DOES FIRMS' RISK MANAGEMENT HUMAN CAPITAL REDUCE THE LIKELIHOOD OF FINANCIAL DISTRESS?

Jing Jia

B Comm (Hons)

Submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

School of Accountancy

QUT Business School

Queensland University of Technology

2017

Keywords

Corporate governance; Financial distress likelihood; Firm performance; Risk management; Risk management committee

Abstract

In light of the corporate collapses and global financial crisis, risk management has been highlighted as an ever increasing important element of corporate governance. As risk management committees (RMC) bear the fundamental responsibility of risk management, RMCs' human capital performs a crucial role in risk management governance and warrants further investigation.

The purpose of this study is to investigate the association between firms' RMC human capital and firms' management of risk, in terms of firm performance and the likelihood of financial distress. This study is motivated by the paucity of research on risk management governance and the Australian Security Exchange Corporate Governance Council's (2014) third edition of *Corporate Governance Principals and Recommendations*. While a body of literature has examined board human capital, the primary focus has only been on one characteristic - board independence, resulting in a deficiency in understanding board human capital as a whole. Moreover, previous studies have called for future researchers to explore more detailed and comprehensive measures of board human capital.

Based on human capital theory and resource dependence theory, this study has developed a theoretical framework to explain the relationship between RMCs' human capital and firms' management of risk in terms of firm performance and the likelihood of financial distress. Accordingly, this study addresses the following research question:

Is firms' risk management committee human capital associated with the firms' management of risks?

Six hypotheses were developed to answer the research question. Before examining RMCs' human capital, this study first investigated the association between the existence of RMCs and the existence of separate RMCs on firms' management of risk in terms of firm performance and the likelihood of financial distress, leading to the development of the first two hypotheses. The next two hypotheses addressed the relationship between the human capital of RMCs members and firms' management of risk. Lastly, the remaining two hypotheses paid particular attention to firm-specific and general human capital.

This study used a sample of the top 300 ASX listed companies between 2007 and 2014 to capture whether there was a growing emphasis on risk management practice in firms over time. Two models were developed and tested. The first was an overall human capital score derived from RMCs' human capital characteristics using principle component analysis; the second examined individual RMCs' human capital characteristics.

With respect to the association between RMCs, separate RMCs existence, and firms' management of risk in terms of firm performance and the likelihood of financial distress, the results revealed that the number of firms with a separate RMC remained stable over time, whereas there was an increasing trend of combined RMC establishment, and a decrease in the number of firms without a RMC. The regression results reveal that the existence of a RMC and a separate RMC were not significantly related to firm performance and the likelihood of financial distress. However, the findings show that the existence of a separate RMC moderated the relationship between firm risk and a firm's accounting performance. In terms of RMC human capital, the overall RMC human capital score was positively related to firm performance and market measurement of the likelihood of financial distress. With

respect to individual RMC human capital characteristics, the total amount of experience (as a type of general human capital) was positively related to accounting performance, while RMC members' board tenure (as a type of firm-specific human capital) was negatively related to market performance.

The findings make several important contributions. Firstly, this study contributes to the literature by providing empirical evidence about human capital theory from a risk management perspective, and draws on research to determine whether human capital is associated with firm performance and research that determines the association between risk management and firm performance. Secondly, this study informs policy setters about the current risk management practice in Australia, and provides implications for regulating risk management practices. Overall, the findings of this study highlight the importance of RMCs' human capital.

Table of Contents

List of Figures

List of Tables

List of Abbreviations

ASXCGC	Australian Security Exchange Corporate Governance Council
CGPR	Corporate Governance Principals and Recommendations
ERM	Enterprise Risk Management
RMC	Risk Management Committees
RMCHC	Risk Management Committee Human Capital
SRMC	Separate Risk Management Committees

Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

QUT Verified Signature

Signature:

Date: 18/08/2017

Acknowledgements

This thesis would not have been possible without the unconditional support, encouragement, and contribution of many people.

Foremost, I would like to express my sincere gratitude to my supervisors, Professor Marion Hutchinson and Ms Kate Hogarth, for their continuous support of my PhD study, and their patience, motivation, enthusiasm, wealth of knowledge, and expertise. They were always there, providing support and being incredible mentors to me.

In addition to my supervisors, I would like to thank my final seminar committee members: Associate Professor Peter Verhoeven and Associate Professor Gavin Nicholson, for their insightful comments and encouragement. I would like to acknowledge all of the members of the Accountancy Group for their encouragement and all of the fun we had.

Finally, I would like to thank my family and friends for their love and unconditional support. They were always encouraging me with their best wishes, and this will never be forgotten.

Chapter 1: Introduction

1.1 INTRODUCTION

Risk management has been recognised as an ever increasing component of the corporate governance of firms (Australian Stock Exchange Corporate Governance Council [ASXCGC], 2014). Failure to recognise and manage risks can adversely impact companies, as well as other stakeholders, such as employees, customers, suppliers, creditors, consumers, taxpayers, and the boarder community in which the entity operates risk management. Companies with good risk management may protect investors' value and assist firms in identifying opportunities to create value [1] (ASXCGC, 2014). Therefore, risk management plays a crucial role in corporate governance (ASXCGC, 2014).

Previous studies have identified that inadequate or inefficient risk management has largely contributed to corporate collapses and the global financial crisis (ASXCGC, 2014; Kirkpatrick, 2009; Rosen, 2003). Rosen (2003) specifically examined the failure of Enron from the perspective of risk management and corporate governance. Rosen (2003) suggested that the board of directors failed to monitor the company's activities and knowingly allowed the company to engage in high-risk practice without proper assessment of its risks. Enron's board failed to demand, understand, and analysis risk information, which lead to insufficient monitoring of risk management practice (Rosen, 2003). Similarly, according to a study by Kirkpatrick (2009), weak monitoring by the board of directors contributed to the severity of the

[1]Previous research suggests that successfully managing risk can lower the firms' expected tax payments, encourage and protect firm specific investments, assist firms in developing financial plans and funding programs, and reduce financial distress and bankruptcy costs (Froot, Scharfstein, and Stein, 1993; Kaen, 2005).

global financial crisis. As the boards are the ones who review and guide risk policy, ineffective board oversight leads to ineffective risk management (Francis, Hasan, and Wu, 2010; Kirkpatrick, 2009). Therefore, board knowledge and expertise are closely associated with firms' risk management. Board of directors' human capital, such as qualifications and experience, can be regarded as an indicator of how well the risk management practices work in the companies (Minton, Taillard, and Williamson, 2010). As a result, it is expected that firms' risk management human capital plays a significant role in firms' management of risk and warrants further investigation.

1.2 MOTIVATION

This study has several motivations. Firstly, it has been suggested that accounting research has paid little attention to risk management governance (Gordon, Loeb, and Tseng, 2009). This study adds to the literature by examining risk management governance from a human capital perspective. As risk management committee (RMC) members bear the fundamental responsibility of risk management, their human capital, such as qualifications and experience, plays a crucial role in risk management governance. The human capital of RMCs determines the boards' ability to monitor companies' risk management practices, control managers' risk-taking behaviour, and ensures appropriate risk governance functioning of RMCs (Bilimoria and Piderit, 1994; Carter, D'Souza, Simkins and Simpson, 2010). In addition, a number of studies have pointed out the importance of risk management human capital in efficiently managing risks. For example, Rosen (2003), Kirkpatrick (2009), and Pirson and Turnbull (2011) suggested that the chance of bankruptcy increases for companies with insufficient knowledge to monitor, understand, and analyse risk information. It is therefore important to examine firms' risk management human capital.

Secondly, the majority of previous studies on board human capital have focussed only on board independence, and found mixed results between board characteristics and firm outcomes (K. Campbell and Vera, 2010; Dionne and Triki, 2004; Johnson, Schnatterly and Hill, 2013, Marsden and Prevost, 2005; Volonté and Gantenbein, 2016). The inconclusive results may stem from the fact that previous studies have only considered one attribute of the board of directors and omitted other important variables. Most importantly, researchers have argued that board independence is not an important board human capital characteristic, as it does not provide a good scope of the board's role (Volonté and Gantenbein, 2016). Therefore, there is a growing demand to examine more relevant human capital characteristics, such as specific skills and experience, as suggested by resource dependency theory (Fama and Jensen, 1983; Johnson, Schnatterly and Hill, 2013; Volonté and Gantenbein, 2016). Specifically, after conducting a review of the studies on board human capital characteristics, Johnson, Schnatterly and Hill (2012) called for future researchers to explore more detailed and comprehensive measures of board human capital, instead of only focusing on board age, size, and independence.

Thirdly, the Australia Stock Exchange Corporate Governance Council (ASXCGC) issued the third edition of Corporate Governance Principals and Recommendations (CGPR) in 2014. Principle 7 of the ASX CGPR provides primary guidance applicable to companies for risk management in Australia. In the third version, this guideline stresses the importance of RMCs and recommends Australian companies establish a RMC (ASXCGC, 2014), as delegating a committee to address different elements of risk can provide an efficient and effective mechanism to provide transparency, focus, and independent judgement to oversee the entity's risk management framework (ASXCGC, 2014, p 29), which consequently enhances the

level of risk management. Most importantly, the ASX CGPR (ASXCGC, 2014) suggests that RMCs should have members with the necessary technical knowledge and experience in order to meet their risk management responsibilities. This highlights the increased attention by regulators regarding RMCs' human capital.

1.3 RISK MANAGEMENT DISCLOSURE IN DIFFERENT SETTINGS

Debate about the importance of risk disclosure started in 1998, when the Institute of Chartered Accountants in England and Wales published a discussion paper that proposed that directors need to disclose risk information in the annual report (Linsley and Shrives, 2006). There is currently no consensus regarding whether risk management disclosures should be mandatory or voluntary, and the International Accounting Standard Board has not issued a mandatory risk reporting standard (Cabedo and Tirado, 2004; J. L. Campbell, Chen, Dhaliwal, Lu and Steele, 2014). Regulators are undecided when it comes to whether or not risk management disclosures should be mandated. On one hand, if it is compulsory for firms to disclose risk information, risk management disclosures may become uniform, providing less useful information to investors. On the other hand, if risk management disclosures are voluntary, companies may provide little or no risk management information (Jia, Munro and Buckby, 2016). As a result, different countries have adopted different risk management disclosure strategies.

Many countries, such as the US, UK, and Germany, require risk disclosure in both the notes for financial statements and supplementary management reports. Risk disclosures for the financial statement are mainly related to financial risk and the use of financial instruments. Specifically, countries such as Canada, Australia, and the UK, have adopted the International Financial Reporting Standard (IFRS); IFRS7

"Financial Instrument: Disclosures"[2], which mandates risk information and requires firms to disclosure their risk information in the notes to the accounts for financial instruments (Jia, Munro and Buckby, 2016). Different countries tend to have different preferences in terms of financial statement note disclosure. By comparing risk disclosure in the notes to financial statements, previous studies have suggested that the US Generally Accepted Accounting Principles regulations focus on specific, detailed, and usually more complex risk disclosure, whereas Canadian regulators – the Canadian Institute of Chartered Accountants, appear to deal more comprehensively with different types of financial instruments usage disclosure (Lajili and Zéghal, 2005).

Risk disclosure in the management report section primarily concerns material risks that could adversely affect firms' financial positions. Specifically, in the US, Financial Reporting Release NO.48 (FRR 48) was introduced in 1997, and requires Securities Exchange regulator registrants to provide information in the management, discussion, and analysis section of the 10K-reports, which mainly focus on the materiality of risks and significant risk exposures, such as financial risk information relating to operations, financial condition, and forward-looking information. Similarly, Canada, North America, and Europe also require firms to disclose risk information in the management, discussion, and analysis section, including a description of business operations and description of risks and uncertainties (Dobler, Lajili, and Zéghal, 2011).

Domestic regulations may take different approaches regarding risk disclosures in the management report. For example, the US Securities Exchange requires detailed disclosure of off-balance sheet arrangements and internal controls (FRR36). Forward-looking risk management disclosure is only encouraged in Canada (Lajili and Zéghal,

[2] Also in International Accounting Standard IAS 32 and 39

2005). In Germany, German Accounting Standard 5 mandates a risk reporting section in the management report, covering risks of any category (Dobler, Lajili and Zéghal, 2011). In the UK, the Company Act requires a description of principle risks and uncertainties faced by the firm and the main factors that are likely to affect the firms' future development (Dobler, Lajili and Zéghal, 2011). Specifically, in 2014, the Financial Reporting Council issued the Strategic Report[3], which is equivalent to management, discussion, and analysis, to provide guidance regarding narrative disclosure, including risk disclosure. It is required that firms' strategic reports must contain a description of the principal risks and uncertainties facing the company under S414C (2) (b) of the Company Act (2001). It also requires firms to disclose an indication of financial risk management objectives and policies, including the policy for hedging major types of forecasted transactions for each hedge accounting if risks are material under Schedule 7.6 (1) (a) of the 'Large and Medium-sized Companies and Groups (Accounts and Reports) Regulations 2008'. Additionally, firms need to disclose any material risk exposures, which is mandated under Schedule 7.6 (1) (b) of the 'Large and Medium-sized Companies and Groups (Accounts and Reports) Regulations 2008'.

On the other hand, some risk management information is disclosed voluntarily by firms and is mainly contains non-financial risk information. For example, in Canada, disclosures that relate to non-financial risks and management's policies to manage risks are largely voluntary (Dobler, Lajili and Zéghal, 2011). Similarly, in Malaysia, non-financial risk management information is disclosed on a voluntary

[3]The strategic report placed the operating and financial review (OFR) report in 2014.

basis, and only financial risk information is required to be disclosed under Malaysian Financial Reporting Standards (Abdullah, Abdul, Mohamed and Ahmad, 2015).

Some countries disclose risk information based on the principle of "comply or explain". That is, if firms do not disclose risk information they must explain the reasons. For example, in the UK, the Financial Reporting Council introduced the *Combined Code on Corporate Governance* in 2003, based on the concept of "comply or explain" (Financial Reporting Council Ltd, 2003). This report was revised in 2008, 2010, and 2012, and focuses on a board's engagement with the shareholders regarding risk management. Specifically, under section C 2 "risk management and internal control," it suggests that the board is responsible for determining the nature and extent of the principle risks it is willing to take in achieving its strategic objectives. In addition, section 2 indicates that the board should maintain sound risk management and an internal control system (Financial Reporting Council Ltd, 2003). This is in line with certain mandatory disclosures, such as Disclosure and Transparency Rules 7.2.5 R, which states that the corporate governance statement must contain a description of the main features of the company's internal control and risk management systems in relation to the financial reporting process (Financial Reporting Council Ltd, 2003). Section C 2.1 of the Combined Code on Corporate Governance recommends that the directors describe principal risks and explain how they are being managed or mitigated (Financial Reporting Council Ltd, 2003).

Australia adopted a similar corporate governance code. Australian regulators, through the Australian Securities Exchange Corporate Governance Council (ASXCGC) introduced *Corporate Governance Principles and Recommendations* (CGPR) in 2003, which was subsequently amended in 2007, 2010, and 2014. One of the principles of the ASX CGPR - Principle 7 provides the primary guidance

applicable to companies for risk management disclosures in Australia, and it illustrates the increasing importance of risk management as a part of the recommended corporate governance practices (ASXCGC, 2014). Although corporate governance principles and recommendations are not mandated, companies are required to comply with an "if not, why not" approach in disclosing risk management information, which is consistent with the UK's "comply or explain" approach. This 'self-regulatory' principle provides an ideal setting in which to examine firms' risk management practices and differs from other jurisdictions where risk management disclosure information is purely voluntary or mandated (Beretta and Bozzolan, 2004).

As evidenced by the changes to ASX CGPR (ASXCGC, 2014), there is a growing emphasis on risk management practices in Australian firms. Due to the drastic consequences of the global financial crisis, corporate collapse, and the increasing complexity of business environments, risk management practice plays a significant role in safeguarding shareholders' wealth and value creation (ASXCGC, 2014). This guideline recommends that Australian companies have a RMC (ASXCGC, 2014). Specifically, the ASX CGPR recommends that

> "A risk committee should be of sufficient size and independence, and its members between them should have the necessary technical knowledge and a sufficient understanding of the industry in which the entity operates, to be able to discharge the committee's mandate effectively" (ASXGCG, 2014, p. 29).

This means that firms need to have RMC members with the necessary technical knowledge, experience, and a sufficient understanding of the industry in which the entity operates, in order to effectively oversee risk management.

In summary, most mandatory rules and voluntary recommendations for risk disclosure primarily relate to financial risks and their potential impact on the firms.

Australia is the only country that has paid particular attention to RMCs and RMCs' human capital in the CGPR. Therefore, Australia provided the ideal setting for this study to examine firms' risk management human capital.

1.4 OBJECTIVE OF THE STUDY AND RESEARCH QUESTIONS

Human capital literature suggests that individuals and society can produce economic benefits by investing in people, and higher levels of human capital can increase people's productivity (Becker, 1993; Mincer, 1974; Sweetland, 1996). Therefore, firms with a high level of risk management human capital may increase risk management efficiency and generate positive outcomes. The aim of the study is to investigate the association between firms' RMC human capital and firms' management of risk in terms of firm performance and the likelihood of financial distress. In order to achieve this objective, the principal research question is:

> *Is firms' risk management committee human capital associated with firms' management of risk?*

In order to address the research question, this study first examines the relationship between the existence of RMCs and firms' management of risks in terms of firm performance and the likelihood of financial distress. Specifically, this study examines two types of RMC, a combined RMC[4] and a separate RMC[5].

This study then focuses on firms' RMC human capital and examines its relationship with firms' management of risk.

[4] A combined RMC is where risk management committee is combined with other committee, such as audit and risk committee.
[5] A separate RMC is a stand-alone committee only in charge of risk management.

1.5 THEORETICAL FRAMEWORK

In addressing the research question, this study drew on a number of theories and previous studies to develop the theoretical framework. Firstly, human capital theory provides insight into the overall theoretical relationship among firms' risk management human capital, firm performance, and firms' likelihood of financial distress. Specifically, human capital theory highlights the importance of firms' human capital and the positive impact of a high level of human capital on firms' productivity and efficiency. As a result, firms with high risk management human capital may increase their risk management efficiency and generate positive outcomes.

Secondly, resource dependence theory suggests that firms require parties who can bring crucial resources to companies and thus provide strength to the company. This crucial resource, such as previous experience, may help firms to decrease uncertainty and lower transaction costs, leading to positive firm outcomes. Hence, resource dependence theory highlights the importance of firms' human capital, such as experience and qualifications, and its positive association with firms' outcomes.

Thirdly, firms' risk management human capital is expected to contribute to the reduction of agency costs. According to agency theory, there is a conflict of interest between managers and shareholders due to the separation of ownership and control, leading to agency costs. Managers may have incentives to act opportunistically in order to maximise their own wealth at the expense of shareholders' value (Watts and Zimmerman, 1990). As a result, it is important that shareholders monitor managers' behaviours, especially their risk-taking behaviours. It is proposed that firms with a high level of risk management human capital are more likely to have the capacity to monitor managers' risk-taking behaviours, leading to lower agency costs.

Within this framework, six research hypotheses were developed to address the research question. Before examining RMC human capital, this study first investigated the association between the existence of RMC and the existence of a separate RMC on firms' management of risk in terms of firm performance and the likelihood of financial distress by developing the first two hypotheses. The next two hypotheses addressed the relationship between the overall human capital of RMC members and firms' management of risk. Lastly, the remaining two hypotheses paid particular attention to firm-specific and general human capital.

1.6 RESEARCH DESIGN

This study examined firms' risk management human capital and firms' management of risk based on a sample of top 300 ASX between 2007 and 2014. The time frame of 2007 to 2014 was chosen to perform a longitudinal analysis of RMC human capital in Australia for several reasons. Firstly, in 2007, the CGPR was revised (ASXCGC, 2007). Therefore, 2007 is the starting point of when Australian companies began to comply with the revised edition of ASX CGPR. In addition, this study also takes into account the effect of the 2007-2008 global financial crisis. As a result, it was also appropriate to choose 2007 as the first year in this study to capture whether there has been a growing emphasis on risk management practice in firms since the global financial crisis period. The year 2014 was selected because this is the latest date risk management data was available for this study.

This study chose the top 300 ASX listed firms of each year (i.e., unbalanced panel dataset) based on the expectation that this corporate group could provide an overall representation of the risk management practice of ASX listed companies (Van der Laan and Dean, 2010). The top 300 ASX companies cover large, mid, and small-

cap components of all ASX listed companies, thus, it provided enough variation in the sample to be representative of all listed firms.

