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The Adoption and Design of Enterprise Risk Management Practices: An Empirical Study

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ABSTRACT We examine (1) the extent of enterprise risk management (ERM) implementation and the factors that are associated with cross-sectional differences in the level of ERM adoption, and (2) specific risk management design choices and their effect on perceived risk management effectiveness. Broadly consistent with previous work in this area, we find that the extent of ERM implementation is influenced by the regulatory environment, internal factors, ownership structure, and firm and industry-related characteristics. In addition, we find that perceived risk management effectiveness is associated with the frequency of risk assessment and reporting, and with the use of quantitative risk assessment techniques. However, our results raise some concerns as to the COSO (Committee of Sponsoring Organizations) framework. Particularly, we find no evidence that application of the COSO framework improves risk management effectiveness. Neither do we find support for the mechanistic view on risk management that is implied by COSO's recommendations on risk appetite and tolerance.

1. Introduction

Over the last decade, there has been a growing interest in risk management. Stakeholders' expectations regarding risk management have been rising rapidly, especially since the recent financial crisis. In that crisis, weaknesses in risk management practices became painfully visible, and companies are currently under significant pressure to strengthen their risk management systems and to take appropriate actions to improve stakeholder value protection. This pressure is

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intensified by regulators and standard setters promulgating new risk management rules and requirements. In addition, credit rating agencies like Standard & Poor's have begun to evaluate firms' risk management systems as part of their credit rating analysis.

In the wake of these increasing expectations, the idea of enterprise risk management (ERM) has gained substantial momentum as a potentially effective response to risk management challenges. ERM differs from traditional conceptions of risk management in its enterprise-spanning aspirations and in the adoption of a holistic approach in which strategic, operational, reporting and compliance risks are addressed simultaneously rather than separately. Such an integrated approach should help companies to deal with risks and opportunities more effectively, enhancing the entity's capacity to create and preserve value for its stakeholders (COSO, 2004a).

The emergence and evolution of ERM in practice has begun to attract research attention, and an academic risk management literature is starting to develop. One set of papers in this body of work examines the factors that influence ERM adoption (e.g. Beasley *et al.*, 2005; Kleffner *et al.*, 2003; Liebenberg and Hoyt, 2003). Other studies address the effects of ERM adoption on performance (Beasley *et al.*, 2008; Gordon *et al.*, 2009). Yet another cluster of papers explores the details of risk management practices in specific organisational settings (e.g. Mikes, 2009; Wahlström, 2009; Woods, 2009). With this paper, we seek to add to this incipient literature.

Our study aims to make three main contributions. One, based on survey data from 825 organisations headquartered in the Netherlands, we provide new evidence on the factors that are associated with the extent of ERM implementation. This part of our study connects to previous work of Kleffner *et al.* (2003), Liebenberg and Hoyt (2003) and especially Beasley *et al.* (2005), and significantly expands the empirical foundations of this research stream. Prior contributions were based largely on US (Beasley *et al.*, 2005; Liebenberg and Hoyt, 2003) and Canadian (Kleffner *et al.*, 2003) data.¹ Our observations add a European perspective, allowing some new insights into the generalisability of the earlier findings across different institutional contexts. This is important, because at least some evidence suggests that ERM adoption might be conditional on the legal and regulatory environment, and perhaps also on cultural factors (Beasley *et al.*, 2005; Liebenberg and Hoyt, 2003). In addition, our sample includes small and medium-sized enterprises, as well as public sector and not-for-profit organisations. Both of these groups were absent in earlier studies.

Two, we provide a relatively detailed description of current ERM practices, shedding light on the specific design choices organisations make when configuring and implementing their ERM systems. The existing literature has tended to study ERM at a high level of aggregation. For instance, Liebenberg and Hoyt (2003) and Beasley *et al.* (2008) rely on data on Chief Risk Officer appointments as their sole indicator for ERM adoption. Beasley *et al.* (2005) use an ordinal scale ranging from 'no plans exist to implement ERM' to 'complete ERM is in

place' to capture the extent of ERM implementation.² And Gordon *et al.* (2009) measure ERM indirectly through the extent to which the organisation has been successful in realising a number of generic strategic, operational, reporting and compliance objectives. These studies, however, do not address the particulars of ERM practices, nor the differences in ERM design between firms. Yet, there is considerable variety in ERM across organisations. For instance, Arena *et al.* (2010) provide case study evidence from three Italian firms that demonstrates that ERM can be very different things to different organisations. In her study of two large banks, Mikes (2009) concludes that systematic variations in ERM practices exist, even within a single industry setting (see also Mikes, 2008). In addition, Woods (2009) reports significant variety at the operational level of the ERM system within a single large public sector organisation. As we still know fairly little about the specific ERM design choices organisations make, the attempt to document these choices in a large sample study is instructive in its own right.

Three, we explore the relationship between ERM design choices and perceived risk management effectiveness. A whole industry has emerged to assist firms in improving their risk management systems and practices. In addition, several semi-regulatory bodies have published frameworks to guide these efforts. The most prominent of these is the COSO ERM framework (COSO, 2004a; cf. Power, 2009). These normative frameworks implicitly or explicitly suggest that their standards and recommendations represent so-called 'best practices'. This suggestion, however, does not have a clear theoretical or empirical foundation. Even though some research papers present evidence to indicate that ERM improves firm performance (Beasley *et al.*, 2008; Gordon *et al.*, 2009), we found no studies that examine the effects of the specific recommendations of COSO-type frameworks on risk management effectiveness. Therefore, the question as to whether these frameworks actually help to advance sound risk management is still largely unanswered, and it might well be the case that the effort to standardise and codify risk management practices is premature (Kaplan, 2011). Given the influence of these frameworks, empirical work addressing the effects of the standards and recommendations on risk management effectiveness seems long overdue. We take a step in that direction by analysing the influence of various ERM design alternatives on the perceived quality of the risk management system.

Our results regarding the extent of ERM implementation appear to replicate most of the findings of earlier work in this line of research. Broadly consistent with previous studies, we find that the extent of ERM implementation is influenced by the regulatory environment, internal factors, ownership structure, and firm and industry-related characteristics. These findings indicate that the factors that are associated with ERM adoption are similar across different national contexts. As to risk management effectiveness, we find that the frequency of both risk assessment and risk reporting contribute to the perceived quality of the ERM system. In addition, the use of quantitative methods to

assess risk appears to improve ERM effectiveness. However, our results also raise some concern as to the COSO ERM framework. Particularly, we find no evidence that application of the COSO framework improves risk management effectiveness. Neither do we find support for the mechanistic view on risk management that is implicit in COSO's recommendations on risk appetite and tolerance. These findings might be taken to suggest that this framework does not fully live up to its purpose, which is to help organisations establish sound risk management.

The remainder of this paper is structured as follows. In Section 2, we provide information on the data-set. Section 3 reports on the examination of the extent of ERM implementation. Section 4 explores ERM design choices and their impact on risk management effectiveness. Finally, Section 5 discusses the findings and limitations of this study.

2. Data Collection and Sample

The survey data we rely on in this paper have been made available to us by a research team involving representatives from PwC, Royal NIVRA (the Dutch Institute of Chartered Public Accountants), the University of Groningen and Nyenrode Business University.³ The composition of this team was quite diverse, bringing together individuals from different professional backgrounds, including two academics specialising in risk management (one of which also has extensive practical experience in internal auditing), a researcher employed by the professional association of auditors and an experienced risk management consultant. To capitalise on these various backgrounds, the design of the questionnaire was set up as a joint team effort. A pre-test among four risk managers and internal auditors confirmed the relevance, composition and clarity of wording of the survey questions.

The aim of the research team was to provide a broad, factual picture of current ERM practices and issues in the Netherlands for an audience of practitioners in the field. Although the research team was familiar with the academic literature in the field and used this literature in the construction of the survey, it had no *ex ante* intention to connect to this literature, and it paid no explicit attention to scholarly scale construction, validation and measurement considerations. As a consequence, some of the variables on which we rely in this paper are somewhat naive. In addition, because the questionnaire has not been designed with the specific purposes of the current study in mind, the match between the available information and the concepts on which we rely in our analyses is not always perfect. Nevertheless, we believe that the data remain valuable because they provide an informative glimpse into ERM adoption, design choices and effectiveness.

