					(2) ERM = 1				
	N	Mean	Std. Dev.	Minimum	Maximum	N	Mean	Std. Dev.	Minimum	Maximum
MAT WEAK	13171	0.068	0.46	0	11	511	0.047	0.254	0	3
AUDIT FEE	13171	3,101,625***	6,460,137	18,000	145,000,000	511	5,346,755***	11,400,000	99,200	75,100,000
BIG 4	13171	0.233***	0.423	0	1	511	0.137***	0.344	0	1
LEVERAGE	13171	0.545***	0.239	0.048	0.999	511	0.789***	0.176	0.181	0.999
AGE	13171	50.4***	42.1	3	180	511	74.7***	56.0	3	180
SIZE	13171	19, 338***	129,312	10	3,221,972	511	134,936***	457,680	121	3,270,108
LOSS	13171	0.228***	0.419	0	1	511	0.157***	0.364	0	1
GROWTH	13171	0.093*	0.290	0	1	511	0.067*	0.249	0	1
GOVERNANCE	13171	4.8***	2.4	0	17	511	5.9***	2.6	0	15

Variable definition:

MAT WEAK = The amount of reported material weaknesses

AUDIT FEE = The total amount of reported audit fees

ERM = Dummy variable equal to one for firm year observations who have an identified ERM framework

BIG 4 = Dummy variable equal to one if the auditor of the current fiscal year is a Big Four auditor and zero otherwise

LEVERAGE = Leverage ratio calculated by dividing total liabilities by total assets

AGE = The difference between the current fiscal year and the year founded

SIZE = The amount of reported total assets in thousands

LOSS = Dummy variable equal to one for firm year observations for which the sum of income before extraordinary items in year *t* and *t-1* is negative and zero otherwise

GROWTH = Dummy variable equal to one for firm year observations in which current sales divided by last year's sales is in the higher quintile of that industry

GOVERNANCE = The amount of independent board members

Note: The first column presents the different variables used in this study. The descriptive statistics are reported separately for the sample only with firm year observation where ERM has been identified, labeled ERM=0, and without firm year observation where ERM has been identified, labeled ERM=1,where, N denotes the number of firm year observations and Std. Dev. the standard deviation. The asterisks indicate the p-value of the difference in mean values between the ERM and non-ERM sample. The p-value is calculated using a two-sided t-test, where ***. **. * stand for p-value<0.1%, p-value<1% and p-value<5%, respectively. Below the descriptive statistics is a list of variable definitions.

Table 4
Descriptive statistics for each industry of the dependent and independent variables

	Nr. of observations		AUDIT FEE		SIZE		MAT WEAK	
Industry	ERM = 0	ERM = 1	ERM = 0	ERM = 1	ERM = 0	ERM = 1	ERM = 0	ERM = 1
Agriculture, forestry, fishing	41	2	2,571,770	319,800	3,575	950	0.049	0.000
Mining & construction	1,089	19	2,099,942	1,179,388	8,357	3,714	0.091	0.000
Manufacturing	4,809	33	3,500,958	6,973,651	8,949	32,978	0.075	0.060
Transportation & public utilities	1,236	17	3,307,231	2,846,051	17,497	3,147	0.049	0.000
Wholesale & retail trade	1,148	9	2,005,379	1,270,776	6,348	1,376	0.091	0.000
Finance, insurance & real estate	2,918	405	3,284,005	5,808,831	54,565	167,030	0.070	0.052
Services	1,889	26	2,405,088	2,562,197	4,076	3,019	0.080	0.000
Public administration	41	0	26,173,861	0	165,306	0	0.000	0
Total	13,171	511	3,101,625	5,346,755	19,338	134,936	0.068	0.047

Note: Industries are classified using the Standard Industrial Classification (SIC) Code's first digit. A SIC Code is a four-digit numerical code assigned by the United States government to firms to identify the industry area. Exceptions to the classifying industries on the basis of its first SIC Code digit are first digit SIC Codes 2 and 3 which together form the manufacturing industry classification and first digit SIC Codes 7 and 8 which together form the service industry classification. Nr. of observations reports the number of firm year observations. The numbers below columns AUDIT FEE, SIZE and MAT WEAK (columns 4-9) are mean values. For the number of observations, AUDIT FEE, SIZE and MAT WEAK, the reported numbers are presented separately for the sample consisting only of firm year observations where firms do not have an hypothesized ERM framework, labeled ERM=0, and the sample consisting only of firm year observations where firms do have an hypothesized ERM framework, labeled ERM=1.

4.2 Pearson and Spearman correlation

Table 5 presents the results of the correlations between all variables in the form of a Pearson and Spearman correlation matrix. Note that log(AUDIT FEE) and log(SIZE) are used, since these will be used in the analyses. The Pearson and Spearman correlation matrix allows for the identification of correlations potentially harming the contribution of the independent variable to the analysis. However, no variable presented in Table 5 shows a correlation large enough to harm the results of the analyses.

