

# **The Impact of Organizational Cultural Factors on Advancing Enterprise Risk Management Sophistication**

Mark Beasley  
*North Carolina State University*  
Mark\_Beasley@ncsu.edu

Bruce Branson  
*North Carolina State University*  
Bruce\_Branson@ncsu.edu

Evelyn Braumann  
*Aarhus University*  
ebraumann@econ.au.dk

Don Pagach  
*North Carolina State University*  
Don@ncsu.edu

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## **ABSTRACT**

We examine how organizational culture affects enterprise risk management (ERM) sophistication. We find that organizations whose leaders demand enhanced risk oversight and organizations perceiving pressure from external parties to improve ERM, have significantly higher levels of ERM sophistication than other organizations without similar demands or pressures. However, when there are perceived constraints on resources to support more advanced risk oversight or when there are perceptions that ERM may not add value, ERM processes are significantly less sophisticated. In addition, when the prevailing attitude among organizational leaders is risk-seeking, the level of ERM sophistication is significantly lower than in risk-averse organizations. Furthermore, the extent of perceived resource constraints dampens the impact of internal demands from top leadership and negative perceptions about the value proposition of ERM lower the impact of perceived external pressures for more ERM sophistication. Our findings suggest that cultural factors help explain differences in risk oversight effectiveness.

**Keywords:** Enterprise Risk Management, ERM Sophistication, Risk Attitude, Cultural Barriers, ERM Leadership

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## **I. INTRODUCTION**

Over the past two decades, organizations have faced major risk events affecting their ability to preserve or create strategic value for key stakeholders. These events have highlighted the importance of having effective processes in place to identify, assess, and respond to risk events, allowing for a more resilient and timely response and recovery. More recently, the unfolding global impact of the COVID-19 pandemic is illustrating the critical importance of having processes in place to identify and manage the complex portfolio of risks impacting many organizations.

There have been a number of calls for organizations to strengthen their enterprise-wide risk management efforts (NYSE 2004; SEC 2010; Dodd-Frank 2010; S&P 2012; NACD 2018). Expectations have been placed on boards and senior executives to enhance their risk oversight processes and to provide greater transparency about their organizations' approaches to enterprise-wide risk management (SEC 2010; S&P 2012). The accounting profession has been a leader in providing guidance to assist management in the enhancement of their risk management processes, particularly through the work of the Committee of Sponsoring Organizations of the Treadway Commission (COSO 2004) which issued one of the first enterprise risk management (ERM) principles-based frameworks and its recent update (COSO 2017). In addition, internal control frameworks, such as COSO's *Internal Control – Integrated Framework*, emphasize the entity's risk assessment processes as one of the five required components of effective internal control (COSO 2013). Furthermore, auditing standards emphasize the need for auditors to understand and evaluate the entity's risk assessment processes as part of the auditor's understanding of the entity and its environment to assess the risk of material misstatements.

Given growing expectations for enhanced risk oversight, many organizations have implemented ERM processes to develop increased resilience and agility to help navigate ever-evolving uncertainties. However, other organizations have not invested as heavily in enhancing their enterprise-wide risk management processes for overseeing their most critical risks. We believe an organization's culture plays a significant role in how or whether an organization supports investments into ERM processes. Little is known about what cultural factors within organizations might affect the decision made by their leaders to embrace ERM in order to strengthen their understanding of the risk environment. This study explores these cultural factors.

While other studies have focused on ERM implementations and the value proposition of ERM, there is only limited research focusing explicitly on how organizational cultural factors affect the sophistication of ERM processes (Kimbrough and Compton 2009; Bromiley, McShane, Nair and Rustambekov 2015; Viscelli, Beasley and Hermanson 2016). Organizational culture plays an important role in driving business value (Graham, Grennan, Harvey, and Rajgopal 2019; Hermalin 2013; Schein 2010), and with respect to management control systems (Merchant and Otley 2007; Otley 2016; Posch 2020), such as ERM. Moreover, principles-based frameworks issued by thought leaders (e.g., COSO, ISO) emphasize the important role organizational culture plays in providing the foundation for effective enterprise-wide risk oversight. According to COSO (2017, 27), “...*culture reflects the entity's core values, beliefs, attitudes, desired behaviors, and importance of understanding risk.*” However, little empirical research provides insight on whether these “beliefs, attitudes, desired behaviors, and importance of understanding risk” are in fact relevant to an organization's decision to strengthen its ERM processes.

Our study responds to calls for research related to risk management. Kaplan (2011, 373) notes that “risk management is a great issue for accounting academics ... the topic contains issues relevant for financial reporting, management control, and auditing.” This paper contributes to the

accounting literature by providing evidence, obtained through survey responses, on the extent to which an entity's core cultural values explain varying levels of investment in enterprise risk oversight processes, which we refer to as ERM sophistication, across organizations. To capture measures of these core values, we examine three important categories of cultural factors that we believe are most likely to reflect varying aspects of the entity's *beliefs, attitudes, desired behaviors, and importance of understanding risks* emphasized by COSO (2017). While there are likely other aspects of culture we do not consider, we believe our study provides some initial insights about certain aspects of organizational culture related to ERM sophistication.

First, we examine the extent to which perceptions about *internal* demands from the entity's top leaders (i.e., the CEO and board of directors) and perceptions of *external* pressures from regulators and corporate governance leaders have on ERM sophistication. Second, we investigate how perceived *resource constraints* and perceptions about the *value proposition* of ERM influence ERM sophistication. Third, we investigate how the entity's overall attitude towards risk-taking (i.e., risk aversion or risk seeking) influences ERM sophistication to capture aspects of the entity's core values related to the "importance of understanding risks." Finally, we explore two moderating effects related to the development of more sophisticated ERM processes. Since available resources may be limited and thus, may prevent significant investments in ERM, we investigate whether perceived resource constraints restricting ERM investments dampen the effect of internal demands for better ERM. In addition, questions about the value proposition of ERM (e.g., how will external parties value additional investments in ERM?) may affect how external pressures influence ERM adoption. Hence, we also examine whether such doubts about the value proposition of ERM dampen the effect of pressures from external parties to invest in more sophisticated risk management processes.

Our analysis is based on 2,460 survey responses collected over a six-year period (2011-2016) in the United States. The survey was directed to those individuals serving in senior

executive positions who would have direct knowledge of the entity's detailed risk oversight procedures. To deepen our analysis, we run all models across three groups: the full sample including all respondents in varying positions, responses only from C-suite positions, and responses only from CFOs.

We find evidence that core cultural values reflective of the entity's beliefs, attitudes, desired behaviors, and importance of understanding risk are related to an organization's level of ERM sophistication. We observe that organizations whose CEOs and boards are demanding enhanced risk oversight have significantly higher levels of ERM sophistication. Similarly, we observe that organizations that perceive pressure from external parties, such as regulators and corporate governance leaders, are more likely to have greater ERM sophistication. Thus, core cultural values perceived as supportive of greater risk management by others inside and outside the organization do seem to impact decisions to invest in ERM processes. However, we find that when there are other less supportive core cultural values, such as perceptions that there are constraints on resources to support more advanced risk oversight or perceptions that ERM may not add value or may introduce unneeded bureaucracy, ERM processes are significantly less sophisticated. We also show that when the prevailing attitude across the organization is more risk-seeking, the level of ERM sophistication is significantly lower than in organizations where the prevailing attitude is more risk-averse.

Further, we find that increasing levels of resource constraints negatively moderate the impact of internal demands on more advanced risk management processes. That is, perceptions that there are insufficient resources to advance ERM reduce the effect of increasing demand from the CEO and/or the board on ERM sophistication. We also find that concerns over whether ERM may add unnecessary bureaucracy and costs that exceed benefits dampens the positive effect associated with pressures from external parties, such as regulators and corporate governance proponents, to enhance ERM.

In a supplementary analysis, we examine the extent to which our results vary between the financial services industry, where ERM is a required regulatory activity, and organizations in other industries. We observe limited differences in the financial services industry versus other industries; however, we do find that the presence of value barriers moderate external pressures with regard to ERM sophistication only for non-financial services firms. In Figure 1 we provide a diagram of the posited effects on the level of ERM sophistication across organizations. Collectively, our findings provide insights about the role that specific aspects of an organization's culture play on decisions to strengthen an entity's risk management processes.

Insert Figure 1 About Here

Our study contributes to the ERM literature by providing initial evidence of specific organizational cultural factors associated with ERM sophistication. While aspects of culture that reflect beliefs, attitudes, desired behaviors and importance of understanding risk management are believed to be a critical component necessary for effective ERM (COSO 2017, 27), there is limited, if any, empirical research that demonstrates that reality (Viscelli et al. 2016; Braumann 2018). Our findings highlight specific cultural factors that boards, management teams, auditors, and other key stakeholders may find helpful to consider as they assess factors that might explain an organization's level of enterprise-wide risk management maturity. Perceptions about the value placed on ERM by both internal and external parties, including their overall attitude towards risk taking, and perceptions about the value of investing in ERM in light of limited resources appear to be important dimensions to consider when evaluating overall risk oversight effectiveness. Consequently, we suggest that important organizational cultural dimensions might help to explain why some organizations have more sophisticated ERM processes and others do not. We further contribute to contingency-based research in accounting (Chenhall 2003; Gerdin and Greve 2004; Otley 2016) by examining the moderating effect of two relevant cultural factors with regard to

ERM sophistication and also consider how they may affect the relationship in different risk-related contexts (i.e., financial services v. non-financial services).

The next section provides background information about the critical role culture plays in supporting more ERM sophistication, and, building upon prior literature, we develop hypotheses related to the impact of specific culture-related organizational factors on ERM sophistication. We then provide an overview of the research design and analysis of results. We conclude with a summary of the key findings.

## **II. THEORY AND HYPOTHESES DEVELOPMENT**

### **Increasing Importance of ERM Sophistication**

Relative to other business disciplines, ERM is comparatively new, emerging in the late 1990s and early 2000s. Greater focus on the fundamental principles of ERM began to develop as thought leaders, such as COSO and ISO, introduced their respective ERM frameworks in the early 2000s, with more recent updates of those frameworks by COSO in 2017 and ISO in 2018 (COSO 2004, 2017; ISO 2009, 2018). Expectations for enhanced enterprise-wide risk oversight have increased over the past decade as a number of corporate governance reform proponents have called for more effective value-enhancing strategic governance of the enterprise (Nocco and Stulz 2006; Power 2007; Baxter, Bedard, Hoitash and Yezegel 2013; Cohen, Krishnamoorthy and Wright 2017) and as regulators and other market participants began to call for more enhanced risk oversight (NYSE 2004; Dodd-Frank 2010; SEC 2010; S&P 2012). Overall, both regulatory issues and claims of value-generation have triggered a new stream of academic research over the past two decades of embracing ERM (Bromiley et al. 2015; McShane 2018). In general, the ERM literature has focused on two broad themes: antecedents of ERM implementations and evidence on the value proposition of ERM.