Using information from company.info, the research team identified organisations located in the Netherlands with annual revenues of more than EUR 10 million and more than 30 employees. A total of 9579 organisations appeared

Table 1. The data-set

	Mean	Std. dev.	Min	Median	Max
Revenue (\times € million)	791	5213	11	65	85,000
Number of employees	1177	4.809	31	260	80,000
Industry	Number	%			
Wholesale and retail	104	12.6			
Transportation	40	4.8			
Manufacturing	149	18.1			
Financial services	45	5.5			
Business services	88	10.7			
Telecom and IT	33	4.0			
Energy and utilities	25	3.0			
Public sector and not-for-profit	334	40.5			
Unknown	7	0.8			

to fit these cumulative criteria. The survey was mailed to the board of these organisations in May 2009, asking them to respond within four weeks. To increase the response rate, the team ran a series of ads in several professional journals, announcing the project and emphasising the importance of respondent cooperation. Two hundred and forty questionnaires were undeliverable. Of the remaining 9339 surveys, 928 were returned, resulting in an overall response rate of 9.9%. Upon closer inspection, 103 responses were found not to match the initial selection criteria after all, leaving a final sample of 825 observations. Respondents were board members or CFOs (56%), controllers (20%) or (risk) managers (24%).⁴

We have no data to examine representativeness in a formal, quantitative way. The sample, however, comprises a relatively large number of (semi-)public sector and not-for-profit organisations (40.5%). We shall control for the potential influence of this dominance in the various analyses. The private sector part of the sample is varied in terms of organisational size and industry, and contains no obvious biases. Table 1 gives a general description of the data-set.

3. Antecedents of ERM Implementation

The idea that ERM is a key component of effective governance has gained widespread acceptance. Nevertheless, organisations vary in the extent to which they have adopted it. Some organisations have invested in sophisticated ERM systems, whereas others rely on rather ad hoc responses to risks as they become manifest. In this section of the paper, we explore a number of factors that may help to explain the level of development of ERM practices across organisations. Building on previous studies, we identify five broad groups of factors that we expect to be associated with the extent of ERM implementation: (1)

regulatory influences; (2) internal influences; (3) ownership; (4) auditor influence; and (5) firm and industry-related characteristics.

3.1. Factors Affecting Implementation: Expectations

Regulatory influences

In many countries, regulators are pressing firms to improve risk management and risk reporting (Collier *et al.*, 2006; Kleffner *et al.*, 2003). Examples of such regulatory pressure include the NYSE Corporate Governance Rules and the Sarbanes–Oxley Act in the USA, the Combined Code on Corporate Governance in the UK and the Dutch Corporate Governance Code, also known as the Tabaksblat Code. These codes apply to publicly listed firms, and require firms to maintain a sound risk management system. Corporate governance regulation, however, has not been confined to publicly traded companies. Governance rules are also common in parts of the (semi-) public and not-for-profit sector. In addition, some trade associations demand compliance with a governance code as a membership requirement. Like the formal rules that apply to listed companies, these codes typically call for some form of systematic risk management, and we expect that many ERM initiatives arose because of this regulatory pressure (cf. Collier *et al.*, 2006). Accordingly:

H1: Corporate governance regulation is positively associated with the degree of ERM implementation.

Regulatory pressure differs in intensity. Some governance codes are mandatory (e.g. the stock exchange rules and the Dutch public sector codes), whereas others are being presented as optional ‘best practices’. Moreover, to the extent that the codes are in fact mandatory, the intensity of enforcement varies. In the Netherlands, the enforcement of corporate governance regulation seems to be rather weak, except for firms listed on the Amsterdam Stock Exchange. In the discussion leading to H1, we argued that regulatory pressure is a driver of ERM implementation. However, when corporate governance codes are non-binding or when enforcement is weak, this pressure might be easy to ignore. Listed firms are subjected to a special class of regulation, and for these firms, non-compliance is a less viable option. Therefore:

H2: Listed firms have more fully developed ERM systems than non-listed organisations.

Internal influences

The decision to implement ERM is rather consequential, affecting the entire organisation and implying major organisational change. Such far-reaching decisions require strong support from senior management. To emphasise

their commitment to ERM, many organisations choose to locate ultimate responsibility for risk management explicitly at the senior executive level by appointing a Chief Risk Officer (CRO). Presumably, senior executive leadership is a powerful catalyst for organisational change, and could significantly speed up the process of ERM implementation (Beasley *et al.*, 2005, 2008):

H3: The presence of a CRO is positively associated with the degree of ERM implementation.

Another internal factor to affect ERM development is the presence of an audit committee. Audit committees play an important role in the oversight of risk management practices. In this monitoring role, they can influence the board to ensure that ERM gets adequate management attention, and that sufficient resources are allocated to further ERM development:

H4: The presence of an audit committee is positively associated with the degree of ERM implementation.

Ownership

Liebenberg and Hoyt (2003) argue that pressure from shareholders is an important driving force behind ERM adoption (cf. also Mikes, 2009). Proponents of ERM claim that shareholders benefit from integrated risk management because ERM enables companies to improve risk-adjusted decision-making and increase firm value. If that is true, shareholders are likely to be keen ERM supporters. The effectiveness of shareholder pressure, however, differs across firms. If ownership is dispersed, management might find it relatively easy to ignore shareholders' preferences – at least temporarily. However, institutional investors are more likely to be heard. This additional influence of institutional investors arises from two related sources (Kane and Velury, 2004): (1) as institutional owners hold large shares in the firm, they control a substantial part of the voting rights that can be employed directly to influence management, and (2) the control of large institutional block holders over the supply of capital is such that they can affect the cost of capital of the firm, which ensures a greater receptiveness on the side of management to their preferences – perhaps even to the extent that they no longer need to voice their wishes explicitly, but can expect management to anticipate these preferences. Consistent with this reasoning, Liebenberg and Hoyt (2003) suggest that a higher degree of institutional ownership increases the effectiveness of shareholder pressure, which in turn is positively associated with the extent of ERM adoption:

H5: Institutional ownership is positively associated with the degree of ERM implementation.

Arguably, insider owners have even more influence over management than institutional owners, especially if they hold a controlling share in the firm. This is the case in owner-managed firms in which ownership and control coincide. However, owner-managers have less incentive to press for ERM. Because agency problems between owners and management are absent in owner-managed firms, the value of ERM is lower in such firms, *ceteris paribus*. Further, owner-managers tend to rely less on formal control systems (Lovata and Costigan, 2002), which makes them unlikely sponsors of ERM. Therefore:

H6: Owner-managed firms have less developed ERM systems.

Auditor influence

In the auditing literature, it is often proposed that larger auditing firms (i.e. the Big 4) provide higher audit quality (see DeAngelo, 1981 for a classic reference and Francis, 2004 for a recent overview). Such high-quality audit firms may be more persuasive in encouraging clients to improve their ERM systems and practices. In addition, it might be the case that organisations that select high-quality auditors are also more committed to risk management (Beasley *et al.*, 2005), and perhaps to good governance in general. Both lines of reasoning seem to imply that firms that engage a Big 4 audit firm are likely to have more elaborate ERM systems:

H7: Engagement of a Big 4 audit firm is positively associated with the degree of ERM implementation.

Firm and industry-related characteristics

For some firms, the value of ERM is larger than for others. Liebenberg and Hoyt (2003) hypothesise that ERM is especially important for firms that experience significant growth (cf. also Beasley *et al.*, 2008; Gordon *et al.*, 2009). Such firms face more uncertainties and require better risk management to control the risks that emerge, but also to include the risk profile of various growth opportunities in organisational decision-making (Collier *et al.*, 2007; Liebenberg and Hoyt, 2003). Thus:

H8: Organisational growth is positively associated with the degree of ERM implementation.

The size of the organisation is also likely to affect the extent of ERM adoption (Beasley *et al.*, 2005; Kleffner *et al.*, 2003). Presumably, there are considerable economies of scale involved in operating an ERM system, and it may well be the case that only larger organisations can afford a fully functional ERM system. In addition, larger firms tend to be more formalised, which may be conducive to ERM adoption:

H9: Organisational size is positively associated with the extent of ERM implementation.