The correlation of ERM and MAT WEAK is not significant; however, the sign is according with the expectations of hypothesis 1. The correlation of ERM and AUDIT FEE is also not significant, however the sign is contradicting hypothesis 2. Oddly, AUDIT FEE is only weakly significantly correlated to MAT WEAK.

Most control variables are significantly correlated to both dependent variables. The correlation of log(AUDIT) and log(SIZE) is highly significant equal to 0.7645, meaning the majority of the variation in log(AUDIT) sample is the result of changes in log(SIZE). According to the theory, GOVERNANCE is negatively correlated to MAT WEAK, but not to AUDIT FEE, meaning an independent board is beneficial for the internal control quality, but not the amount of audit fees. Additionally, the majority control variables are significant correlated to ERM. Most of the signs can be explained by the fact that most ERM observations are financial firms, which are generally more levered and larger.

Table 5
Pearson and Spearman correlation

	MAT WEAK	Log(AUDIT FEE)	ERM	BIG 4	LEVERAGE	AGE	Log(SIZE)	LOSS	GROWTH	GOVERNANCE
MAT WEAK	1									
Log(AUDITFEE)	0.0175* 0.0846	1								
ERM	-0.0087 0.3558	0.0185 0.2509	1							
BIG 4	-0.0254** 0.0018	0.0891*** 0	-0.0435*** 0	1						
LEVERAGE	0.0074 0.9651	0.2272*** 0	0.1905*** 0	-0.017*** 0	1					
AGE	-0.0205* 0.0279	0.2530*** 0	0.1074*** 0	-0.0299*** 0.0001	0.2929*** 0	1				
Log(SIZE)	-0.0660*** 0	0.7628*** 0	0.1419*** 0	0.0476*** 0	0.4763*** 0	0.3472*** 0	1			
LOSS	0.0820*** 0	-0.1764*** 0	-0.0322*** 0.0004	0.0087 0.1542	-0.0658*** 0.1124	-0.1865*** 0	-0.3149*** 0	1		
GROWTH	0.0084 0.9414	-0.0913*** 0	-0.0171* 0.1434	0.0378*** 0.0009	-0.0715*** 0	-0.1600*** 0	-0.1131*** 0	0.1050*** 0	1	
GOVERNANCE	-0.0565*** 0	0.2480*** 0	0.0859*** 0	0.0449*** 0	0. 2692*** 0	0. 2949*** 0	0. 3828*** 0	-0. 1958*** 0	-0.1021*** 0	1

Note: The first column and first row present the variables used in this study For each variable the first row depicts the correlation and the second row the significance level reported in the p-value. ***, ** and * stand for p-value<0.1%, p-value<1% and p-value<5% respectively.

4.3 Regression analyses

This section presents the results of the regression analysis that was conducted for each hypothesis. Table 6 presents the results of the regressions using model 1 in panel A and the results of the regression using model 2 in panel B.

Column (1) of panel A shows the results using the entire sample. As predicted by H1, the coefficient for ERM is negative and insignificant. The negative sign implies ERM is positively related to the number of material weaknesses, thus negatively to internal control quality. However, due to the possible simultaneity bias, as mention earlier in section 3, the relation could also run in the opposite direction. The result then implies that firms with a higher internal control quality are more inclined to implement ERM.

The significant relation of the different control variables are largely as expected. The coefficient for LOSS is positive and significant. This supports the hypothesis stating loss-making firms have a lower expected internal control quality due a lack of adequate financial resources and time management. However, this result should be interpreted with caution, as I cannot predict a causal relation between LOSS and MAT WEAK. For this reason the result might also support the hypothesized consequence of low internal control quality negatively affecting earnings, resulting in losses. The negative coefficient for GOVERNANCE supports the claim that a more independent board positively affects the internal control quality. SIZE is, contrary to my expectations, negatively related to MAT WEAK, providing evidence for the theory that larger firms are expected to report less material weaknesses. Supporting the theory where larger firms enjoy economies of scale improving the internal control quality, opposed to the contradicting theory where larger firms have more accounting processes and are generally more complex.

Since the observations of ERM firms are largely clustered in the financial services industry, I perform an additional analysis separately for a sample of financial- and a sample of non-financial firms. The results are presented in, respectively, column (2) and (3) of panel A. For the sample of financial firms, again the coefficient for ERM is negative and insignificant. The ERM coefficient using the sample of non-financial firms is negative and significant, indicates ERM is expected to have a positive relation with internal control quality for non-financial firms. However, this result should be interpreted with caution, since only one non-financial firm reported material weaknesses.

To conclude that for the non-financial sector ERM is expected to have a positive relation with internal control quality a large sample size is required. Additionally, the ERM coefficient for the financial industry is insignificant. The financial industry is where the majority of my firm year observations are clustered and an ERM framework is hypothesized to be most developed. Furthermore, the ERM coefficient for the regression results using the entire sample is also insignificant. Due to the insignificant results in both samples where the majority of ERM observations are, I cannot reject null hypothesis $H1_0$.