Our study extends the former stream of research by focusing on how aspects of an organization's culture are related to the organization's ERM sophistication. We focus on the role of culture given its foundational relation to effective ERM. In fact, COSO's 2017 ERM Framework emphasizes the role of culture in supporting effective ERM:

*Enterprise risk management is defined as "The culture, capabilities, and practices, integrated with strategy-setting and performance, that organizations rely on to manage risk in creating preserving, and realizing value" (COSO 2017, 10).*

While prior research documents a number of factors associated with ERM implementations and how ERM enhances value, there is minimal research that focuses on the role of organizational culture, the related internal dynamics, and the decision of management or the board to implement ERM processes (Kimbrough and Compton 2009; Bromiley et al. 2015; Viscelli et al. 2016; Posch 2020). While "*ERM helps people make decisions while understanding that culture plays an important role in shaping those decisions*" (COSO 2017, 10), little is known about factors that might affect the decision to implement ERM, and little is known about how culture-related factors affect the level of investment in processes that lead to more sophisticated ERM. Our study contributes to the relative dearth of culture-related research in the literature.

### **The Relevance of Organizational Culture to ERM**

While extant studies provide insights into a number of organization-specific characteristics that might explain implementations of ERM processes and different aspects of how ERM provides value to the organization, the current body of research on ERM offers little explicit analysis of the roles power and politics play in advancing ERM sophistication in organizations. Further, we do not understand how competition among (groups of) actors may influence the advancement of effective ERM processes.



Principles-based ERM frameworks highlight the critical importance of governance and culture in achieving ERM effectiveness. For example, COSO's 2017 ERM Framework highlights governance and culture as one of five core components necessary for effective ERM. As stated by COSO (2017, 27), *"An entity with a culture that is risk-aware stresses the importance of managing risk and encourages transparent and timely flow of risk information."* To further advance that component, COSO's 2017 ERM Framework outlines five principles related to governance and culture (out of a total of 20 principles in their ERM Framework). COSO 2017 further emphasizes the important influence of culture on risk management by stating that *"culture reflects the entity's core values, the beliefs, attitudes, desired behaviors, and importance of understanding risks"* (COSO 2017, 27).

While it is widely accepted that an organization's culture is an important driver of value, there is little empirical evidence of how specific aspects of culture matter (Graham et al. 2019), particularly in the accounting literature (Otley 2016). Mikes (2009) conducted a field-based study to examine how different calculative cultures—the shareholder value imperative (ERM by the numbers) versus the risk-based internal control imperative (holistic ERM)—explain systematic variations of ERM practices in two different financial services institutions. Arena, Arnaboldi and Azzone (2010) explore the role of risk rationalities, experts, and technologies related to the embeddedness of ERM. Viscelli, Hermanson and Beasley (2017) found through their semi-structured interviews of 15 ERM champions that an organization's culture and approach to preparing for ERM's launch can have a significant impact on the success of integrating ERM and strategy for the organization. Braumann, Grabner and Posch (2020) examine how both interactive and diagnostic use of budgets and performance measures interact with tone from the top, a form of cultural control, in managing risk awareness.

This study seeks to advance our understanding about how different contextual factors related to the organization's culture drive ERM sophistication. To capture measures that might

reflect the entity's cultural core values, we examine three factors likely to reflect varying aspects of the entity's "beliefs, attitudes, desired behaviors, and importance of understanding risks." We specifically focus on perceptions related to these aspects of culture:

1. Perceptions about internal demands and external pressures for ERM.
2. Perceptions about resource constraints and the value proposition of ERM.
3. Perceptions about the organization's attitude towards risk-taking.

We explore the direct effects and two moderating effects of these perceptions related to the development of more sophisticated ERM processes in a variety of contexts.

### **Impact of Perceived Internal Demands and External Pressures on ERM Sophistication**

Prior research finds widespread consensus that ERM can create strategic value in several forms. Evidence shows that ERM can: (1) enhance management consensus and increase management accountability (Gates, 2006), (2) provide organizations competitive advantage (Elahi 2013; Beasley, Branson and Pagach 2015), (3) enable shareholders to better quantify and manage the organization's risk-return tradeoff (Farrell and Gallagher 2015; Gates 2006), and (4) reduce the probability of large cash flow shortfalls and avoid the corporate underinvestment problem by protecting an organization's ability to implement its business plan (Nocco and Stulz, 2006). Moreover, numerous studies document an association between ERM and certain organizational performance measures, such as Tobin's Q, return on assets, or abnormal/excess returns (e.g., Beasley, Pagach and Warr 2008; Gordon, Loeb and Tseng 2009; Hoyt and Liebenberg 2011; McShane, Nair and Rustambekov 2011; Baxter et al. 2013). Recently, it was shown that greater board risk oversight is associated with lower tax uncertainty, as well as lower overall tax burdens (Beasley, Goldman, Lewellen and McAllister 2020). Hence, greater attention to and awareness of the strategic value of ERM should motivate organizations, in particular the CEO and board of directors, to invest in enhancing ERM sophistication and place greater internal

demands on members of management and other personnel across the organization to engage in more robust risk management activities.

While some top leaders seek to enhance their organization's approach to risk management due to the potential for strategic advantages, others may be motivated by external pressures to conform to emerging expectations, best practices, and/or regulatory requests. The compliance literature outlines that organizations have economic, social, and/or normative interests to demonstrate compliance or non-compliance behavior (Nielsen and Parker 2012). In terms of compliance with ERM expectations, managers might be driven by: (1) economic motives to implement ERM processes because they perceive ERM as a best practice and good governance mechanism to improve their performance, (2) social motives to earn approval by others inside and outside the organization (i.e., stakeholders), and (3) normative motives to show their commitment to obeying the law and follow the "right" rules.

A number of external demands for enhanced risk management have emerged in the last couple of decades. In 2004, the NYSE revised its corporate governance rules to include explicit requirements for the audit committee of the board to "discuss policies with respect to risk assessment and risk management" (NYSE 2004). In 2008, credit rating agencies, such as Standard & Poor's, began to announce expanded considerations of the processes used by management and the board in the oversight of risks for the organization as a component of their credit rating evaluations (Standard & Poor's 2008). To enhance the transparency of information about the board's role in risk oversight and to encourage more effective board risk oversight, the Securities and Exchange Commission (SEC) expanded its proxy disclosure regulations effective March 1, 2010 (SEC 2010). The Dodd-Frank legislation requires the creation of board risk committees for large financial institutions (Dodd-Frank 2010). Insurance regulators have adopted the National Association of Insurance Commissioner's "Risk Management and Own Risk and Solvency Assessment Model Act," which requires U.S. insurers to file annually with their state

regulator a report that includes a summary of the insurer's risk management framework that includes an assessment of the risk culture and governance (NAIC 2012). Collectively, these developments have placed greater pressure on an organization's top leaders to enhance their organization's enterprise-wide risk management processes.

Perceptions within the entity about internal demands and external pressures reflect some aspects of the entity's overall "beliefs, attitudes, and desired behaviors" that are considered components of the entity's overall culture regarding risk management. As individuals within organizations perceive greater internal demands for better risk management and as they perceive the need to respond to growing external pressures related to the organization's risk management processes, we expect the organization will be more likely to have higher levels of ERM sophistication related to organizations where internal demands and external pressures are less well formed, as stated by the following hypotheses:

**H1A:** *Organizations with greater perceptions of internal demands from top leadership for enhanced risk oversight will have higher levels of ERM sophistication.*

**H1B:** *Organizations with greater perceptions of external pressures from regulators and corporate governance proponents for enhanced risk oversight will have higher levels of ERM sophistication.*

### **Impact of Perceived Resource Constraints and Value Barriers on ERM Sophistication**

While both internal demands and external pressures may provide motivation for enhanced risk management capabilities, there may be perceived constraints that limit the organization from investing in the infrastructure necessary for effective ERM. Resource constraints that limit an organization's ability to fund the people, processes, and technologies may inhibit the development of the necessary infrastructure for enhanced risk management capabilities (Low, Liu, Ng and Liu 2013). Furthermore, organizations may misconceive that ERM can be

decentralized and done in piecemeal (Fraser and Simkin 2016). Hence, “*resources may be constrained to the point where existing risk responses and actions break down*” (COSO 2017).

In addition to limited financial resources, other strategic initiatives of the organization may be perceived as having higher priority than investment in ERM processes (Fraser and Simkins 2016). As individuals across the organization perceive that there are other competing priorities of greater importance, there may be greater reluctance to invest heavily in more sophisticated ERM processes, resulting from the perceived lack of management consensus (related to ERM investments) about strategic priorities (Bowman and Ambrosini 1997).

In addition to resource constraints and competing priorities, there are other potential behavioral barriers that may limit the organization’s ERM sophistication (Harner 2010). For example, Power (2009) emphasizes the failure of ERM to become embedded in managers’ decision-making processes because ERM is prone to lapse into rules-based compliance. Sometimes, there are individuals who do not recognize ERM as a value-adding activity for the organization. Instead, they view ERM as adding additional layers of bureaucracy to day-to-day tasks that distract personnel from more value-enhancing efforts (Fraser and Simkins 2016).

Perceptions about potential resource constraints and perceptions about the value proposition of ERM also reflect aspects of an organization’s “beliefs and attitudes” about risk management contributing to the organizational culture important to ERM. When these cultural barriers exist within an organization, the level of ERM sophistication is expected to be lower than when these perceived barriers are not present. Based on these arguments, we state the following hypotheses:

**H2A:** *Organizations with perceived resource constraints will have lower levels of ERM sophistication.*

**H2B:** *Organizations with greater perceptions that ERM is non-value adding will have lower levels of ERM sophistication.*

## **Impact of Risk Attitude on ERM Sophistication**

One aspect of culture that may explain different levels of ERM sophistication is the overall attitude of management and the board towards risk taking (i.e., risk appetite) (Stulz 2015; Harwood, Ward and Chapman 2009; Sitkin and Pablo 1992). Organizations that are more willing to take risks may be less interested in enhancing its ERM processes, given their overall willingness to accept risks and unwillingness to restrict management's entrepreneurial spirit through what may be viewed as more risk limiting oversight. Hence, risk-seeking organizations may wish to remain more flexible, in terms of control, for growth, creativity and innovativeness (Henri 2006), while organizations with greater aversion to risk-taking may have stronger motivations to develop more sophisticated ERM processes to more effectively manage risks. Moreover, Kliem and Ludin (1997) suggest that the degree of policies and procedures within an organization is associated with organizational risk propensity, arguing that risk-averse organizations show a more *restrictive* environment while risk-seeking organizations exhibit a more *relaxed* environment. That leads us to the following hypothesis:

**H3:** *Organizations perceived to be more risk-seeking will have lower levels of ERM sophistication.*

## **The Moderating Effects of Resource Constraints and the Value Proposition of ERM**

While each of the organizational cultural factors that we examine may individually explain differing levels of ERM sophistication, we also investigate whether certain cultural factors may moderate the impact of other factors on the extent of ERM sophistication. Specifically, we examine whether and how more internally focused cultural factors interact to affect ERM sophistication, and whether and how more externally focused cultural factors interact to affect ERM sophistication.