The research methods used to examine the firms' risk management human capital and firms' management of risk included both univariate and multivariable analysis. Specifically, risk management human capital was investigated by utilising two research models based on a risk management human capital score derived from principal component analysis, and on individual risk management human capital characteristics developed from the literature. The random effects regression analysis method was adopted to assess the relationship between RMC human capital and firms' management of risk.

1.7 SUMMARY OF MAJOR FINDINGS

The analysis of RMCs revealed that the number of firms with a separate RMC remained stable, whereas there was an increasing trend of combined RMC formation of sampled companies, with the number increasing from 121 (40.3%) companies in 2007 to 186 (62%) in 2014. The number of companies that did not have a RMC dropped during the same time span, with almost half of the sample companies (155) not having a RMC in 2007 down to only 84 companies (28%) in 2014. The regression results on the association between the existence of a RMC and firms' management of risk revealed that the existence of a RMC and a separate RMC were not significantly related to firm performance and the likelihood of financial distress. However, the finding shows that the existence of a separate RMC moderated the relationship between firm risk and accounting performance, indicating the existence of a separate RMC was associated with better risk management.

By developing an overall risk management human capital score utilising principal component analysis, the results on the association between risk management

human capital and firms' management of risk revealed that risk management human capital was positively related to firm performance (both accounting and market performance) and market measurement of the likelihood of financial distress. Most importantly, risk management human capital moderated the relationship between risk and the likelihood of financial distress. The results suggest that at higher risk, firms increasing the level of RMC human capital will decrease the likelihood of financial distress. This highlights the value of RMC human capital of firms.

The results of the model using individual risk management human capital characteristics to test the association between firms' general and firm-specific risk management human capital and firms' management of risk show that the total amount of experience, as a type of general human capital, was positively related to firms' accounting performance, while RMC members' board tenure, as a type of firm-specific human capital, was negatively related to market performance. Firm-specific and general human capital characteristics had no association with the likelihood of financial distress.

The overall results highlight the importance and the value of firms' risk management human capital. They also provide evidence regarding the importance of forming a separate RMC. However, contrary to expectations, no strong evidence was found regarding the relationship between firm-specific, general human capital and firms' management of risk.

1.8 CONTRIBUTION OF THIS STUDY

This paper contributes to human capital literature, and more generally to corporate governance literature, in several aspects. Firstly, it has been suggested that accounting research has paid little attention to risk management governance (Gordon, Loeb and Tseng, 2009). This study contributes to the literature by providing empirical

evidence about human capital theory from a risk management perspective, and draws on research attempting to determine whether human capital is associated with firm performance (e.g. G. Chen and Hamrick, 2012; Crook, Todd, Combs, Woehr, and Ketchen, 2011) and research determining the association between risk management and firm performance (e.g. Gordon, Loeb, and Tseng, 2009; Orlitzky and Benjamin, 2001; Pagach and Warr, 2010).

Secondly, the majority of previous studies have only focused on one element of human capital characteristics, such as board independence or board diversity. Therefore, this study adds to the literature by going beyond the limited characteristics identified in previous studies and focussing on a wider variety of directors' human capital characteristics, thereby providing a more comprehensive picture of RMC human capital. In addition, in contrast to previous research, which has largely examined the association between specific indicators of human capital and specific outcomes (Carpenter, Pollock and Leary, 2003; Hillman, 2005; McDonald, Westphal and Graebner, 2008), this study extends this area of research on the value of board human capital by empirically arguing and testing the relationship between a number of human capital indicators and overall firm outcomes.

Thirdly, the practical contribution of this study is that it informs firms about the benefits of RMC human capital. Additionally, this study informs regulators about current RMC human capital practice in Australia and provides implications to policy makers in relation to regulating risk management practice from the perspective of firms' human capital. Specifically, a number of findings provide implications for future policy decisions. Firstly, the findings demonstrate the importance of RMC human capital in firms, as it is positively related to firm performance and negatively related to firms' likelihood of financial distress. Secondly, the results show that the

total amount of experience obtained by RMC members is positively related to firm performance and markets penalise firms with long-tenured RMC members. As a result, future reviews of the corporate governance recommendations may consider providing improved guidance to Australian firms regarding the composition of RMC members, with a particular emphasis on the experience and tenure of RMC members.

1.9 STRUCTURE OF THE STUDY

The remainder of the thesis is organised as follows. The next chapter provides a brief overview of risk management literature, including risk, risk management, the responsibilities of managing risks, and risk governance research. A human capital literature review is also presented, including human capital research regarding the board of directors and committee members. Using human capital and resource dependence theory as a basis, Chapter 3 explains the relevant risk management theories and reviews the findings of previous literature, followed by the hypotheses development for this study. Chapter 4 describes the research design of this study, including the sample, study period, research models, and definition of the variables. The results of the statistical analysis of this study (regarding the existence of RMC and RMC human capital) are reported in Chapter 5, along with a discussion of the results. The final chapter concludes the thesis with a summary of this study and the main findings. The final chapter also highlights the contributions and limitations of this study and opportunities for future research.

Chapter 2: Literature Review

2.1 INTRODUCTION

Risk and risk management have captured the attention of regulators and financial report users. Previous studies have investigated risk management from different perspectives, and this chapter provides a literature review of the research in relation to risk, risk management, and risk governance, as presented in Section 2.2. Section 2.3 describes the corporate governance mechanism that bears the responsibility of risk management, namely the board of directors, who may delegate this responsibility to a RMC (either a combined or separate RMC). The theories that explain the importance of establishing a RMC are also described in this section. Section 2.4 provides an overview of human capital literature. A relevant review of board human capital and committee member human capital research is also presented, embedded with the theories used to illustrate the importance of firms' human capital. Section 2.5 presents the concluding comments of this chapter.

2.2 RISK, RISK MANAGEMENT, AND RISK GOVERNANCE

2.2.1 Risk

In the light of accounting corporate collapses and the global financial crisis, risk and risk management have been highlighted as important components of corporate governance (risk governance), in particular, how they have been underemphasised (Van Asselt and Renn, 2011). As a core objective of the risk management procedure, risk governance translates the substance and core principles of governance into the context of risk and risk management (Froot, Scharfstein and Stein, 1993; Psaros, 2009; Van Asselt and Renn, 2011). The recognition of different types of risk is central to risk governance (Van Asselt and Renn, 2011).

According to AS/NZS ISO 31000:2009, risk is defined as "the effect of uncertainty on objectives" (ISO, 2009, p13). In a more general sense, risk is any opportunity or prospect, or any hazard, danger, harm, threat or exposure that has already impacted upon the company or may impact upon the company in the future (Linsley and Shrives, 2006). All of these activities are "material" if misstatement or omission could influence information users' decision-making about the price or value of a company's securities (ISO, 2009). "Material" changes to a company's risk profile can affect investors, as well as shareholders' decision-making. Therefore, it is important that companies identify their material business risks. According to the International Accounting Standards Board (2010), entities should make judgments on the significance of a variety of issues, based on their nature (how it relates to companies) and their magnitude (how significantly it affects companies) that may affect their financial reporting. Additionally, in 2010, ASX CGPR 2nd edition (ASXCGC, 2010) recommended that each company must determine the material business risks they are facing, especially the most significant areas of uncertainty or exposure at a whole company level that could impact the achievement of organisational objectives. These areas present opportunities and threats for financial gains or loss.

Most business risks can be determined by choice of company activity, the external environment, and the nature of company assets. Factors such as the health of the industry sector, market share, market size, competition, industrial relations, foreign exchange and interest rates, equity and commodity prices, and political visibility will influence the risk profile. There are also risks associated with the direct internal activities of an organisation, such as those emanating from operational performance, compliance, financial control and reporting, technology, people and skills, and quality

of management related issues. All of these risks may be relevant to a company's risk profile. Internal and external risks that a company faces, can be broken down to 13 risk categories, including operational, environmental, sustainability, compliance, strategic, ethical conduct, reputation or band, technological, product service quality, human capital, financial reporting and market-related risks (ASX CGPR, 2010). Similarly, the "Group of 100" identify risks into four broad risk categories with different sub-categories of risks: financial risk (including market, liquidity and credit, accounting and reporting, and capital structure), strategic risk (including governance, planning and resource allocation, stakeholders, and market dynamics), compliance risk (including standard of business conduct, regulatory, and legal), and operations risk (including value-chain, physical assets, people, knowledge, and information technology). The main risk categories and their definitions that frequently disclosed in companies' reports are:

- Operational risk –the risk of loss resulting from inadequate or failed internal process, people and systems or from external events (WBC[6], 2013; ANZ[7], 2013; QBE[8], 2013; Basel II[9])
- Credit risk – the risk of financial loss where a customer or counterparty fails to meet their financial obligation (WBC[1], 2013)
- Compliance risk- the risk of legal or regulatory sanction, and financial or reputation loss, arising from our failure to abide by the compliance obligations required of us (WBC[1], 2013)

[6] Westpac Banking Corporation
[7] Australia and New Zealand banking group Limited
[8] QBE Insurance Group
[9] Second of the Basel Accords

- Strategic risk – the current and prospective impact on earnings and or capital arising from strategic business decisions, implementation of decisions and responsiveness to external change (QBE[3], 2013)
- Reputation risk – the risk to earnings or capital arising from negative public opinion resulting from the loss of reputation or public trust and standing (WBC[1], 2013)
- Market-related risk – the risk of an adverse impact on earnings resulting from changes in market factors, such as foreign exchange, interest rates, commodity prices and equity prices (WBC[1], 2013).

As each organization is exposed to different levels of uncertainty in their business environment, it is foreseeable that different organizations exposed to different kinds of risk category would have different risk profiles. For example, Westpac (2015) recognised their risk profile consistsof credit risk, liquidity risk, market risk, operational risk, compliance risk, business risk, environmental, social and governance risks, equity risk, insurance risk, related entity risk, and reputation risk,while QBE insurance (2015) identifiedtheir risk profile only consists of strategic risk, insurance risk, credit risk, market risk, liquidity risk and operational risk.

2.2.2 Risk management

After recognising the risks that companies are exposed to and identifying what types of risk are involved in their business environment, the next step is to manage risk, that is, risk management. Risk management is coordinated activities that direct and control an organisation's risk (ISO, 2009), with an objective of maximising the wealth of company owners and ensuring companies are not jeopardised by excessive risk taking behaviours (Kaen, 2005). This is in line with the CGPR (ASXCGC, 2010),

which suggests that risk management should be designed to identify, assess, monitor, and manage risk (p.32). Alternatively, risk management can be recognised as a series of activities performed by companies that are designed to minimise the negative impact of uncertainty regarding potential losses (Schmit and Roth, 1990). As risk taking is fundamental to business activities (Spira and Page, 2003) and all firms take risks, the main purpose of the risk management function is to mitigate the risk of large losses (Ellul and Yerramilli, 2011), by taking smart, well-informed, and considered risks and potentially exploring business opportunities (Psaros, 2009).

2.2.3 The importance of risk management

Managing risk is necessary for companies because risk management can decrease the probability of incurring bankruptcy or organisation costs, help firms enter into contracts with better terms (with suppliers, customers), reduce the incidence of value-decreasing investment decisions (Triantis, 2005), and enhance the environment for identifying and capitalising on opportunities to create value and protect established value (ASXCGC, 2010; Froot, Scharfstein and Stein, 1993).

Successfully managing risk can provide many benefits to companies: it can lower the firm's expected tax payment, protect firm-specific investments, assist firms in developing financial plans and funding programs, and reduce financial distress and bankruptcy costs (Froot, Scharfstein and Stein, 1993; Kaen, 2005). For instance, risk management strategies allow firms to utilise more debt, that is, increase their financial leverage. As a result, risk management can be used as a way to reduce taxes by letting a firm borrow more money and obtain interest expense tax shields. In addition, companies can use risk management strategies to mitigate the potential financial problems associated with currency risk. Companies can hedge their exchange rate exposure and adopt other exchange rate exposure strategies, such as currency swaps

for financing foreign operations, which reduce the likelihood of companies experiencing severe financial problems from unexpected exchange rate movements (Kaen, 2005). Additionally, risk management strategies, such as hedging, can be used to reduce agency costs and therefore increase the market value of the company. Unlike shareholders, managers cannot diversify away the unique risks associated with the company, which are known as unsystematic risks. By using risk management strategies, such as hedging, managers can eliminate unsystematic risks. Therefore, managers would be more likely to undertake projects that are profitable based on their systematic risk exposures, not on unsystematic risks, which is in line with the interests of shareholders (Kaen, 2005). Most importantly, good risk management contributes to the achievement of objectives and improvement of performance in a wide range of activities, such as project management, product quality, and efficiency in operations, governance, and reputation (ISO, 2009). In contrast, failure in risk management can lead to difficulties in achieving the company's objectives, which can substantially increase its financial failure (Psaros, 2009).

As risk management plays a crucial and significant role in increasing firm value and future growth, it is important to consider how companies manage their risks once they have been identified.

2.2.4 How to manage risk

Risk treatment

After companies identify their risks, there are five options they can take in order to decrease the effect of risks on their companies.

Firstly, companies can avoid the problem by not proceeding with the risky activity; however, risk avoidance may lead to other consequences. For example, firms may miss the opportunity to exploit a profitable project.

Secondly, companies can choose the step of reducing the likelihood of risks occurring, for example, through auditing and compliance programs designed to protect firms from exposure to risk. Firms can generally reduce risk through diversification by creating a portfolio of business divisions or product lines. The likelihood of risk occurring can also be controlled through decreasing either financial or operating leverage. Decreasing leverage can sacrifice upside gains in order to eliminate downside risks (Triantis, 2005). As the ultimate goal of each company is to maximise their profit, companies are likely to invest in real options in order to manage their risk without sacrificing profit. Real options provide an opportunity for firms to limit their downside risk while still holding profit on the upside (Miller and Waller, 2003). By investing in real options, firms can avoid risky projects but still gain the valuable opportunity that risky projects may provide. Real options place firms in a position to delay investment without losing their competitive advantage, to abandon a project when it is unprofitable, or to adjust its operating strategy at low cost, or avoid risks and exploit profitable opportunities. Firms can take advantage of real options, and then use financial contracts to transfer and control any residual risk, consequently achieving value maximisation. However, firms need to have an ability to delay their investment without losing out to competition, otherwise real options may be worthless (Triantis, 2005).

Thirdly, the company can reduce the impact of risk if it occurs, for example, through contingency planning or disaster recovery plans (DRP) that have been developed within companies. These plans are designed to help an organisation respond effectively and efficiently to a significant future situation or event that may or may not happen.

Alternatively, companies can transfer some or all of the risk to an external party that has the capacity to bear the risk or may be able to manage or control the risk more effectively, for example, insurance contracts, joint ventures, and financial derivatives. In some cases, it can bring together two parties with opposite risk exposures and neutralise the risk exposure for both parties (e.g. a Chinese company's exposure to US dollars risk and a US company's exposure to RMB dollars risk) (Triantis, 2005).

Lastly, companies can choose to retain the risk, while monitoring the consequences of the residual risk.

The way companies manage risks

Traditionally, companies manage different types of risk in a segmented and separated way, which is the "silo approach" to risk management (Laux, 2005). Different risks are managed by different instruments. For example, pure risks, such as property, liability, and work injury risks, are usually managed individually through a combination of loss control, retention, and insurance contracts. Price risks, such as interest rate, exchange rate, commodity price, and credit risk, are addressed through derivative contracts, including options, forwards, futures, and swaps (Laux, 2005). Since the late 1990s, many researchers have questioned the appropriateness of traditional risk management by arguing that firms should consider managing their risks at an enterprise level in order to increase firm value and risk management efficacy (see Hoyt and Liebenberg, 2011; Liebenberg and Hoyt, 2003; Meulbroek, 2002). This approach is usually called enterprise risk management (ERM) or integrated risk management. Previous studies have highlighted that a portfolio view of risk management is essential because risks are not just simply added up. Mitigating one type of risk may increase the whole company's risk portfolio if that risk is a natural hedge for another (Laux, 2005). Additionally, managers might not recognise some

risks when they are considered individual and unrelated. As a result, a good understanding of the firm's risk cannot be obtained by managers. This could lead to financial loss and lack of competitiveness in the market. Whether a company chooses a silo-based approach or enterprise-based approach is still based on firm-specific characteristics, such as firm size, business factors, and the costs of risk management (see Pagach and Warr, 2007, 2010), suggesting that different companies can choose to adopt different risk management approaches based on their own firm characteristics. There is no one risk management approach that fits all companies.

Risk management process and framework

Given the breadth, depth, and intertwined nature of risk areas, organisations need to have coordinated policies and risk management structures in place in order to identify and manage risks (Psaros, 2009). ISO 31000:2009, *risk management – principles and guidelines*, provides principles, a framework, and a process for managing risk for Australian companies (ISO, 2009). Risk is generally managed within a risk management framework that each Australian company is required to have (ASXCGC, 2014). A risk management framework is "a set of components that provide the foundations and organisational arrangements for designing, implementing, monitoring, reviewing, and continually improving risk management throughout organisation" (ASXCGC, 2014, p34). Management designs and implements that framework to ensure the entity operates within the risk appetites set by the boards. Additionally, ISO (2009) identified the process of risk management (Figure 2.1), to guide companies in risk management. As illustrated in Figure 2.1, the process of risk management can be broken into five steps. Firstly, communication and consultation with internal and external shareholders should take place at an early stage, and should address the risks, such as the causes, consequences, and treatment. Secondly,

companies should identify the internal and external business environment of the company. The company can then conduct a risk assessment, including risk identification, risk analysis, and risk evaluation, to assess its potential risk. Next, organisations should assess and modify risks to ensure the risks are managed within a tolerable level. Finally, continuous monitoring and reviewing should be undertaken in order to oversee the companies' risk management processes and ensure risk management activities are sound over time.

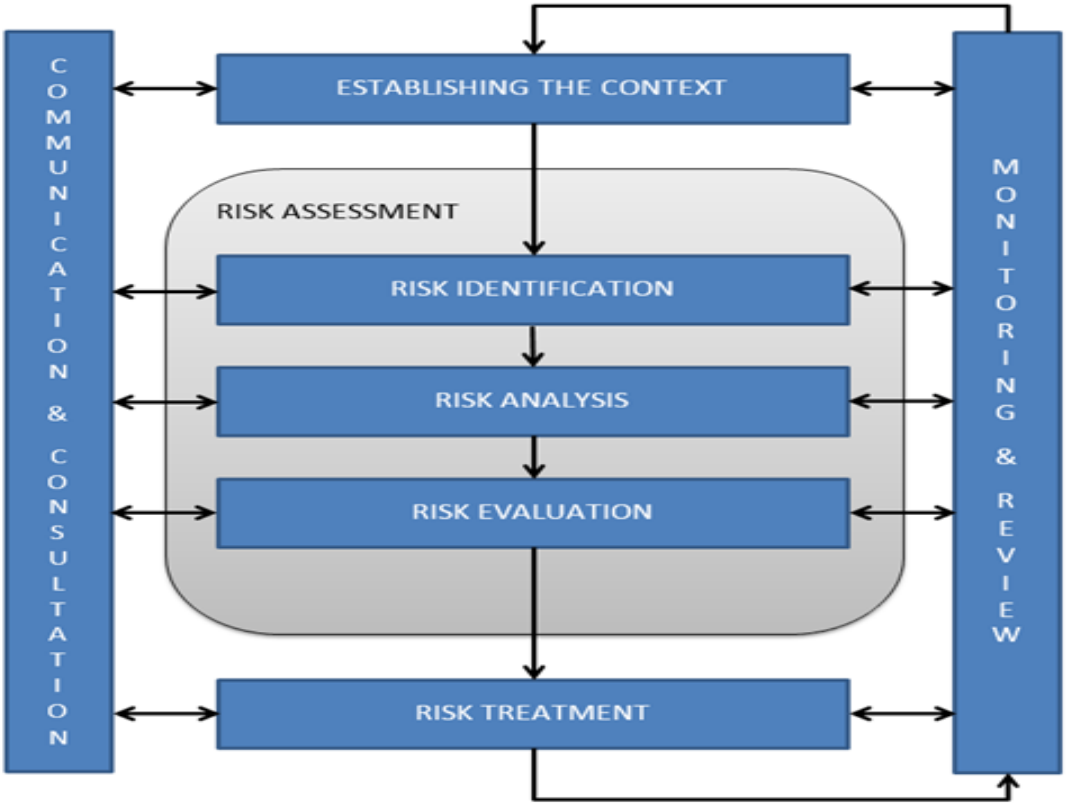

Figure 2.1: ISO risk management process (adopted from Australian/New Zealand Standard AS/NZS ISO 31000:2009)

2.2.5 Risk governance literature review

Risk governance indicates how firms manage their risks, and which decisions about risks are taken and implemented (Van Asselt and Renn, 2011). Therefore, risk governance is closely related to risk management, and firms require a governance

structure to manage their risks. Specifically, firms analyse and formulate risk management strategies to avoid risk uncertainty and economic loss caused by risks. Research has investigated firms' risk governance from the viewpoint of the board of directors, who oversee the risk governance of firms. Previous literature in this field has mainly examined the relationship between board characteristics and risk management from two perspectives: risk management activity and risk taking.