Although the insignificant results for the ERM coefficient provide evidence that there is no relation between ERM and internal control quality, this can be due to the fact that there is insufficient variation in the MAT WEAK variable across ERM observation to find a significant relation of ERM to MAT WEAK. I construct dummy variable MAT $WEAK_{dummy}$ equal to one for firm year observations for which the amount of reported material weaknesses is greater than zero, and zero otherwise. The mean of MAT $WEAK_{dummy}$ is higher for ERM observations, meaning the sample of ERM firms has relatively more observations where material weaknesses are observed. I rerun the regressions of panel A of Table 6 by replacing dependent variable MAT WEAK by dummy variable MAT $WEAK_{dummy}$; however these results present no noticeable differences.

Panel b of Table 6 presents the results of the regressions using model 2. Column (1) of panel B presents the regression results using the entire sample. The ERM coefficient is highly significant and negative, in accordance to the expectations of hypothesis 2. This supports the hypothesis implying that ERM is expected to decrease the amount of AUDIT FEE. Since I measure AUDIT FEE by its natural logarithm, the ERM coefficient explains that, ceteris paribus, firms with an ERM framework are expected to have 11,2% less audit fees comparted to firms with an ERM framework. The majority of the control variables have a sign in accordance with the expectations. Surprisingly, the coefficient of LEVERAGE is negative, which implies that more levered firms are expected to have a lower amount of audit fees.

Similar to model 1, I again perform a separate analysis on the financial services and non-financial services industry presented in columns (2) and (3) of Table 6 panel B. Again, the ERM coefficient for the financial services industry is insignificant. For the non-financial industry the ERM coefficient is a significantly positive, hence a positive relation between ERM and the

amount of audit fees. This result is contradicting the result earlier found for the relation between ERM and audit fees using entire sample.

The only significant change between the results in column (1) and column (3), besides the ERM coefficient, is that for the non-financial industry the sign of control variables LEVERAGE and GOVERNANCE is positive. Another explanation could be that ERM in the non-financial industry is not as developed as in the financial industry. As presented by the descriptive statistics, and also prior literature, ERM is much more common in the financial industry which could have a positive effect on the potential benefits of ERM in the financial industry.

It seems the negative ERM coefficient for the entire sample can be largely attributed to the large relative amount of financial ERM firms in my sample. However, the regression results for ERM using only financial firms are not significant. Moreover, the change in the magnitude of the ERM coefficients when comparing the sample for the full sample and the financial industry is hard to explain. One would expect that the ERM coefficient for the financial industry would drop below -0.112 since the non-financial observations are eliminated for which the ERM coefficient is positively significant.

As a result of the highly significant ERM coefficient for the entire sample I reject null hypothesis $H2_0$ stating ERM has no relation to the reported amount of audit fees. However, the ERM coefficient for the financial industry is insignificant, considering the majority of the ERM observations in my sample are financial firms. Additionally, the ERM coefficient for the non-financial sample has an opposing sign. For this reason the significant negative ERM coefficient, predicting a negative relation between ERM and the reported amount of audit fees, has to be interpret with caution. In the next section I will perform various robustness checks to test if the results presented in Table 6 are robust.

Table 6
Regression results

Panel A results of estimating model 1:

$$MAT\ WEAK_{i,t} = \alpha + \beta_1 * ERM_{i,t} + \beta_2 * BIG\ 4_{i,t} + \beta_3 * LEVERAGE_{i,t} + \beta_4 * AGE_{i,t} + \beta_5 * \log(SIZE)_{i,t} + \beta_6 * LOSS_{i,t} + \beta_7 * GROWTH + \beta_8 * GOVERNANCE_{i,t} + \beta_9 * YEAR\ FE_{i,t} + \beta_{10} * INDUSTRY\ FE_{i,t} + \varepsilon_{MAT\ WEAK}$$

Independent variable	Predicted sign	Coefficient (1) Full sample	(2) Financial industry	(3) Non-financial industry
ERM	-	-0.00768	-0.00308	-0.0508**
		(0.0129)	(0.0169)	(0.0195)
BIG 4	-	-0.0232**	0.000619	-0.0285**
		(0.00803)	(0.0147)	(0.00935)
LEVERAGE	+	0.0549**	0.0619*	0.0658**
		(0.0200)	(0.0276)	(0.0245)
AGE	-	0.000148	0.000205	0.0000936
		(0.000101)	(0.000178)	(0.000118)
Log(SIZE)	+	-0.00992***	-0.000333	-0.0155***
		(0.00254)	(0.00368)	(0.00319)
LOSS	+	0.0682***	0.126***	0.0502***
		(0.0142)	(0.0380)	(0.0152)
GROWTH	+	-0.00203	0.0561*	-0.0232
		(0.0137)	(0.0278)	(0.0157)
GOVERNANCE	-	-0.00950***	-0.0112***	-0.00850***
		(0.00163)	(0.00252)	(0.00204)
Constant		0.0937*	0.001	0.160***
		(0.0403)	(0.0361)	(0.0226)
Adjusted R-squared		0.0130	0.0212	0.0127
Observations		13,682	3,323	10,359
Year fixed effects		Included	Included	Included
Industry fixed effects		Included	Not Included	Included