Several studies in the ERM literature have proposed the existence of industry effects. It is commonly assumed that firms in the financial services industry are especially likely to embrace ERM (Beasley *et al.*, 2005; Kleffner *et al.*, 2003; Liebenberg and Hoyt, 2003). Since the release of Basel II, banks have strong incentives to adopt ERM as that may help to reduce capital requirements (Liebenberg and Hoyt, 2003; Mikes, 2009; Wahlström, 2009). In addition, ERM facilitates better disclosure of the firm's risk exposure. This is especially important in the banking industry, in which it is relatively easy for firms to opportunistically change their risk profiles. Improved disclosure provides a means to make a credible commitment against this behaviour, thus lowering the cost of capital (Liebenberg and Hoyt, 2003).

Another sector that seems more prone to ERM adoption is the energy industry. Kleffner *et al.* (2003) report that energy firms are relatively heavy ERM users, which they ascribe to the volatile markets in which these firms operate. Because ERM may reduce earnings volatility (Liebenberg and Hoyt, 2003), firms in such markets may value ERM more than firms that face stable market conditions. Accordingly:

H10: Firms in the financial services industry (**H10a**) and energy sector (**H10b**) have more fully developed ERM systems than firms in other sectors of the economy.

Unlike previous studies in this line of research, our sample includes public sector and not-for-profit organisations. The surge of risk management has not been confined to the private sector, but has affected the public sector too. Mirroring the private sector, the public sector now commonly sees risk management as an important dimension of good governance and as an aid in the achievement of organisational objectives (Woods, 2009). The various governance codes that have been implemented in parts of the public sector are an expression of this. There is nevertheless reason to believe that the diffusion of ERM has been slower in the public sector relative to the private sector. Operating in a complex and political environment, public sector organisations may find it particularly hard to operationalise their risk management agenda. In addition, available risk management tools and techniques tend to be highly analytical and data driven (Mikes, 2009), which may not accord very well with the dominant culture and management style in the public sector (cf. Bhimani, 2003; Mikes, 2009). These considerations suggest that public sector organisations can be expected to have less developed ERM systems:

H11: Relative to private sector firms, public sector organisations have less developed ERM systems.

3.2. Summary of Expectations and Measurement of Variables

Table 2 summarises the expectations and describes the measurement of the relevant variables.

Almost all variables are factual and are based on straightforward survey questions that do not pose special measurement issues. The exception is the dependent

Table 2. Summary of expectations and measurement of variables

Dependent variable:

Extent of ERM implementation (STAGE). Ordinal scale, adapted from Beasley *et al.* (2005):

- 1 = risk management is mainly incident-driven; no plans exist to implement ERM
- 2 = we actively control risk in specific areas (e.g. health & safety, financial risk); we are considering to implement a complete ERM
- 3 = we identify, assess and control risk in specific areas; we are planning to implement a complete ERM
- 4 = we identify, assess and control strategic, financial, operational and compliance risks; we are in the process of implementing a complete ERM
- 5 = we identify, assess and control strategic, financial, operational and compliance risks; ERM is an integral part of the (strategic) planning & control cycle

Expectation

Regulatory influences:

- Governance code (+)
- Stock exchange listing (+)

Internal influences:

- Chief Risk Officer (+)
- Audit Committee (+)

Ownership:

- Institutional ownership (+)
- Owner-managed firm (-)

Auditor influence:

- Big 4 audit firm (+)

Firm/industry characteristics:

- Growth opportunities (+)
- Size (+)
- Industry effects:
 - o Financial services (+)
 - o Energy (+)
 - o Public sector (-)

Measurement

GOVERNCODE and STOCKEX are dummy variables that take on a value of 1 if the organisation is listed (STOCKEX) or when governance rules apply (GOVERNCODE).

CRO and AUDITCOM are dummy variables that take on a value of 1 if a Chief Risk Officer (CRO) or an audit committee (AUDITCOM) is present.

INSTOWNER and OWNERMAN are dummy variables that take on a value of 1 if the majority of shares are owned by institutional investors (INSTOWNER), or if the firm is managed by an owner holding a controlling share (OWNERMAN).

BIG4 is a dummy variable that takes on a value of 1 if the auditor is a Big 4 audit firm.

GROWTH is an ordinal variable expressing the average yearly growth of revenues over the last three years (1 = less than 10%, 2 = between 10 and 25%, 3 = more than 25%).

lnREVENUE is indicative of size and is calculated as the natural log of revenue (or the size of the budget in case of public sector organisations).

FINSERV, ENERGY and PUBSEC are industry dummies that take on a value of 1 if the organisation belongs to the financial services industry, the energy sector or the public sector.

variable, that is, the extent of ERM implementation (STAGE). STAGE is measured using an ordinal scale, based on Beasley *et al.* (2005), but adapted to suit the research interests of the team that constructed the survey (see Section 2). Specifically, whereas the original scale of Beasley *et al.* was based on broad statements regarding (intentional) ERM implementation,⁵ the survey items on which we rely contain additional descriptive detail regarding manifest ERM practices. From the perspective of the current study, these adaptations are potentially problematic because the added description of actual practices in a particular answer category need not coincide with the ERM intentions described in that same category. For instance, it is possible that an organisation actively controls risk in specific areas (which should lead to a score of 2 or 3 on STAGE; see Table 2), yet has no intentions to implement full-scale ERM (which should lead to a score of 1). However, although this problem is quite serious in principle, it does not appear to be so in fact. As none of the respondents checked more than one of the relevant categories (which they could have done given the technical design of the questionnaire), respondents apparently had no major difficulty in scoring their organisations on the scale. This suggests that in the real world as perceived by the respondents, the answer categories are descriptively accurate after all.

The questionnaire contains additional information to support the implementation metric on which we rely. Respondents were asked to provide information on the scope of their periodic risk identification and assessment efforts by indicating whether or not they include each of the categories strategic, financial, operational, reporting and compliance risks in the exercise. Because ERM is characterised by its broadness and comprehensive ambitions, the scope of risk assessment is a highly relevant indicator of the extent of ERM implementation,⁶ and we expect a significant correlation between the scope of risk assessment (measured by the number of risk categories included in periodic risk assessment) and STAGE. In support of our implementation proxy, the data corroborate this expectation ($r = 0.397$; $p = 0.000$). In addition, a factor analysis confirms that both variables load on a single factor.

3.3. *Analysis and Results*

Table 3 provides an overview of the descriptive statistics. These statistics show that approximately 11% of the organisations in the sample report having a fully functional ERM system in place. Another 12.5% is currently in the process of implementing such a system. Fourteen per cent do not seem to have a systematic and proactive approach to risk management.

Table 4 presents the correlation matrix. The bivariate correlations indicate that the extent of ERM implementation is associated with most of the independent variables discussed in Section 3.1, providing some initial evidence in support of the hypotheses. The matrix also indicates that the correlations between the independent variables are low, and prompt no multicollinearity concerns.

Table 3. Descriptive statistics extent of implementation

Ordinal and ratio variables					
	Mean	Std. dev.	Min	Median	Max
STAGE	2.68	1.190	1	2	5
GROWTH	1.34	0.557	1	1	3
lnREVENUE	4.43	1.447	2.35	4.17	11.35
Distribution of ordinal variables over response categories					
	1	2	3	4	5
STAGE	114 (14.0%)	318 (38.9%)	192 (23.5%)	102 (12.5%)	91 (11.1%)
GROWTH	571 (70.6%)	203 (25.1%)	35 (4.3%)	–	–
Nominal variables					
	Yes (= 1)	No (= 0)			
GOVERNCODE	492 (60.8%)	317 (39.2%)			
STOCKEX	75 (9.1%)	747 (90.9%)			
CRO	154 (18.8%)	666 (81.2%)			
AUDITCOM	399 (51.3%)	420 (48.7%)			
INSTOWNER	82 (10.6%)	688 (89.4%)			
OWNERMAN	123 (16.0%)	647 (84.0%)			
BIG4	625 (77.2%)	185 (22.8%)			
FINSERV	45 (5.5%)	773 (94.5%)			
ENERGY	25 (3.1%)	793 (96.9%)			
PUBSEC	334 (40.8%)	484 (59.2%)			

Because the dependent variable (extent of ERM implementation; STAGE) is measured on an ordinal scale, and because most of the independent variables are categorical, we test the hypotheses using ordinal logistic regression. Table 5, panel A reports the results of this analysis. The model appears to fit the data quite well ($\chi^2 = 152.767$, $p = 0.000$; Cox and Snell pseudo $R^2 = 0.193$). Further, the test of parallel lines (not reported) indicates that the slope coefficients are the same across the various levels of the dependent variable and that, consequently, ordinal logistic estimation is appropriate. Due to missing values on some variables for various cases, we lose a number of observations in the regression, and the sample size drops from 825 to 714.