Corporate governance and risk management activity.

Previous research has examined the association between corporate governance characteristics and risk management activity (such as dealing with financially sophisticated tools and implementing enterprise risk management [ERM]) (Dionne Maalaoui Chun, and Triki, 2013), with an emphasis on the linkage between board of directors and firms' risk management activities. Among those studies, the majority have paid attention to one characteristic of board of directors – board independence. The findings seem to have inconclusive results regarding the association between outside directors (independent directors) and risk management activities. Dionne, Maalaoui Chun and Triki (2013) found that board independence plays an active role in firms' risk management through increasing hedging activities. Similarly, the results of Borokhovich, Brunarski, Crutchley, and Simkins (2004) showed that the proportion of independent directors on the board increases interest derivatives usage. However, Dionne and Triki (2004) and Marsden and Prevost (2005) reported that the presence of independent directors had no effect on a firm's risk management policy, such as decisions about a hedge or the extent of the hedge. Whidbee and Wohar (1999) conducted an empirical study based on a sample of bank holding companies and the results were similar to Dionne and Triki (2004) and Marsden and Prevost (2005). They

found that the presence of independent directors increased derivatives usage only when non-independent directors held a large proportion of shares in the firm (Whidbee and Wohar, 1999). These inconclusive results may stem from the fact that board independence is not the main factor related to risk management activities and only considering one attribute of the board of directors may omit other important board characteristics. Therefore, it is necessary for scholars to examine other attributes of the board of directors. Additionally, Dionne, Maalaoui Chun and Triki (2013) provided insight into the association between the financial educational level of board members and the extent of hedging. Specifically, they suggested that boards with a majority of financially educated directors are more active in managing their risks. Their results highlight the importance of board human capital in relation to risk management activity and provide the initial empirical evidence in regards to the relationship between board human capital and risk management activities.

While the board of directors oversee the governance process, they also need to co-operate with other parties, such as managers, to fulfil their governance responsibilities. As a result, other studies have investigated the association between managers' characteristics and risk management activities and suggested that firm and managerial characteristics may have an impact on risk management activities. For example, Tufano (1996) examined risk management practices in the US gold mining industry. His results revealed that managers who own fewer shares manage more risk, and firms with a greater outside shareholding tend to manage less risk. Most importantly, he also examined the tenure, age, and stock ownership of CEOs and CFOs and found that CFOs with shorter tenure seemed to manage more risk. In addition, the presence of a Chief Risk Officer (CRO), board independence, and the apparent support

of ERM processes by the CEO and CFO were positively related to the stages of ERM implementation (Tufano, 1996).

Corporate governance and risk taking

Many studies in this field have adopted agency theory, which suggests that there are agency conflicts between shareholders and managers, and certain characteristics of corporate governance may influence risk taking and firm performance (Eng and Marek, 2003). However, the relationship between corporate governance and risk taking has not been confirmed, as arguments can be made from both the positive and negative sides. A high level of corporate governance (governance compliance) and better investor protection may reduce managerial discretion and limit opportunities for more risk taking behaviours, whereas a high level of investor protection may also lead managers to undertake riskier but more profitable projects (John, Litov and Yeung, 2008; Minton, Taillard and Williamson, 2010).

A great deal of research has empirically examined the relationship between shareholder ownership and risk, and consistently found a positive relationship between these two variables. For example, C. R. Chen, Steiner, and White (2001) documented that when management ownership increases, the alignment of interests of managers and owners enhances, leading to greater risk taking by managers. Similarly, Eng and Mak (2003), He and Sommer (2011), Nguyen (2011), and Calomiris and Carlson (2016) confirmed the importance of ownership structure for corporate governance on risk taking. In addition to shareholder ownership, Eng and Mak (2003) suggested that corporate governance elements, such as compensation, monitoring, and ownership structure are all significantly related to risk taking. Other research has investigated the relationship between board structure and composition, such as board size and board independence, in relation to corporate risk taking. In the UK, McNulty, Florackis and

Ormrod (2013) reported a negative relationship between board size and financial risk using a questionnaire survey. However, Akbar, Kharabsheh, Poletti-Hughes and Shah (2017) found no significant effect of board size on corporate risk taking in the UK financial sector. By examining US banks, Pathan (2009) revealed a negative relationship between the percentage of board independence and total risk, idiosyncratic risk, systematic risk, and assets return risk. Similarly, Akbar, Kharabsheh, Poletti-Hughes and Shah (2017) confirmed the Pathan (2009) finding in the UK and reported a negative relationship between the presence of independent directors and corporate risk taking.

Other studies have examined board human capital in relation to risk taking and firm performance. For example, Minton, Taillard and Williamson (2010) found that in the banking industry, the financial expertise of the board was associated with more risk taking, higher firm value before the GFC, and lower firm performance during the crisis. This study suggested the importance of firms' human capital in relation to risk taking level (Minton, Taillard and Williamson, 2010). In addition, Akbar, Kharabsheh, Poletti-Hughes and Shah (2017) provided preliminary evidence showing that the existence of a risk committee in the board structure reduces corporate risk taking. Their results highlight the linkage between RMC and risks (Akbar, Kharabsheh, Poletti-Hughes and Shah, 2017).

In summary, prior literature has shown the impact of human capital on risks and the potential linkage between RMC and risks. The next section examines bankruptcy risk and reviews the previous research that has examined firms' bankruptcy risk in relation to corporate governance.

Corporate governance and bankruptcy risk

Although corporate governance is apparently related to bankruptcy risk, the evidence in this area is sparse. Existing research has mainly examined the relationship between corporate governance and performance (either operating or firm performance) (see Darrat, Gray, Park, and Wu, 2016). In addition, a number of studies have indicated the relationship between corporate governance and bankruptcy risk (Darrat, Gray, Parker and Wu, 2016; Fich and Slezak, 2008; Parker, Peters, and Turetsky, 2002). However, the majority of past research has only examined corporate governance characteristics, without considering firm-specific attributes, such as directors' human capital in firms. In general, prior research has only examined a few corporate governance characteristics, such as board size, board independence, board diversity, and a powerful CEO, in relation to bankruptcy risk. In terms of board size, a large amount of research has suggested complex firms with a larger board perform better (Boone, Field, Karpoff and Raheja, 2007; Darrat, Gray, Parker and Wu, 2016; Linck, Netter and Yang, 2008). Fich and Slezak (2008) contended that a smaller board is positively related to bankruptcy risk for financially distressed firms. In relation to board independence, Darrat, Gray, Parker and Wu (2016) documented that the relationship between board independence and bankruptcy risk depends on some firm-specific circumstances, such as specialist knowledge. Board independence is negatively related to bankruptcy risks in firms that require more specialist knowledge (Darrat, Gray, Parker and Wu, 2016). Other research has indicated that diverse boards are negatively related to bankruptcy risk (Adams and Ferreira, 2009; Darrat, Gray, Parker and Wu, 2016) and a powerful CEO (who serves as board chair or holds a large proportion of the firm's stock) is more likely to increase a firm's bankruptcy risk (Adams, Almeida, and Ferreira, 2005; Darrat, Gray, Parker and Wu, 2016).

2.3 WHO IS RESPONSIBLE FOR MANAGING CORPORATE RISK?

Given that good risk management practice is very important in companies' daily activity, who is best equipped to take on the role of risk management? There are three risk related corporate governance mechanisms that may enhance the level of risk management practice: the board of directors, a combined RMC, and a separate RMC.

2.3.1 Board of Directors

Responsibilities of boards - risk management

Managers are responsible for the day to day running of a business, while the board is ultimately responsible for all corporate decisions, including risk management (Corps Act, 2001, Division 9.1). Managing risk is a fundamental concern in today's dynamic global environment (Gordon, Loeb, and Tseng, 2009) and the board of directors plays a crucial role in risk management. According to McKinsey and Company's (2002) global investor opinion surveys, investors perceive board practices to be as important as financial performance when they are evaluating companies for potential investment. This survey highlights that investors demand that boards communicate and report material matters to their shareholders, as well as responding to requests for information by investors in regards to governance issues, especially if the issue relates to risk management (Laksmana, 2008). This highlights the relationship between the board of directors and risk management.

Theoretically speaking, the board of directors holds both monitoring and advisory roles. According to agency theory, due to the separation of ownership and management in companies, managers may engage in opportunistic behaviour at the expense of shareholders' wealth. As a result, one of the main roles of the board of directors is to monitor managers' opportunistic behaviour on behalf of shareholders, which in turn decreases agency costs (Adams and Ferreira, 2007; Dionne, Maalaoui

Chun and Triki, 2013; Fama and Jensen, 1983; Hermalin and Weisbach, 2003; Jensen and Meckling, 1976). Effective monitoring by the board of directors can improve companies' corporate governance practice, reduce agency costs, and consequently increase firm performance (Hillman and Daiziel, 2003). Additionally, effective monitoring by boards may increase the efficiency of companies using risk-related tools, such as hedging and derivatives (Marsden and Prevost, 2005). It is therefore expected that the board of directors may positively influence companies' risk management practices.

Resource dependency theory highlights the second role of the board of directors – their advisory role. The theory indicates the relevance of directors' skills and characteristics in response to firms' activities and advice management about firms' behaviour, such as risk management behaviour (Pfeffer and Salancik, 1978). Board characteristics, such board size, board expertise, and board independence, are very important components in determining the quality of the boards oversight function (Kirkpatrick, 2009). Previous risk management literature has suggested that a high percentage of independent board members contribute to a good risk management practice (Bhagat and Bolton, 2008; Mongiardino and Plath, 2010), as independent directors have a strong influence in determining and monitoring firms' policy and corporate governance practice (Ajinkya, Bhojraj, and Sengupta, 2005). Additionally, board composition and board competence also play important roles in managing risks and establishing good risk management practices (Aebi, Sabato, and Schmid, 2012; Brancato, Tonello, Hexter, and Newman, 2006; Kirkpatrick, 2009). As a result, boards members should have relevant skills and expertise (such as financial skill and experience) in understanding, evaluating, and accurately interpreting risk information (Karamanou and Vafeas, 2005). In addition, Erkens, Hung, and Matos (2012)

suggested that firms should have board members, specifically RMC members with the relevant skills or experience, to monitor risks and safeguard their wealth, allowing investors to ascertain the risk associated with a firm and obtain sufficient risk information to achieve investment efficiency. These results highlight the importance of board human capital in terms of risk management.

Delegating board responsibilities

Legally, the board of directors have a set of formal duties referred to as corporate governance (including risk management), that include legal terms, such as the duty of care and duty of loyalty, as well as forming different stand-alone committees, such as audit and compensation committees (Feld and Ramsinghani, 2013). The board of directors also has responsibilities related to risk management, such as determining the risk appetite of a firm – the firm's overall risk level and what kind of risks the firm takes (ASXCGC, 2014; Stulz, 2008), deciding the nature and extent of the risks it is prepared to take to meet the objectives of a company, and lastly reviewing and guiding the firm's risk management policies (ASXCGC, 2014; Naciri, 2010). It is therefore necessary for board members to understand and identify different risks that a company is involved in and the consequences for the firm's operation (Stulz, 2008).

In the early life of a company, the board is often small, around three to five members. As a company grows, the amount of issues that boards need to consider and manage grows as well. Given that the complexity of the business and the level of board oversight increases, boards must rely on others to assist them in decision making and other decision making matters (Feld and Ramsinghani, 2013). Therefore, the board is likely to delegate their responsibility to other parties, such as committees.

The delegation of responsibility to others is constrained by law, for instance, the Corporations Act 2001 (Commonwealth of Australia (Cth), 2001). The law recognises

directors' right to delegate only to the extent that the board is confident that it can demonstrate to the court that members are performing their duties within the duty of care and duty of diligence. According to S 198D (1) of the Corporations Act 2001 (Cth, 2001), directors have the power of delegating responsibility to others, including to a committee of directors, a director, or an employee of the company. This means that boards are entitled to delegate some of their responsibilities to others. However, the delegate must exercise the powers delegated in accordance with any directions of the directors (Cth, 2001, 198D (2)). The exercise of the power by a delegate is considered to be as effective as if the director had exercised it (Cth, 2001, S 198D (3)). Without the opportunity to delegate some of the responsibilities of the board, the workload and effectiveness of the main board would be compromised. Although the board of directors can delegate their responsibility to others, the directors need to ensure that there is reasonable ground to believe delegation will act in conformity with Corporations Act 2001 (Cth, 2001), and it is reliable and competent, and does not impair their duty of care and duty of diligence. In addition, if the directors delegate power under the situation of Corporations Act 2001 (Cth, 2001, S198 D), that director is responsible for the power exercised by the delegate as if the power had been exercised by the directors themselves.

Given that the board has a wide range of responsibility and functions that require advanced expertise, most corporate governance reforms require the board to form a number of specific committees to help accomplish the tasks (Naciri, 2010). The board is likely to delegate their responsibility to specific committees in order to manage the company's daily activities effectively and efficiently. These specific committees, known as standalone committees, can be recognised as a sub-committee of the board, which recommend policy for approval by the entire board, as well as undertaking

duties and reporting their results back to the entire board. Generally, these specific committees include audit, compensation, and nomination committees (Naciri, 2010), with existing board members serving on these committees. Depending on the size of the full board, board members often serve on more than one of these committees (Feld and Ramsinghani, 2013). Based on the characteristics of companies, the board is allowed to have as many committees as required. However, boards tend to form other committees when a reoccurring issue appears to be too complex to be addressed by all board members. For example, a standalone committee is formed when the board members cannot make a conclusive decision on a matter, or some of the board of directors may not have the relative skill or knowledge for assessing a particular matter (Naciri, 2010). In addition, governance regulators identify and recommend the formation of specific committees following economic and business disasters. For example, the importance of the audit committee received much attention following the bankruptcies of the 2000's (global corporate collapses such as Enron, Parmalat, WorldCom, and HIH). There has been added interest in risk committees, nominating committees (specifically from a gender diversity perspective), and compensation committees following the global financial crisis.

Delegating the board responsibility to committees is becoming more and more important and beneficial to organisational corporate governance. It allows the board to rely on more expertise, to gain flexibility and more effective control over the organisation. In addition, it allows the committee to be more effective in dealing with complex or specialised issues and uses directors' time and expertise more efficiently. Forming specific committees allows directors to deepen their knowledge of the organisation, develop expertise, and become more actively engaged in the companies' activities (Naciri, 2010).

According to agency theory, there is a separation of ownership and management in companies, and managers may engage in opportunistic behaviour at the expense of shareholders' wealth. As the board is the body that develops governance policy and procedures (Feld and Ramsinghani, 2013), agency theory suggests that one of the many roles of the board of directors is to monitor managers' opportunistic behaviour on behalf of shareholders, which in turn decreases agency costs and consequently maximises shareholder value (Adams and Ferreira, 2007; Dionne, Maalaoui Chun and Triki, 2013; Fama and Jensen, 1983; Hermalin and Weisbach, 2003; Jensen and Meckling, 1976). By forming a specific committee, the board can effectively monitor companies' activities, which consequently improves companies' corporate governance practices, reduces agency costs, and increases firm performance (Hillman and Daiziel, 2003). Resource dependence theory also suggests that firms require others who have the relevant expertise to engage in the company's activities, with the aim of bringing critical resources and strength to a firm (Hillman and Dalziel, 2003; Hillman, Withers, and Collins, 2009). Resources can help companies to reduce the dependency between the organisation and outside uncertainties (Pfeffer and Salancik, 1978), and decrease transaction costs (Williamson, 1984) and potential risks within the firm (Pfeffer, 1972), which consequently increases firm performance. Similarly, Naciri (2010) suggested that the existence of committees may "signal" to investors that the board is taking the particular issues seriously, which may have a positive impact on investors' investment decision making. The findings of Brick and Chidambaran (2007) support this theory that increased oversight and monitoring by the board through committees may lead to some increases in firm value. However, even if specific committees are able to add value to companies, the board of directors should always consider a number

of matters when developing specific committees, such as defining the specific needs to be entrusted to the projected committee.

2.3.2 Types of risk management committees

Risk management committee

In order to effectively manage companies' risk, boards are likely to charge an appropriate board committee to specifically oversee risk management (ASXCGC, 2014). The board of directors usually oversees risk management through two of its specific committees: a combined RMC[10] or a separate RMC. Consequently, RMCs are responsible for overseeing the functioning of the risk management system, the development of a risk management culture within the organisation, determining whether the risk management system meets the needs of the company, and also to ensure that its members are committed to risk activities (Naciri, 2010).

Forming a RMC to oversee risk management (either a combined committee or a separate risk committee) may be more beneficial to companies than not having one. Similar to the board of directors' function, RMCs can be treated as a monitoring mechanism for managing managers' opportunistic behaviours in terms of risk management on behalf of shareholders, thereby reducing agency costs and increasing firm performance (Hillman and Dalziel, 2003). Establishing a RMC may also increase the efficiency of companies using risk related tools, such as hedging and derivatives (Marsden and Prevost, 2005). In addition, in light of resource dependence theory, directors who sit on the RMC are expected to provide critical resources to companies, including their experience, expertise, reputation, and network with other firms and external contingencies (Hillman and Dalziel, 2003). Resources are beneficial to

[10] The majority of combined risk committees are audit and risk committees.

companies as they can enhance risk management strategies and strengths of a given firm (Hillman and Dalziel, 2003; Hillman, Withers and Collins, 2009). Therefore, it is expected that companies with risk matters overseen by a RMC may be associated with better risk management compared to companies where risk matters are overseen by the entire board.

Similarly, as suggested by ASXCGC (2014), each company should have a RMC to oversee risks, it does not matter whether the committee has a stand-alone risk committee (a separate RMC), or a combination of board committees (such as audit and RMC). Delegating a committee to address different elements of risk can provide an efficient and effective mechanism to provide transparency, focus, and independent judgment to oversee the entity's risk management framework (ASXCGC, 2014), which consequently enhances the level of risk management practice. Therefore, RMCs play a crucial role in risk management.

Combined or separate risk management committee (audit committee or risk management committee)

Generally, the risk management activities of a company can be overseen by one of the following three bodies: the board of directors, a combined RMC, and a separate RMC. Depending on firm-specific characteristics, such as board size, some companies oversee their risk matters by the entire board, while some companies delegate risk management responsibility to their audit committee, and a few companies form a separate committee to specifically manage their risks (Subramaniam, McManus and Zhang, 2009).

Research has suggested that delegating responsibility to a separate RMC instead of a combined committee to oversee risk activities is a more effective way for companies to obtain a better risk management practice (Aebi, Sabato and Schmid,

2012; Brancato, Tonello, Hexter and Newman, 2006; Kirkpatrick, 2009; Mongiardino and Plath, 2010). Having a separate RMC may provide specialised insight with regards to risk management decision making, which allows members to obtain necessary risk information, and make correct and timely risk management decisions (Karamanou and Vafeas, 2005; Pirson and Turnbull, 2011). Similarly, resource dependence theory states that having a separate RMC as a monitoring mechanism can provide direction to companies, especially in relation to risk management matters. Therefore, it is expected that a separate RMC is a better way of enhancing the level of risk management.

As most combined RMCs consist of audit and risk, the literature review of research into the combined audit and risk committee and RMC indicates there are two reasons why a separate RMC contributes to superior risk management practice, and a combined audit and risk committee may not be as efficient in addressing risks within companies.

Research suggests that the workload of audit committees has increased dramatically in recent years due to changes in regulation (Brown, Steen, and Foreman, 2009). Due to increased workloads and responsibilities, scholars have suggested that it has gone beyond the scope and capabilities of audit committees to oversee the risk management functions of companies (Brown, Steen and Foreman, 2009). Similarly, Daly and Bocchino (2006) revealed that audit committee members feel that they have too much responsibility and do not have the time or inclination to oversee risk management. Time constraints and fatigue are more likely to occur in combined committees, which may consequently inhibit the committee members' desire and ability to undertake a more rigorous review of the various reports and processes and

consequences that raise the potential for inefficiencies in risk management (Subramaniam, McManus and Zhang, 2009).