Panel B results of estimating model 2:

$$Log(AUDIT\ FEE)_{i,t} = \alpha + \beta_1 * ERM_{i,t} + \beta_2 * BIG\ 4_{i,t} + \beta_3 * LEVERAGE_{i,t} + \beta_4 * AGE_{i,t} + \beta_5 * \log(SIZE)_{i,t} + \beta_6 * LOSS_{i,t} + \beta_7 * GROWTH + \beta_8 * GOVERNANCE_{i,t} + \beta_9 * YEAR\ FE_{i,t} + \beta_{10} * INDUSTRY\ FE_{i,t} + \varepsilon_{AUDTIT\ FEE}$$

Independent variable	Predicted sign	Coefficient (1) Full sample	(2) Financial industry	(3) Non-financial industry
ERM	-	-0.112***	-0.0156	0.130*
		(0.0321)	(0.0313)	(0.0577)
BIG 4	+	0.0744***	0.152***	0.0216
		(0.0121)	(0.0319)	(0.0123)
LEVERAGE	+	-0.234***	-1.623***	0.286***
		(0.0311)	(0.0882)	(0.0300)
AGE	-	0.0000889	-0.00154***	0.00153***
		(0.000146)	(0.000278)	(0.000149)
Log(SIZE)	+	0.557***	0.657***	0.507***
		(0.00375)	(0.00804)	(0.00375)
LOSS	+	0.209***	0.289***	0.171***
		(0.0142)	(0.0407)	(0.0139)
GROWTH	+	-0.0336	-0.0334	-0.0803***
		(0.0198)	(0.0479)	(0.0198)
GOVERNANCE	-	-0.0111***	-0.0405***	0.0114***
		(0.00262)	(0.00528)	(0.00274)
Constant		10.122***	9.853***	10.017***
		(0.0949)	(0.0704)	(0.105)
Adjusted R-squared		0.727	0.712	0.773
Observations		13,682	3,323	10,359
Year fixed effects		Included	Included	Included
Industry fixed effects		Included	Not included	Included

Note: The first column presents the different variables and regression statistics. The second column presents the predicted sign the variable of first column has in the dependent variable. Columns (1), (2) and (3) present the regression coefficients of the corresponding variables in the first column with standard errors in parentheses. The asterisks indicate the level of significance where ***, ** and * stand for p-value<0.1%, p-value<1% and p-value<5%, respectively. The number of observations is reported in firm year observations. Additionally, the adjusted R-squared, the number of firm year observations are included. The table also indicates whether fixed and/or industry effects are included. The financial industry represents a sample of all finance, insurance and real estate firm year observations. The non-financial industry represents a sample of all remain firm year observations.

4.4 Robustness check

In this section, I perform various robustness checks and study the impacts of these checks on my results. Table 7 presents the regression results of the various robustness checks, where panel A presents the results for model 1 and panel B presents the results for model 2. Again, I perform the regression of models 1 and 2 for; the entire sample, the sample including only financial firms and the sample including only non-financial firms. I compare the results of Table 7 to the results reported in Table 6.

First, I rerun model 1 without taking the natural logarithm of SIZE; these results are presented in panel A.[12] The sign and p-value of the ERM coefficient for all three samples are comparable to the results presented in Table 6. The same procedure is undertaking using model 2 where, additionally, log(AUDIT FEE) is replaced by AUDIT FEE. These results are presented in panel B of table 7. The ERM coefficient for both the full sample as the non-financial industry of model 2 has a lower significance level. This means ERM and audit fees most likely do not have a linear relation. The ERM coefficient using model 2 one can be interpreted as the percentage change in the amount of audit fees when a firm is hypothesized to have an ERM framework. Whereas the ERM coefficient when using audit fees, without using its natural logarithm, is interpreted as an absolute increase in the amount of audit fees. Common sense of course dictates that the relation of ERM on audit fees is more likely to be relative as opposed to absolute, similar for SIZE.

Secondly, I check if winsorizing both variables AGE and GROWTH harms the regression results. The ERM coefficients for model 1 and 2 using the unwinsorized observations are presented in respectively panel A and panel B of Table 7. For both models I do not find any noticeable changes in the ERM coefficient. Thirdly, I exclude the public administration industry, since this industry had substantially large audit fees and no ERM observations. This presents no notable changes for both models 1 and 2. Note that the ERM coefficient for model 1 and 2 of the financial industry is the same as reported in Table 7, since no the exclusion of the public administration industry has no effect on the observations in the financial industry.