First, we pair two internally focused factors to investigate whether one moderates the effect of the other on ERM sophistication. Specifically, since resource constraints within the

organization may limit the ability of an organization to implement ERM even in the presence of internal demands for increased investment in ERM, we examine whether the presence of perceived resource constraints may lessen the effect on ERM sophistication of internal demands for enhanced ERM. Given that resources are by nature scarce (at least for most organizations), individuals may see other internal initiatives as more critical, and they might feel frustrated about demands to advance ERM (at the cost of neglecting competing priorities) from the top. Especially in cases where they lack the appropriate skills and/or sense a lack of direction (Grabner, Posch and Wabnegg 2018), individuals may find it difficult to decide what is most critical. As such, they experience a lack of confidence of how to approach the issue of ERM (Agle, Nagarajan, Sonnenfeld and Srinivasan 2006), at least in the short-run. Thus, we expect that greater perceptions of insufficient internal resources for ERM will lessen the impact of internal demands for enhanced risk oversight. That leads us to expect the following:

**H4:** *As perceptions of internal resource constraints increase, the relationship between internal demands for enhanced risk oversight and ERM sophistication will be reduced.*

We next pair two factors that are more external to the organization. We examine whether the perceived ERM value proposition moderates the association between perceived external pressures from regulators and corporate governance reform proponents and increased ERM sophistication. The concept of ERM has emerged outside a given organization as a governance paradigm broadly applicable to all types of entities as a value-adding initiative. Specifically, institutional theory, developed in the sociology of organizations and organizational behavior literatures, suggests that, in the presence of emerging expectations, regulations, and conceptual frameworks, a number of organizations may feel pressure to state that they have embraced and implemented ERM processes so that their organizations are in line with basic external expectations (Powell 1991; Cohen, Krishnamoorthy and Wright 2008). This may be a particularly prevalent view at the onset of an ERM process implementation. In doing so, however, they may

implement only minimal aspects of ERM so that the organization is in form compliant with those expectations, but the board and management fail to substantively embrace specific and robust key elements of what would be deemed as effective enterprise-wide risk oversight. Institutional theory would suggest that organizations embrace the basics of ERM as symbolic gestures to all relevant parties, with little substantive intent.

Given this line of thought, the increasing importance and attention paid to proponents of heightened corporate governance and compliance with regulatory mandates may not be well embraced in organizations where they perceive ERM to be bureaucratic and non-value adding. Moreover, organizations could perceive the increasing complexity of regulations and standards as unfair and hence would not be motivated to acquire knowledge of the regulations and standards, which in turn reduces also their ability to invest in effective ERM processes (Mendoza, Dekker and Wielhouwer 2016). That leads us to expect the following:

**H5:** *As perceptions of ERM as non-value adding increase, the relationship between external pressure for enhanced risk oversight and ERM sophistication will be reduced.*

As mentioned previously, Figure 1 summarizes each of the hypotheses in the context of an organization's ERM sophistication.

### **III. EMPIRICAL SETTING AND SAMPLE DESCRIPTION**

Data for this study were obtained through the administration of an identical online survey instrument over six consecutive years. From 2011 – 2016 the survey was sent to members of the American Institute of Certified Public Accountants' (AICPA) Business, Industry, and Government Group, and from 2014 – 2016 it was expanded to members of the Chartered Institute of Management Accountants (CIMA). It was directed to those individuals serving their



organizations as the CFO or in other senior executive positions.<sup>1</sup> Over the six-year period we collected 5,482 surveys (AICPA: 4,271; CIMA: 1,211), of which 2,785 were answered by companies based in the U.S. (the geographical focus of our study). The final sample containing complete data for our analysis equals 2,460 organizations (AICPA: 2,406; CIMA: 54).<sup>2</sup> The number of surveys received is relatively uniform across the six years with the exception of 2014, which produced a significantly larger sample of 937 complete surveys (all other years range from 244 to 361 surveys). The range of positions held by the respondents across the six years of the survey is provided in Table 1, with individuals serving in CFO positions representing the highest percentage (38 percent) of respondents. Thus, our study benefits from a rich data set allowing us access to vital information directly obtained from the person with significant knowledge of the risk management process in the organization.

Insert Table 1 About Here

Respondents completed an online survey instrument consisting of over 40 questions that sought information about various aspects of risk oversight at both board of director and management levels within their organizations.<sup>3</sup> Further, we asked questions about the risk environment, cultural factors, implementation barriers and drivers, and other characteristics. Responses to our questions reflect the respondents' perceptions of these characteristics. Given our desire to capture aspects of an organization's culture that might be reflective of "beliefs,

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<sup>1</sup> Some of our respondents are from lower level positions (e.g. controller, treasurer), but we excluded these positions in a subsample analysis and arrive at similar results.

<sup>2</sup> We do not have data on how many survey requests were sent out. The AICPA and CIMA managed the survey request process. Emailed requests for survey participation were sent by the AICPA and CIMA to this membership group on multiple occasions each year.

<sup>3</sup> Survey respondents were asked to provide information about specific aspects of their organization's ERM process. To help respondents understand our use of the term "enterprise risk management (ERM)", the beginning of the survey instrument contained the COSO definition of ERM along with a notation that ERM in the context of the survey represents a formal process led by the organization's leaders, that is enterprise-wide, and that addresses risks in a portfolio manner where risk interactions might be considered. The inclusion of this information helped reinforce that our survey was focused on ERM processes and not any specific type or definition of risk.

attitudes, desired behaviors, and importance of understanding risk” within an organization, perceptions are what we seek to measure.

Because the completion of the survey was voluntary, there is potential for bias if those choosing to respond differ significantly from those who did not respond. Our study’s results may be limited to the extent that such bias exists. Also, there is a high concentration of respondents representing financial reporting roles. There may be others leading the risk management effort within their organizations whose views are not captured in the responses we received.

All survey responses were anonymous, and all data used in this study, including demographic information such as organization size (revenues) and industry classification, were self-reported by the survey participants and cannot be independently verified. Despite these limitations, we believe the responses we obtained provide a unique opportunity to examine how organizational cultural factors are associated with information about internal risk management processes that indicate the sophistication of ERM programs within the surveyed organizations.

Common method bias (CMB) is a potential problem associated with survey studies (Podsakoff, MacKenzie and Podsakoff 2012). Our study addresses the potential problem of CMB ex-ante through the design of the survey instrument, and ex-post we use statistical controls in multiple ways. In line with Podsakoff et al. (2012), we believe that potential biases in responses are countervailed through: (1) psychological separation of measuring the dependent and independent variables, (2) anonymous respondents, and (3) counter-balancing the order of the measurement of the dependent and independent variables. Ex-post we computed Harman’s single-factor test to assess CMB statistically. The solution returned more than one factor with the first factor explaining less than half (26.6%) of the overall variance, implying that single-source bias may not be a significant concern (Podsakoff and Organ 1986). Furthermore, Siemsen, Roth and Oliveira (2010) demonstrate that the presence of CMB is less likely for studies relying on interactions effects, as CMB can only deflate interaction effects. Hence, finding significant

interaction effects despite the influence of CMB in the data should be taken as strong evidence that an interaction effect exists, given that they are unlikely to be part of respondents' cognitive maps. Given the results of our tests, the survey design, and the fact that part of our analyses focuses on interaction effects, we feel confident that our findings are not driven by the presence of CMB in our dataset.

A broad range of industries and organization sizes (measured by fiscal year revenues) are represented by the respondents and are also provided in Table 1. Our greatest industry representation is finance, insurance, and real estate (collectively, financial services), which comprise 27 percent of our sample. Almost a third of our sample organizations have revenues equal to or greater than \$500 million.

### **Variable and Construct Measurement**

All variables in this study were collected through a structured survey with closed-end questions. Given that the survey questions were developed prior to our study, we had to self-develop our constructs with meaningful items which we validated by following established guidelines (Churchill 1979; Bedford and Speklé 2018). Most variables are measured on a Likert scale with a range from one to five. The respondents were asked to assess to what extent the statements applied in their organizations with the end points anchored as one, "*Not at all*" and five, "*Extensively*." Some variables employed a more specific response scale: risk attitude, for example, is measured on a scale where one equaled "*Strongly risk averse*" and five equaled "*Strongly risk seeking*."

A strong emphasis was put on the development and pre-testing of the survey instrument. We took several steps to establish the validity of the survey items, including reviews by three academics in addition to practitioners in leadership positions at the AICPA and CIMA. Furthermore, it was used for two years prior to the first year of collection of the data examined in

this study, with minimal adjustments needed to the terminology affecting the comprehension of the questions. We also included several questions asking for the same content in different ways at several stages of the questionnaire to validate previous answers.<sup>4</sup> For complete descriptions of the variables, please refer to Table 2.

Insert Table 2 about here

### **Dependent Variable: ERM Sophistication**

We build upon Beasley et al. (2015) to develop our measure of ERM sophistication. They find that organizations with more mature ERM possess explicit risk management characteristics and processes, and their boards are more engaged in risk oversight leadership. Consistent with constructs used by Beasley et al. (2015), we combine the responses to eleven board and management engagement (BME) variables that are related to objectively measurable risk management processes. By doing so, we are able to indirectly proxy for the level of ERM sophistication and avoid potentially subjective or biased views of an organization's ERM program that might occur when asking respondents directly about the level of ERM activities in their firm. Our focus on processes at the senior management level is supported by the finding of Farrell and Gallagher (2015) that top-level executive engagement is the most important determinant of valuation premiums for firms with more mature ERM.

*ERM Sophistication* is calculated as an index of ERM program sophistication based on the 11 BME variables. Table 2 includes detailed descriptions of each of our 11 BME variables that we use as indicators of ERM sophistication. This index ranges in value from zero to eleven.

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<sup>4</sup> For example, we included the following two survey questions measuring the same content: (1) To what extent have *regulators* asked for increased senior executive involvement in risk oversight. (2) To what extent are *regulatory demands* increasing senior executives' focus on risk management related activities. The answers are highly correlated at 0.80.

Higher scores of *ERM Sophistication* correspond to more mature and robust ERM processes relative to lower scores.

For robustness, we also develop a measure that is based on factor analysis of the standardized values for these 11 BME variables. All BME items load on one factor with loadings greater than 0.56. The Cronbach's alpha of the construct is 0.88. The construct strongly correlates with our ERM sophistication measure ( $r = 0.978$ ) and provides similar results in all our analyses.

### **Independent Variables**

Our independent variables are based on perceptions that reflect different aspects of an organization's "beliefs, attitudes, desired behaviors, and importance of understanding risk" that collectively represent important elements of the organization's culture. We are interested in examining whether these subsets of cultural factors are associated with different levels of ERM sophistication.

To create the variables that we ultimately employ in our models, we use both exploratory and confirmatory factor analysis, calculate Cronbach's alpha, and review the item scale for our constructs to establish both content and construct validity. In Table 3, Panel A we report the results of factor analyses used to support the uni-dimensionality of the reflective constructs (the results of confirmatory factor loadings are very similar in terms of factor loadings). After testing for multi-collinearity, we only included items that have loadings above the recommended minimum of 0.40 (Costello and Osborne 2005). For the final score of our variables, we average the responses across the items of a construct. Furthermore, the multi-trait matrix presented in Table 3, Panel B provides additional support for the discriminant validity of the survey constructs, given that the Cronbach's alphas on the diagonal exceed inter-construct correlations in all cases. We also applied the Fornell-Larcker criterion (1981) to analyze the discriminant validity between the constructs of our study. In line with this criterion, the square root of the

AVEs for our constructs consistently exceeds the inter-construct correlations. Overall, the statistical analyses consistently underscore that our constructs display satisfactory discriminant validity.

Insert Table 3 about here

The variable *Internal Demands (ID)* is measured using the following two dimensions: (1) To what extent has the Board of Directors asked for increased senior executive involvement in risk oversight? and (2) To what extent has the CEO/President asked for increased senior executive involvement in risk oversight? All items load onto a single factor with a satisfactory reliability of  $\alpha = 0.76$ .