The results offer support for several of our expectations. We find that publicly traded firms do in fact have more mature ERM systems (H2), whereas owner-managed firms appear less inclined to invest in ERM development (H6). In addition, we find the presence of both a CRO (H3) and an audit committee (H4) to contribute to the degree of ERM implementation. Finally, we observe that larger organisations (H9) and firms in the financial sector (H10a) tend to have more sophisticated ERM systems. These results are generally consistent with the findings of previous studies.

Contrary to hypothesis H5, we do not find an effect for institutional ownership. A potential explanation could be that in the Netherlands, institutional block holders are traditionally rather reluctant to interfere with management.

Table 4. Spearman correlation matrix (extent of implementation)

	1	2	3	4	5	6	7	8	9	10	11	12
1: STAGE	1											
2: GOVERNCODE	0.198***	1										
3: STOCKEX	0.216***	0.194***	1									
4: CRO	0.245***	0.108***	0.105***	1								
5: AUDITCOM	0.283***	0.183***	0.409***	0.208***	1							
6: INSTOWNER	0.143***	0.286***	-0.005	0.078**	0.100***	1						
7: OWNERMAN	-0.167***	-0.088**	-0.291***	-0.051	-0.304***	-0.151***	1					
8: BIG4	0.117***	0.101***	0.214***	0.016	0.236***	0.094*	-0.252***	1				
9: GROWTH	0.010	0.104***	-0.063*	0.028	-0.106***	0.162***	0.149***	-0.106***	1			
10: lnREVENUE	0.261***	0.192***	0.163***	0.021	0.222***	0.115***	-0.175***	0.230***	-0.042	1		
11: FINSERV	0.150***	-0.019	0.030	0.077**	0.115***	0.222***	0.004	0.080**	0.024	0.119***	1	
12: ENERGY	0.064*	-0.006	-0.032	0.024	0.054	0.038	-0.014	-0.006	0.074*	0.023	-0.043	1
13: PUBSEC	-0.045	-0.226***	0.289***	-0.057	0.254***	-0.239***	-0.336***	0.189***	-0.282***	-0.032	-0.200***	-0.147***

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$ (2-tailed).

Table 5. Ordinal logistic regression results

	Estimate ^a	Std. error	Wald	<i>p</i> (2-tailed)
Panel A: full sample results				
Dependent variable: STAGE				
Sample: 825; included observations: 714				
GOVERNCODE	0.180	0.166	1.184	0.276
STOCKEX	0.674	0.273	6.072	0.014
CRO	0.882	0.180	23.890	0.000
AUDITCOM	0.577	0.166	12.048	0.001
INSTOWNER	0.142	0.249	0.326	0.568
OWNERMAN	-0.419	0.221	3.596	0.058
BIG4	0.168	0.178	0.884	0.347
GROWTH (= 2)	0.017	0.364	0.002	0.963
GROWTH (= 3)	0.065	0.354	0.034	0.854
lnREVENUE	0.226	0.054	17.495	0.000
FINSERV	0.857	0.343	6.247	0.012
ENERGY	0.275	0.397	0.481	0.488
PUBSEC	-0.202	0.185	1.196	0.274
$\chi^2 = 152.767$; $p = 0.000$				
Cox and Snell pseudo $R^2 = 0.193$				
Panel B: sample excluding (semi-) public sector and not-for-profit organisations				
Dependent variable: STAGE				
Sample: 484; included observations: 424				
GOVERNCODE	0.119	0.214	0.309	0.578
STOCKEX	0.787	0.289	7.394	0.007
CRO	0.876	0.229	14.614	0.000
AUDITCOM	0.593	0.237	6.242	0.012
INSTOWNER	0.142	0.262	0.293	0.588
OWNERMAN	-0.409	0.226	3.287	0.070
BIG4	0.153	0.210	0.526	0.486
GROWTH (= 2)	0.188	0.389	0.232	0.630
GROWTH (= 3)	0.265	0.379	0.489	0.484
lnREVENUE	0.194	0.063	9.359	0.002
FINSERV	0.854	0.347	6.049	0.014
ENERGY	0.274	0.398	0.475	0.491
$\chi^2 = 119.035$; $p = 0.000$				
Cox and Snell pseudo $R^2 = 0.245$				

^aTo facilitate interpretation, the estimates we report for dummy variables express the effect when the variable of interest takes on a value of 1. For example, the positive estimate we report for the variable CRO in panel A (0.882, $p = 0.000$) indicates that firms that have a CRO also have more fully developed ERM systems (i.e. higher scores on STAGE), *ceteris paribus*. This is different from the output generated by most statistical software packages (including SPSS) that typically return estimates expressing the effect when the variable of interest is zero.

However, Liebenberg and Hoyt (2003) did not find an effect in their US-based sample either. This could mean that investors do not value ERM adoption after all. However, it can also mean that if ERM contributes to shareholder value

creation, companies will invest in ERM regardless of explicit shareholder pressure. Our data do not allow us to differentiate between these rival explanations.

The analysis does not lend support for the supposed influence of governance codes (H1), suggesting that governance regulation and the associated pressure to invest in risk management do not affect ERM development. However, we do find that listed firms have more fully developed ERM systems (as per H2). In conjunction, these findings might be taken as evidence that strong code enforcement (which is typically absent, except for stock exchange regulation) is required to affect the risk management behaviour of organisations. However, these findings are also consistent with an alternative explanation that holds that the absence of significant differences between organisations that are subject to governance regulation and those to which no governance codes apply is caused by widespread voluntary adoption of corporate governance regulation by the latter group (cf. Deumes and Knechel, 2008), and that sustains that the effect of stock exchange listing has nothing to do with stricter enforcement, but merely indicates that listed firms are more sophisticated in general. The data do not allow a further examination of these alternative explanations.

Prior studies provide mixed evidence on the effect of growth (H8). Gordon *et al.* (2009) report a positive effect of growth opportunities on the extent of ERM implementation. The results of Beasley *et al.* (2008) and Liebenberg and Hoyt (2003), however, do not support this finding. The results of our study are also negative in this respect. However, it should be emphasised that our sample includes only 35 firms reporting high growth. Additional analysis (details not reported here) shows that many of these high-growth firms are owner-managed (42%), and that almost all of them are small. Given these numbers, our null finding may not be very instructive.

It is interesting to note that in our analysis, auditor quality (H7) has no effect on ERM development. This is at odds with Beasley *et al.* (2005), who did find a significant and positive auditor effect. An explanation of this difference can perhaps be found in the high quality of the Dutch audit profession. At least the Dutch professional association of certified accountants believes that the quality of the Dutch CPA is truly world class, even in smaller firms. If this is actually true, there is no reason to expect that auditor identity matters in this Dutch sample after all.

Finally, the industry effects (H10 and H11) seem to be limited to the financial services sector. We observe no effects for the energy sector. However, the number of energy firms in our sample is very small (25, or only about 3% of the total sample size). Neither do we observe a public sector effect, suggesting that ERM implementation is not hindered by the inherently larger complexity of the political environment in which public sector organisations operate.