Lastly, I merge the full sample used throughout the thesis with the segment data extracted from Compustat used to construct the COMPLEXITY measure, where COMPLEXITY equals the sum of business and geographical segments for each firm. The merging process resulted in

[12] Although not presented in Table 7, replacing log(SIZE) by SIZE made no noticeable changes to the SIZE coefficient for models 1 or 2 in any sample.

1,445 unmatched firm year observations which accounted for approximately 12% of the initial observations. Remarkably, 20% of the 1,445 firm year observations are observations with an identified ERM framework, accounting for half of the initial amount of ERM observations. This average amount of relative ERM observations is five times higher than the average amount of the entire sample, which is equal to only 4%. Almost all of the unmatched observations are financial firms, which explains the high relative amount of ERM observations in the unmatched sample. The sample created after merger with the dataset used to measure COMPLEXITY is referred to as the Complexity sample and the sample unmatched observations is referred to as the Unmatched sample. Panel A presents the ERM coefficient by preforming the regression of model 1, additionally controlling for complexity using the Complexity sample. The sign for the coefficient of ERM changes, however, the sign is still insignificant.

More notable are the changes to the results of model 2 with complexity as an additional control variable. The coefficient for ERM using the entire sample has changed from an insignificant negative coefficient to a significant positive coefficient. To elaborate on this I included Table 8 comparing the full sample with the complexity sample and the unmatched sample. The mean SIZE and LEVERAGE of the unmatched sample is substantially higher compared to the sample used in the regression analysis; however mean AUDIT FEE shows no noticeable differences.

As previously mentioned, the unmatched sample is primarily composed of financial firms with a relatively large number of ERM observations. Additionally, Table 8 shows the mean SIZE and LEVERAGE of the unmatched firms is substantially higher compared to the sample used in the regression analysis. This largely explains the difference in signs for the ERM coefficient, since relatively larger firms with comparable audit fees are eliminated and size is the main cause for variation in audit fees. Meaning, where previously the higher AUDIT FEE for ERM was partially explained by a likewise higher SIZE, this is now partially explained by ERM, hence the positive since.

I am interested if the change in the results of model 2 is due to the inclusion of control variable COMPLEXITY. Therefore, I use rerun model 2 without COMPLEXITY as a control variable using the Complexity sample. These results are similar to the result where COMPLEXITY was included. The coefficient for ERM in the non-financial sample has a higher p-value. This means COMPLEXITY accounts for some of the variation in AUDIT FEE, since

the inclusion of COMPLEXITY in model 2 decreases the significance level of the relation of ERM on AUDIT FEE.

In conclusion, the results for model 1, which explain the relation between ERM and internal control quality, are robust to changes. With the exception of using unwinsorized observations, the magnitude or sign of the ERM coefficients are similar across panel A. The ERM coefficients for model 2 are not robust, since the sign and significance for both the full sample and the sample of financial firms change in sign and significance in various robustness checks.

Table 7
Robustness checks

Panel A results using model 1				
Procedure	Independent variable	(1) Full sample N=13,682	(2) Financial industry N=3,323	(3) Non-financial industry N=10,359
Replace log(SIZE) by SIZE	ERM	-0.0137	-0.00553	-0.0546**
		(0.0125)	(0.0164)	(0.0196)
Using unwinsorized observations	ERM	-0.00766	00.00275	-0.0513**
		(0.0129)	(0.0170)	(0.0196)
		(1) Reduced sample N=13,641	(2) Financial industry N=3,323	(3) Non-financial industry N=10,318
Excluding the public administration industry	ERM	-0.00758	-0.00308	-0.0508**
		(0.0129)	(0.0169)	(0.0195)
		(1) Complexity sample N=12,235	(2) Financial industry N=1,949	(3) Non-financial industry N=10,286
Including COMPLEXITY as a control variable	ERM	-0.0120	-0.00415	-0.0476*
		(0.0167)	(0.0282)	(0.0197)
	COMPLEXITY	-0.000117	-0.00298	0.000231
		(0.000367)	(0.00189)	(0.000353)
Using only the COMPLEXITY sample, but not including COMPLEXITY as a control	ERM	-0.0121	-0.00297	-0.0470*
		(0.0167)	(0.0279)	(0.0199)
Panel B results using model 2				
		(1) Full sample N=13,682	(2) Financial industry N=3,323	(3) Non-financial industry N=10,359
Replace log(SIZE) by SIZE and log(AUDIT FEE) by AUDIT FEE	ERM	-935760.5**	-529848.0	423849.4
		(320403.3)	(389443.4)	(287940.0)
Using unwinsorized observations	ERM	-0.122***	-0.0156	0.131*
		(0.0321)	(0.0314)	(0.0575)
		(1) Reduced sample N=13,641	(2) Financial industry N=3,323	(3) Non-financial industry N=10,318
Excluding the public administration industry	ERM	-0.111***	-0.0156	0.130*
		(0.0321)	(0.0313)	(0.0577)