In general, audit committees are focused on the oversight of financial reporting risks and related compliance risks rather than a wider scope for risk management (Brown, Steen and Foreman, 2009; Xie, Davidson, and DaDalt, 2003). Therefore, it is suggested that audit committees may have insufficient skills for overseeing non-financial risks, such as operational, strategic, and regulatory risks (Brown, Steen and Foreman, 2009; Daly and Bocchino, 2006). One plausible solution to the issue is the creation of a separate RMC (Brown, Steen and Foreman, 2009). A separate RMC would enable the board of directors to cope more effectively with assessing the various threats and opportunities faced by an entity (Subramaniam, McManus and Zhang, 2009). Most importantly, in 2014, the Australian Security Exchange Corporate Governance Council (ASXCGC) released the third edition of *Corporate Governance Principles and Recommendations*. Recommendation 7.1 recommends companies form a specific RMC for overseeing risks, which also highlights the importance of having a separate RMC within companies (ASXCGC, 2014).

Due to the issues related to a combined risk and audit committee illustrated above, it is suggested that a separate RMC is required in order to efficiently manage companies' risks (Daly and Bocchino, 2006). Harrison (1987) suggested that a separate committee enables directors to focus on specific areas of responsibility, enhancing legitimacy and accountability in corporations. It has also been suggested that separate committees have more influence on corporate performance (Klein, 1998). Therefore, it is expected that companies with a separate RMC are likely to produce a superior risk management practice compared to where the risk management function is delegated to the audit committee.

2.3.3 Theories – RMC existence

Agency theory

Agency theory is derived from the agency relationship, which exists between managers (agents) and shareholders (principles) (Watts and Zimmerman, 1978). Shareholders employ managers to act in their best interest and managers have ethical and legal duties to fulfil shareholders' expected increases in value. However, due to the self-interested behaviour of managers, this may not always be the case. According to agency theory, there are conflicts of interest between managers and shareholders (Ismail and Rahman, 2011). Managers may have incentives to act opportunistically in order to maximise their own wealth at the expense of shareholders' value (Watts and Zimmerman, 1990). Agency theorists suggest that due to incomplete contracts, agency costs of monitoring and bonding are borne by the principle. Managers are likely to engage in opportunistic behaviours, such as risk avoidance or excessive risk-taking, to generate returns for themselves instead of for shareholders. Specifically, this agency problem arises from information asymmetry between ownership and management (Cotter, Lokman, and Najah, 2011). Managers have greater knowledge about the firms' operations, finances, and the exposed risks of firms than shareholders (Cotter, Lokman, and Najah, 2011). Consequently, information asymmetry and differences in risk tolerance may impede the efficient allocation of resources in capital markets (Healy and Palepu, 2001). Specifically, agency theory suggests that there are divergent risk preferences of risk-neutral (diversified) shareholders and risk-averse managers, which necessitates monitoring by the board (Jensen and Meckling, 1976). Specifically, unlike managers, who have a substantial proportions of their earnings tied up in the one firm, shareholders are assumed to hold a diversified portfolio of investments (Kaen, 2005). As a result, managers tend to be more risk-averse than shareholders. Consequently, without monitoring, risk-averse managers may reject profitable (but

riskier) projects that are attractive to shareholders who prefer the increased return from the higher level of risk. In order to minimise managers' opportunistic behaviour, the board of directors monitors managers' behaviour. Therefore, it is important for the board of directors to oversee companies' risk activities and monitor managers' self-interested behaviour in terms of risk-taking. As a result, the board of directors may delegate a RMC (either a combined RMC or a separate RMC) to specifically address firms' risk management matters. It is expected that establishing a RMC may reduce agency costs and control for managers' opportunistic behaviours, in terms of risk taking and risk management.

Signalling theory

Signalling theory is useful in describing behaviour when two parties have access to different information, and it has frequently been used to explain information asymmetry (Connelly, Certo, Ireland and Reutzel, 2011; Spence, 2002). Signalling theory suggests information asymmetry can be reduced by the party with more information signalling it to others (Cotter, Lokman, and Najah, 2011). As a result, firms may communicate their corporate governance compliance through different communication channels, such as the annual report. In addition, it is beneficial for firms to disclose their corporate governance mechanisms to create a favourable image/reputation in the market. Specifically, establishing corporate governance practices may flag the firms' commitment to better governance. As a result, it is expected to minimise any potential risk of investors' devaluation of the firm (Subramaniam, McManus and Zhang, 2009). There is no current mandatory regulatory requirement for establishing a RMC in Australia. Therefore, firms may voluntarily form a RMC or a separate RMC to flag their commitment to risk management practices

to the market and indicate to external investors their effort in effectively managing risk.

2.4 HUMAN CAPITAL LITERATURE REVIEW

2.4.1 Human capital - "what you know"

Human capital, as one category of intellectual capital, is defined by Bontis (1999, p443) as:

> Human capital represents the human factor in the organisation, the combined intelligence, skills and expertise that gives the organisation its distinctive character. The human elements of the organisation are those that are capable of learning, changing, innovating and providing the creative trust which of properly motivated can ensure the long-term survival of the organisation.

Alternatively, human capital can be described as individuals' knowledge and skills that allow for changes in economic growth and action (Becker, 1964; Coleman, 1988). Human capital is embodied in the skills, knowledge, and expertise that people have, and may be developed through experience, training, and education (Baron and Armstrong, 2007; Dakhli and De Clercq, 2004). It is the knowledge and skills of individuals that create value and increase firm effectiveness, and firms need to focus on the ways of attracting, retaining, and developing their human capital (Baron and Armstrong, 2007). Firms do not own human capital, but human capital can be secured by the employment relationship (Baron and Armstrong, 2007).

Human capital has been viewed as a valuable, non-transferrable, and non-substitutable resource, as it is scarce and specialised knowledge (Coff, 1997). Human capital perceives individuals as valuable resources that can be developed and that can lead to economic outcomes and competitive advantage (Dakhli and De Clercq, 2004). Crook, Todd, Combs, Woehr and Ketchen (2011) conducted meta-analysis and the

results revealed that human capital accumulations are positively related to firm performance. Firms with a high level of human capital are more likely to profit from firm-specific knowledge, skills, and resources to sustain competitive advantage.

A high level of human capital may potentially improve firm performance by increasing customer benefits and decreasing the costs associated with production and delivery (Becker, 1964; Mincer, 1974). Smarter workers may help lower production and delivery costs by developing new innovations that decrease costs and increase utilisation. In addition, better human capital may lead to better problem solving and planning, which are likely to increase product quality and enhance reliability production and delivery efficiency, leading to a low level of organisational costs (Youndt and Snell, 2004). Customer satisfaction would be increased when product quality and reliability are increased by knowledgeable workers, which may potentially be beneficial to firm performance (Youndt and Snell, 2004).

Some leading economic scholars have provided the explanation of the benefits of human capital. For example, Schultz (1961) illustrated human capital as a form of capital where people obtain knowledge and skills through education and training, and that this capital is a product of deliberate investment that yields returns. One aspect of this explanation is that human capital is a stock of experiences, knowledge, and skills that generate returns for individuals and organisations. Human capital enhances firm performance, leading to a high level of productivity and profitability (Becker, 1964; David and Lopez, 2001; Romer, 1990; Schultz, 1961). Specifically, the human capital theory explains the gains of education, training, and experience as a form of investment in human resources (Aliaga, 2001), and the main argument is that people are considered a form of capital for development (Aliaga, 2001; Engelbrecht, 2003). As a result, education and previous experience can be seen as investments that increase the

productivity of individuals and organisations, as well as increasing the effectiveness of the production. Lucas (1988, 1990) suggested that the fundamental principle underlying human capital theory is the belief that peoples' learning capacities are as crucial as other resources involved in the production of goods and services. It is beneficial to individuals, organisations, and society as a whole when the human capital resource is effectively utilised (Schultz, 1961). Therefore, the human capital theory provides insight into the overall theoretical relationship among human capital, firm performance, and individuals' production effectiveness.

Empirically, researchers have consistently suggested that human capital leads to better performance (Colombo and Grill, 2005). For example, Gimeno, Folta, Cooper, and Woo (1997), Pennings, Lee, and Van Witteloostuijn (1998), and Dimov and Shepherd (2005) found that human capital, such as education level and work experience, is positively related to firm performance. In addition, the positive relationship between human capital and employee performance is well accepted and many studies have provided empirical support (e.g. Mincer, 1974; Van Praag and Cramer, 2001). In general, the conclusion stemming from those studies indicates that people who are better educated, have more experience, and invest more time and resources into enhancing their skills are able to produce higher profits at both individual and firm levels. In addition, Dakhli and De Clercq (2004) found human capital was positively associated with firm innovation in 59 countries.

Prior literature has identified three characteristics of human capital: education, experience, and knowledge. Studies have found these three characteristics are all positively related to firm performance and firm activity (Dimov and Shepherd, 2005; Gimeno, Folta, Cooper, and Woo, 1997). This is consistent with human capital theory,

which considers that knowledge may bring better cognitive skills to individuals, thus increasing their productivity and efficiency in firms (Becker, 1964).

2.4.2 General and firm-specific human capital

Human capital theory recognises the knowledge and skills that committee members have gained from firm or industry level experiences (Bailey and Helfat, 2003), and human capital has been widely categorised as general human capital and firm-specific human capital (Becker, 1962). Firm-specific human capital is the expertise derived from the skills and knowledge gained in the position that is specific to the firm, and it increases the future marginal product of the firm (Wulf and Singh, 2011).

The value of firm-specific human capital remains within the firm, and the rights to the profits generated from investing in human resources also belong to the firm (Abdel-khalik, 2003; Donaldson and Earton, 1976). Unlike general human capital, firm-specific human capital cannot be used in the same way at multiple firms; and thus, it is not valued by all potential employers (Becker, 1962). Firm-specific human capital is only beneficial for that firm.

Previous studies have suggested that firm-specific human capital increases the human capital of organisations, as it can retain companies' value through competitive advantage and performance advantage, and competitors are not able to purchase such resources (Crook, Todd, Combs, Woehr, and Ketchen, 2011; Datta, Guthrie, and Wright, 2005). While the acquisition of firm-specific skills is valuable to the organisation, it is personally costly for the employee, not only because of the effort involved, but also because such skills are not perfectly marketable (Jaggia and Thakor, 1994). In contrast, general human capital is valued by all potential employers, as it can produce value in different firm settings, and it remains within the individual, as the

cost is generally covered by the individual and not the firm (Becker, 1964; Kor and Sundaramurthy, 2008).

2.4.3 Board of directors' human capital

The human capital of the board of directors plays a crucial role in firms. Board capital is intended to capture the capability and ability of the board of directors to provide resources to the firm (Hillman and Dalziel, 2003). The board may provide firms with crucial resources through personal connections, skills, experiences, and legitimacy (Pfeffer and Salancik, 1978). Hillman and Dalziel (2003) suggested that board capital is the sum of the board of directors' human and social capitals, demonstrating the ability of the board of directors to manage firms and provide advice to the top management team. Human capital can be recognised as an individual's experience, expertise, knowledge, and skills (Becker, 1964; Coleman, 1988), whereas social capital is "the sum of the actual and potential resources embedded within, available through, and derived from, the network of relationships possessed by an individual" (Nahapiet and Ghoshal, 1998, p 243).

The human capital of the board of directors has long been a subject of research in different disciplines (e.g. Johnson, Schnatterly, and Hill, 2012). Research on corporate boards generally suggests that board human capital is linked to board governance effectiveness. (Carpenter and Westphal, 2001; Hillman and Dalziel, 2003; McDonald, Westphal, and Graebner, 2008; Rose, 2007). Board human capital can be seen as a proxy for the ability of the board to govern the firm, which may stimulate firm outcomes, such as firm performance (Hillman and Dalziel, 2003; Rose, 2007). Management literature has extensively adopted the human capital explanation to predict a firm's outcomes, using upper echelons theory. Many studies have indicated that firms with a high level of human capital generate a number of positive outcomes,

such as better firm performance (e.g., Carpenter and Westphal, 2001; Westphal and Milton, 2000). It is suggested that board human capital is significantly related to the board's capability to monitor and advise management teams (Kor and Sundaramurthy, 2009). Specific board human capital may enable boards to monitor and advise managers in a more effective way (Carpenter and Westphal, 2001). Specifically, certain types of human capital may influence firm performance from different aspects. For example, Carpenter, Pollock and Leary (2003) revealed that directors' international experience affects firms' international sales. McDonald, Westphal and Graebner (2008) revealed that directors' acquisition experience is positively related to firms' acquisition performance. In another article, Hillman (2005) suggested that directors' political connections, as a form of social capital, are valuable for firms operating in highly regulated industries.

Previous research into board characteristics has mainly focussed on the structural factors of the board, such as board size, board independence, and association with firm performance. However, a review of board literature concludes that independence has little to do with firm performance and board effectiveness. More recently, research has begun to examine board human capital, such as education, experience, and its association with firm outcomes using resource dependence theory (Carpenter and Westphal, 2001; Hillman and Dalziel, 2003; McDonald, Westphal and Graebner, 2008).

Resource dependence theory is very powerful in explaining directors' human capital and firm outcomes (Hillman, Withers and Collins, 2009; Johnson, Schnatterly and Hill, 2013; Withers, Hillman, and Cannella, 2012). Specifically, resource dependence theory suggests that firms require parties who can bring crucial resources to companies, and thus provide strength to the company (Hillman and Dalziel, 2003;

Hillman, Withers and Collins, 2009; Pfeffer and Salancik, 1978). The crucial resources help reduce dependence on the organisation and external parties, decreasing the uncertainty of the firm, lowering firms' transaction cost, and consequently diminishing the bankruptcy rate of the firm, leading to an incremental increase in firm performance (Pfeffer, 1972; Pfeffer and Salancik, 1978; Singh, House, and Tucker, 1986).

Resource dependence theory has frequently been used to study boards of directors (such as Hillman, Cannella and Paetzold, 2000; Pfeffer, 1972; Pfeffer and Salancik, 1978). Pfeffer and Salancik (1978) indicated that board members can offer certain benefits to companies, including providing advice and expertise and access to resources and legitimacy. The results of previous empirical studies support these proposed benefits.[11] For example, Provan (1980) found that firms with powerful members of the community on the board are more likely to acquire crucial resources from the environment. Pfeffer and Salancik (1978) showed that firms in regulated industries require more people with relevant experience. Similarly, Hillman (2005) found that firms operating in heavily regulated industries tended to have more former politicians on their board, as ex-politicians enable companies to have access to important political resources/information, and these resources play a crucial role in enhancing firms' financial performance. Kor and Misangyi (2008) showed a lack of top management industry experience can be offset by the presence of external directors with significant managerial industry experience, suggesting directors supplement management with crucial resources and experiences. Crucial resources can also generate profit for firms. Peng (2004) suggested that resource-rich external directors are more likely to have a positive impact on firm performance than firms with poorly

[11]Also see Cowen and Marcel, 2011; Khanna, Jones and Boivie, 2014; Kor and Misangyi, 2008.

resourced external directors. The results suggest that it is very important for firms to attract board members with crucial resources in order to gain benefits for their company.

Although the literature has begun to examine the relationship between board human capital and firm outcomes using resource dependence theory, the focus of this stream of research has only investigated a few human capital characteristics (Haynes and Hillman, 2010). For example, Tian, Haleblian and Rajagopalan (2011) used CEO experience and industry experience to represent board human capital, which is better classified as performance by management rather than the board. Peng, Sun and Markóczy (2015) identified two types of human capital: international experience and political ties. There is a lack of research examining board human capital in a more detailed and comprehensive way. In addition, RMC as a board subcommittee that specifically oversees firms' risk activities, and the relationship between RMC human capital and firm outcomes or governance effectiveness remain underexplored. As a result, the aim of this study is to investigate RMC human capital in a more comprehensive and in depth manner. Moreover, in contrast to previous research, which has largely examined the association between specific indicators of human capital and specific outcomes (Carpenter, Pollock and Leary, 2003; Hillman, 2005; McDonald, Westphal and Graebner, 2008), this study extends this area of research on the value of board human capital by empirically testing and arguing the relationship between a number of human capital indicators and overall firm outcomes.

2.4.4 Human capital of different committee members

Few studies have examined the human capital of committee members and the human capital of the audit committee has been largely examined among other committees. In general, previous research has revealed that for firms with audit

committee members who have a higher level of financial knowledge, and financial or accounting management expertise, managers are more likely to make or update an earnings forecast, and their forecasts will be more accurate and precise, which elicits a more favourable market response (Karamanou and Vafeas, 2005). In terms of financial experience, prior studies have suggested that the financial experience of audit committee members is effective in constraining earnings management, reducing fraud and restatement, and enhancing firm performance in the market (Abbott, Parker and Peters, 2004; Aldamen, Duncan, Kelly, McNamara and Nagel, 2012; Bédard, Chtourou and Courteau, 2004; Carcello, Hermanson, and Ye, 2011; Xie, Davidson and DaDalt, 2003). However, other studies found no relationship between financial experience and earnings restatement (Lin, Li and Yang, 2006) and industrial experience (Chen, Moroney and Houghton, 2005). Zhang, Taylor, Qu and Oliver (2013) examined the association between audit committee characteristics and corporate risk disclosure and their findings revealed that the financial expertise of audit committee members was found to have no impact on the extent of risk disclosure. These inconclusive results may stem from the fact that only considering the financial experience of the audit committee may omit other important audit committee human capital characteristics. Therefore, it is necessary for scholars to examine other attributes of audit committee members.

As for accounting experience, previous scholars have suggested that accounting expertise complements strong corporate governance (Krishnan and Lee, 2009) and is associated with improved accruals quality (Carcello, Hermanson and Ye, 2011; Dhaliwal, Naiker and Navissi, 2010) and fewer restatements (Carcello, Hermanson and Ye, 2011). Compared with financial experience, accounting experience plays a more important role in the audit committee. DeFond, Hann and Hu (2005) reported a

positive market reaction to the appointment of an accounting expert to the audit committee, but no reaction to the appointment of a financial expert.

Other studies have indicated the significance of other human capital characteristics of committee members. For example, Aldamen, Duncan, Kelly, McNamara and Nagel (2012) suggested that accounting performance is positively impacted where audit committees include blockholder representation, the chair of the board, whose members have more external directorships and whose chair has more years of managerial experience. Tao and Hutchinson (2013) suggested that RMC and compensation committee characteristics, such as industry experience, board experience, accounting and/or finance qualifications, have an important role in managing the risk level of a firm.

2.5 SUMMARY

This chapter has provided the literature review relevant to this study, the first section reviewed the risk, risk management, and risk governance studies. This was followed by the party that bear the responsibility of risk management being discussed in detail, namely the board of directors, who may delegate this responsibility to a RMC (combined or separate), which embedded the theories that explained the importance of establishing a RMC. Human capital literature was then reviewed, with this study specifically examining the human capital of the board of directors and committee members.

Previous research has highlighted the importance of risk and risk management in firms and highlighted the role risk governance plays in risk management. Specifically, this study reviewed the link between corporate governance, risk management activities, risk taking, and bankruptcy risk, which indicating the significance of RMC existence and human capital in risk management. After reviewing

the human capital research on the board of directors and committee members, previous studies have only focused on one element of human capital characteristics - board independence, and the relationship between board independence and firm performance have been mixed. The conflicting results of the prior research may be due to fact that board independence is not an important board human capital characteristic, as it does not provide a good scope for the board's role. Therefore, there is a growing demand to examine more relevant human capital characteristics, such as specific skills and experience, as suggested by resource dependency theory. In addition, a number of studies have called for future research to examine board human capital in a more detailed and comprehensive way (Johnson, Schnatterly and Hill, 2012). Therefore, this thesis responds to this call, and goes beyond the limited characteristics identified in previous studies. This is achieved by examining the RMCs' human capital based on a number of human capital characteristics.

The following chapter presents the theoretical framework of this study, and based on theories and previous studies, six hypotheses have been developed to examine the relationship between the existence of RMC and firms' management of risk in terms of firm performance and the likelihood of financial distress, and the relationship between RMC human capital and firms' management of risk.

Chapter 3: Theoretical Framework and Hypothesis Development

3.1 INTRODUCTION

Chapter 2 provided the literature review on risk, risk management, and risk governance. It also illustrated the risk-related corporate governance mechanism that bear the responsibility of risk management, namely the board of directors, who may delegate the risk management responsibilities to a RMC (combined or separate). Human capital research regarding the board of directors and committee members was also reviewed.

This chapter discusses the background of risk management and value creation (Section 3.2). Following this, agency theory and signalling theory are used to explain why firms choose to have a RMC or a separate RMC, leading to the development of hypotheses relating to the existence of a RMC, a separate RMC, and firms' management of risk (section 3.3). Human capital theory and resource dependence theory are then discussed to explain the association between RMC human capital and firms. The hypotheses relating to the association between RMC human capital and firms' management of risk are then discussed (section 3.4). Specifically, Section 3.5 illustrates firm-specific and general RMC human capital and its association with firm performance and the likelihood of financial distress. Figure 3.1 provides a summary of all testing models and Figure 3.2 outlines the theoretical framework of this study. Finally, Section 3.6 presents the concluding comments of this chapter.