The variable *External Pressures (EP)* is operationalized using the following three dimensions: (1) To what extent are emerging corporate governance requirements increasing senior executives' focus on risk management related activities?, (2) To what extent are emerging best practice expectations increasing senior executives' focus on risk management related activities? and (3) To what extent are regulatory demands increasing senior executives' focus on risk management related activities? Factor analysis reveals loadings  $> 0.68$  of all items on a single factor ( $\alpha = 0.78$ ).

The variable *Resource Constraints (RC)* covers two dimensions: (1) To what extent are competing priorities creating barriers for your organization's implementation of an effective enterprise-wide risk management process? and (2) To what extent are insufficient resources creating barriers for your organization's implementation of an effective enterprise-wide risk management process? All items load onto a single factor with a satisfactory reliability of  $\alpha = 0.79$ .

The variable *Value Barriers (VB)* is measured using the following three dimensions: (1) To what extent is lack of board or senior executive ERM leadership creating barriers for your organization's implementation of an effective enterprise-wide risk management process?, (2) To

what extent is lack of perceived value for ERM creating barriers for your organization's implementation of an effective enterprise-wide risk management process? and (3) To what extent is the perception that ERM would add unneeded bureaucracy creating barriers for your organization's implementation of an effective enterprise-wide risk management process? Factor analysis returns a single factor with item loadings  $> 0.71$  and satisfactory reliability ( $\alpha = 0.83$ ).<sup>5</sup>

Finally, the variable *Risk Attitude (RA)* is measured as a single-item asking: How would you describe the risk management culture at your organization? The response scale ranges from five, "strongly risk seeking" to one, "strongly risk averse."

### Control Variables

We control for *Risk Volume*, which measures to what extent perceptions of the volume and complexity of risks has increased for the organization over the past five years. For the same reason, we include *Sig Oprisk* as a control variable which measures to what extent the organization has faced a significant operational surprise in the last five years. In both cases, we would expect these prior events to have influenced ERM program development.

Prior research consistently finds that size is an important factor associated with greater ERM sophistication. In response, we include the variable *Revenues*, which represents the organization's most recent annual revenues.<sup>6</sup> All of our sample organizations are U.S.-based. However, we control for whether they operate solely within the U.S. or have both domestic and foreign operations. We also control for whether the organization is a public or private organization. We employ indicator variables here to control for any potential differences in these

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<sup>5</sup> To examine potential cross-loadings between *Internal Demands* and *External Pressures*, we included all items in one factor analysis. The test returned two factors with significant loadings ( $> 0.68$ ) on their respective factor and significant lower loadings on the other factor ( $< 0.4440$ ). We followed the same procedure for testing *Resource Constraints* and *Value Barriers*, which led to a similar result.

<sup>6</sup> The survey asked respondents to choose the range of values that their organization's revenues fell within. Nine ranges were provided. The natural log of the midpoint of the indicated range was used in the analyses.

subgroups. Moreover, we control for any survey year effects and for industry type. Finally, we control for the ERM Leader as a dummy variable equaling one if the respondent is serving as the firm's CRO or equivalent.

Table 4 contains descriptive statistics for each of the variables in the study. Panel A includes the dependent, independent, and control variables, and Panel B includes the four board and seven management engagement variables used to create the dependent variable *ERM Sophistication*. We observe that the mean score for *ERM Sophistication* is 3.70 with a standard deviation of 3.15. The median score equals 3.00.

Insert Table 4 about here

In Table 5 we provide correlations between the variables of interest that we use in determining the factors that enter our models. There is a high degree of correlation between many of our variables. For this reason, we use exploratory and confirmatory factor analysis to develop the actual variables we employ, so as not to create undue difficulty in interpreting our results. The statistical tests discussed below support this approach.

Insert Table 5 about here

#### IV. RESULTS

We run all models across three groups: the full sample including all respondents in varying positions, responses only from C-suite positions, and responses from only CFOs. In Table 6 we report the results for the basic regression analysis using the following model:

$$\begin{aligned} ERM\ Sophistication = & \beta_0 + \beta_1 Internal\ Demands + \beta_2 External\ Pressures + \beta_3 Resource \\ & Constraints + \beta_4 Value\ Barriers + \beta_5 Risk\ Attitude + \beta_6 Risk\ Volume + \beta_7 Sig\_Oprisk + \\ & \beta_8 Revenues + \beta_9 Int\_Operations + \beta_{10} Public + \beta_{11-15} Year + \beta_{16-21} Industry\_Dummies + \\ & \beta_{22} ERM\_Leader + \varepsilon \end{aligned}$$

Insert Table 6 about here

Overall, we find that our proxy for ERM sophistication is significantly related to our variables of interest and consistent with our hypotheses H1A – H3. The model (using the full



sample and subsamples) displays a satisfactory level of predictive validity ( $R^2 = 0.590$  for the full sample,  $R^2 = 0.529$  for the C-Suite sample, and  $R^2 = 0.503$  for the CFO sample).

We find that internal demands (*ID*) and external pressures (*EP*) for more ERM are significantly positively associated with *ERM Sophistication* ( $p < 0.01$ ), consistent with H1A and H1B, respectively. We find this result with respect to the full sample and when examining both subsamples, C-Suite members and CFOs.

Examining resource constraints (*RC*) and value barriers (*VB*), we find that these constructs are both significantly negatively related to *ERM Sophistication* ( $p < 0.01$ , for the full sample), consistent with H2A and H2B, respectively. It is reasonable that when there are resource constraints due to perceived insufficient resources or competing priorities, ERM sophistication would be diminished. Also, when ERM is seen as non-value adding, this condition would negatively affect the level of ERM sophistication. This finding is consistent across the full sample, as well as for the subsamples we present in Table 6. We do note that for the subsample of CFO responses, the association between *RC* and *ERM Sophistication* is only significant at the 10% level. This result is not driven by CFOs in any specific industry and may be due to CFOs more explicitly understanding the value proposition of ERM (Bailey 2019; Clyburn 2012; Dunn 2019).

We also find a significant negative relationship ( $p < 0.01$ ) between *Risk Attitude* and *ERM Sophistication*, consistent with H3. The more risk-seeking an organization is the lower its ERM sophistication. This result is consistent across the full sample and for both the C-Suite and CFO subsamples. This result is however somewhat inconsistent with Pagach and Warr (2011) who found that organizations that provide CEOs more compensation in the form of stock options are more likely to have implemented an ERM program, suggesting that organizations that reward risk-seeking behavior also want an ERM program to monitor and mitigate risk. Furthermore, Kaplan and Mikes (2012) state that such an ERM program would not stop organizations from

undertaking risky ventures. To the contrary, ERM would enable organizations to take on higher-risk, higher-reward ventures than could competitors with less effective risk management. This is an interesting tension between our findings and prior literature.

With regards to our control variables, we find that *Revenues* is positively significant ( $p < 0.01$ ), providing evidence that larger organizations are more likely to be associated with a sophisticated ERM program, consistent with many prior studies. We also find evidence that public companies are more likely to have a sophisticated ERM program, as are organizations in the Services industry. Organizations that have international operations in addition to U.S. operations have higher levels of ERM sophistication ( $p < 0.01$ , for the full sample). Finally, those organizations that have the dedicated ERM leader as survey respondent have higher levels of ERM sophistication.

### Results of the Moderating Effects

We use hierarchical regression analysis to test the proposed moderation effects. We first report a model with only the control variables and the main effects for *Internal Demands*, *External Pressures*, *Resource Constraints*, *Value Barriers*, and *Risk Attitude* (the Basic Model), and then we add the interaction terms (Moderated Regression Model). In order to better interpret the main effects and avoid potential multi-collinearity problems, all variables involved in interaction terms were mean-centered prior to the analyses (Hartmann and Moers 1999).

Regarding the interaction terms, we specify the following moderated regression model:

$$\begin{aligned} ERM \text{ Sophistication} = & \beta_0 + \beta_1 Internal \text{ Demands} + \beta_2 External \text{ Pressures} + \beta_3 Resource \\ & Constraints + \beta_4 Value \text{ Barriers} + \beta_5 Risk \text{ Attitude} + \beta_6 Resource \text{ Constraints} * Internal \\ & Demands + \beta_7 Value \text{ Barriers} * External \text{ Pressures} + \beta_8 Risk\_Volume + \beta_9 Sig\_Oprisk + \\ & \beta_{10} Revenues + \beta_{11} Int\_Operations + \beta_{12} Public + \beta_{13-17} Year + \beta_{18-23} Industry\_Dummies + \\ & \beta_{24} ERM\_Leader + \varepsilon \end{aligned}$$

The results of the moderated regression are reported in Table 7. The model displays a high level of predictive validity with an  $R^2$  of 0.60 for the full sample moderated regression

model. To assess whether multi-collinearity poses a threat to the validity of our results, we computed Variance Inflation Factors (VIF), and the results suggest that multi-collinearity is of no concern to the validity of our results.

Insert Table 7 about here

We find that the coefficient on the *RC x ID* interaction term is significantly negative, consistent with H4. This suggests that, as perceived resource constraints are magnified, the effect of internal demands for more sophisticated ERM is dampened. We also find a significant negative coefficient on the *VB x EP* interaction term, supporting H5. This suggests that as perceptions of ERM as non-value-adding increase, the effect of external pressures to enhance ERM sophistication is reduced. In both cases, when examining the full sample and both the C-Suite and CFO respondent subsamples, we can conclude that both resource constraints and negative perceptions of the value of ERM play a significant role within the internal context of organizations which inhibit ERM sophistication, despite the presence of internal demands and/or external pressures to enhance ERM processes. This result can help explain why some organizations are not investing in ERM sophistication despite the claim of its increasing importance (Harner 2013).

### **Supplementary Analysis: Financial Services vs. Non-Financial Services Firms**

Prior research demonstrates that ERM adoption may be contingent upon the industry in which the organization operates (Liebenberg and Hoyt 2003; Paape and Speklé 2012; Beasley, Clune and Hermanson 2005; Lechner and Gatzert 2018). Given that the highly-regulated financial services industry has faced repeated calls for more robust risk management practices in response to the financial crisis of 2008 – 2010, we also sought to examine to what extent the proposed direct and moderating effects are sensitive to whether the organization is a member of the financial services industry. We therefore divide our sample between organizations in the

financial services industry and all others, and then rerun the main effect regression models and the regression model including the interaction effects on both subsamples separately.

As reported in columns (1) and (2) of Table 8, we find a highly significant positive relationship between both *ID* and *EP* and *ERM Sophistication* for both subsamples. This result suggests that external pressures have been an effective driver of ERM sophistication not just in the highly-regulated financial services industry, but for all industries, which is consistent with prior literature (Paape and Speklé 2012; Jabbour and Abdel-Kader 2016; Zhao and Singhaputtangkul 2016) and with H1B. We observe that the effects of both *RC* and *VB* are consistent across the subsamples as well. For both groups of firms we observe a significant negative relationship between both *RC* and *VB* and *ERM Sophistication*.

Finally, we note that there is not a significant relationship between *Risk Attitude* and *ERM Sophistication* when respondents were from the financial services industry. This makes sense given the nature of the financial services industry, which is likely more skewed to risk-averse behavior as a consequence of heavy regulation (Pablo and Javidan 2002), and being an industry where regulators expect a higher level of ERM sophistication, regardless of management's overall risk attitude.