		(1) Complexity sample	(2) Financial industry	(3) Non-financial industry
		N=12,235	N=1,949	N=10,286
Including COMPLEXITY as a control variable	ERM	0.136***	0.188***	0.127*
		(0.0373)	(0.0526)	(0.0538)
	COMPLEXITY	0.0147***	0.0253***	0.0135***
		(0.000555)	(0.00218)	(0.000556)
Using only the COMPLEXITY sample, but not including COMPLEXITY as a control	ERM	0.145***	0.178**	0.165**
		(0.0396)	(0.0589)	(0.0558)

Note: This table presents the regression statistics of model 1 and model 2. Columns (1), (2) and (3) present the regression coefficients with standard errors in parentheses for the sample of all industries, the sample of only financial firm and the sample of only non-financial firms respectively. N denotes the number of firm year observations. The asterisks indicate the level of significance where ***, ** and * stand for p-value<0.1%, p-value<1% and p-value<5%, respectively. The financial industry represents a sample of all finance, insurance and real estate firm year observations. The non-financial industry represents a sample of all firm year observations not in the financial industry sample.

Table 8

Comparing samples after merging for COMPLEXITY

Panel A comparing sample means

	Full sample		Complexity sample		Unmatched sample	
Variable name	N	Mean	N	Mean	N	Mean
ERM	13,682	0.037	12,235	0.018	1,447	0.201
MAT WEAK	13,682	0.066	12,235	0.068	1,447	0.056
AUDIT FEE	13,682	3,175,608	12,235	3,204,861	1,447	3,026,472
BIG 4	13,682	0.236	12,235	0.244	1,447	0.113
LEVERAGE	13,682	2.4	12,235	1.9	1,447	8.1
AGE	13,682	51.6	12,235	47.4	1,447	84.9
SIZE	13,682	19,842	12,235	14,859	1,447	94,572
LOSS	13,682	0.224	12,235	0.234	1,447	0.140
GROWTH	13,682	0.092	12,235	0.097	1,447	0.039
GOVERNANCE	13,682	4.9	12,235	4.6	1,447	6.5

Panel B comparing number of observations

	Full sample		Complexity sample		Unmatched sample	
Industry	ERM = 0	ERM = 1	ERM = 0	ERM = 1	ERM = 0	ERM = 1
Agriculture, forestry, fishing	41	2	38	0	3	2
Mining & construction	1,089	19	1,056	18	33	1
Manufacturing	4,809	33	4,797	33	12	0
Transportation & public utilities	1,236	17	1,223	17	13	0
Wholesale & retail trade	1,148	9	1,147	9	1	0
Finance, insurance & real estate	2,918	405	1,832	117	1,086	288
Services	1,889	26	1,881	26	8	0
Public administration	41	0	41	0	0	0
Total	13,171	511	12,015	220	1,156	291

Note: N denotes the amount of firm year observations. The ‘full sample’ depicts the sample as constructed following the procedure of Table 2. The ‘complexity sample’ depicts the sample that resulted after matching with observations from the Segment data of the Compustat database that is used to construct the COMPLEXITY variable. Lastly, the ‘unmatched sample’ depicts the sample of observations that were unmatched, hence observations that are in the ‘full sample’, but not the ‘complexity sample’. Panel A presents mean values and number of observations, denoted by N, for the three different samples. Panel B presents the number of observations for the three different samples comparing ERM and non-ERM observations.

5. Discussion and Conclusion

5.1 Conclusion

This paper investigates if there is a positive relation between ERM and internal control quality, using both the appointment of a CRO and the existence of a risk committee as a proxy for the existence of an ERM framework. Through the use of data available through the WRDS database I composed a sample of firms located in the United States with a total of 13,682 firm year observations. The descriptive statistics show that the majority of the ERM observations are clustered in the financial industry, which largely explains why the ERM firms in my sample are larger and more levered.

I study the relation of ERM and internal control quality by using both the amount of reported material weaknesses and the amount of reported audit fees as a proxy. By means of an OLS regression I study both relations. The relation between ERM and the amount of reported material weaknesses is insignificant and negative. Only when all financial firms are eliminated do I find a negative significant relation. Given that, the sample of non-financial firms has too few ERM observations to make a general statement, I cannot reject null hypothesis $H1_0$, which states ERM has no relation with the amount of reported material weaknesses.

Next, I study the relation between ERM and the amount of reported audit fees. I find a significant negative coefficient for ERM. I am able to reject the null hypothesis stating ERM has no relation to the reported amount of audit fees. However, this result has to be interpreted with caution since the sign of the ERM coefficient when all financial firms are eliminated is significantly positive. Additionally, The ERM coefficient when using only financial firms, considering the large majority of ERM observations are financial firms, is negative and insignificant. Additionally, the results are not robust to the various robustness checks I performed.