3.2 BACKGROUND – RISK MANAGEMENT AND VALUE CREATION

Risk management literature suggests that risk management can add value to companies in many different facets and can also decrease the likelihood of firms' financial distress (Smithson and Simkins, 2005). For instance, on the basis of the shareholder value maximisation hypothesis, modern financial theory indicates that a firm will engage in risk management, if, and only if, it enhances the firm's value (Fatemi and Luft, 2002). In addition, Smith and Stulz (1985) provided the initial financial distress arguments in regards to risk management, arguing that risk management can reduce the likelihood of financial distress and increase a firm's value by reducing allocative inefficiency (i.e., deadweight costs), and increasing debt capacity, which in turn can benefit the firm through valuable tax shields or by decreasing agency costs in excess free cash flow. This was supported by Graham and Rogers (2002), who suggested that risk management can increase firms' market value by allowing firms to increase their debt capacity through reducing income volatility and/or reducing the probability of financial distress (Leland, 1998; Stulz, 1996), thereby reducing the adverse effects of financial distress on shareholders' value. As a result, shareholders will demand a lower rate of return and increase firm value by decreasing the likelihood of financial distress (Fatemi and Luft, 2002).

From an agency theory perspective, efficiently using risk management strategies, such as hedging, can align the interests between shareholders and managers by eliminating unsystematic risks, which reduces agency costs and increases shareholders' wealth (Kaen, 2005). Additionally, risk management may solve underinvestment problems, because risk management can ensure that firms have adequate internally generated funds necessary to undertake positive net present value projects. Accordingly, both firm and shareholder value will increase (Fatemi and Luft,

2002). In particular, Froot, Scharfstein and Stein (1993) demonstrated that risk management can add value to firms by ensuring sufficient internal funds are available to take advantage of net present value projects. Consistent with Froot, Scharfstein and Stein (1993), Gay and Nam (1998) provided strong evidence that the value enhancement of risk management comes from minimising the probability of underinvestment problems. Their results demonstrated that firms with enhanced investment opportunity sets actively engage in risk management as their internal generated cash level declines (Gay and Nam, 1998).

In summary, previous theories and empirical evidence have illustrated that risk management has a positive impact on firms' performance through various avenues and can lower firms' likelihood of financial distress. Since RMCs and the human capital of RMC members play a crucial role in managing risks, this study expects that RMC human capital may be associated with firms' performance and the likelihood of financial distress.

3.3 HYPOTHESES DEVELOPMENT – RISK MANAGEMENT COMMITTEE EXISTENCE

3.3.1 RMC, risk, and firm performance

The board of directors has many risk management responsibilities (ASXCGC, 2014; Stulz, 2008). Due to the complexity and specialist knowledge required to manage risk, the board has the opportunity to delegate these responsibilities to a RMC or separate RMC (Cth, 2001, S190). Agency theory suggests that a RMC, as a monitoring mechanism, may reduce agency costs and control for managers' opportunistic behaviours, in terms of risk taking and risk management, leading to better firm performance (Jensen and Meckling, 1976). Similarly, according to signalling theory, firms may voluntarily form a RMC or separate RMC to flag their

commitment to risk management practices to the market and indicate to external investors their efforts in effectively managing risk, which minimises any potential risk of investors' devaluation of the firm, resulting in an increase in firm performance. However, this study does not posit a direct relationship between the existence of a RMC and/or a separate RMC due to reverse causality and self-selection bias problems. The existence of a RMC may affect firm performance, and firm performance, in turn, can affect the formation of a RMC. In addition, because RMC formation is not mandatory in Australia, firms can voluntarily choose to establish a RMC. As a result, high performing firms may be more likely to establish either a combined or separate RMC, creating self-selection bias. A number of studies have empirically examined the relationship between enterprise risk management (ERM)[12] and firm performance (Hoyt and Liebenberg, 2011), and the results have been mixed. For example, Hoyt and Liebenberg (2011) found a positive relationship between firm value and the use of ERM. Pagach and Warr (2010) found little impact of ERM adoption on firms' outcomes. Gordon, Loeb and Tseng (2009) found the relationship between firm performance and ERM to be contingent on the match between risk management and firm characteristics.

In addition, Hines and Peters (2015) investigated the association between RMC existence and firm performance. They found that in the US, RMC formation is not significantly associated with profitability and short-term risk outcomes, such as the level of loan charge-offs and the presence of a Chief Risk Officer. These mixed results may suggest that there is no direct relationship between the existence of a RMC or ERM and firm performance. Therefore, the relationship between a RMC and firm

[12] ERM is a strategic business discipline that enables companies to manage their risks in an integrated and consistent way (Hoyt and Liebenberg, 2011).

performance should be examined through intervening or moderating variables. A RMC is important because it is a monitoring mechanism that brings advantages to firms by effectively managing risks, including managers' risk awareness. Therefore, this study examines the role a RMC plays in moderating the association between risk and firm performance.

Finance theory suggests that there is a positive association between risk and returns, as investors receive a risk premium for accepting a high level of risk (Myers, 1984). However, the risk may have a negative association with returns (Bowman, 1980). Specifically, high-performing firms may avoid high-risk investments due to the failure in investment and this may significantly affect their reputation, whereas poor performing firms may be more likely to choose a high-risk investment because the success of a high-risk investment may reverse their poor performance (Bowman, 1980). Consequently, this study suggests that firms with high risk need to have a RMC or separate RMC to specifically address their risks, avoid excess risk taking behaviours, monitor risk averse managers, and ensure that investments provide a positive return. Therefore, there is a positive association between risk and performance for firms with a separate RMC or a RMC, leading to the following hypotheses.

H1 (a): There is a positive association between risk and performance for firms that have a risk management committee.

H1 (b): There is a positive association between risk and performance for firms that have a separate risk management committee.

3.3.2 RMC, risk, and the likelihood of financial distress

Prior research has highlighted the link between firms' corporate governance and bankruptcy and suggests that corporate governance characteristics are significantly associated with firms' bankruptcy (Fich and Slezak, 2008). For example, Donker,

Santen and Zahir (2009) suggested that bankrupt firms tend to have lower levels of managerial shareholdings. Lajili and Zéghal (2010) suggested that firms that went bankrupt tended to have higher director turnover and shorter outside director tenure.

More recently, research has investigated the role of governance when there is a global collapse. Many researchers have agreed that poor governance practices were a contributing factor to the global financial crisis. The journal, *Corporate Governance: An International Review* devoted an entire edition to the topic following a conference dedicated to corporate governance and the 2008-2009 financial crisis (Conyon, Judge and Useem, 2011). In their editorial comment, Conyon, Judge and Useem (2011) suggested that boards were unable to prevent risky and short-term decisions that eventually led to the global meltdown. The failure and weakness in corporate governance arrangements largely contributed to the financial crisis and corporate collapses (Kirkpatrick, 2009).

A number of studies have suggested that firms following recommended good corporate governance practice are more likely to survive and perform better during a global financial crisis (Ellul and Yerramilli, 2011). Specifically, Cornett, McNutt and Tehranian (2010) found that better corporate governance, such as a more independent board, a higher pay-for-performance sensitivity, and insider ownership, are positively associated with performance. Ellul and Yerramilli (2011) suggested that companies with a strong and independent risk management function[13] can decrease risk exposures and enhance value, especially during a crisis period. Aebi, Sabato and Schmid (2012) documented that firms with a Chief Risk Officer, who reports directly to the board of directors and not to the CEO, performed significantly better during the global financial

[13] These authors develop a risk management index to measure the strength and independence of the risk management function based on six risk management variables.

crisis period. Minton, Taillard and Williamson (2010) provided evidence that larger and more independent boards are related to a lower level of risk taking, suggesting a lower likelihood of financial distress.

Research has primarily examined the relationship between board composition, board ownership, and the probability of financial distress (Fich and Slezak, 2008). To date, no research could be found that empirically tests whether a RMC has any association with the probability of firm's financial distress. Consistent with the first hypothesis, this study does not posit a direct relationship between the existence of a RMC or a separate RMC and firms' likelihood of financial distress. This study examines the role a RMC plays in moderating the relationship between risk and firm performance.

Previous literature has suggested that excessive risk taking behaviours contribute to firms' bankruptcy in a global financial crisis, and that firms engage in high-risk practice (high risky projects) without proper assessment of risks (Kaen, 2005; Rosen, 2003). Therefore, this study proposes that firms with high risk need to have a RMC or separate RMC to ensure risks are managed under their risk appetite and excess risk taking behaviours have been properly monitored, leading to a decrease in the likelihood of a firm experiencing financial distress. This study thus proposes that there is a negative association between risk and the likelihood of financial distress for firms with a separate RMC or a RMC, leading to the following hypotheses.

H2 (a): There is a negative association between risk and the likelihood of financial distress for firms that have a risk management committee.

H2 (b): There is a negative association between risk and the likelihood of financial distress for firms that have a separate risk management committee.

As mentioned previously, this study does not expect a direct relationship between the existence of a RMC or separate RMC on firms' management of risk, as the existence of a RMC may not be sufficient to explain its efficacy. In the next section, the study turns to human capital theory to develop the hypotheses in relation to RMC human capital and firms' management of risk in terms of firm performance and the likelihood of financial distress.

3.4 HYPOTHESES DEVELOPMENT – RISK MANAGEMENT COMMITTEE HUMAN CAPITAL

3.4.1 Risk management human capital and firm performance

Agency theory suggests there are conflicts of interest between managers and shareholders because managers have an ability to act in their best interest instead of that of shareholders (Carter, D'Souza, Simkins and Simpson, 2010). Evidence of this self-interested managerial behaviour includes avoidance of optimal risk decisions. As explained previously, managers tend to be more risk-averse than shareholders. This is due to the fact that managers have a substantial proportion of their earnings tied up in the one firm, whereas shareholders are assumed to hold a diversified portfolio of investments (Kaen, 2005). In other words, managers are more likely to reject profitable (but riskier) investments that shareholders would prefer managers invest in. The asset pricing models suggests that investors are only rewarded by taking the risk that arises from exposure to general market movements (i.e., systematic risk) rather than taking an unsystematic risk. In this sense, investors are only compensated based on the beta – the riskiness of their investment profile (Tao and Hutchinson, 2013). Therefore, shareholders can only maximise their wealth through risk taking, which means the action of risk-averse managers rejecting profitable investments are contrary to investors' interests; thus, investors would be more likely to discount the price they are willing to pay for the firm's shares, consequently leading to low firm value (Kaen,

2005). As a result, it is important for firms to oversee managers' risk averse behaviours.

In this study, it is proposed that RMC human capital level can be recognised as a determinant of the efficiency and effectiveness of the RMC. This notion is in line with resource dependence theory, which suggests that firms require parties who have greater capacity to manage company's risk activities, so that they can provide crucial risk management resources to firms and ensure firms' strength in monitoring risks (Hillman and Dalziel, 2003; Hillman, Withers and Collins, 2009; Pfeffer and Salancik, 1978). Following this trend, RMC members with a high level of human capital may bring enhanced knowledge to firms for managing risk efficiently and strengthen risk monitoring mechanisms, with an outcome of enhancing the firm's value.

Empirically, previous studies have only examined the relationship between some human capital factors of board and firm performance. Specifically, studies have documented that directors' educational background has no association or positive relationship with a firm's value (Daily and Dalton, 1994; Kim and Lim, 2010; Rose, 2007). As for previous experiences, Fahlenbrach, Low, and Stulz (2010) found that there is a positive stock market reaction when firms appoint CEOs as directors, indicating the benefit of directors with CEO experience. A number of studies have indicated that audit committee human capital is positively related to firm performance. For instance, DeFond, Hann, and Hu (2005) found that the market reacts positively when accounting financial experts are assigned to audit committees and has no reaction when non-accounting financial experts are assigned, which suggests the importance of financial accounting experience. Chan and Li (2008) showed that audit committees with the majority of members who are top executives of other publicly traded firms (i.e., the expert-independent director has relevant expertise) resulted in a positive firm

value. Moreover, a board comprising of more than 50% of expert-independent directors has a significantly positive relationship with firm value. Since both audit committees and RMCs are used as monitoring mechanisms within firms, the characteristics of audit committees can thus be applied to RMCs (Ng, Chong and Ismail, 2012). As such, it is expected that a RMC with a high level of human capital can increase firm performance. Tao and Hutchinson (2013) also provided insight that RMC composition is very important regarding lower information asymmetry and increasing firm performance. Therefore, the following hypothesis was developed:

H3: There is a positive association between risk management committee human capital and firm performance.

3.4.2 RMC human capital and the likelihood of financial distress

A body of research has highlighted the importance of corporate governance and the likelihood of financial distress or bankruptcy (Donker, Santen and Zahir, 2009; Fich and Slezak, 2008; Lajila and Zeghal, 2010). Previous research has primarily examined some characteristics of board composition, board ownership, and leadership factors, such as board size, independence, board share ownership, and CEO duality, as mitigating or exacerbating the probability of financial distress. For example, Fich and Slezak (2008) found that small firms with independent boards and large executive director shareholdings are less likely to be financially distressed. Platt and Platt (2012) documented that the average age of directors is negatively related to bankruptcy, suggesting older directors have valuable experience. They also found that directors with CEO experience are negatively associated with bankruptcy, signifying the benefit of CEO experience of directors. Rasjad Abdel-khalik (2014) find that high risk averse CEO take less risk on investing in R&D. However, there is a lack of empirical research

that has examined whether risk management human capital has any association with the probability of a firm's financial distress.

RMCs have been regarded as an important platform to specifically address risk management issues within firms. As a result, the level of RMC human capital may influence a firms' bankruptcy (Ng, Chong and Ismail, 2012). Resource dependence theory suggests that the resources obtained by board members may influence a firm's likelihood of bankruptcy (Daily, 1996; Hillman, Withers and Collins, 2009). Research has highlighted that firms' likelihood of financial distress is closely related to directors' resources (Cameron, Kim and Whetten, 1987). Specifically, Daily (1995, 1996) showed that a high proportion of outside directors help firms to re-emerge from bankruptcy, and firms with a high proportion of outside and affiliated directors have a reduced chance of bankruptcy. Arthaud-Day, Certo, Dalton, and Dalton (2006) also suggested that when firms face crises, changing directors with crucial resources has been considered an initial step to decrease the severity of the crises. Therefore, the crucial resources obtained by the board of directors may decrease firms' chances of bankruptcy.

Empirically, Ng, Chong and Ismail (2012) found RMC size and independence to be negatively associated with underwriting risk[14], suggesting a larger RMC size leads to more objective and rational decision making. Their results also showed that an independent RMC provides more effective supervision over risk issues and therefore reduces excessive risk taking.[15] This highlights the importance of RMC human capital, because it may relate to bankruptcy risk. The results are consistent with

[14] Underwriting risk was measured as the proportion of loss incurred to premise earned (underwriting risk difference around the expected value)

[15] If the dispersion of underwriting risk around the expected value is positive, that means firms are engaged in excessive risk taking, otherwise this is negative.

resource dependence theory, which suggests that firms require external parties who have a greater capacity to manage a company's activities, and to bring crucial resources and strength to a firm (Hillman and Dalziel, 2003; Hillman, Withers and Collins, 2009; Pfeffer and Salancik, 1978). Thus, RMC members with a high level of human capital can provide enhanced knowledge for firms to manage risk and maintain their risk appetite.

Some studies have suggested that when firms are faced with a high level of bankruptcy, members are less likely to invest in human capital (Berk, Stanton and Zechner, 2010; Jaggia and Thakor, 1994). Specifically, Jaggia and Thakor (1994) suggested that firms' human capital may affect debt usage, which consequently affects a firms' probability of bankruptcy. In addition, Dimov and Shepherd (2005) provided evidence that top management teams with a high proportion of MBA and law degrees were negatively associated with the proportion of portfolio companies that went bankrupt, and that science and humanities education were positively associated with the proportion of profile companies that went public (IPO).

Since the human capital of a RMC may influence their level of risk aversion and their methods for managing and interpreting risks, it could be argued that a RMC with a high level of human capital tends to have a deeper understanding of risks, and more capacity to analyse the risk taking level and ensure firms do not engage in excessive risk taking behaviours; in turn, leading to a low likelihood of financial distress. Similarly, signalling theory also suggests that it is beneficial for firms to disclose a high level of RMC human capital, as this can signal to the market that managers are aware of the risk their firm is exposed to and they have the capability to manage these risks; thus, indicating a low chance of financial distress (Cotter, Lokman and Najah, 2011), leading to the forth hypothesis:

H4: There is a negative association between the probability of financial distress and risk management committee human capital.

3.5 GENERAL AND FIRM-SPECIFIC HUMAN CAPITAL

3.5.1 Firm-specific, general human capital, and firm performance

As firm-specific human capital is expertise derived from the skills and knowledge gained in a position that is specific to the firm (Wulf and Singh, 2011), RMC members with a high level of firm-specific human capital may have better knowledge about the firm's operations. This resource is valuable, unique and difficult to imitate, which can provide a competitive advantage for firms and add value to companies (Amit and Schoemarker, 1993; Hitt, Biermant, Shimizu and Kochhar, 2001). As a result, these advantages may produce positive returns for companies and outperform competitors who are lacking such resources (Crook, Todd, Combs, Woehr and Ketchen, 2011; Peteraf, 1993). This is consistent with agency theory and organisational cycle theory, which tend to suggest that members with a high level of firm-specific human capital are beneficial to firm performance, as such skills may be entrenched and necessary to be obtained by firms to manage firms. Similarly, resource-based views reveal that losing firm-specific human capital may decrease firm performance, as such human capital represents a crucial source of competitive advantage (Le, Kroll and Walters, 2013). Empirically, Carpenter and Westphal (2001) found that if companies have a board member with specific expertise that allows them to better understand the inner knowledge of the firm, the monitoring of the board can be enhanced, which consequently leads to decreases in agency costs and increases in firm performance. By conducting a meta-analysis of 66 previous studies, Crook, Todd, Combs, Woehr and Ketchen (2011) found that firm-specific human capital is valuable in enhancing firm performance. Consequently, a positive association between firm

performance and firm-specific human capital is anticipated to align with resource dependence theory, leading to the following hypothesis:

H5 (a): Firm performance is positively associated with risk management committee firm-specific human capital.

A RMC with high levels of general human capital may have the incentive to protect their reputation. This is because that reputation may help them gain an advantage at the time they need to transfer their general skills to other firms (Fich and Shivdasani, 2007). Therefore, in order to build and protect their reputation, they may behave conservatively, which generates lower returns (Hirshleifer and Thakor, 1994), leading to the following hypothesis:

H5 (b): Firm performance is negatively associated with risk management committee general human capital.

3.5.2 Firm-specific, general human capital, and the likelihood of financial distress

A number of studies have suggested that when firms are faced with a high level of bankruptcy, members are less likely to invest in firm-specific human capital (Berk, Stanton and Zechner, 2010; Jaggia and Thakor, 1994). Specifically, Dimov and Shepherd (2005) indicated that firm-specific human capital was negatively associated with firms' bankruptcy. Jaggia and Thakor (1994) indicated that debt usage, as a factor that affects the probability of bankruptcy, may be influenced by firms' human capital. RMC members with a high level of firm-specific human capital instead of general human capital are less likely to engage in high risk investments that increase a firm's debt level. This is due to the fact that firm-specific human capital reduces employability and may also encounter large losses for the RMC members, leaving them with few employment choices and huge financial losses if their firm has a high

likelihood of bankruptcy (Berk, Stanton and Zechner, 2010). Therefore, because firm-specific human capital is only appreciated within the firms, rather than by all potential employers, RMC members with high firm-specific human capital reduce their marketability. They are less likely to get another job or may have to take another job at substantially lower pay if the firm goes bankrupt (Berk, Stanton and Zechner, 2010). In this sense, RMC members with high firm-specific human capital are more likely to limit their debt and reduce the firm's bankruptcy likelihood to ensure they are not at risk of loss of employment and financial loss, leading to the following hypothesis:

H6 (a): The probability of bankruptcy is negatively associated with risk management committee firm-specific human capital.

RMC members with a high level of general human capital are more likely to get another job at an equal wage or even higher salary once they are unemployed. This is due to the fact that their skill set is highly transferable and perfectly marketable. As a result, they may be more likely to engage in high risky investment which may generate substantive income for them, but also contains excessive risks. In this sense, a RMC member with a high level of general human capital is more likely to engage in excessive risk projects, as they will not be negatively affected if the companies go bankrupt, leading to the following hypothesis:

H6 (b): The probability of bankruptcy is positively associated with risk management committee general human capital.

3.6 SUMMARY

Using human capital and resource dependence theory as a basis, this chapter developed a theoretical framework for RMC human capital. Using this theoretical framework and previous studies, this study developed six hypotheses. The testing

models are summarised in Figure 3.1 and the theoretical framework is presented in Figure 3.2. The following chapter describes the research models used to test these hypotheses.