For our model that includes the two interaction terms, *RC x ID* and *VB x EP*, the results in columns (3) and (4) of Table 8 reveal that in both subsamples *RC x ID* is negative and at least marginally significant (-0.126,  $p < 0.10$  for organizations in the financial services industry, -0.112,  $p < 0.01$  for non-financial services organizations, both two-tailed). This suggests that there is no empirical difference between the financial services industry and non-financial services industries in the finding that perceived resource constraints moderate the effect of internal demands for enhanced risk management (i.e., ERM sophistication).

However, we find a negative, statistically significant interaction between *VB* and *EP* (-0.306,  $p < 0.01$ ) in the non-financial services subsample, but the coefficient for financial

services organizations is insignificant. This suggests that regulatory demands, best practices, or corporate governance requirements are indeed affecting the relationship between ERM value perceptions and ERM sophistication in non-financial organizations but not in those in the financial services industry. This is consistent with the proposition that for organizations in the financial services industry, external pressure is generally strong (e.g., Basel Accords, Solvency Directive, etc.); therefore, perceived barriers regarding the value adding nature of ERM may not be relevant for ERM sophistication in this industry. However, for non-financial services organizations, the decision to invest in ERM may be driven more by strategic value than regulatory compliance (COSO 2017; Nocco and Stulz 2006; Beasley et al. 2015), and barriers related to the perceived value of ERM and external pressures play a stronger role.

Insert Table 8 about here

## V. CONCLUSIONS

Our study provides empirical evidence consistent with the view that a “...*critical influence on enterprise risk management is culture*” (COSO 2017, 27). Given the lack of extensive empirical evidence about the impact of culture on the embrace of ERM, our study provides initial evidence supportive of the view that aspects of culture are important to the advancement of risk oversight processes in organizations and it responds to the call for research by accounting academics related to risk management, particularly related to management control and governance (Kaplan 2011).

Our findings illustrate to executives and boards the important roles they play in establishing an effective tone at the top related to enterprise-wide risk management (Braumann et al. 2020), and they illustrate the importance that governance leaders, including regulators, play in advancing thought leadership related to more enhanced risk oversight in organizations (Jabbour and Abdel-Kader 2016). However, we also show that when there are perceived constraints on

resources to support more advanced risk oversight practices or when there are perceptions that ERM may not add value or may introduce unneeded bureaucracy, ERM processes are significantly less likely to be as sophisticated. Further, we find that increasing levels of resource constraints negatively moderate the impact of internal demands on more advanced risk management processes. That is, perceptions that there are insufficient resources to advance ERM reduce the effect of increasing demand from the CEO and/or the board on ERM sophistication. We also find that concerns over whether ERM may add unnecessary bureaucracy and costs that exceed benefits dampens the positive effect associated with pressures from external parties, such as regulators and corporate governance proponents, to enhance ERM. Collectively, these findings suggest that perceptions about the value placed on ERM by both internal and external parties, including their overall attitude towards risk taking, and perceptions about the value of investing in ERM in light of limited resources appear to be important dimensions to consider when evaluating overall risk oversight effectiveness.

We recognize that there are limitations to our research. First, survey-based research relies on the quality of the responses provided by executives who voluntarily completed our survey. While there is no reason to believe there would be systematic bias in their responses or that a participant would willfully falsify their response(s), those possibilities exist. The volume of responses we analyzed (2,460) should help to mitigate the effects of isolated response error. Second, the obvious drawback of cross-sectional surveys is that they do not allow for the claim of causality. Any statements of causality in this paper are purely based on theoretical positions. Third, our survey participants cannot be independently verified, making it possible for the same company/respondent to answer the survey several times in different years. Finally, ERM sophistication could be proxied in different ways, but we believe that we have developed a robust construct that captures ERM from multiple dimensions, which are rooted in prior literature.

Nevertheless, we did investigate several (unreported) alternative measures of this construct and found results virtually identical to those reported.

This research represents an early step towards a better understanding of how important contextual factors within organizations play a role in how ERM programs have evolved. Future research can contribute by exploring additional organizational (and cultural) factors and how they may interplay with other dimensions (e.g., control systems, financial reporting, auditing and strategic planning) in the organization to create (strategic) value. Thus, we encourage further investigation to develop a robust appreciation for drivers of additional investments into ERM processes.

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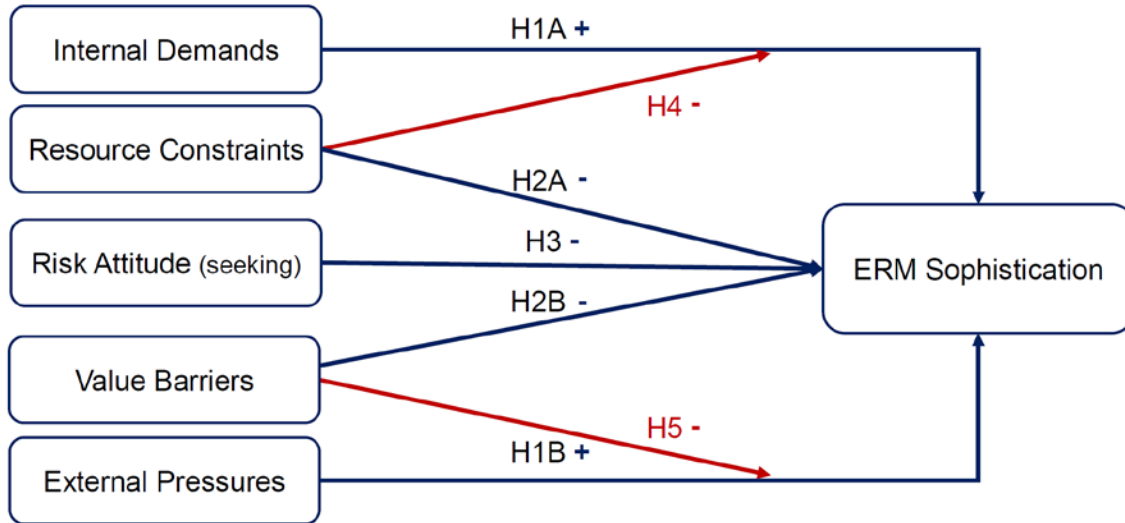
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**FIGURE 1**

**Theoretical Model and Hypotheses**



**TABLE 1**  
**Profile of Survey Respondents**

| <i>Industries represented*</i>    | Number of respondents  |                                |      |      |      |      |      |      |
|-----------------------------------|------------------------|--------------------------------|------|------|------|------|------|------|
|                                   | Full sample<br>(count) | Full<br>Sample<br>(percentage) | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Agriculture, Forestry, Fishing    | 25                     | 1%                             | 2    | 1    | 3    | 12   | 3    | 4    |
| Mining                            | 51                     | 2%                             | 4    | 4    | 8    | 16   | 7    | 12   |
| Construction                      | 101                    | 4%                             | 10   | 15   | 11   | 33   | 15   | 17   |
| Manufacturing                     | 364                    | 15%                            | 40   | 45   | 41   | 132  | 56   | 50   |
| Transportation                    | 66                     | 3%                             | 6    | 10   | 4    | 30   | 7    | 9    |
| Wholesale/Distribution            | 115                    | 5%                             | 13   | 12   | 12   | 41   | 18   | 19   |
| Retail                            | 83                     | 3%                             | 8    | 13   | 6    | 29   | 14   | 13   |
| Finance, Insurance, Real Estate   | 678                    | 27%                            | 81   | 115  | 76   | 225  | 94   | 87   |
| Services                          | 398                    | 16%                            | 34   | 39   | 41   | 170  | 60   | 54   |
| Not-for-profit organization       | 424                    | 17%                            | 42   | 47   | 41   | 157  | 69   | 68   |
| Universities                      | 63                     | 3%                             | 1    | 3    | 5    | 30   | 10   | 14   |
| Government                        | 92                     | 4%                             | 3    | 5    | 2    | 62   | 8    | 12   |
| Total                             | 2460                   | 100%                           | 244  | 309  | 250  | 937  | 361  | 359  |
| <i>Position held</i>              |                        |                                |      |      |      |      |      |      |
| Chief Financial Officer (CFO)     | 946                    | 38%                            | 154  | 130  | 113  | 286  | 140  | 123  |
| Treasurer                         | 78                     | 3%                             | 4    | 5    | 13   | 30   | 18   | 8    |
| Risk Manager Position**           | 183                    | 8%                             | 5    | 24   | 23   | 50   | 25   | 56   |
| Controller                        | 474                    | 19%                            | 34   | 60   | 40   | 191  | 82   | 67   |
| Chief Executive Officer (CEO)     | 114                    | 5%                             | 30   | 0    | 18   | 36   | 11   | 19   |
| C-Suite, other than CFO, CRO, CEO | 36                     | 2%                             | 3    | 1    | 3    | 22   | 5    | 2    |
| Internal Audit                    | 278                    | 11%                            | 5    | 74   | 24   | 103  | 36   | 36   |
| Board Member                      | 46                     | 2%                             | 6    | 1    | 4    | 27   | 2    | 6    |
| Other/Did not respond             | 305                    | 12%                            | 3    | 14   | 12   | 192  | 42   | 42   |
| Total                             | 2460                   | 100%                           | 244  | 309  | 250  | 937  | 361  | 359  |
| <i>ERM function</i>               |                        |                                |      |      |      |      |      |      |
| ERM_Leader                        | 230                    | 9%                             | 18   | 35   | 36   | 68   | 38   | 35   |
| <i>Fiscal year revenues</i>       |                        |                                |      |      |      |      |      |      |
| 0 < X ≤ \$10 Million              | 437                    | 18%                            | 45   | 41   | 46   | 192  | 57   | 56   |
| \$10 Million < X ≤ \$100 Million  | 826                    | 33%                            | 108  | 95   | 97   | 292  | 136  | 98   |
| \$100 Million < X ≤ \$500 Million | 442                    | 18%                            | 51   | 77   | 43   | 160  | 52   | 59   |
| \$500 Million < X ≤ \$1 Billion   | 213                    | 9%                             | 17   | 31   | 13   | 82   | 38   | 32   |
| \$1 Billion < X ≤ \$2 Billion     | 153                    | 6%                             | 9    | 23   | 14   | 52   | 25   | 30   |
| \$2 Billion < X ≤ \$10 Billion    | 225                    | 9%                             | 9    | 24   | 28   | 80   | 31   | 53   |
| X > \$10 Billion                  | 164                    | 7%                             | 5    | 18   | 9    | 79   | 22   | 31   |
| Total                             | 2460                   | 100%                           | 244  | 309  | 250  | 937  | 361  | 359  |

\* Industry classification based on SIC.

\*\* The Risk Manager Position includes positions such as Chief Risk Officer and equivalent, Senior Risk Committee Member, Enterprise Risk Officer, Head of ERM, Risk Management Manager, ERM Program Manager, Risk Controller, etc.