Furthermore, this study is subject to a possible omitted variable bias, where this omitted variable is related to both ERM and internal control quality; hence responsible for some of the explained relation between ERM and internal control quality measured by the OLS regression. The result of the omitted variable bias is that I cannot conclude the changes in internal control quality measured by the ERM coefficient of the OLS regression is solely the result of the implementation of an ERM framework.

Additionally, I am unable to reject the possibility of a simultaneity bias, where the relation of ERM on internal control quality goes both ways. The opposing relation is explained by the internal control quality of a firm that has a significant effect on the implementation of ERM. For this reason I am unable to predict the direct of the relation.

To conclude, I find no significant relation for ERM using both proxies of internal control for the financial industry. The separation between these two industries is important due to the often complex structure of financial firms, making them hard to comparable. Again, the majority of ERM observations are financial firms. For this reason I conclude I fail to find that the existence of an ERM framework improves internal control.

This is a concerning though as more and more public pressure and also the interest of firms aim towards a more holistic approach to risk management. For this reason I argue disclosure, or assessment by and external auditor, of risk management practices is greatly recommended.

Additionally, I find a negative sign for the ERM coefficient of the financial industry and a positive sign non-financial industry. An alternative explanation for this result is that the quality of ERM differs between the financial industry and non-financial industry. As reported by the majority of the prior literature, ERM is must more common and developed in the financial industry.

5.2 Limitations

There are a number of concerns regarding the limitations of this study. Firstly, the identification of ERM within a firm is difficult, since disclosure of ERM activities is not mandatory. A lack of solid ERM measures means that ERM literature struggles to identify the implications of ERM. This study used the identification of a CRO or risk committee as a measure for ERM, which is an indirect measure of ERM. The strength of my results relies on the ability of my proxy for ERM to identify firms with a hypothesized ERM framework. Additionally, for the hypothesized effect of ERM on internal control it is assumed that the ERM framework is well developed. Since the quality of ERM framework is unclear, I might observe firm year observations with an ERM framework of insufficient quality, or low level of implementation, which does not have the desired effect on the internal control quality. This might be the cause for the insignificant ERM coefficients I found.

Secondly, the various robustness checks showed that the results used to test the relation of ERM on audit fees are not robust. This is particularly true of merging with the sample used to compute the COMPLEXITY variable, which significantly changed the coefficients of the variables of interest. For the results regarding the regression used to test the relation of ERM on internal control quality, nothing notable changed.

Moreover, the limited number of ERM observations in the non-financial industry affected the results, especially those concerning the relation of ERM on internal control quality. For the non-financial firms, only one firm year observation has reported material weaknesses greater than zero. For this reason the non-financial sample is not noticeably interesting to investigate regarding internal control quality. By using the amount of reported material weaknesses as a proxy for internal control quality, I am not able to distinguish between different qualities of internal control if a firm has zero reported material weaknesses. The number of non-financial observations in the ERM sample is equal to 105. The average expected number of firms reporting material weaknesses according to the sample average is between 4 and 5.[13] The number of non-financial observations in the ERM sample needs to increase by a multiple of at least 10 to be able to detect any difference between firms who have implemented ERM and those who have not.

Lastly, McKinsey&Company (2012) state that an audit committee discusses risks those primarily involve compliance with law and informal strategic decision making. When a firm evolves in its risk management practices and risk-return trade-offs are involved, the board decides to upgrade the mind-set and capabilities of the audit committee. However, the board does not necessarily change the name from audit committee to risk committee or establish a separate risk committee. This means that, while some firms do have an ERM framework, this cannot be observed in this study since it is this operating under the name of audit committee.

5.3 Future research

As ERM has become more and more popular since the late 20th century (Liebenberg and Hoyt, 2003) and the growing number of firms who implemented ERM will solve some of the limitations encountered in this study. Future research further exploring the effects of ERM will

[13] There are 105 non-financial observations in the ERM sample and the average amount of firms reporting material weaknesses greater than zero is 4.5%, see table 3. 106*0.045 = 4.725.

stimulate this process. As mentioned before, ERM literature is still in its pre-paradigm state, meaning future research on proper improved constructs for ERM is greatly encouraged. In future studies I recommend studying specific risk benefits of ERM, since the relation between ERM and internal control is based on the consequences of ERM on the audit committee. An interesting topic for future research is the relation between ERM and audit committee quality. Additionally, as empirical literature struggles to identify the true benefits of ERM, I recommend conducting a survey on the different firm motivations for ERM implementations.