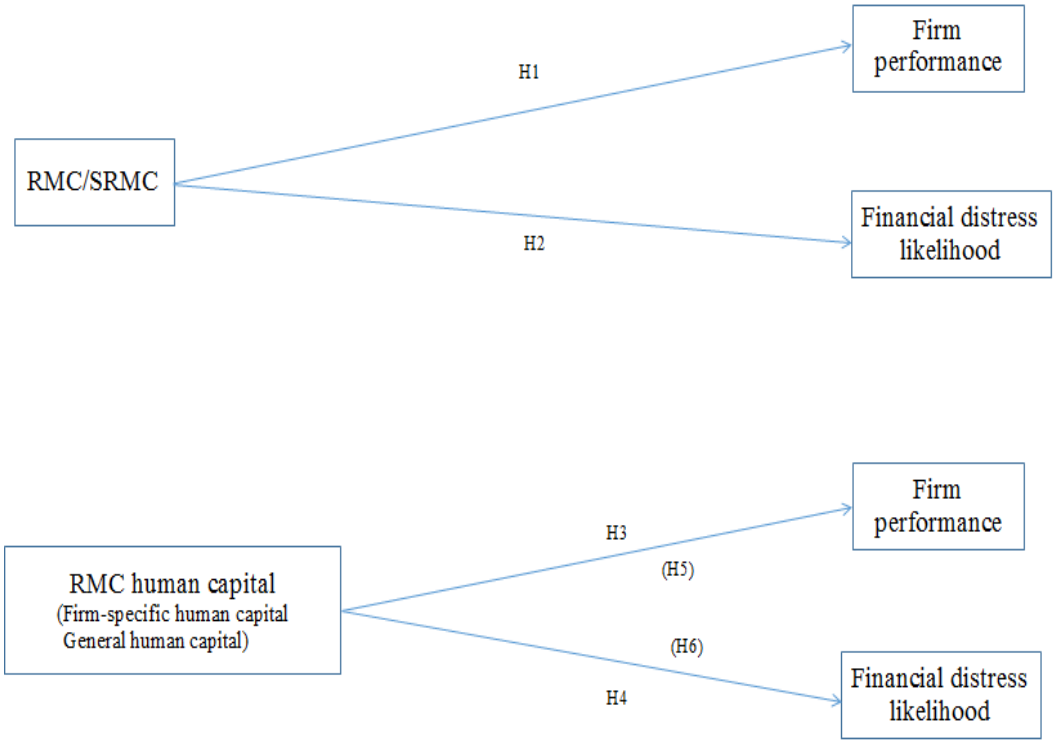

Figure 3.1: Testing Models

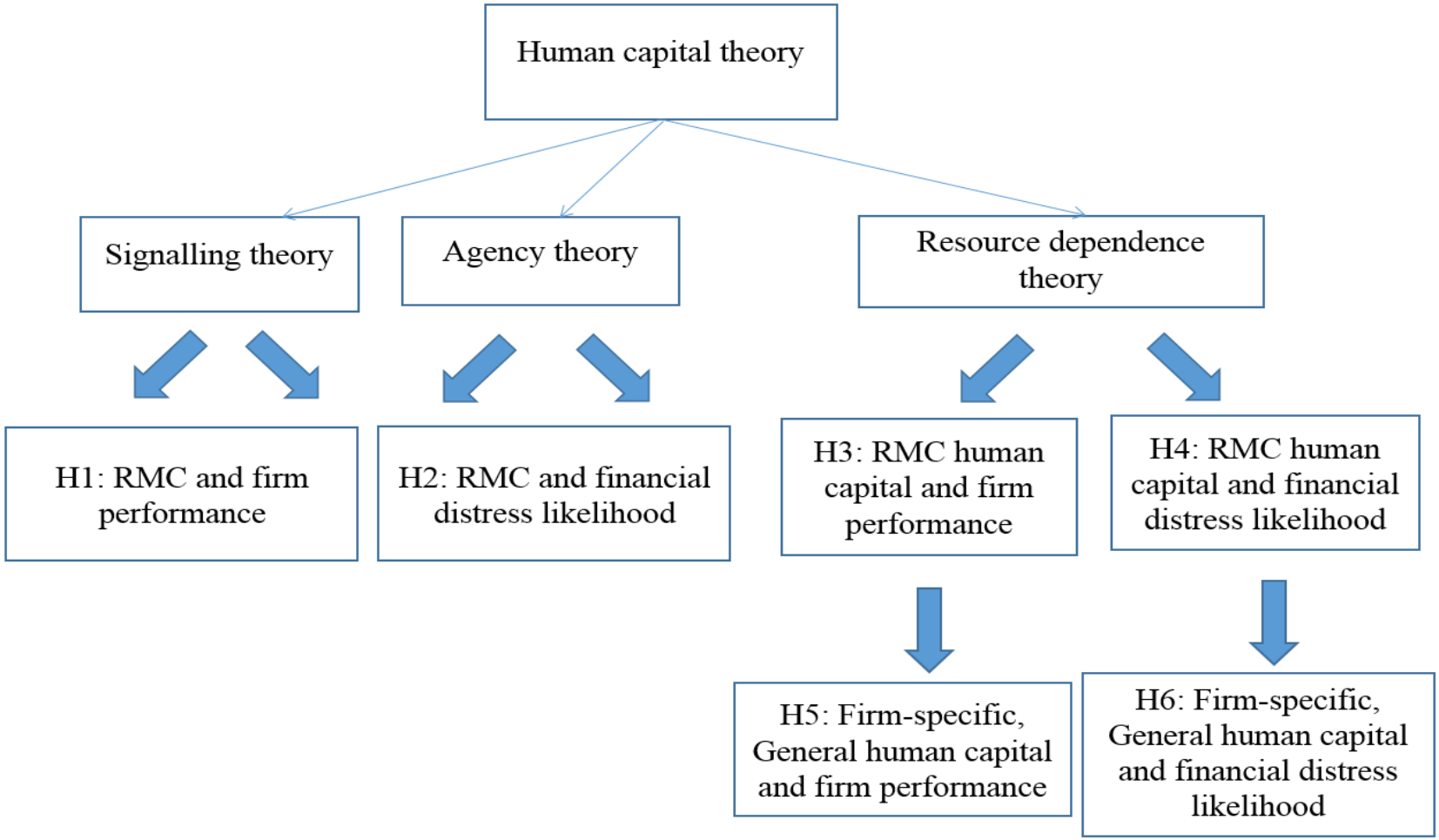

Figure 3.2: Theoretical framework

Chapter 4: Research Design

4.1 INTRODUCTION

The previous chapter developed hypotheses concerning the existence of a RMC and the human capital of a RMC. This chapter describes the sample selection and data source for this study. The research models used for testing the research question and the subsequent hypotheses are also presented, along with the definition of the variables used in the models.

4.2 SAMPLE SELECTION AND DATA SOURCE

The focus of this study is to examine whether the human capital of a RMC is associated with firms' management of risk. To test the research question, this study tested the six hypotheses developed in Chapter 3, which are listed below:

- H1 (a): There is a positive association between risk and firm performance for firms with a risk management committee.
- H1 (b): There is a positive association between risk and firm performance for firms with a separate risk management committee.
- H2 (a): There is a negative association between the probability of financial distress and risk for firms with a risk management committee.
- H2 (b): There is a negative association between the probability of financial distress and risk for firms with a separate risk management committee.
- H3: there is a positive association between RMC human capital and firm performance.

- H4: There is a negative association between the probability of financial distress and RMC human capital.
- H5 (a): Firm performance is positively associated with RMC firm-specific human capital.
- H5 (b): Firm performance is negatively associated with RMC general human capital.
- H6 (a): The probability of bankruptcy is negatively associated with RMC firm-specific human capital.
- H6 (b): The probability of bankruptcy is positively associated with RMC general human capital.

The sample selected comprised the top 300 ASX listed companies, measured by market capitalisation as at 30 June 2007 to 2014. These companies were selected for this study based on the expectation that this corporate group could provide an overall representation of the risk management practices of ASX listed companies (Van der Laan and Dean, 2010). Specifically, the top 300 ASX companies covered large, middle, and small-cap components of all ASX listed companies, which occupied approximately 81% of Australian equity market capitalisation (ASX, 2014). In addition, the market capitalisation of the sample companies ranged from 4,847,293 to 24.4 billion, suggesting there was enough variation in the sample to be representative of all listed firms. It was also assumed that larger firms had more resources to have a separate RMC, a higher level of RMC human capital, and a greater need, as they are under great public scrutiny and higher litigation risk (Miihkinen, 2012). Top 300 ASX companies face stricter structure and greater disclosure requirements (ASXCGC, 2014). Therefore, they are more likely to establish risk management practices and

disclose their risk management information to the public, which would decrease the number of companies with missing data in this study. It was also expected that if there were significant associations using the sample of the top 300 ASX companies, then the relationships would be more significant than when the sample included all Australian firms (Azizkhani, Monroe and Shailer, 2010).

The data on the RMCs was hand collected from the companies' annual reports from 2007 to 2014 from the Connect 4 Australian database. Annual reports are still considered important and fundamental public documents that are heavily relied upon by outsiders (Linsley and Shrives, 2005). The financial data was collected from Thomson Returns and the Morningstar database.

The time frame of the years 2007 to 2014 was chosen to perform a longitudinal analysis of RMC human capital in Australia. In 2007, the CGPR was revised (ASXCGC, 2007). Therefore, 2007 was a starting point for when Australian companies began to comply with the revised edition of ASX CGPR (ASXCGC, 2007). In addition, this study also accounted for the effect of the 2007-2008 global financial crisis, Probohudono, Tower and Rusmin (2013) provided evidence that there were low levels of risk management practice compliance in Australia during the global financial crisis (2007-2009 financial years). Therefore, it was appropriate to choose 2007 as the first year in this study to capture whether there has been a growing emphasis on risk management in firms. The final year 2014 was selected because this was the latest date risk management data was available for this study.

The sample consisted of 2,400 firm-year observations. However, due to the missing RMC data, the final sample decreased to 2,330 firm-year observations of 597 firms. Therefore, it provides an unbalanced panel dataset of 597 firms. The sample profile by industry sector code is presented in Table 4.1. The material sector provided

the highest proportion of the sampled companies, with 23%, followed by the financial industry at 20.6%, whereas telecommunication services occupied the lowest proportion, with 2.3%.

Table 4.1: Sample profile (2330 firm-year observations, 597 firms)

Industry (GICS) sector	No. of companies	Percentage
Materials	137	23%
Financials	123	20.6%
Consumer Discretionary	83	13.9%
Industrials	76	12.7%
Energy	60	10%
Health Care	33	5.5%
Consumer Staples	27	4.5%
Utilities	24	4%
Information Technology	21	3.5%
Telecommunication Services	13	2.3%
Total No.	597	100%

Among all samples, 1,374 firm-year observations of 371 firms (59%) had established a RMC. The distribution of these firms amongst the industry codes is presented in Table 4.2. Among the 1,374 firms with a RMC, 82 (22%) were financial firms, followed by materials (15.5%) and industrials (15.5%), whereas only 3% of the firms (12 firms) were in telecommunication services or information technology industry.

Table 4.2: Firms with a RMC (1374 firm-year observations, 371 firms)

Industry (GICS) sector	No. of companies	Percentage
Financials	82	22%
Materials	57	15.5%
Industrials	57	15.5%
Consumer Discretionary	53	14%
Energy	35	10%
Consumer Staples	22	6%
Utilities	22	6%
Health Care	19	5%
Telecommunication Services	12	3%
Information Technology	12	3%
Total No.	371	100%

4.3 RESEARCH MODELS AND MEASURES

In order to answer the research question, regression analyses were utilised to test the association between RMC human capital and firms' management of risk. This was done by firstly testing whether the existence of the RMC was associated with firm performance and/or the likelihood of financial distress. Secondly, the association between RMC human capital and firm performance, and/or the likelihood of financial distress was tested. It was assumed in this study that a firm with appropriate risk management was likely to have better firm performance and less likelihood of financial distress.

As hypothesised, the following describes the dependent variables, independent variables, and the control variables used in this study to test the association between the RMC human capital, firm performance, and the likelihood of financial distress.

4.3.1 Definition of dependent variables, independent variables, and control variables.

Definition of dependent variables

Firm performance: This study used two measures of firm performance: accounting-based and market-based performance.

Accounting performance, return on assets (ROA), measured as net income plus interest expense multiplied by (1-corporate tax rate) divided by [total assets - outside equity interests] (e.g. Huson, Malatesta and Parrino, 2004). ROA is a profitability ratio, which indicates how profitable a company's assets are in generating income. Specifically, ROA is an indication of the ability of the firm to produce accounting-based revenues in excess of actual expenses from a given portfolio of assets measured as amortised historical costs (Carter, D'Souza Simkins, and Simpson, 2010). It is used as an accounting based measurement of firm performance (Carter, D'Souza, Simkins and Simpson, 2010).

Market performance, was assessed using Tobin's Q, which was measured as the market value of the firm divided by placement value of assets (as adopted by Agrawal and Knoeber, 1996). Tobin's Q measures the market value of shareholder and creditor investment, it encompasses a market assessment of the investment opportunity set and further cash flows of the firm (Hutchinson, Mack and Plastow, 2015). Therefore, Tobin's Q is a market-based measurement of firm performance, as it is based on the market value of shareholder and creditor investments.

Financial Distress Risk

To determine whether RMC human capital reduces the likelihood of financial distress, a proxy was needed to measure the probability of financial distress. Early indicators of financial distress include losses in multiple consecutive years, cash flows drying up, declining sales, etc. This study used two measurements to capture firms' likelihood of financial distress.

Altman Z-Score - accounting measurement of the likelihood of financial distress.

First, the most popular measure of financial distress risk is the Altman Z-Score model[16], which uses discriminant analysis (DA) to combine five accounting ratios into a score that represents the financial distress risk inherent in a firm (Altman, 1968). Although the model was introduced in the late 1960s, it is still relevant and used for

[16]Altman (1968) derived a "cut-off" point, or optimum Z value, by observing firms that were misclassified by the DA model in the initial sample (p. 606). He concluded that all firms with a Z-Score of greater than 2.99 clearly fall into the "non-bankrupt" sector, while those firms with a Z below 1.81 are bankrupt. Consequently, firms are classified as firms with a small Z-Score (≤ 1.81) recognised as a high probability of financial distress and with a high Z-Score (≥ 2.99) recognised as a low probability of financial distress.

financial research to proxy for financial distress and default risk (Aslan and Kumar, 2012; Becker and Stromberg, 2012).

The Altman Z-Score is based on five accounting ratios calculated as follows: Z-Score = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E, where:

A = Working Capital/Total Assets: WC = (Current assets - cash) - (current liabilities – short term debt)

B = Retained Earnings/Total Assets

C = Earnings Before Interest and Tax/Total Assets

D = Market Value of Equity/Total Liabilities

E = Sales/Total Assets

Altman (1968) suggested that the predictive model is useful for screening out undesirable investments, because investors tend to underestimate the extent of financial difficulties of the firms that eventually go bankrupt. Specifically, a high Z-Score indicates lower financial distress, whereas a low Z-Score indicates greater financial distress. As a result, Z-Score has an inverted relationship with the likelihood of financial distress. In order to facilitate the interpretation of the results, this study used PBANK as –Z-Score. As a result, PBANK is positively related to the likelihood of financial distress.

Naïve model – market measurement of the likelihood of financial distress

Second, this study used the Naïve model developed by Bharath and Shumway (2004) as an additional measurement of the likelihood of financial distress. Unlike Altman's Z-Score, which focuses on accounting ratios, the Naïve model is based on the KMV-Merton default forecasting model, which is a market-based measurement. A number of studies, such as Kealhofer and Kurbat (2001), and Duffie and Wang

(2004), indicate that the KMV-Merton model is appropriate to measure the likelihood of financial distress, as it captures all of the information in traditional agency rating and well-known accounting default probability variables.

Additionally, Bharath and Shumway (2004) suggested that based on the KMV-Merton default forecasting model, the Naïve model has significant predictive power and performs well in capturing firms' financial distress probability. Specifically, the Naïve model generates the distance to default rate for each firm (Naïve DD), to predict firms' probability of experiencing financial distress. The distance to default rate is calculated using a formula, which includes the firms' total volatility (Naïve σ_V), stock return over the previous year (r_{it}−1), the volatility of each firm's debt (Naïve σ_D), face value of the firm's debt (F), and the market value of the firm's equity (E). The formula is shown below.

$$\text{Naive } DD = \frac{\ln[(E+F)/F] + (r_{it-1} - 0.5 \text{ Naive } \sigma_V^2)T}{\text{Naive } \sigma_V \sqrt{T}}.$$

The components involved in the Naïve model can be calculated using formulas 1 to 4. Firstly, the market value of each firms' debt is calculated with the face value of its debt, using formula 1. Secondly, the volatility of each firm's debt is computed using formula 2, which involves the firms' equity risk (the standard deviation of each firm's stock price). Next, the total volatility of a firm is calculated using formula 3. Formula 4 is used to calculate the expected return on a firm's assets, which is equal to the firm's stock return over the previous year.

$$\text{Naive } D = F, \tag{1}$$

$$\text{Naive } \sigma_D = 0.05 + 0.25 * \sigma_E. \tag{2}$$

$$\text{Naive } \sigma_V = \frac{E}{E + \text{ Naive } D}\sigma_E + \frac{\text{Naive } D}{E + \text{Naive } D}\text{Naive } \sigma_D = \frac{E}{E+F}\sigma_E + \frac{F}{E+F}(0.05 + 0.25 * \sigma_E). \quad (3)$$

$$\text{Naive } \mu = r_{it-1}. \quad (4)$$

Definition of independent variables

The independent variable in this study is RMC human capital. Specifically, according to previous literature, this study has identified five types of human capital that have frequently been examined in previous research: board tenure, RMC tenure, experiences, education, and share ownership. These five types of human capital have been widely investigated in the previous literature, indicating their importance. In addition, firms often disclose these five risk management variables to the public, rendering them available to examine in this study.

Firm-specific human capital (board tenure, RMC tenure, and RMC share ownership)

a) Tenure (board tenure and RMC tenure)

Tenure is the number of years that a director has held a particular position (Laing and Weir, 1999). It represents the extent of company-specific skills or experience that a board obtains to perform the task (Bilimoria and Piderit, 1994; Hogan and McPheters, 1980; Wulf and Singh, 2011). According to expertise hypothesis, long-board tenure directors are associated with a high level of experience, commitment, and competence about the firm and the firm's business environment (Vafeas, 2003). With directors spending more and more time serving on boards, they face a variety of issues that may enhance their familiarly with specific governance issues and problems of the company (Kesner, 1988). Long-board tenure directors gain a high level of job-specific knowledge and experience, and they may be more committed to their duties over time (Fiedler, 1970; Salancik, 1977; Sun, Lan and Liu, 2014). Directors with long tenure

tend to have better knowledge of the management team and directing companies' strategy. Thus, they are better prepared for oversight responsibilities and monitoring managers (Bilimoria and Piderit, 1994). Previous studies have examined the impact of board tenure on firms' outcomes. For example, Kor and Sundaramurthy (2009) found average director tenure was negatively related to annual sales growth. Hillman, Shropshire, Certo, Dalton and Dalton (2011) documented that shareholders are discontented with the monitoring of long-tenured directors. This is consistent with Chan, Liu, and Sun (2013), who found the proportion of long board tenure audit committee members was negatively related to audit fees, indicating audit committee members' long board tenure results in lower audit effort. On the other hand, some studies have documented a positive impact of board tenure on firms. For example, Dhaliwal, Naiker and Navissi (2010) provided evidence that there is a positive association between audit committee members' board tenure and financial reporting quality, while other studies found no association between board tenure and firms' outcomes (e.g. Johnson, Hoskisson and Hitt, 1993; Nugroho and Eko, 2012; Sundaramurthy, 1996). These inconclusive results may be due to tenure having a non-linear effect. In fact, Musteen, Datta and Kemmerer (2010) found there was an inverted U-relationship between board tenure and firm outcomes.