3.4. Additional Analysis

Despite the fact that we do not observe a public sector effect in the previous analysis, we cannot rule out the possibility that the results of this analysis are affected by the dominance of (semi-) public sector and not-for-profit organisations in our sample (as reported in Table 1, 40.5% of the observations come from such organisations). For this reason – and also to facilitate comparison with previous studies in this line of research (e.g. Beasley *et al.*, 2005; Kleffner *et al.*, 2003) – we rerun the analysis with a sample that excludes these organisations. The results of this additional analysis are in Table 5, panel B. The findings are qualitatively similar to the full sample results, and reinforce our original inferences.

4. ERM Design and Perceived Effectiveness

In configuring their ERM systems, organisations need to face numerous design choices. Over the years, a large industry has emerged to assist firms in making these choices. In addition, several semi-regulatory bodies have published frameworks to guide organisations in their ERM design and implementation efforts. The best-known example is the COSO ERM framework (COSO, 2004a). This framework, however, only provides very broad guidance, suggesting key principles and concepts but leaving the details to the adopting organisations themselves. That is to say, COSO does actually attend to the everyday details of risk management practice, but only in an annex to the framework (COSO, 2004b). This annex is explicitly not part of the framework itself, but intends to provide practical illustrations that might be useful to those seeking to apply ERM techniques. COSO emphasises that these illustrations should not be interpreted as preferred methods or best practices.

COSO's cautious and unassuming position as to the practical side of ERM is quite sensible, given the paucity of evidence-based knowledge of effective ERM system design. Comprehensive ERM theories do not exist, and as far as we know, there are no empirical studies that systematically document specific ERM practices and their contribution to ERM effectiveness.⁷ Therefore, we must assume that the application techniques described in the annex are based on anecdotal evidence at best, and COSO is right not to present these illustrations as actual prescriptions. However, as a consequence, ERM-adopting organisations face very open-ended design problems, with little concrete guidance at the operational and instrumental level.

The data-set that has been made available to us includes information on specific ERM design choices, particularly in the areas of risk identification and assessment, and risk reporting and monitoring. We also have information on risk tolerance definition. These data allow us to describe current practices, tools and techniques in these areas, providing a broad overview of their incidence and prevalence. In addition, the data-set contains information on perceived risk

management effectiveness, providing the opportunity empirically to examine possible relationships between ERM practices and effectiveness. This analysis will be distinctly exploratory in nature. We have no clear theory to build on. Neither is there any prior empirical research to inform a systematic development of hypotheses. Therefore, we shall structure the analysis around a number of research questions, and instead of trying to test theory, we shall focus the analysis on finding answers to these questions. We organise the research questions in three broad themes, corresponding with the areas identified above, that is, risk tolerance, risk identification and assessment, and risk reporting and monitoring. However, we begin with a preliminary question: does application of the COSO framework help organisations to implement an effective ERM system?

4.1. ERM Design Choices

The 2004 COSO report is generally viewed as the most authoritative ERM framework. Given this reputation, one would expect to observe widespread application of the framework in practice. Furthermore, if this framework deserves its reputation, one would expect that its application improves risk management effectiveness. Whether this is empirically true, however, is still an open question. Hence:

Q1: Does application of the COSO ERM framework contribute to risk management effectiveness?

Risk tolerance

The entity's risk appetite is a key concept in the COSO ERM framework. Risk appetite refers to 'the amount of risk, on a broad level, an entity is willing to accept in pursuit of value' (COSO, 2004a, p. 19). Risk appetite, thus, expresses the organisation's risk attitude at the level of the organisation as a whole. Risk appetite is the starting point of COSO-type ERM, and according to COSO, organisations need to consider and define their risk appetite, essentially as a precondition for successful risk management. Risk appetite may be expressed in qualitative or quantitative terms, and COSO declares to be indifferent between these two options. However, the COSO framework also proposes that in addition to the expression of the entity's high-level risk attitude, organisations need to define their risk attitudes at a lower level of aggregation, that is, at the level of specific objectives. At this lower level, COSO refers to the notion of risk tolerance, which is 'the acceptable level of variation relative to achievement of a specific objective' (COSO, 2004a, p. 20). These risk tolerances are a further specification of the entity's high-level risk appetite, and they should help the organisation to remain within the boundaries of its stated risk appetite. At this lower level, COSO conveys a clear preference for quantification: 'risk tolerances can be measured, and often are best measured in the same units as the related objectives' (COSO, 2004a, p. 40).

In these recommendations on risk appetite and tolerance, COSO espouses a highly mechanistic view on risk management. It is, however, uncertain whether such a view is realistic and practicable. For instance, Collier *et al.* (2007) find that subjective, heuristic methods of risk management are much more common than the systems-based approaches advocated in much professional training and in the professional literature. Power (2009) argues that the idea of organisation-wide risk appetite and risk tolerance assumes that organisations are unitary and intentional actors, which he regards as reductive, simplistic and potentially misleading. In addition, COSO works from a very traditional perspective on human decision-making in which agents are fully rational and risk attitudes are explicable and stable. Such a perspective is hard to maintain in the face of years of behavioural studies documenting systematic biases and situational and path dependencies in risky choice problems (e.g. Thaler and Johnson, 1990; Tversky and Kahneman, 1992; see also Power, 2009).⁸ These divergent positions feed into the second research question:

Q2: Does explication and quantification of risk tolerance improve risk management effectiveness?

Risk identification and assessment

Organisations need to address the question as to the frequency of risk identification and analysis. How often should the organisation go over the risks to ascertain the availability of sufficient up-to-date information to act upon? Risk exposure is not static, and it is plausible to assume that the frequency of risk assessment should keep pace with changes in the environment. Additionally, some minimum level of frequency may be required to ensure that risk management becomes ingrained sufficiently deeply in the functioning of the organisation, and to prevent it from becoming a merely ceremonial compliance exercise (cf. Arena *et al.*, 2010). The COSO framework is silent on these issues, but they seem important nonetheless:

Q3: Is the frequency of risk assessment associated with risk management effectiveness?

Another choice variable in the area of risk identification and assessment is the number of management levels to include in the risk appraisal exercise. Is it sufficient to localise risk assessment at the senior management level? Alternatively, is it better to involve middle management as well? And if so, how far down does one need to go? Although COSO does not provide a clear answer to these questions, it does indicate that even though the CEO has ultimate responsibility for ERM, ERM is 'the responsibility of everyone in an entity and therefore should be an explicit or implicit part of everyone's job description' (COSO, 2004a, p. 88). This seems altogether reasonable, not just from a shared responsibility

perspective, but also from an information asymmetry point of view: if middle managers enjoy an information advantage as to the specifics of their business units or departments, it makes sense to engage them in risk identification and assessment:

- Q4:** Does engagement of lower levels of management in risk assessment contribute to risk management effectiveness?

Formally, COSO requires organisations to apply a combination of qualitative and quantitative risk assessment techniques. However, a closer reading of the discussion in the COSO report (2004a, p. 52) strongly suggests that this requirement is merely a diplomatic way to express COSO's preference for quantification, and that the provision actually means that organisations should not rely on qualitative methods alone, but should apply quantitative techniques if at all possible. Accordingly:

- Q5:** Is the use of quantitative risk assessment techniques positively associated with risk management effectiveness?

Risk reporting and monitoring

The process of risk management – from initial risk identification via risk response selection to monitoring and evaluation – requires relevant, timely and reliable information, and organisations that implement ERM need to invest in information systems to support the risk management function. The COSO ERM framework acknowledges this need, but its guidance as to the actual set-up of these information systems is highly generic. COSO does, however, argue that monitoring should ideally proceed on an ongoing basis, as continuous monitoring is more effective than separate evaluations (cf. COSO, 2004a, pp. 75–76): separate evaluations take place after the fact and, consequently, are less able to assure a timely response to problems as and when they occur. This suggests that high-frequency risk reporting is valuable, and may enhance the quality of risk management:

- Q6:** Does the frequency of risk reporting positively affect risk management effectiveness?