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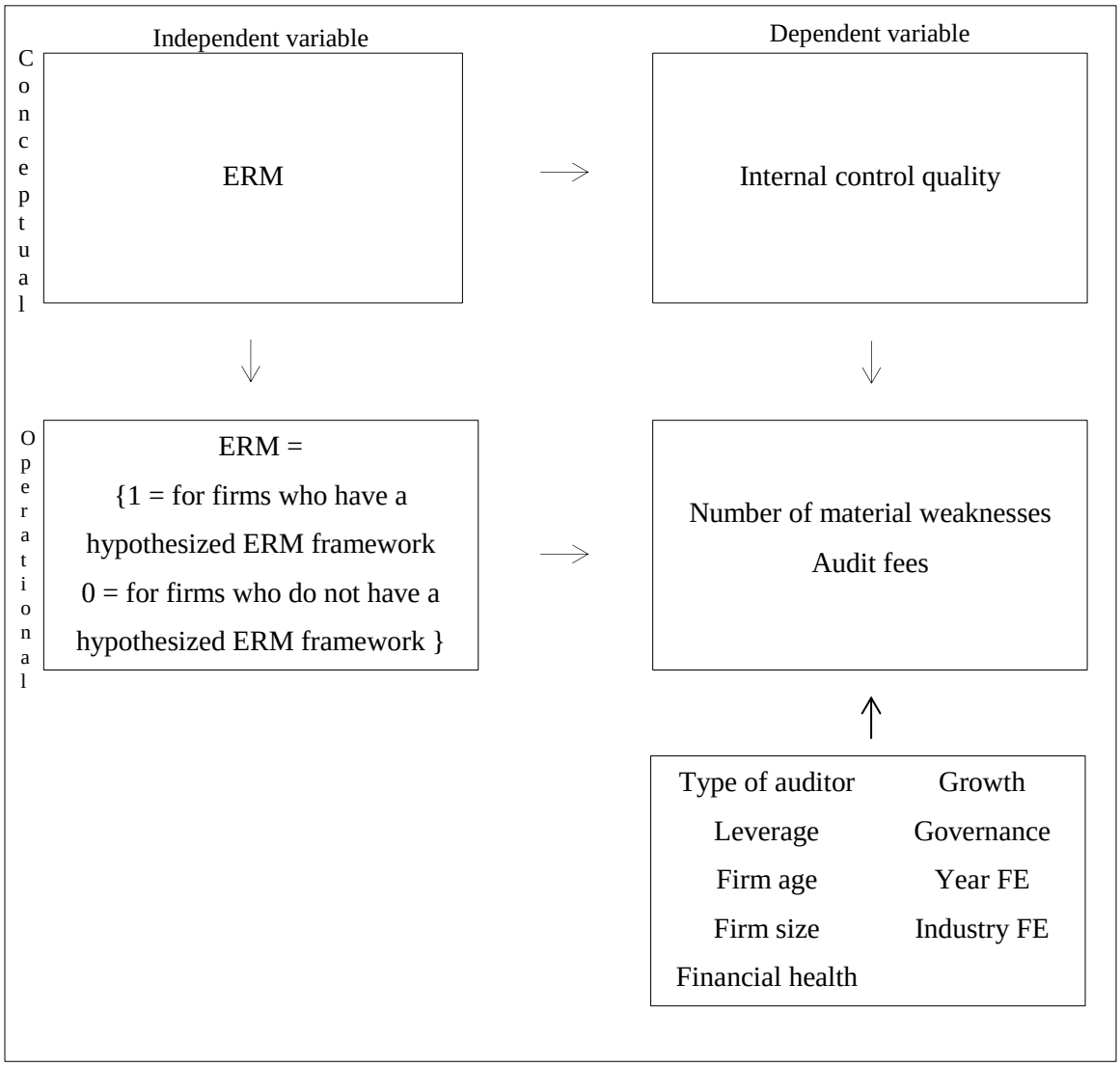
Appendix A: Libby box

Figure A



Note: The Libby Box depicts the relation between the conventional variable on the top row and the construct variable on the middle row. Moreover, the relations between the independent variable in the first column and the dependent variable in the second column are illustrated. Additionally, the different control variables are given in the bottom right corner.

Appendix B: Descriptive statistics on search string

Table B

Panel A descriptive statistics on search string used to identify ERM activity	
Search string	Number of executive
"Risk Officer"	344
"Enterprise Risk"	35
"Chief Risk"	327
"Integrated Risk"	0
"Strategic Risk"	0
"Risk Committee"	131
"Committee of Risk"	0
Total	838
Panel B descriptive statistics on frequency of identified ERM activity	
Number of executive with a matched search string	Number of observations
1	194
2	307
3	9
Total	510

Notes: Panel A presents the different search strings that I use to identify ERM activity in the first column and the corresponding number of executive where the search string matches with the executive's function name. The total amount of executives with a matched search string is greater than the total amount of ERM observations, because some firms have multiple executives with a matched search. The ERM firm year observations in my sample have one, two or three different executives with a matched search string. Panel B presents the number of firm year observations for each group of number executive with a matched search string