In this study, board tenure was measured as the average number of years the RMC members served as board members of a firm. Similarly, RMC tenure was measured as the average number of years the RMC members served as a RMC member of a firm in this study. Long tenure represents a high level of experience, commitment, and competence about the firm and the business environment that the firm operates in (Vafeas, 2003), as a result, long-tenured directors are better prepared for oversight responsibilities. Following this trend, the long length of tenure of RMC members can

be beneficial in effective oversight risk management activities and carrying out risk management strategies. Therefore, board tenure (the length of time sitting on the board) and RMC tenure (the length of time sitting on the RMC) are crucial to determining the efficiency of risk management. It is expected that board tenure and RMC tenure would increase firm performance and decrease the likelihood of financial distress.

b) Share ownership

Share ownership can be treated as an internal mechanism that reduces the possibility of managerial opportunism and for the interest of large stockholders (Edwards and Nibler, 2000). A high level of share ownership suggests a high level of monitoring and controls from investors over firms' decisions, this is because large stockholders have the incentive to safeguard their investments (Bredart, 2014; Burkart, Gromb and Panunzi, 1997; Edwards and Nibler, 2000; Lange and Sharpe, 1995; Shleifer and Vishny, 1986). Large stockholders are more likely to pay attention to the strategic and risk management decisions of firms (Edwards and Nibler, 2000), and make sure companies are managing their risk properly and firms are not taking excessive risks, thus, safeguarding investors' investments. As a result, directors' share of ownership affects firms' outcomes.

A number of studies have indicated that dispersion creates free-riding problems and decreases monitoring levels. Therefore, a positive relationship between ownership and firm performance is expected (Rose, 2007). Consistent with this argument, Shleifer and Vishny (1986) showed that shareholder ownership is positively associated with the price of firm shares. In addition, previous literature has indicated that ownership structures can influence corporate risk taking (Jensen and Meckling, 1976; John, Litov and Yeung, 2008). Empirically, Shehzad, De Haan, and Scholtens (2010)

found ownership concentration reduces bank riskiness at low levels of shareholder protection rights and supervisory control. A higher ownership concentration is associated with better loan quality, lower asset risk, and lower insolvency risk in the banking industry (Iannotta, Nocera and Sironi, 2007). These results suggest that there is an association between share ownership and risk management.

Directors' share of ownership can be treated as an internal mechanism that reduces the possibility of managerial opportunism and the interest of large stockholders (Edwards and Nibler, 2000). A high level of share ownership – ownership concentration[17] – suggests a high level of monitoring and control from investors over firms' decisions. As a result, this study expects that the share of ownership by RMC members is positively related to firm performance and negatively related to the likelihood of financial distress.

General human capital (qualifications and experiences)

a) Qualification

In this study, education refers to the qualifications held by board members – Diploma, Bachelor, Masters, Ph.D. degree, MBA and professional qualifications of CA/CPA (Aldamen, Duncan, Kelly, McNamara and Nagel, 2012). Previous literature has documented that education level may affect directors' cognitive and decision-making (Johnson, Schnatterly, and Hill, 2012), which potentially affects firms' outcomes. Kim and Lim (2010) provided evidence that the educational background of directors was positively related to firm performance in Korea. However, Rose (2007) found that education was not significantly related to firm performance in Denmark. As for innovation performance, Wincent, Anokhin and Ortqvist (2010) showed the

[17] Ownership concentration has been recognised if individual investors or block-holders hold more than 5% of the companies' shares (Holderness, 2009).

number of qualifications held by the board is positively associated with innovation performance. The variety of findings in the education area may be due to educational backgrounds presenting many different underlying constructs, such as social status or friendship ties (Johnson, Schnatterly, and Hill, 2012). For example, D'Aveni and Kesner (1993) suggested that people who go to university often develop and maintain social networks that can be valuable to increasing knowledge and experience. In addition, Christy, Matolcsy, Wright, and Wyatt (2010) demonstrated that a negative relationship exists between board qualifications and market risk of equity, suggesting that education level may be associated with a firm's risk level. Similarly, Dionne, Maalaoui Chun and Triki (2013) showed that the education level of the board of directors affects the hedging level, and further provided evidence that highly educated directors encourage risk management. These results demonstrate that there is an association between education level and firms' risk management.

The qualifications gained by RMC members are essential to risk management efficiency, as they provide the members with the necessary professional knowledge. Therefore, it is expected that the number of qualifications held by RMC members may enhance risk management efficiency; thus, leading to an increase in firm performance and decrease in the likelihood of financial distress.

b) Experience

It is generally agreed that experience with performing a certain task leads to improved expertise in that task (Tian, Haleblian, and Rajagopalan, 2011). Therefore, individuals with a high level of task expertise can make better decisions regarding that task and have better judgment of the qualification of others to perform similar tasks (Bandura, 1997). This is because individuals with experience in an area have already developed knowledge and expertise (Day and Lord, 1992). The board bears the major

monitoring and decision-making role. Therefore, the experience of the board of directors is crucial in order for them to effectively discharge their duties.

Prior studies have examined the amount of directors' experience, with an emphasis on financial experience (Dionne, Maalaoui Chun and Triki, 2013). Specifically, the financial experience of the board can impact on a number of firm issues, such as debt strategies and earnings management (An and Jin, 2004; Mizruchi and Stearns, 1994). Xie, Davidson and DaDalt (2003) documented that board and audit committee members with financial experience decreased discretionary current accruals, indicating that the financial experience of directors may influence the level of earnings management. Guner, Malmendier, and Tate (2008) reported a positive relationship between the banking experience of the board and the firms' debt level, indicating that the financial experience of the board enables the firm to contract more debt, thus, decreasing the firms' likelihood of bankruptcy. In addition, Rosenstein and Wyatt (1990) showed a positive abnormal return when appointing an outside director who has financial experience. Similarly, DeFond, Hann, and Hu (2005) and Davidson, Xie and Wu (2004) documented a positive market response when appointing a financial expert to the audit committee. These results show that the market acts positively when boards have financial experience. Some literature has reported that the absence of financial experience in an audit committee may lead to severe consequences. For example, Agrawal and Chadha (2005) provided evidence that the probability of earnings restatement is higher in firms whose directors do not have financial or accounting experience. In addition, the absence of a financial expert on the audit committee increases the probability of financial restatement and financial fraud (Abbott, Parker and Peters, 2004). This previous literature highlights the importance of the financial experience of the board.

Industry familiarity also influences how directors process information and make board decisions, and may help firms to access crucial resources (Johnson, Schnatterly, and Hill, 2012). For example, Day and Lord (1992) revealed that individuals without knowledge and skills developed in a similar setting may need more time to reach effective outcomes. Similarly, Kroll, Walters, and Wright (2008) suggested industry experience enables the board to make acquisition decisions that are positively received by external investors. In addition, industry experience provides firms with tacit knowledge of the opportunities, threats, and regulations specific to that industry (Kor, 2003). As a result, the knowledge of prior industry conditions can help firms to understand the industry's current dynamics and detect potential opportunities in the industry, while also helping directors to evaluate managers' proposals for growth (Arthur, 1994; Castanias and Helfat, 2001). Specifically, Kor and Sundaramurthy (2009) determined industry experience to be positively related to sales growth. Walter, Kroll and Wright (2008) and Tian, Haleblian, and Rajagopalan (2011) documented that industry experience affects stock market reaction and CEO successions. Similarly, boards that have other types of experience may create benefits for firms. For example, DeZoort and Salterio (2001) suggested that audit committee members with greater audit experience are more likely to have a high level of audit quality.

Directors with experience in a certain field can develop their knowledge and expertise in that area. As a result, RMC members with experience performing risk management activities will have developed relevant risk management knowledge and expertise. Therefore, it can be argued that RMC members with experience related to risk management may be better at managing risks. This study identified five types of experience related to risk management matters: financial, industry, management, auditing, and tax experience. As risk management activities are involved in a firm's

financial activities, such as sophisticated financial tools, RMC members with financial experience are highly desirable to oversee risk management matters and monitor risk management systems (Dionne, Maalaoui Chun and Triki, 2013; Kaen, 2005). Industry familiarity also influences how directors process risk management information and make decisions. Specifically, Kor and Sundaramurthy (2009) demonstrated that industry experience is positively related to sales growth and stock market reaction. Therefore, the industry experience of the RMC has an effect on firms' risk management. Similarly, RMC members who have management, accounting, auditing, and tax experience may have a particular advantage in managing risks due to their previous experience.

This study recognised that a RMC member had financial experience if he/she currently or previously held any position related to finance, such as CFO, treasurer, and banker. This study recognised that a RMC member had management experience if he/she currently or previously held any position related to management, such as general manager and CEO. A RMC member was said to have an accounting experience if he/she was a CA/CPA or had any education, work experience or activity related to accounting. A RMC member was said to have industry experiences if she/he previously worked in the same industry as categorised by GICS industry sector. It was expected that an RMC member with more types of experience would be more likely to provide effective risk management, thus leading to an increase in firm performance and a decrease in the likelihood of financial distress.

c) Control variables

This study controlled for firm factors that were likely to be related to RMC human capital, firm performance, and the likelihood of bankruptcy, such as industry, leverage, and past performance.

Including lagged performance (ROA_{t-1}) as an independent variable allowed for performance persistence and feedback from past to current performance (Bohren and Strom, 2010; Wooldridge, 2002). Lagged market performance (Tobin's Q_{-1}) and lagged Z-Score ($Z\text{-}Score_{t-1}$) were included as control variables because they could have impacts on the dependent variables. In addition, the inclusion of the lag of the dependent variable was likely to mitigate concerns over reverse causality and omitted variables. To the extent that omitted correlated variables are relatively stable, their effects can be captured by lagged values of the dependent variable.

This study controlled for growth opportunities, measured as the market to book ratio (MTB). Growth opportunities capture changes in economic conditions that could be exploited by a distressed firm. If there is a change in the market demand for a product that improves a firm's growth options, then that firm will be less likely to become bankrupt (Fich and Slezak, 2008). Higher growth opportunities provide incentives to invest sub-optimally, or to accept risky projects that expropriate wealth from debt-holders. This raises the cost of borrowing; and thus, a firm's growth tends to use internal resources or equity capital rather than debt. Consequently, growth opportunity influences the likelihood of financial distress (Deesomsak, Paudyal and Pescetto, 2004).

Leverage (LEV) was included in this study as it is likely to be associated with firm performance, because higher leverage is associated with greater risk of financial failure. Year dummies were also included to demonstrate the effects of year differences. This study also controlled for firm size (lnMKTCAP), because large companies are less likely to be in financial stress (Huang and Zhao, 2008), while firm size is likely to lead to greater performance and be negatively associated with firm risk (Pathan, 2009). Market performance (Tobin's Q) is more likely to be driven by market

capitalisation, indicating multicollinearity issues; therefore, following previous studies, this study used total assets (lnTA) as the measurement of firm size in all Tobin's Q regressions (Bebchuk, Cohen and Ferrell, 2009; Gugler and Yurtoglu, 2003). Industry (INDUS) was controlled for because different industries have quite different debt ratios and other different characteristics that could potentially affect the results (Huang and Zhao, 2008). This study also controlled for board independence (INDEP), board size (BRDSIZE), and CEO duality (CEODUAL), which are standard corporate governance control variables that could affect the dependent variables (Bhagat and Bolton, 2008; Core, Guay and Rusticus 2006; Platt and Platt, 2012).

4.3.2 Regression models

Fixed effects and random effects estimations are two typical principle approaches used when examining panel or longitudinal data. In the random effects approach, time-invariant unobservables are treated as disturbances, and it is assumed that the correlation between them and independent variables equals zero. In contrast, the fixed effects approach assumes that time-invariant unobservables for each observable are correlated with independent variables. If the fixed effects assumption holds, then the fixed effects approach is more efficient than the random effects approach. Otherwise, it will generate inconsistent and biased estimates.

After observing the testing variables – RMC human capital variables – this study found that they were mostly constant over time. This required that random effects models should be adopted to capture the variations among different variables. Even though fixed effects models may generate more robust coefficients in cases where the time invariant omitted variables are correlated with independent variables, it does not

allow for adequate testing of the variables if there is little variation over time.[18] As a result, random effects models were adopted to test the developed hypotheses. The chosen approach was then adopted, along with robust estimation to test the hypotheses in this study. The robust estimation ensured the regressions did not suffer from heteroscedasticity and autocorrelation (Huber, 1967; White, 1980; 1982). As the dataset was panel data, which involved repeated observations of sample firms, errors in the regression model were correlated with each other over the testing period because the unobservable factors varied from each case (Allison, 2009). Failure to address the serial correlation issue would have led to underestimation of standard errors and confidence interval (Allison, 2009). Similarly, heteroscedasticity rises when the standard error terms do not have constant variance, which may occur due to model misspecification or other interaction effects. When heteroscedasticity is presented, the standard errors are biased, which leads to bias in test statistics and p-value (Allison, 2009). Therefore, this study adopted robust estimates analysis in order to overcome heteroscedasticity and autocorrelation issues, producing unbiased results. Clustered standard errors at the firm level were used to adjust the standard errors. Clustered standard errors accounted for the dependence in the panel data and generating unbiased results (Petersen, 2009).

First, the association between a RMC and firm performance (H1) was tested using models 1 to 4.

$$ROA_{i,t} = a + b_1 RMC_{i,t} + b_2 Risk_{i,t} + b_3 RMC_{i,t} * Risk_{i,t} + b_4 Controls_{i,t} + \varepsilon_{i,t} \quad (1) \text{ –H1(a)}$$

$$ROA_{i,t} = a + b_1 SRMC_{i,t} + b_2 Risk_{i,t} + b_3 SRMCi_{,t} * Risk_{i,t} + b_4 Controls_{i,t} + \varepsilon_{i,t} \quad (2) \text{– H1(a)}$$

[18] This study adopted the fixed effect regression model in the robustness test.

$$Tobin's\ Q_{i,t} = a + b_1 RMC_{i,t} + b_2\, Risk_{i,t} + b_3 RMC_{i,t} * Risk_{i,t} + b_4 Controls_{i,t} + \varepsilon_{i,t} \quad (3) – \text{H1(b)}$$

$$Tobin's\ Q_{i,t} = a + b_1 SRMC_{i,t} + b_2\, Risk_{i,t} + b_3 SRMC_{i,t} * Risk_{i,t} + b_4 Controls_{i,t} + \varepsilon_{i,t} \quad (4) – \text{H1(b)}$$

Second, the association between a RMC and the likelihood of financial distress (H2) was tested using models a-d.

$$Z\text{-}Score_{i,t} = a + b_1 RMC_{i,t} + b_2\, Risk_{i,t} + b_3 RMC_{i,t} * Risk_{i,t} + b_4 Controls_{i,t} + \varepsilon_{i,t} \quad (a) – \text{H2(a)}$$

$$Z\text{-}Score_{i,t} = a + b_1 SRMCi_{,t} + b_2\, Risk_{i,t} + b_3 SRMCi_{,t} * Risk_{i,t} + b_4 Controls_{i,t} + \varepsilon_{i,t} \quad (b) – \text{H2(a)}$$

$$Naïve_{i,t} = a + b_1 RMC_{i,t} + b_2\, Risk_{i,t} + b_3 RMC_{i,t} * Risk_{i,t} + b_4 Controls_{i,t} + \varepsilon_{i,t} \quad (c) – \text{H2(b)}$$

$$Naïve_{i,t} = a + b_1 SRMC_{i,t} + b_2\, Risk_{i,t} + b_3 SRMC_{i,t} * Risk_{i,t} + b_4 Controls_{i,t} + \varepsilon_{i,t} \quad (d) – \text{H2(b)}$$

Table 4.3 presents a detailed description of all of the variable definitions used to answer H1 and H2.

Table 4.3. Variable definitions – the existence of RMC

Variables	
Dependent variables	Explanations
Firm performance (ROA)	Firm profitability, measured by return on asset ratio, ROA
Bankruptcy likelihood (lnZ-Score)	Altman Z-Score; PBANK = (-lnZ-Score)
Tobin's Q (lnTobin's Q_t)	The market value of equity of equity and debt divided by The book value of total assets in year t
Naïve	The probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004)
Predictors	
SRMC	Dummy variable, taking a rate of 1 when firms with a separate RMC, 0 otherwise.
RMC	Dummy variable, taking a rate of 1 when firms with a RMC (combined and separate), 0 otherwise.
RMC*risk	Moderating variable of RMC and risk
SRMC*risk	Moderating variable of separate RMC and risk
Controls	
Leverage (LEV)	The financial leverage of the firm, computed as total liabilities to total assets
Growth opportunity (MTB)	Market to book ratio. The ratio of year-end market capitalisation to total common equity.
Firm size (lnMKTCAP)	The natural logarithm of market capitalisation as at 30 June
Risk (STDDEV)	Total risk calculated as the standard deviation of firm daily stock Returns for each fiscal year
CEO duality (CEODUAL)	A dummy variable, taking a rate of 1 if the CEO is also the chair, 0 otherwise
Board size (BRDSIZE)	Number of board members
Prior firm year performance (ROA-1)	Measured by return to asset ratio of the prior year
Prior year Tobin's Q (lnTobin's Q_{t-1})	Tobin's Q of previous year
Prior year Z-Score(lnZ-$Score_{t-1}$)	Altman Z-Score of previous year; PBANK $_{t-1}$ = (-Z-Score $_{t-1}$)
Board independence (INDEP)	The percentage of aboard member who is independent calculated as the independent board total/ total number of board
Industry (INDUS)	Coded based on the GICS (Global Industry Classification Standard)
Year	Year dummy variable

This study used two research models to examine the association between RMC human capital and firms' management of risk in terms of firm performance and the likelihood of financial distress. The first research model was principle component analysis, which captured the overall human capital of risk management deriving from

a number of RMC human capital characteristics. The second model used individual RMC human capital characteristics to examine the relationship between RMC human capital and firms' management of risk.

Model 1 - principle components analysis

Due to a lack of prior research indicating which characteristic is the most important for risk management and the likelihood that the characteristics are likely to be interrelated, a factor score was developed for RMC. A principle components analysis (PCA) was conducted using the RMC human capital characteristics described above. Except for RMC tenure and board tenure, the rest of the RM human capital characteristics were all on the scale between 0 and 1, therefore, this study added all of these variables together and combined them into a variable named "rescaling". The principle component factor analysis was then conducted based on "rescaling", RMC tenure, and board tenure. One benefit of conducting PCA is that it can reduce a set of factors and extract as much variance with the least number of factors (Jolliffe, 2002). The PCA approach also alleviates multicollinearity issues, as well as issues related to a lack of theoretical underpinning. After the latent RM human capital score (RMCHC) was identified from the PCA, it was then used in the following regression models.

$ROA_{i,t} = a + b_1 RMC_{i,t} + b_2 RMCHC_{i,t} + b_3 Controls_{i,t} + \varepsilon_{i,t}$ (*model 1a*)– H3

$Tobin's\ Q_{i,t} = a + b_1 RMC_{i,t} + b_2 RMCHC_{i,t} + b_3 Controls_{i,t} + \varepsilon_{i,t}$ (*model 1b*)– H3

$Z\text{-}Score_{i,t} = a + b_1 RMC_{i,t} + b_2 RMCHC_{i,t} + b_4 Controls_{i,t} + \varepsilon_{i,t}$ (*model 1c*)– H4

$Naïve_{i,t} = a + b_1 RMC_{i,t} + b_2 RMCHC_{i,t} + b_4 Controls_{i,t} + \varepsilon_{i,t}$ (*model 1d*)– H4

Model 2 - Individual RMC human capital (general and firm-specific) characteristics

In the second research model, this study used risk management tenure, board tenure, average number of qualifications, average amount of experience, and RMC

share ownership as independent variables, in order to examine the individual RM human capital characteristics. The following regression analyses were used:

$ROA_{i,t} = a + b_1 RMC_{i,t} + b_2 Tenure_{i,t} + b_3 RMC\ Tenure_{i,t} + b_4 Exp_{i,t} + b_5 Quali_{i,t} + b_6 SHARE_{i,t} + b_7 Controls_{i,t} + \varepsilon_{i,t}$ (*model 2a*) - H5

$Tobin's\ Q_{i,t} = a + b_1 RMC_{i,t} + b_2 Tenure_{i,t} + b_3 RMC\ Tenure_{i,t} + b_4 Exp_{i,t} + b_5 Quali_{i,t} + b_6 SHARE_{i,t} + b_7 Controls_{i,t} + \varepsilon_{i,t}$ (*model 2b*) - H5

$Z\text{-}Score_{i,t} = a + b_1 RMC_{i,t} + b_2 Tenure_{i,t} + b_3 RMC\ Tenure_{i,t} + b_4 Exp_{i,t} + b_5 Quali_{i,t} + b_6 SHARE_{i,t} + b_7 Controls_{i,t} + \varepsilon_{i,t}$ (*model 2c*) - H6

$Naïve_{i,t} = a + b_1 RMC_{i,t} + b_2 Tenure_{i,t} + b_3 RMC\ Tenure_{i,t} + b_4 Exp_{i,t} + b_5 Quali_{i,t} + b_6 SHARE_{i,t} + b_7 Controls_{i,t} + \varepsilon_{i,t}$ (*model 2d*) - H6

Table 4.4 presents a detailed description of all of the variable definitions to answer the association between RMC human capital and firms' management of risks.