**TABLE 2**  
**Variable Definitions**

| Dependent variables  |   |
|--|---|
| <i>ERM_Sophistication</i>  | Our dependent variable is measured as an index (0-11) based on four board engagement variables and seven management engagement variables which we collectively refer to as the BME variables. See below for definitions of each of the 11 variables used to construct ERM_Sophistication. Note: Risk_Appetite, Mgt_Compensation, Training, and Key_Risk_Updates are recoded to Dummy variables. They are coded equal to 1 if the original rating corresponds to 4 or 5, otherwise 0. We code <i>Key_Risk_Updates</i> equal to 1, if the original rating is greater than 2, otherwise 0. |
| Four Board engagement variables used in ERM_Sophistication       |   |
| <i>Formal_Resp</i>   | Has the board of directors assigned to one of its committees formal responsibility for overseeing management's risk assessment and risk management processes? ( <i>Assignment to a board committee indicates greater scrutiny and focus placed upon the risk management process</i> )   |
| <i>Formrep_BOD</i>   | Does management provide a formal report describing the entity's top risk exposures to a committee of the board of directors or the full board at least annually? ( <i>Formal reporting indicates periodic dialogue and exchange of risk information between management and the board</i> )  |
| <i>Specific_Mtg</i>  | Does the full board review and discuss in a specific meeting the top risk exposures facing the organization? ( <i>Specific agenda time to discuss risk exposures indicates explicit focus and discussion by the board on risk management issues</i> )<br>Each of these variables used the following response scale:<br>1 = Yes<br>0 = No  |
| <i>Risk_Appetite</i>   | To what extent has your organization articulated its appetite for or tolerance of risks in the context of strategic planning? ( <i>Formal development of a risk appetite statement is often argued to be a feature of more robust ERM programs</i> )<br>Each of these variables used the following response scale:<br>5 = Extensively<br>4 = Mostly<br>3 = Somewhat<br>2 = Minimally<br>1 = Not at all  |
| Seven Management engagement variables used in ERM_Sophistication |   |
| <i>Formal_CRO</i>  | Has your organization formally designated an individual to serve as the chief risk officer (CRO) or senior risk executive equivalent? ( <i>Assignment of specific risk leadership responsibility provides greater accountability for ERM progress</i> )   |
| <i>Mgtlevel_Riskcomm</i>   | Does your organization have a management-level risk committee (or equivalent committee consisting of (at least some of) the entity's senior executives) that formally discusses enterprise level risk? ( <i>An internal risk management committee enhances the ability to develop an enterprise-wide understanding of top risk exposures</i> )  |
| <i>Formal_Policy</i>   | Does your organization have a formal policy statement regarding its enterprise-wide approach to risk management? ( <i>A formal policy helps emphasize the importance of ERM across the organization</i> )   |
| <i>Explicit_Guide</i>  | Has your organization provided explicit guidelines or measures to business unit leaders on how to assess the impact of a risk event (e.g., assigning specific dollar measures of loss or effect on revenues/profits to specific impact rankings)? ( <i>Formal guidelines or measures provides more depth and rigor to ERM processes</i> )<br>Each of these variables used the following response scale:<br>1 = Yes<br>0 = No  |

|   |   |
|---|---|
| <i>MGT_Compensation</i>                             | To what extent are risk management activities an explicit component in determining management performance compensation? ( <i>Linking compensation to risk management activities is often cited as a feature of more mature ERM programs</i> )   |
| <i>Training</i>                                     | To what extent have senior executives and key business unit leaders received formal training and guidance on risk management in the last 2 years? ( <i>Formal training in ERM at the management level should help management better understand the value proposition of more robust enterprise risk oversight</i> )<br>Each of these variables used the following response scale:<br>5 = Extensively<br>4 = Mostly<br>3 = Somewhat<br>2 = Minimally<br>1 = Not at all |
| <i>Key_Risk_Updates</i>                             | How frequently does your organization go through a dedicated process to update its key risk inventories? ( <i>More frequent updating of management's consideration of risks increases its level of understanding of its most important risk exposures</i> )<br>6 = Daily<br>5 = Weekly<br>4 = Monthly<br>3 = Quarterly<br>2 = Semi-Annually<br>1 = Annually<br>0 = Not at all   |
| <hr/> Independent variables - Demands for ERM <hr/> |   |
|   | <b><i>Internal Demands</i></b>  |
| <i>BOD_Ask</i>                                      | To what extent has the board of directors asked for increased senior executive involvement in risk oversight?   |
| <i>CEO_Ask</i>                                      | To what extent has the CEO/President asked for increased senior executive involvement in risk oversight?  |
|   | <b><i>External Pressures</i></b>  |
|   | To what extent are the following factors increasing senior executives' focus on risk management related activities:   |
| <i>Emerg_CorpGov</i>                                | Emerging corporate governance requirements?   |
| <i>Emerg_BestPractices</i>                          | Emerging best practice expectations?  |
| <i>Reg_Demands</i>                                  | Regulatory demands?   |
|   | Each of these variables used the following response scale:<br>5 = Extensively<br>4 = Mostly<br>3 = Somewhat<br>2 = Minimally<br>1 = Not at all  |
| <hr/> Independent variables – Barriers to ERM <hr/> |   |
|   | To what extent are the following factors creating barriers for your organization's implementation of an effective enterprise-wide risk management process:  |
|   | <b><i>Resource Constraints</i></b>  |
| <i>Priorities</i>                                   | Competing priorities?   |
| <i>Resources</i>                                    | Insufficient resources?   |
|   | <b><i>Value Barriers</i></b>  |
| <i>Leadership</i>                                   | Lack of board or senior executive ERM leadership?   |
| <i>Value_Perception</i>                             | Lack of perceived value for ERM?  |
| <i>Bureaucracy</i>                                  | Perception that ERM would add unneeded bureaucracy?   |
|   | Each of these variables used the following response scale:<br>5 = Significant barrier<br>4 = Barrier<br>3 = Somewhat of a barrier   |

|  |   |
|--|---|
|  | 2 = Minimal barrier<br>1 = Not a barrier  |
| <hr/>                                    |   |
| Independent variables                    | Attitude Toward Risk-Taking   |
| <i>Risk_Attitude</i>                     | How would you describe the risk management culture at your organization?<br>5 = Strongly risk seeking<br>4 = Risk seeking<br>3 = Risk neutral<br>2 = Risk averse<br>1 = Strongly risk averse  |
| <hr/>                                    |   |
| Control variables – Risk environment     |   |
| <i>Risk_Volume</i>                       | To what extent has the volume and complexity of risks increased for your organization over the past five years?   |
| <i>Sig_Oprisk</i>                        | To what extent has your organization faced a significant operational surprise in the last 5 years?<br>Each of these variables used the following response scale:<br>5 = Extensively<br>4 = Mostly<br>3 = Somewhat<br>2 = Minimally<br>1 = Not at all  |
| <hr/>                                    |   |
| Control variables – Firm characteristics |   |
| <i>Revenues</i>                          | Please indicate your organization's annual revenues for the most recent fiscal year   |
| <i>Int_Operations</i>                    | The variable equals 1 if "U.S.-based, with foreign operations", and equals 0 if "U.S.-based, operating domestically only"   |
| <i>Public</i>                            | Is your organization a publicly traded company?<br>1 = Yes<br>0 = No  |
| <i>Industry</i>                          | The following industry choices were provided. Each industry is a separate dummy variable indicating the respective industry.<br>Agriculture, Forestry, Fishing (SIC 01–09)<br>Mining (SIC 10–14)<br>Construction (SIC 15–17)<br>Manufacturing (SIC 20–39)<br>Transportation (SIC 40–49)<br>Wholesale/Distribution (SIC 50–51)<br>Retail (SIC 52–59)<br>Finance, Insurance, Real Estate (SIC 60–67)<br>Services (SIC 70–89)<br>Not-for-profit organization<br>Universities<br>Government |
| <i>Position held</i>                     | Please indicate your position (or equivalent) in the organization:<br>1 = Chief Financial Officer (CFO)<br>2 = Treasurer<br>3 = Risk Manager Position*<br>4 = Controller<br>5 = Chief Executive Officer (CEO)<br>6 = C-Suite, other than CFO/CRO/CEO<br>7 = Internal Audit<br>8 = Board Member<br>9 = Other/Did not respond   |
| <i>ERM_Leader</i>                        | Are you serving as the CRO (or equivalent)?<br>1 = Yes<br>0 = No  |

\* The Risk Manager Position includes positions such as Chief Risk Officer and equivalent, Senior Risk Committee Member, Enterprise Risk Officer, Head of ERM, Risk Management Manager, ERM Program Manager, Risk Controller etc.



**TABLE 3**  
**Panel A - Construct Validity**

| Internal Demands (ID)  |            |                 |
|--|------------|-----------------|
| Cronbach's $\alpha = 0.76$   | AVE = 0.50 | Factor loadings |
| <i>To what extent have each of the following parties asked for increased senior executive involvement in risk oversight:</i>                                     |            |                 |
| Board of Directors   |            | 0.709           |
| CEO/President  |            | 0.709           |
| External Pressures (EP)  |            |                 |
| Cronbach's $\alpha = 0.78$   | AVE = 0.52 | Factor loadings |
| <i>To what extent are the following factors increasing senior executives' focus on risk management related activities:</i>                                       |            |                 |
| Emerging corporate governance requirements   |            | 0.794           |
| Emerging best practice expectations  |            | 0.682           |
| Regulatory demands   |            | 0.704           |
| Resource Constraints (RC)  |            |                 |
| Cronbach's $\alpha = 0.79$   | AVE = 0.54 | Factor loadings |
| <i>To what extent are the following factors creating barriers for your organization's implementation of an effective enterprise-wide risk management process</i> |            |                 |
| Competing priorities   |            | 0.733           |
| Insufficient resources   |            | 0.733           |
| Value Barriers (VB)  |            |                 |
| Cronbach's $\alpha = 0.83$   | AVE = 0.57 | Factor loadings |
| <i>To what extent are the following factors creating barriers for your organization's implementation of an effective enterprise-wide risk management process</i> |            |                 |
| Lack of board or senior executive ERM leadership   |            | 0.806           |
| Lack of perceived value for ERM  |            | 0.738           |
| Perception that ERM would add unneeded bureaucracy   |            | 0.719           |

The table illustrates the results of factor analyses for the constructs used in this study. Factor loadings > 0.400 used in the final measurement of reflective constructs are in bold.

**Panel B - Multi-Trait Matrix**

| Variable | Obs   | Mean | SD.  | Min  | Max  | VB           | RC           | ID           | EP           |
|----------|-------|------|------|------|------|--------------|--------------|--------------|--------------|
| VB       | 2,460 | 2.77 | 1.12 | 1.00 | 5.00 | <b>0.826</b> |              |              |              |
| RC       | 2,460 | 3.24 | 1.14 | 1.00 | 5.00 | 0.451***     | <b>0.789</b> |              |              |
| ID       | 2,460 | 3.13 | 1.10 | 1.00 | 5.00 | -0.254***    | 0.091***     | <b>0.765</b> |              |
| EP       | 2,460 | 2.86 | 1.02 | 1.00 | 5.00 | -0.176***    | 0.122***     | 0.568***     | <b>0.781</b> |

The diagonal of the matrix in Panel B shows the Cronbach's alpha for each variable. The other cells of the table report bivariate correlation coefficients. \*, \*\*, \*\*\* Significant at  $p < 0.10$ ,  $p < 0.05$ , and  $p < 0.01$ , two-tailed, respectively.