In discussing the contents of risk reporting, COSO emphasises the need to report all identified ERM deficiencies (COSO, 2004a, p. 80). Internal risk reporting, however, will typically be broader. The process of risk management can meaningfully be conceptualised in terms of Demski's decision-performance control framework. This framework emphasises both the need for feedforward information to calibrate and feed the decision model to arrive at an 'optimal' decision (e.g. the organisation's risk response), as well as feedback information to monitor

the implementation of the risk response policy and to adapt the model and its implementation to environmental disturbances (cf. Demksi, 1969). To support monitoring and model calibration, internal risk reporting should include retrospective diagnostic data on current risk profiles and ongoing risk management processes. For feedforward purposes, organisations might also demand prospective information as part of their regular risk reporting practices, for example, information on important internal or external changes that may affect their risk exposure and that should be included in future decision-making. It seems plausible to assume that risk management effectiveness is affected by the richness of both this retrospective and prospective information:

Q7: Does the richness of retrospective (**Q7a**) and prospective (**Q7b**) risk reporting enhance risk management effectiveness?

Control variables

Our sample contains data from organisations in varying stages of ERM implementation. Some have fully fledged ERM systems in place, whereas others have adopted ERM, but are still in the process of implementation. Stage of implementation is likely to have an effect on perceived risk management effectiveness. In addition, it may be the case that the extent of implementation is correlated with various specific design choices. For these reasons, we control for differences in ERM implementation in the analysis. We also control for size and potential industry effects. Consistent with previous research, we found that firms in the financial services industry tend to have more fully developed ERM systems in place (see Section 3). However, because the value of these systems is typically higher in the financial services industry than in other sectors, it might well be that the aspiration level as to the quality of the risk management system is higher here as well. This would imply that perceived effectiveness is lower, *ceteris paribus*. We also argued in Section 3 that the extent of ERM implementation is likely to be lower in the public sector, because the standard ERM approach does not seem to fit very well with the political environment in which public sector organisations operate, nor with the dominant culture and management style of these organisations. The data, however, did not support these contentions, and we observed no differences in ERM implementation between the public and the private sector. However, it is still possible that there is a public sector effect in the analysis of risk management effectiveness, and we explore this possibility by including a public sector dummy in the model.

4.2. Summary of Research Questions and Measurement of Variables

In Table 6, we summarise the research questions and describe the operationalisation of the variables. Most variables are rather factual in nature, and are based on relatively uncomplicated survey questions that do not require much interpretation

Table 6. Research questions and measurement of variables

Dependent variable:

Effectiveness (EFFECTIVENESS) is measured by asking respondents to score the quality of their risk management on a 10-point scale (1 = deeply insufficient, 6 = adequate, 10 = excellent)

Research question

Application of COSO

Measurement

COSO is a dummy variable that takes on a value of 1 if the organisation reports application of COSO.

Risk tolerance:

- Explication/quantification of risk tolerance (TOLERANCE)

TOLERANCE is measured using an ordinal scale:

- 1 = no explication of risk tolerance
- 2 = risk tolerance is explicated in qualitative terms
- 3 = risk tolerance is quantified

Risk identification and assessment:

- Frequency of risk assessment (ASSESSFREQ)
- Engagement of lower management levels (LEVEL)
- Quantitative risk assessment (QUANTMETHODS)

ASSESSFREQ expresses the frequency of the entity-wide risk identification/assessment exercise (1 = never, 2 = yearly, 3 = quarterly, 4 = monthly, 5 = weekly).

LEVEL counts the number of management levels involved in risk identification/assessment. A score of 1 means that only the board is involved, 2 means that the exercise includes the board and the management level just below the board, etc. QUANTMETHODS is a dummy that takes on a value of 1 if the organisations use one or more of the following four techniques: scenario analysis, sensitivity analysis, simulation and stress testing.

Risk reporting and monitoring:

- Reporting frequency (REPORTFREQ)
- Richness of reporting: retrospective (RETROSPECT) and prospective (PROSPECT) information

REPORTFREQ indicates how often the organisation reports on risk to internal constituencies (1 = never, 2 = ad hoc, 3 = yearly, 4 = quarterly, 5 = monthly, 6 = weekly).

Both RETROSPECT and PROSPECT count the number of items from a 4-item list that the organisation includes in its standard risk reporting format. The list for RETROSPECT includes general information on risks, the status of risk control activities, critical risk indicators and incidents. The PROSPECT list comprises developments in risk profile, significant internal changes, significant external changes and risk control improvements.

Control variables:

See Table 2.

or judgement on the side of the respondent. This is, however, different for the dependent variable, that is, risk management effectiveness. The scores on this variable are based on the following survey question: ‘how would you rate your organisation’s risk management system on a scale of 1 to 10?’ This question is broad and open, and appears to be designed to capture respondents’ subjective assessment of the contribution of the risk management system to the attainment of the organisation’s (implicit or explicit) risk management objectives. The question does not specify what is meant by a risk management system,⁹ nor the dimensions that should be included in the quality assessment. For our purposes, this is unfortunate, because it forces us to measure an inherently complex and multi-faceted construct with a single survey item. However, the survey contains additional information to support this metric. In another part of the questionnaire, respondents were asked to indicate whether they believe that their risk management system has helped them to cope with the effects of the financial crisis. The scores on this question (measured on a 5-point Likert scale) seem a somewhat narrow but relevant additional indicator of the quality of the risk management system. This alternative proxy correlates significantly with the risk management effectiveness measure on which we rely ($r = 0.197$; $p = 0.000$), suggesting that our measure is at least reasonable.

4.3. Sample Selection and Descriptive Statistics on Current ERM Practices

Consistent with the aims of this study, we base the analysis of ERM practices and effectiveness on the questionnaire responses from the organisations that have actually adopted ERM. We define ERM adopters as organisations that report to be in stage 4 or 5 on the scale we use to measure the extent of ERM implementation (STAGE; see Section 3.2 and Table 2). These organisations have implemented broad and inclusive risk management systems that encompass strategic, financial, operational and compliance objectives, and have integrated ERM in their (strategic) planning and control cycle – or are in the process of doing so. The other organisations in the sample (i.e. those that are in stages 1–3) apply more traditional, silo-based approaches to risk management, and although they may consider ERM as an interesting alternative, they have not (yet) adopted ERM. The number of ERM adopters in the sample is 193. This number includes 55 (semi-) public sector organisations (28.5%) and 25 firms from the financial services sector (13.0%). All the following analyses are based on this subsample of ERM adopters.

Table 7 presents descriptive statistics on perceived risk management effectiveness and the various design choices. The data indicate that the average organisation believes that the effectiveness of its risk management system is quite good (7.33 on a 10-point scale). Only about 4% of the respondents report their system to be less than satisfactory (score ≤ 5 ; details not tabulated), whereas approximately 16% consider their system to be outstanding (score ≥ 9).¹⁰ Despite its acclaimed authority, application of the COSO ERM framework is not

Table 7. Descriptive statistics design and effectiveness variables

Ordinal and ratio variables						
	Mean	Std. dev.	Scale	Min	Median	Max
EFFECTIVENESS	7.33	1.083	1–10	3	7	10
TOLERANCE	1.84	0.906	1–3	1	1.5	3
ASSESSFREQ	2.41	0.801	1–5	1	2	5
LEVEL	2.67	1.154	1–5	1	3	5
REPORTFREQ	4.15	1.035	1–6	1	4	6
RETROSPECT	2.20	1.044	0–4	0	2	4
PROSPECT	1.79	1.282	0–4	0	2	4
STAGE	4.47	0.500	4–5	4	4	5
lnREVENUE	5.09	1.964	–	2.40	4.55	11.35
Nominal variables						
	Yes (= 1)	No (= 0)				
COSO	83 (43%)	110 (57%)				
QUANTMETHODS	114 (60.6%)	74 (39.4%)				

widespread. Only 43% of the organisations in the sample of ERM adopters apply the COSO framework.¹¹ However, this figure might underestimate COSO’s true influence. Casual observation suggests that many organisations have hired consulting firms to help design and implement the ERM system, and it seems plausible that the solution packages offered by these consultants are in fact heavily influenced by COSO. If this is actually the case, the (indirect) impact of COSO on current ERM practices is much larger than the reported application rate suggests. Another interesting fact is that the mean score on TOLERANCE is 1.84, which seems to imply that a quantification of risk tolerance is not very common. This is indeed the case. A further analysis of this variable (not tabulated) reveals that only 31% of the respondents express risk tolerance in quantitative terms. Almost half of the organisations convey that they do not explicate risk tolerance; not even in qualitative terms.

4.4. The Relationship between ERM Design and Effectiveness: Analysis and Results

Table 8 displays the correlation matrix. This matrix provides initial evidence that perceived risk management effectiveness is in fact dependent on most of the design choices identified in Section 4.1, at least in a bivariate analysis. This table also shows that the design choices are to some extent interrelated, as many correlations between the independent variables are significant. The correlations are, however, low enough not to signal multicollinearity issues.¹²

We explore the impact of the various design choices on risk management effectiveness by estimating a multivariate OLS model that includes all design variables on which we have information, and a number of control variables to

Table 8. Spearman correlation matrix (design and effectiveness)

	1	2	3	4	5	6	7	8	9	10	11	12
1: EFFECTIVENESS	1											
2: COSO	0.032	1										
3: TOLERANCE	0.134*	0.019	1									
4: ASSESSFREQ	0.221***	-0.131*	0.130*	1								
5: LEVEL	0.143*	0.193***	0.019	-0.041	1							
6: QUANTMETHODS	0.240***	-0.016	0.290***	0.212***	-0.087	1						
7: REPORTFREQ	0.189***	-0.119	0.103	0.340***	0.047	0.050	1					
8: RETROSPECT	0.011	0.062	0.026	0.046	0.139*	0.028	0.169**	1				
9: PROSPECT	0.051	-0.092	-0.129*	0.124*	0.048	0.147**	-0.061	0.255***	1			
10: STAGE	0.318***	-0.045	0.165**	0.177**	0.206***	0.066	0.001	0.130*	0.065	1		
11: lnREVENUE	0.055	0.346***	0.098	-0.055	0.170**	-0.009	-0.041	0.216***	-0.033	-0.008	1	
12: FINSERV	0.017	0.098	0.075	0.042	0.056	0.119	0.244***	0.324***	0.147**	-0.055	0.044	1
13: PUBSEC	-0.173**	-0.091	-0.078	-0.039	-0.035	-0.197***	-0.267***	0.023	0.049	0.095	-0.098	-0.247***

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$ (2-tailed).

Table 9. OLS regression results

Dependent variable: EFFECTIVENESS				
Sample: 193; included observations: 156				
	Coefficient	Std. error	<i>t</i>	<i>p</i> (2-tailed)
Intercept	4.191	0.690	6.072	0.000
COSO	0.129	0.142	0.909	0.365
TOLERANCE	-0.010	0.079	-0.121	0.904
ASSESSFREQ	0.196	0.090	2.185	0.031
LEVEL	-0.009	0.061	-0.138	0.890
QUANTMETHODS	0.321	0.150	2.137	0.034
REPORTFREQ	0.133	0.075	1.778	0.078
RETROSPECT	0.021	0.073	0.292	0.771
PROSPECT	0.018	0.055	0.327	0.744
STAGE	0.431	0.141	3.064	0.003
lnREVENUE	0.007	0.035	0.201	0.841
FINSERV	-0.248	0.208	-1.195	0.234
PUBSEC	-0.284	0.158	-1.796	0.075

$F = 3.534; p = 0.000$
 $R^2 = 0.229; \text{adjusted } R^2 = 0.164$

capture possible size and industry effects. Due to missing values, we lose 37 observations in this analysis, and we run the model using data from 156 organisations. Table 9 reports the results.

The model explains 22.9% of the variance in the dependent variable (adjusted $R^2 = 0.164$). The regression results show that perceived risk management effectiveness is affected by the extent of implementation: unsurprisingly, organisations that have adopted ERM but are still in the process of implementation are less positive about the effectiveness of their systems than those that have already finalised implementation. Furthermore, the results suggest that application of the COSO ERM framework as such does not help to improve risk management quality (Q1), and that quantification of risk tolerances does not contribute to perceived risk management effectiveness (Q2). These results raise some rather profound questions as to the generally acclaimed authority of COSO as the leading framework in ERM. We defer the discussion of these questions to Section 5.

Several research questions in the areas of risk identification/assessment and risk reporting/monitoring can be answered affirmatively. Thus, we find that the frequency of risk assessment (Q3), the use of quantitative risk assessment techniques (Q5) and the frequency of risk reporting (Q6) contribute to perceived risk management effectiveness. However, we do not find a significant effect for the engagement of lower levels of management (Q4): apparently, devolvement of risk assessment does not generally improve risk management effectiveness. Neither do we find that the richness of retrospective and prospective risk reporting (Q7a and Q7b) helps to advance the quality of risk management.

Organisational size does not seem to matter. There are, however, industry effects. Although firms in the financial services industry do not appear to differ from the average firm in the sample, we do observe a significant negative effect for organisations in the (semi-) public sector. This finding will also be discussed more fully in Section 5.

4.5. Additional Analysis

The sample of ERM adopters contains a relatively large number of (semi-) public sector and not-for-profit organisations (55 organisations, or 28.5% of the sample). Although we included a dummy variable in the analysis to control for sector effects, this does not fully exclude the possibility that the results reported in Table 9 are affected by the relatively large proportion of (semi-) public sector and not-for-profit organisations in the sample. Therefore, we run an additional analysis with a sample that only includes observations from private sector firms. This (untabulated) analysis returns similar results, confirming the original findings.

The questionnaire asked respondents to score the quality of their risk management system on a 10-point scale. This being a rather fine-grained scale, respondents might have had some difficulties in scoring their systems. Although we do expect respondents generally to know whether their risk management is poor, sufficient or excellent, they may have trouble judging whether their system is worth a 7 or a 6. To mitigate this potential problem, we transform the original effectiveness scores into three broader levels of effectiveness,¹³ that is, poor (≤ 5), sufficient (6–7) and excellent (≥ 8), and rerun the analysis, now using logistic regression. The results of this analysis (not tabulated for sake of brevity) are very similar to the original findings, except for the effect of the use of quantitative risk assessment methods (QUANTMETHODS), which is no longer significant. All other findings remain unaffected, reinforcing our earlier inferences.

5. Discussion

In this paper, we examined two main themes relating to ERM. First, we studied the extent of ERM implementation and the factors that may help to explain cross-sectional differences in the level of adoption. In the second part of the study, we explored specific ERM design choices and their association with perceived risk management effectiveness. The first part of the paper builds on the findings of previous research into the extent of implementation (e.g. Beasley *et al.*, 2005; Kleffner *et al.*, 2003; Liebenberg and Hoyt, 2003). Using data from 825 organisations, our study considerably broadens the empirical basis underlying this stream of research. Specifically, whereas prior studies were based mainly on US and Canadian data, we work with data from organisations headquartered in the Netherlands, allowing some insights into the generalisability of the earlier findings in a different institutional context. In addition, unlike earlier studies,

we include small and medium-sized enterprises, as well as public sector organisations. The findings largely corroborate the results of prior work, suggesting that the factors that are associated with ERM implementation are similar across different national contexts. Particularly, we found that publicly traded firms and organisations with a CRO and audit committee have more mature ERM systems, whereas the applicability of corporate governance regulation does not appear to influence ERM adoption. In addition, we found that larger organisations and firms in the financial sector tend to have more sophisticated ERM systems. These results are all consistent with prior empirical work. There is no evidence of an effect of institutional ownership, which is also consistent with previous findings. We do, however, observe that owner-managed firms are less prone to invest in ERM. Earlier studies did not include this factor. Finally, we found no auditor-related influences, suggesting that in the Netherlands, Big 4 and non-Big 4 audit firms are equally effective in promoting high-quality ERM among their clients.