**TABLE 4**  
**Panel A - Sample Descriptive Statistics**

| Variable                                | Obs          | Mean        | Std. Dev.   | Min         | Max         |
|---|--------------|-------------|-------------|-------------|-------------|
| <b>Dependent Variable</b>               |              |             |             |             |             |
| <i>ERM_Sophistication</i>               | 2,460        | 3.70        | 3.15        | 0.00        | 11.00       |
| <b>Variables of Interest</b>            |              |             |             |             |             |
| <b><i>Internal Demands (ID)</i></b>     | <b>2,460</b> | <b>3.13</b> | <b>1.10</b> | <b>1.00</b> | <b>5.00</b> |
| <i>BoD_Ask</i>                          | 2,460        | 3.05        | 1.25        | 1.00        | 5.00        |
| <i>CEO_Ask</i>                          | 2,460        | 3.22        | 1.19        | 1.00        | 5.00        |
| <b><i>External Pressures (EP)</i></b>   | <b>2,460</b> | <b>2.86</b> | <b>1.02</b> | <b>1.00</b> | <b>5.00</b> |
| <i>Emerg_CorpGov</i>                    | 2,460        | 2.80        | 1.18        | 1.00        | 5.00        |
| <i>Emerg_BestPractices</i>              | 2,460        | 2.93        | 1.11        | 1.00        | 5.00        |
| <i>Reg_Demands</i>                      | 2,460        | 2.84        | 1.36        | 1.00        | 5.00        |
| <b><i>Resource Constraints (RC)</i></b> | <b>2,460</b> | <b>3.24</b> | <b>1.14</b> | <b>1.00</b> | <b>5.00</b> |
| <i>Resources</i>                        | 2,460        | 3.21        | 1.24        | 1.00        | 5.00        |
| <i>Priorities</i>                       | 2,460        | 3.27        | 1.27        | 1.00        | 5.00        |
| <b><i>Value Barriers (VB)</i></b>       | <b>2,460</b> | <b>2.77</b> | <b>1.12</b> | <b>1.00</b> | <b>5.00</b> |
| <i>Leadership</i>                       | 2,460        | 2.57        | 1.33        | 1.00        | 5.00        |
| <i>Value_Perception</i>                 | 2,460        | 2.98        | 1.27        | 1.00        | 5.00        |
| <i>Bureaucracy</i>                      | 2,460        | 2.76        | 1.29        | 1.00        | 5.00        |
| <b><i>Risk Attitude</i></b>             | <b>2,460</b> | <b>2.47</b> | <b>0.86</b> | <b>1.00</b> | <b>5.00</b> |
| <b>Control Variables</b>                |              |             |             |             |             |
| <b>Risk environment</b>                 |              |             |             |             |             |
| <i>Risk_Volume</i>                      | 2,460        | 3.69        | 0.92        | 1.00        | 5.00        |
| <i>Sig_Oprisk</i>                       | 2,460        | 3.02        | 1.06        | 1.00        | 5.00        |
| <b>Firm characteristics</b>             |              |             |             |             |             |
| <i>Revenues</i>                         | 2,460        | 2114        | 5070        | 5           | 20000       |
| <i>Int_Operations</i>                   | 2,460        | 0.26        | 0.44        | 0.00        | 1.00        |
| <i>Public</i>                           | 2,460        | 0.23        | 0.42        | 0.00        | 1.00        |

\*ERM Sophistication: measured as index (0-11) based on the 11 BME variables where Risk\_Appetite, Mgt\_Compensation, Training, and Key\_Risk\_Updates are recoded to Dummy variables.

\*\*Revenues are in millions of USD.

**TABLE 4 (cont.)**  
**Panel B - Sample Descriptive Statistics**  
**BME Variables**

| Variable                               | Obs   | Mean | Std. Dev. | Min  | Max  |
|--|-------|------|-----------|------|------|
| <b>Board Engagement Variables</b>      |       |      |           |      |      |
| <i>Formal_Resp</i>                     | 2,460 | 0.47 | 0.50      | 0.00 | 1.00 |
| <i>Formrep_BOD</i>                     | 2,460 | 0.49 | 0.50      | 0.00 | 1.00 |
| <i>Specific_Mgt</i>                    | 2,460 | 0.54 | 0.50      | 0.00 | 1.00 |
| <i>Risk_Appetite*</i>                  | 2,460 | 3.00 | 1.08      | 1.00 | 5.00 |
| <b>Management Engagement Variables</b> |       |      |           |      |      |
| <i>Formal_CRO</i>                      | 2,460 | 0.33 | 0.47      | 0.00 | 1.00 |
| <i>Mgtlevel_Riskcomm</i>               | 2,460 | 0.46 | 0.50      | 0.00 | 1.00 |
| <i>Formal_Policy</i>                   | 2,460 | 0.31 | 0.46      | 0.00 | 1.00 |
| <i>Explicit_Guide</i>                  | 2,460 | 0.29 | 0.45      | 0.00 | 1.00 |
| <i>Mgt_Compensation*</i>               | 2,460 | 2.28 | 1.11      | 1.00 | 5.00 |
| <i>Training*</i>                       | 2,460 | 2.21 | 1.10      | 1.00 | 5.00 |
| <i>Key_Risk_Updates*</i>               | 2,460 | 1.22 | 1.28      | 0.00 | 6.00 |

\* Risk\_Appetite, Mgt\_Compensation, Training, and Key\_Risk\_Updates are recoded to Dummy variables for calculating the variable ERM\_Sophistication.

**TABLE 5**  
**Correlation Table**

|                                 | (1)   | (2)   | (3)          | (4)         | (5)          | (6)  | (7)         | (8)          | (9)         | (10)         | (11)        | (12) |
|---------------------------------|-------|-------|--------------|-------------|--------------|------|-------------|--------------|-------------|--------------|-------------|------|
| (1) <i>ERM Sophistication</i>   | 1.00  |       |              |             |              |      |             |              |             |              |             |      |
| (2) <i>External Pressure</i>    | 0.55  | 1.00  |              |             |              |      |             |              |             |              |             |      |
| (3) <i>Resource Constraints</i> | -0.15 | 0.12  | 1.00         |             |              |      |             |              |             |              |             |      |
| (4) <i>Risk Attitude</i>        | -0.15 | -0.11 | 0.06         | 1.00        |              |      |             |              |             |              |             |      |
| (5) <i>Value Barriers</i>       | -0.45 | -0.18 | 0.45         | 0.13        | 1.00         |      |             |              |             |              |             |      |
| (6) <i>Internal Demand</i>      | 0.52  | 0.57  | 0.09         | -0.08       | -0.25        | 1.00 |             |              |             |              |             |      |
| (7) <i>Risk_Volume</i>          | 0.26  | 0.43  | 0.20         | <b>0.02</b> | <b>-0.02</b> | 0.42 | 1.00        |              |             |              |             |      |
| (8) <i>Sig_Oprisk</i>           | 0.10  | 0.23  | 0.21         | 0.06        | 0.08         | 0.30 | 0.44        | 1.00         |             |              |             |      |
| (9) <i>Revenues</i>             | 0.44  | 0.27  | <b>0.00</b>  | -0.05       | -0.09        | 0.31 | 0.19        | 0.14         | 1.00        |              |             |      |
| (10) <i>Int_Operations</i>      | 0.19  | 0.05  | <b>0.01</b>  | 0.04        | <b>-0.03</b> | 0.13 | 0.06        | 0.08         | 0.42        | 1.00         |             |      |
| (11) <i>Public</i>              | 0.41  | 0.25  | <b>-0.04</b> | -0.05       | -0.11        | 0.25 | 0.15        | 0.10         | 0.53        | 0.40         | 1.00        |      |
| (12) <i>ERM Leader</i>          | 0.20  | 0.08  | <b>-0.02</b> | <b>0.03</b> | -0.14        | 0.10 | <b>0.03</b> | <b>-0.02</b> | <b>0.00</b> | <b>-0.01</b> | <b>0.01</b> | 1.00 |

Insignificant correlations (where  $p > 0.05$ ) are bold.

**TABLE 6**  
**Multiple Regression Analysis (Basic Model) – Dependent Variable (ERM Sophistication)**

| VARIABLES          | (1)<br>Full Sample   | (2)<br>C-Suite       | (3)<br>CFO           |
|--------------------|----------------------|----------------------|----------------------|
| Int_Demands        | 0.524***<br>[0.049]  | 0.520***<br>[0.068]  | 0.503***<br>[0.072]  |
| Ext_Pressures      | 0.787***<br>[0.055]  | 0.737***<br>[0.078]  | 0.708***<br>[0.084]  |
| Res_Constraints    | -0.198***<br>[0.042] | -0.116**<br>[0.059]  | -0.120*<br>[0.064]   |
| Value_Barriers     | -0.652***<br>[0.045] | -0.625***<br>[0.063] | -0.607***<br>[0.067] |
| Risk_Attitude      | -0.185***<br>[0.049] | -0.222***<br>[0.069] | -0.224***<br>[0.073] |
| Risk_Volume        | 0.023<br>[0.055]     | 0.018<br>[0.077]     | -0.058<br>[0.083]    |
| Sig_Oprisk         | -0.074*<br>[0.044]   | -0.098<br>[0.062]    | -0.048<br>[0.069]    |
| Revenues           | 0.267***<br>[0.022]  | 0.194***<br>[0.036]  | 0.184***<br>[0.040]  |
| Int_Operations     | 0.299***<br>[0.112]  | 0.389**<br>[0.179]   | 0.375*<br>[0.196]    |
| Public             | 0.964***<br>[0.121]  | 1.032***<br>[0.241]  | 1.040***<br>[0.260]  |
| Financial Services | 1.240***<br>[0.138]  | 1.470***<br>[0.215]  | 1.356***<br>[0.227]  |
| Manufacturing      | 0.056<br>[0.155]     | 0.141<br>[0.245]     | 0.107<br>[0.256]     |
| Services           | 0.438***<br>[0.148]  | 0.732***<br>[0.231]  | 0.680***<br>[0.247]  |
| Wholesale          | -0.034<br>[0.217]    | 0.471<br>[0.321]     | 0.388<br>[0.338]     |
| NPO                | 0.269*<br>[0.148]    | 0.383*<br>[0.217]    | 0.387*<br>[0.227]    |
| Construction       | -0.100<br>[0.228]    | 0.361<br>[0.316]     | 0.268<br>[0.333]     |
| ERM_Leader         | 1.278***<br>[0.143]  | 1.377***<br>[0.206]  | 1.472***<br>[0.227]  |
| Constant           | 0.065<br>[0.304]     | 0.214<br>[0.431]     | 0.551<br>[0.466]     |
| Years              | Yes                  | Yes                  | Yes                  |
| Observations       | 2,460                | 1,096                | 946                  |
| R-squared          | 0.590                | 0.529                | 0.503                |

\*, \*\*, \*\*\* Indicate  $p < 0.10$ ,  $p < 0.05$ , and  $p < 0.01$ , respectively, two-tailed test. Standard errors are in brackets.

**TABLE 7**  
**Moderated Regression Analysis – Dependent Variable (ERM Sophistication)**

| VARIABLES          | (1)                         | (2)                         | (3)                         | (4)                         | (5)                         | (6)                         | (7)                         | (8)                         | (9)                         |
|--------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|                    | Full Sample                 |                             |                             | C-Suite                     |                             |                             | CFO                         |                             |                             |
| Int_Demands        | 0.512***<br>[0.049]         | 0.521***<br>[0.049]         | 0.512***<br>[0.049]         | 0.513***<br>[0.066]         | 0.520***<br>[0.067]         | 0.514***<br>[0.066]         | 0.507***<br>[0.071]         | 0.512***<br>[0.072]         | 0.512***<br>[0.071]         |
| Ext_Pressures      | 0.801***<br>[0.054]         | 0.777***<br>[0.054]         | 0.792***<br>[0.054]         | 0.734***<br>[0.076]         | 0.733***<br>[0.077]         | 0.731***<br>[0.076]         | 0.712***<br>[0.082]         | 0.710***<br>[0.083]         | 0.713***<br>[0.082]         |
| Res_Constraints    | -0.198***<br>[0.042]        | -0.228***<br>[0.042]        | -0.218***<br>[0.042]        | -0.129**<br>[0.058]         | -0.193***<br>[0.060]        | -0.180***<br>[0.060]        | -0.139**<br>[0.062]         | -0.205***<br>[0.066]        | -0.192***<br>[0.065]        |
| Value_Barrier      | -0.700***<br>[0.045]        | -0.649***<br>[0.044]        | -0.691***<br>[0.044]        | -0.733***<br>[0.064]        | -0.623***<br>[0.062]        | -0.717***<br>[0.064]        | -0.730***<br>[0.068]        | -0.602***<br>[0.066]        | -0.713***<br>[0.068]        |
| Risk_Attitude      | -0.183***<br>[0.048]        | -0.191***<br>[0.048]        | -0.188***<br>[0.048]        | -0.222***<br>[0.068]        | -0.230***<br>[0.069]        | -0.228***<br>[0.068]        | -0.220***<br>[0.072]        | -0.232***<br>[0.073]        | -0.225***<br>[0.072]        |
| <b>RC x ID</b>     |                             | <b>-0.174***</b><br>[0.031] | <b>-0.118***</b><br>[0.032] |                             | <b>-0.209***</b><br>[0.043] | <b>-0.143***</b><br>[0.044] |                             | <b>-0.197***</b><br>[0.048] | <b>-0.129***</b><br>[0.049] |
| <b>VB x EP</b>     | <b>-0.256***</b><br>[0.034] |                             | <b>-0.217***</b><br>[0.036] | <b>-0.323***</b><br>[0.049] |                             | <b>-0.278***</b><br>[0.051] | <b>-0.337***</b><br>[0.053] |                             | <b>-0.299***</b><br>[0.055] |
| Risk_Volume        | 0.014<br>[0.054]            | 0.001<br>[0.054]            | 0.000<br>[0.054]            | 0.008<br>[0.076]            | -0.005<br>[0.076]           | -0.007<br>[0.075]           | -0.056<br>[0.082]           | -0.072<br>[0.083]           | -0.065<br>[0.081]           |
| Sig_Oprisk         | -0.062<br>[0.044]           | -0.062<br>[0.044]           | -0.056<br>[0.044]           | -0.078<br>[0.061]           | -0.090<br>[0.061]           | -0.076<br>[0.061]           | -0.037<br>[0.067]           | -0.051<br>[0.068]           | -0.041<br>[0.067]           |
| Revenues           | 0.259***<br>[0.022]         | 0.263***<br>[0.022]         | 0.258***<br>[0.022]         | 0.192***<br>[0.035]         | 0.189***<br>[0.036]         | 0.189***<br>[0.035]         | 0.176***<br>[0.039]         | 0.177***<br>[0.039]         | 0.172***<br>[0.039]         |
| Int_Operations     | 0.283**<br>[0.111]          | 0.285**<br>[0.111]          | 0.276**<br>[0.110]          | 0.353**<br>[0.176]          | 0.392**<br>[0.178]          | 0.361**<br>[0.175]          | 0.367*<br>[0.192]           | 0.396**<br>[0.194]          | 0.381**<br>[0.191]          |
| Public             | 0.943***<br>[0.120]         | 0.966***<br>[0.120]         | 0.947***<br>[0.120]         | 0.990***<br>[0.236]         | 1.028***<br>[0.238]         | 0.993***<br>[0.235]         | 0.970***<br>[0.255]         | 1.021***<br>[0.258]         | 0.965***<br>[0.254]         |
| Financial Services | 1.127***<br>[0.137]         | 1.237***<br>[0.137]         | 1.142***<br>[0.137]         | 1.373***<br>[0.211]         | 1.478***<br>[0.213]         | 1.392***<br>[0.211]         | 1.259***<br>[0.223]         | 1.374***<br>[0.225]         | 1.282***<br>[0.222]         |
| Manufacturing      | -0.001<br>[0.154]           | 0.043<br>[0.154]            | -0.001<br>[0.153]           | 0.062<br>[0.241]            | 0.110<br>[0.243]            | 0.052<br>[0.240]            | 0.040<br>[0.251]            | 0.076<br>[0.254]            | 0.027<br>[0.250]            |
| Services           | 0.392***<br>[0.146]         | 0.428***<br>[0.147]         | 0.391***<br>[0.146]         | 0.673***<br>[0.227]         | 0.691***<br>[0.228]         | 0.653***<br>[0.226]         | 0.608**<br>[0.242]          | 0.646***<br>[0.245]         | 0.595**<br>[0.241]          |
| Wholesale          | -0.142<br>[0.215]           | -0.044<br>[0.216]           | -0.133<br>[0.215]           | 0.334<br>[0.315]            | 0.458<br>[0.318]            | 0.344<br>[0.314]            | 0.267<br>[0.332]            | 0.369<br>[0.335]            | 0.268<br>[0.331]            |
| NPO                | 0.208<br>[0.147]            | 0.263*<br>[0.147]           | 0.213<br>[0.146]            | 0.325<br>[0.213]            | 0.397*<br>[0.215]           | 0.343<br>[0.213]            | 0.322<br>[0.223]            | 0.406*<br>[0.225]           | 0.342<br>[0.222]            |
| Construction       | -0.160<br>[0.226]           | -0.118<br>[0.227]           | -0.163<br>[0.225]           | 0.245<br>[0.310]            | 0.357<br>[0.312]            | 0.259<br>[0.309]            | 0.144<br>[0.327]            | 0.302<br>[0.330]            | 0.181<br>[0.326]            |
| ERM_Leader         | 1.260***<br>[0.142]         | 1.258***<br>[0.142]         | 1.250***<br>[0.141]         | 1.365***<br>[0.202]         | 1.365***<br>[0.204]         | 1.358***<br>[0.201]         | 1.447***<br>[0.222]         | 1.463***<br>[0.225]         | 1.444***<br>[0.221]         |
| Constant           | 0.955***<br>[0.196]         | 0.964***<br>[0.197]         | 0.982***<br>[0.196]         | 1.051***<br>[0.275]         | 1.139***<br>[0.278]         | 1.101***<br>[0.274]         | 1.206***<br>[0.299]         | 1.260***<br>[0.303]         | 1.262***<br>[0.299]         |
| Years              | Yes                         | Yes                         | Yes                         | Yes                         | Yes                         | Yes                         | Yes                         | Yes                         | Yes                         |
| Observations       | 2,460                       | 2,460                       | 2,460                       | 1,096                       | 1,096                       | 1,096                       | 946                         | 946                         | 946                         |
| R-squared          | 0.599                       | 0.595                       | 0.601                       | 0.547                       | 0.539                       | 0.552                       | 0.523                       | 0.512                       | 0.527                       |

\*, \*\*, \*\*\* Indicate  $p < 0.10$ ,  $p < 0.05$ , and  $p < 0.01$ , respectively, two-tailed test. Standard errors are in brackets. All independent variables are mean-centered.

**TABLE 8**  
**Sample Split Based on Financial Services/Non-Financial Services Firms**  
**Dependent Variable (ERM Sophistication)**

| VARIABLES       | Basic Multiple Regression Analysis |                               | Moderated Regression Analysis |                               |
|-----------------|------------------------------------|-------------------------------|-------------------------------|-------------------------------|
|                 | (1)<br>Financial Services          | (2)<br>Non-Financial Services | (3)<br>Financial Services     | (4)<br>Non-Financial Services |
| Res_Constraints | -0.278***<br>[0.087]               | -0.171***<br>[0.049]          | -0.234***<br>[0.089]          | -0.217***<br>[0.049]          |
| Int_Demands     | 0.730***<br>[0.104]                | 0.470***<br>[0.056]           | 0.705***<br>[0.104]           | 0.464***<br>[0.055]           |
| RC x ID         |                                    |                               | <b>-0.126*</b><br>[0.066]     | <b>-0.112***</b><br>[0.037]   |
| Value_Barriers  | -0.568***<br>[0.092]               | -0.674***<br>[0.051]          | -0.544***<br>[0.096]          | -0.782***<br>[0.053]          |
| Ext_Pressures   | 0.798***<br>[0.114]                | 0.764***<br>[0.063]           | 0.754***<br>[0.115]           | 0.808***<br>[0.062]           |
| VB x EP         |                                    |                               | -0.079<br>[0.077]             | <b>-0.306***</b><br>[0.044]   |
| Risk_Attitude   | -0.065<br>[0.094]                  | -0.225***<br>[0.057]          | -0.087<br>[0.094]             | -0.215***<br>[0.056]          |
| Risk_Volume     | 0.059<br>[0.106]                   | 0.013<br>[0.064]              | 0.044<br>[0.106]              | -0.003<br>[0.063]             |
| Sig_Oprisk      | -0.148*<br>[0.085]                 | -0.044<br>[0.052]             | -0.143*<br>[0.085]            | -0.017<br>[0.051]             |
| Revenues        | 0.340***<br>[0.042]                | 0.240***<br>[0.026]           | 0.342***<br>[0.042]           | 0.225***<br>[0.025]           |
| Int_Operations  | 0.030<br>[0.269]                   | 0.348***<br>[0.123]           | 0.003<br>[0.269]              | 0.313***<br>[0.121]           |
| Public          | 0.870***<br>[0.202]                | 0.994***<br>[0.153]           | 0.859***<br>[0.202]           | 0.994***<br>[0.150]           |
| ERM_Leader      | 0.756***<br>[0.245]                | 1.539***<br>[0.178]           | 0.750***<br>[0.244]           | 1.502***<br>[0.175]           |
| Manufacturing   |                                    | 0.034<br>[0.155]              |                               | -0.037<br>[0.152]             |
| Services        |                                    | 0.411***<br>[0.147]           |                               | 0.331**<br>[0.144]            |
| Wholesale       |                                    | -0.044<br>[0.215]             |                               | -0.171<br>[0.212]             |
| NPO             |                                    | 0.236<br>[0.148]              |                               | 0.154<br>[0.146]              |
| Construction    |                                    | -0.132<br>[0.227]             |                               | -0.204<br>[0.222]             |
| Constant        | 0.015<br>[0.580]                   | 0.494<br>[0.345]              | 1.717***<br>[0.286]           | 1.201***<br>[0.223]           |
| Years           | Yes                                | Yes                           | Yes                           | Yes                           |
| Observations    | 678                                | 1,782                         | 678                           | 1,782                         |
| R-squared       | 0.577                              | 0.534                         | 0.581                         | 0.553                         |

\*, \*\*, \*\*\* Indicate  $p < 0.10$ ,  $p < 0.05$ , and  $p < 0.01$ , respectively, two-tailed test. Standard errors are in brackets.  
All independent variables are mean-centered.