The second part of the paper addresses specific ERM design choices and their relation with risk management effectiveness. As far as we know, our paper is the first larger scale empirical study to examine this relation. In the analysis, we found that the frequency of risk assessment, the use of quantitative risk assessment techniques and the frequency of risk reporting contribute to perceived risk management effectiveness. In addition, we observe that on average, public sector organisations report lower risk management effectiveness than private sector organisations. In the part of the paper focusing on ERM adoption, we argued that public sector organisations may experience unique problems in ERM implementation due to the complex political environment in which they operate and their dominant culture and management style. The data did not corroborate this expectation. However, in conjunction with the negative public sector effect in the analysis of risk management effectiveness, the analysis suggests the following interpretation: it may be the case that in the public sector, organisations seek to conform to general expectations by implementing ERM systems that are relatively sophisticated from a technical point of view, even though the generic ERM concepts, tools and techniques are less effective in a public sector context. This suggests that there may be considerable value in developing an ERM approach that is more tailored to the specific needs and circumstances of the public sector. This seems an important challenge for regulators and standard-setting agencies, and also an interesting research opportunity. Research in this area is remarkably scarce, and further theoretical and empirical work would certainly help to gain a deeper understanding of the functioning of risk management in a public sector context.

Several factors included in the analysis do not appear to affect risk management effectiveness. Some of these null results are perhaps even more interesting than the positive findings. For instance, even though the data might underestimate the true influence of COSO ERM, we found that only 43% of ERM adopters actually use that framework. In addition, we found that application of the COSO ERM

framework does not contribute to risk management effectiveness. These findings raise concern as to the assumed authoritative status of this framework. If the framework is actually good, why do so many firms choose not to use it? Moreover, why are firms that do use it not more successful than those that don't? Another interesting observation is that the majority (66%) of organisations do not quantify risk tolerances. In fact, approximately half of them do not explicate risk tolerances at all. This practice is contrary to COSO, which claims that explication of risk appetite and, subsequently, quantification of risk tolerances is essentially a *conditio sine qua non* for reliable risk management. The regression results, however, indicate that explication and quantification of risk tolerances do not contribute to perceived risk management effectiveness. Taken together, these negative findings challenge the validity of some of COSO's key assumptions. The COSO framework is predicated on the idea that sound risk management should be highly structured, starting with an explicit definition of the organisation's overall risk appetite, followed by a deductive process to decompose the risk appetite into quantified risk tolerances at the level of specific objectives, which subsequently need to be matched with appropriate risk responses and control activities to ensure that the organisation remains within the pre-set boundaries. This mechanistic and technocratic perspective has been criticised for being built on a reductionist notion of organisations as unitary and intentional actors, and for assuming hyperrational human agency (Power, 2009). Our empirical evidence also suggests that this perspective might be misguided. That is to say, the majority of organisations do not seem to embrace COSO's systematic, 'calculative' (Mikes, 2009) approach, and apparently without loss of effectiveness. This may be taken to imply that a less structured, more heuristic approach to risk management is feasible (cf. also Collier *et al.*, 2007; Mikes, 2009). A practical implication of this inference would be that standard setters may wish to reconsider their frameworks to accommodate more subjective and exploratory risk management styles.

Overall, the findings of our study reflect that ERM is still in a developing stage, and that important knowledge gaps remain – both in practice and in academe. Seeking to conform to rapidly increasing expectations from stakeholders and regulators, organisations struggle with the (re-)design of their risk management systems, looking for effective approaches that suit their needs. Although standard setters present ERM as an effective response to risk management challenges, only a minority of respondents (11%) report to have fully functional ERM systems in place, while another 13% is in the process of implementing such a system. A significantly larger group is still considering ERM implementation (39%). These observations indicate that the practice of risk management has not yet matured, and that new and innovative approaches might emerge over time. Remarkably, standard setters appear quite eager to codify 'best practices', apparently ignoring that such practices may be hard to identify at a point in time at which risk management practices are still being tried and tested by organisations. In the meantime, academic research offers precious little guidance to inform the design of

effective risk management systems, and many questions remain unanswered – including some very basic ones. For instance, we have only got a rudimentary understanding of how decision-makers respond to information on risk, and how these responses can be influenced to ensure a proper weighting of risk in the decision. In addition, we know virtually nothing about how organisations integrate risk management in their management control structures to guide the behaviour of lower level managers in decentralised organisations. This list could easily be expanded. Given the relevance of risk management in contemporary organisations, questions such as these should be high on the agenda of the accounting research community (cf. Kaplan, 2011).

This study has several limitations that should be recognised when interpreting the evidence. Although we cherish the permission to use the data, the fact that we rely on secondary data forced us to focus the analysis on the factors on which we have information, rather than on the factors that are most interesting from the point of view of this paper. Fortunately, the two largely coincide. Nevertheless, it would have been interesting to include, for instance, the way in which organisations have integrated risk management in a strategy setting, or to study the impact of the internal environment on risk management effectiveness – to name but a few of the central themes of the COSO ERM framework. For now, we must leave the exploration of these factors to future research.

Another consequence of our reliance on this particular data-set is that some of our measures are rather naive. Most variables are single item metrics. Although this is adequate for the more factual variables (actually, most of the independent variables qualify as such), several other constructs are so complex that measuring them with only one indicator is clearly not ideal. Especially, the measurement of perceived risk management effectiveness could be improved, and we expect future studies to make significant progress in that area. It should also be emphasised that the effectiveness measure is based on perceptions rather than on ‘hard’ data. Therefore, the scores on this measure may be biased, and they may be an inaccurate reflection of the actual contribution of ERM to the functioning of the organisation (cf. Ittner and Larcker, 2001). On the other hand, the organisational position of the respondents seems to ensure that they are knowledgeable about the functioning of the risk management systems and able to make meaningful evaluative statements about these systems. Therefore, we believe that the analysis is at least informative of current risk management practices and of the contribution of elementary design choices to overall risk management quality. As a first step towards a more rigorous, evidence-based understanding of successful risk management practices, this seems well worth the effort.

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Notes

¹In addition to these US-based and Canadian studies, Collier *et al.* (2007) surveyed risk management practices in the UK. However, because their examination of the drivers of ERM implementation is limited to an analysis of bivariate correlations, it is difficult to relate their findings to the other studies in this line of research.

²In our analysis of the factors associated with the extent of ERM implementation, we adopt a similar metric.

³One of the authors of the current paper was involved in this team.

⁴The fact that the respondents come from different functional groups and hierarchical levels does not affect our analyses. We included dummy variables in all regressions to control for possible effects related to the organisational position of the respondents, but found none. The dummies were insignificant in the regressions, and their inclusion did not alter the substantive findings of the analyses. The regression results we report in Sections 3 and 4 exclude the respondent dummies.

⁵The Beasley scale is as follows: (1) no plans exist to implement ERM; (2) investigating ERM, but no decision made yet; (3) planning to implement ERM; (4) partial ERM is in place; and (5) complete ERM is in place (Beasley *et al.*, 2005).

⁶We considered using this information as an alternative to STAGE in the analyses. This, however, is not an attractive option for two reasons. First, using the alternative metric would complicate comparison with the results from previous studies (particularly Beasley *et al.*, 2005). Second, using the alternative metric would cost us well over 200 observations due to missing values (the survey instrument instructed respondents only to complete the relevant questions in specific circumstances).

⁷To the best of our knowledge, the only study that explores the relationship between ERM design and effectiveness is Collier *et al.* (2007). This study, however, examines risk management practices at a high level of aggregation, using broad categories of practices as independent variables, rather than specific instruments and techniques.

⁸Remarkably, COSO appears to be well aware of this behavioural literature (see, for instance, COSO, 2004a, pp. 51–52). It is unclear why COSO has chosen to ignore the implications of this work.

⁹We mitigate this specific problem by restricting the empirical analysis of ERM effectiveness to organisations that have adopted ERM (see Section 4.3). This restriction ensures that all included respondents subscribe to the notion of ERM, and we can be reasonably assured that their point of reference in scoring their risk management system is sufficiently similar to allow a meaningful comparison. We thank an anonymous reviewer for suggesting this approach.

¹⁰In the total sample (i.e. including organisations in stages 1–3), the average grade is 6.44, with approximately 20% of respondents indicating that their system is not sufficient.

¹¹In the total sample (including firms that have not (yet) adopted ERM), 21.5% of the respondents report to apply (elements of) COSO.

¹²A diagnosis of the variance inflation factors (VIF) confirms this; the highest VIF in the analysis is only 1.382.

¹³We thank an anonymous reviewer for this suggestion.

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