Table 4.4: Variable definitions – RMC human capital

Variables	
Dependent variables	Explanations
Firm performance (ROA)	Firm profitability, measured by return on asset ratio, ROA.
Tobin's Q	Market measure of wealth, measured by market value of firm + debt / book value of total assets
Likelihood of financial distress (Z-Score)	Altman Z-Score; PBANK=(-lnZ-Score).
Naïve	The probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004).
Predictors	
RMC	Dummy variable, taking a rate of 1 when firms had a separate RMC, 0 when firms had a combined RMC.
Firm-specific HC: Tenure	Average number of years as a board member of a firm.
RMC Tenure	Average number of years as a member of RMC.
RMC share ownership (SHARE)	The average percentage of RMC members' shareholding.
General HC:	
Experience (Exp)	The average amount of experience (industry, financial, management, governance, accounting, auditing, and tax experience) obtained by RMC members.
Qualification (Quali)	The average number of qualifications (diploma, bachelor, masters, PhD, MBA, CA/CPA) held by RMC members.
RMCHC	The major factor extracted from principle component analysis based on rescaling, RMC tenure, and tenure.
Rescaling	Sum of a number of factors of RMC members (including the proportion of industry, RM, financial, management, governance, accounting, auditing and tax experience; the proportion of MBA, CA, CPA, diploma, bachelor, masters, Ph.D. qualifications; average percentage of RMC members shareholding).
Controls	
Leverage (LEV)	The financial leverage of the firm, computed as total liabilities to total assets
Growth opportunity (MTB)	Market to book ratio. The ratio of year-end market capitalisation to total common equity.
Market capitalisation (lnMKTCAP)	The natural logarithm of market capitalisation as at 30 June.
Risk (STDDEV)	Total risk calculated as the standard deviation of firm daily stock returns for each fiscal year.
CEO duality (CEODUAL)	A dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise.
Board size (BRDSIZE)	Number of board members.
Prior firm year performance (ROA_{t-1})	Measured by return to asset ratio of the prior year.
Prior year Tobin's Q	Measured by Tobin's Q ratio of the prior year.
Prior year Z-Score ($Z\text{-}Score_{t-1}$)	Measured by Altman Z-Score of the prior year; $PBANK_{t-1} = (-Z\text{-}Score_{t-1})$.
Board independence (INDEP)	The percentage of board members who were independent calculated as the independent board total/total number of board.
Industry (INDUS)	Coded based on the GICS (Global Industry Classification Standard).

4.4 SUMMARY

This chapter presented the research design of this study, specifically the selection of the sample and data resources. Regression models were also developed to test the hypotheses described in Chapter 3. Hypotheses 1 and 2 investigated the relationship between the existence of a RMC or a separate RMC and firms' management of risk in terms of firm performance and the likelihood of financial distress. The remaining hypotheses focussed on RMC human capital and its association with firms' management of risk. The independent variables and dependent variables of each model were specified and described in this chapter.

The next chapter details the descriptive results of RMC and separate RMC establishment. The regression results of all six hypotheses of this study are also presented in the following chapter.

Chapter 5: Results

5.1 INTRODUCTION

This chapter presents the results of testing all six hypotheses of the sampled firms. First, an analysis of the existence of a RMC and a separate RMC is provided. The first and second hypothesis were tested to examine the relationship between a separate RMC, the existence of a RMC, and firms' management of risk, in terms of firm performance and the likelihood of financial distress. The second section of the chapter then provides the results of RMC human capital, specifically, the relationship between RMC human capital and firm performance, and likelihood of financial distress, which examines hypotheses 3 to 6. Hypotheses 3 and 4 examined the overall RMC human capital, whereas hypotheses 5 and 6 focused on firm-specific and general RMC human capital. Following this, additional tests and robustness tests are presented. The chapter concludes with a discussion of the results of the six hypotheses.

5.2 RMC EXISTENCE

In order to examine the relationship between RMC human capital and firms' management of risks, this study first examines whether there is any association between the existence of a RMC, a separate RMC, and firm performance, and the likelihood of a firm's financial distress.

5.2.1 Descriptive statistics - RMC and SRMC

Table 5.1 describes the formation of the RMC for the sampled companies during the period 2007 to 2014. Overall, the number of companies that established a separate RMC over the eight years remained constant, starting with 24 companies who had a separate RMC in 2007, and this number remained stable during 2008 and 2013, with a range of 23 to 25 firms; the figure then jumped to 30 (10%) companies in 2014. There was an increasing trend of combined RMC formation of sampled companies, with the number of companies being 121

(40.3%) in 2007 and then 186 (62%) in 2014. The number of companies that did not have a RMC dropped during the same time span, with almost half of the sample companies (155) not having a RMC in 2007 and only 84 companies (28%) having no RMC in 2014.

Figure 5.1 shows the overall trend of sample firms with a combined RMC and the firms with a separate RMC between 2007 and 2014. It clearly indicates that the number of firms with a separate RMC remained stable. There was an increase in firms with a combined RMC during the testing period and a decreasing trend for firms without a RMC. This finding indicates that only a few firms were willing to establish a separate RMC, whereas more and more firms chose to form a combined RMC. In addition, the increasing trend of a firm establishing a RMC between 2007 and 2014 may have been due to the increasing emphasis on risk management by the ASX CGPR Principle 7, which specifically recommends that Australian firms establish a RMC (ASXCGC, 2014). These results demonstrate that most top 300 ASX companies complied with the CGPR recommendation to form a RMC (ASXCGC, 2014); however, only around 10% of firms had a separate RMC, while 28% of firms (84 firms) did not have a RMC in 2014.

Among the total sampled firms, 318 firms had a combined RMC. Firms with a combined RMC had integrated the risk management responsibilities with other committees. Specifically, Table 5.2 shows that the sample companies had 11 types of combined RMCs. Most of the companies with a combined RMC (74.8%) had combined the risk management responsibilities with their audit committee, forming an audit and risk committee. Some companies had established audit, risk, and compliance committees (15.1%). Only a few companies had combined risk management with reputation, governance, and sustainability committees. This result is interesting, as firms may establish different types of RMC due to different industry or specific risk requirements. For example, the three firms that established the environment, safety, and risk committees were all in the material industry. Thus, their main risks therefore

arise from environmental damage or workers' safety. As a result, these three firms chose to integrate their risk management responsibilities into the environment and safety committee, forming an environment, safety, and risk committee.

Table 5.1: Committee types

Committee TYPE	2007	%	2008	%	2009	%	2010	%	2011	%	2012	%	2013	%	2014	%
SRMC	24	8%	25	8.3%	24	8%	23	7.6%	27	9%	23	7.6%	23	7.6%	30	10%
Combined RMC	121	40.3%	120	40%	127	42%	140	46.7%	147	49%	160	53.3%	184	61.3%	186	62%
No RMC	155	51.7%	155	51.7%	149	50%	137	45.7%	126	42%	117	39.1%	93	31.1%	84	28%
Total	300	100%	300	100%	300	100%	300	100%	300	100%	300	100%	300	100%	300	100%

Table 5.2: Types of Combined RMC

Types	Audit and Risk Committee	Audit Compliance and Risk Management Committee	Risk and Compliance Committee	Audit, Finance, and Risk Committee	The Environment, Safety and Risk Committee	Risk and Governance Committee	Audit, Risk, and Nomination Committee	Audit, Risk Management, and Safety Committee	Finance and Risk Management Committee	Risk and Reputation Committee	Risk, Compliance, and Sustainability Committee	Total
No. firms	238	48	18	4	3	2	1	1	1	1	1	318
%	74.8%	15.1%	5.7%	1.3%	0.9%	0.7%	0.3%	0.3%	0.3%	0.3%	0.3%	100%

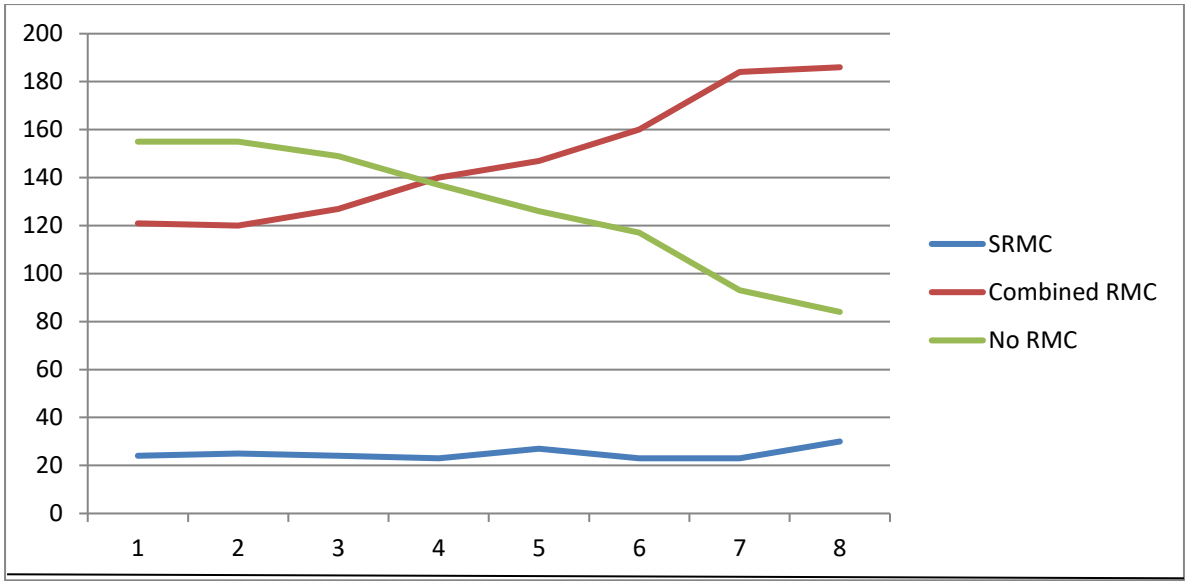

Figure 5.1 RMC formation

The sample used to examine the relationship between the existence of a RMC, a separate RMC, and firms' management of risk described in Chapter 3 contained 2,330 firm-year observations from 597 firm between 2007 and 2014. The analysis in this section used a panel data approach, and the descriptive statistics for the pooled data are reported in Panel A of Table 5.3. It reports the summary of descriptive statistics for the variables relating to risk, the probability of bankruptcy, the percentage of board independence, board size, leverage, growth opportunity, and firms' market performance and accounting performance.

The results show that the sampled companies had an average leverage of 0.45. The mean of total risk (STDDEV) was 10.11, with a maximum of 43.1 and a minimum of 0. On average, firms had 2.74 of growth opportunities (MTB), with Tobin's Q exhibiting a mean of 1.79. The average board size was 7.84, ranging from 3 to 25 members and on average 62% of the board directors were independent from management. The average Z-Score was 9.08. There was a considerable variation in firm size, as indicated by total assets and market capitalisation. The mean of the market capitalisation was 0.5 billion, with a range of 0.005 to 24.4 billion, whereas

the mean of the total assets was about 1.44 billion, ranging from 0.003 to 88.3 billion. This suggests that sample firms were comprised of both large and small firms.

Of the control variables, zero skewness log transformations were performed on Z-Score, Tobin's Q and firm size, as those variables were not normally distributed and involved outliers. As a result, those variables were transformed to reduce skewness.

Panel B of Table 5.3 presents the frequency statistics relating to CEO duality, number of observations with a separate RMC, and with a combined RMC. The results show that only approximately 5% of the sample firms delegated the CEO as the chairperson of the board. In addition, there were 1,384 firm-year observations with a combined RMC, in contrast to only 199 firm-year observations with a separate RMC, which also suggests a low level of firms with a separate RMC.

Table 5.3: Descriptive statistics – the existence of RMC
(N = 2330 observations - 597 firms)

Panel A

Variable	N	MEAN	STD.DEV	MIN	MAX
STDDEV	2328	10.11	6.92	0	43.1
INDEP	2330	0.62	0.20	0	1
LEV	2328	0.45	0.24	0.00	1.62
MTB	2323	2.74	3.71	-29.55	53.63
MKTCAP ($B)	2330	0.50	1.69	0.005	24.4
TA($B)	2330	1.44	7.66	0.003	88.3
BRDSIZE	2330	7.84	2.44	3	25
$Z\text{-Score}_t$	2097	9.08	30.66	-11.52	378.06
ROA_t	2330	0.06	0.13	-2.73	0.97
Tobin's Q_t	2328	1.79	2.28	0.07	23.52
Naïve	2330	0.05	0.14	0	1

Panel B Frequency

Variable	TOTAL	Percentage
CEODUAL	109	4.68%
SRMC	199	8.54%
RMC	1384	59.4%

Note: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; ln*MKTCAP*: the natural logarithm of market capitalisation; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; *BRDSIZE*: number of board members; *Z-Score*: probability of bankruptcy in year t calculated using Altman Z-Score; $Z\text{-Score}_{t-1}$: probability of bankruptcy of previous year calculated using Altman Z-Score*; ROA*: current year return on assets; ROA_{t-1}: prior year return on assets; *Tobin's Q:* the market value of equity of equity and debt divided by the book value of total assets in year t; *Tobin's Qt-1:* prior year Tobin's Q; *RMC*: dummy variable, where firms with a RMC (combined and separate) coded 1, 0 otherwise. *SRMC:* dummy variable, where firms with a separate RMC were coded 1, 0 otherwise; *Naïve:* the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004).

5.2.2 Univariate tests

Preliminary examinations of the relationships between a RMC, a separate RMC, and firms' management of risk were undertaken using independent T-test.

Independent samples T-test – the existence of a RMC

Table 5.4 reports the results of testing whether there were significant differences between firms that had a RMC and firms without one. Preliminary tests showed that firms with a RMC were significantly different to the companies without a RMC for firms' accounting performance (ROA_t), market performance (Tobin's Q_t, Tobin's Q_{t-1}), and likelihood of financial distress (Z-$Score_t$, Z-$Score_{t-1}$). Specifically, firms with a RMC had a significantly higher accounting performance (ROA) than firms that did not have a RMC ($p<0.01$). However, contrary to expectation, firms with a RMC had a significantly lower level of market performance (Tobin's Q) and lower Z-Score, suggesting a higher level of the likelihood of financial distress. There was no significant difference between firms with a RMC and firms without one in relation to the Naïve measurement of the likelihood of financial distress. In addition, compared to companies without a RMC, companies that had a RMC tended to have a low level of total risk (STDDEV) ($p<0.01$), large board size (BRDSIZE) ($p<0.01$), large firm size (MKTCAP) ($p<0.01$), high level of board independence (INDEP) ($p<0.01$), and low level of CEO duality (CEODUAL) ($p<0.01$). In contrast, firms with a RMC tended to have lower growth opportunity (MTB) ($p<0.05$).

Table 5.4: Comparison of means for companies with a RMC and without a RMC
(N = 2330 observations - 597 firms)

	RMC	N	Mean	t	Sig. (2 tailed)	Mean Difference
ROA	1	1384	0.069	-3.626	0.000	0.019
	0	946	0.050			
Tobin's Q	1	1384	1.594	5.133	0.000	0.445
	0	945	2.039			
Z-Score	1	1366	5.721	6.357	0.000	9.339
	0	945	14.568			
Naïve	1	1384	0.049	0.918	0.359	0.005
	0	946	0.055			
LEV	1	1384	0.469	-12.650	0.000	-0.122
	0	946	0.374			
STDDEV	1	1384	10.313	6.586	0.000	2.141
	0	946	12.454			
BRDSIZE	1	1384	8.129	-7.018	0.000	-0.725
	0	946	7.413			
INDEP	1	1384	0.636	-5.911	0.000	0.051
	0	946	0.586			
CEODUAL	1	1384	0.021	7.217	0.000	0.064
	0	946	0.085			
MKTCAP (AUS $b)	1	1382	0.586	-2.922	0.004	-0.209
	0	939	0.377			
MTB	1	1379	2.584	2.411	0.016	0.378
	0	944	2.962			

Note: *STDDEV:* total risk calculated as the standard deviation of firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent, calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *MKTCAP*: market capitalisation; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; *BRDSIZE*: number of board members; *Z-Score*: probability of bankruptcy in year t calculated using Altman Z-Score; *Z-Score* $_{t-1}$: probability of bankruptcy of previous year calculated using Altman Z-Score*; ROA*: current year return on assets; *ROA* $_{t-1}$: prior year return on assets; *Tobin's Q:* the market value of equity and debt divided by the book value of total assets in year t; *Tobin's* Q_{t-1}:prior year Tobin's Q; *Naïve:* the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004).

Correlation

This study used correlation as a second method to examine the preliminary relationship between the existence of a RMC, a separate RMC, and firms' management of risks in terms of firm performance and the likelihood of financial distress.

The results of Pearson correlation matrices relating to a RMC and a separate RMC existence are shown in Tables 5.5 and 5.6. Specifically, Table 5.5 shows the correlation between a RMC, a separate RMC, and firm performance (ROA and Tobin's Q).

The results show that RMC existence was negatively related to ROA and to Tobin's Q at the significance level of 0.05. SRMC was not significantly related to ROA and Tobin's Q. Additionally, there was a significant association between the existence of a RMC and the existence of a separate RMC. Board size (BRDSIZE) and board independence (INDEP) were both positively associated with the existence of a RMC and SRMC, whereas risk (STTDEV) was negatively related to RMC and SRMC.

As for the likelihood of financial distress, Table 5.6 suggests that RMC existence was negatively related to Naïve at the significance level of 0.05, whereas there was no significant relationship between SRMC and Naïve. RMC and SRMC were negatively related to Z-Score. Similar to the correlation results of RMC, SRMC, and firm performance, board size (BRDSIZE) and board independence (INDEP) were both positively associated with the existence of RMC and SRMC; whereas risk (STTDEV) was negatively related to RMC and SRMC.

Correlation analysis provided a preliminary relationship among all the variables. A more robust analysis, regression analysis, was then undertaken to provide more rigorous results regarding the hypotheses. Given that some of the correlation coefficients among the independent variables were quite high, variance inflation factors (VIF) were conducted in the regression analysis to ensure multicollinearity did not impact the results of the regression models.

Table 5.5: Correlation statistics – RMC and separate RMC existence and firm performance

Variables	RMC	SRMC	ROA_t	ROA_{t-1}	Tobins' Q_t	Tobin's Q_{t-1}	MKTCAP	GRTH	BRDSIZE	LEV	STDDEV	INDEP
RMC	1											
SRMC	0.252**	1										
ROA_t	-0.046*	-0.013	1									
ROA_{t-1}	-0.047*	-0.014	0.986**	1								
Tobins' Q_t	-0.049*	-0.028	0.108**	0.107**	1							
Tobin's Q_{t-1}	-0.013	-0.049*	0.003	0.009	0.596**	1						
MKTCAP	-0.032	-0.013	0.924**	0.880**	0.089**	-0.001	1					
GRTH	-0.054**	-0.033	0.070**	0.071**	0.757**	0.471**	-0.055**	1				
BRDSIZE	0.148**	0.164**	-0.101**	-0.135**	-0.223**	-0.162**	-0.143**	-0.165**	1			
LEV	-0.030	-0.013	0.888**	0.889**	0.073**	-0.010	0.937**	0.053*	-0.137**	1		
STDDEV	-0.162**	-0.080**	-0.050*	-0.047*	0.177**	0.191**	-0.055**	0.070**	-0.194**	-0.049*	1	
INDEP	0.0126**	0.096**	-0.132**	-0.127**	-0.162**	-0.102**	-0.136**	-0.091**	0.035	-0.129**	-0.130**	1

Two-tailed test significant at: ** $p<0.01$; *$p<0.05$

Table 5.6: Correlation statistics – RMC and separate RMC existence and the likelihood of financial distress

Variables	RMC	SRMC	$Z\text{-Score}_t$	$Z\text{-Score}_{t-1}$	Naïve	MKTCAP	GRTH	BRDSIZE	LEV	STDDEV	INDEP
RMC	1										
SRMC	0.252**	1									
$Z\text{-Score}_t$	-0.131**	-0.043**	1								
$Z\text{-Score}_{t-1}$	-0.126**	-0.043*	0.482**	1							
Naïve	-0.046*	-0.022	-0.028	-0.039	1						
MKTCAP	-0.032	-0.013	-0.013	-0.116**	0.338**	1					
GRTH	-0.054**	-0.033	0.334**	0.220**	0.001	-0.055**	1				
BRDSIZE	0.148**	0.164**	-0.154**	-0.136**	-0.029	-0.143**	-0.165**	1			
LEV	-0.030	-0.013	-0.012	-0.281**	0.218**	0.937**	0.053*	-0.137**	1		
STDDEV	-0.162**	-0.080**	0.263**	0.249**	0.031	-0.055**	0.070**	-0.194**	-0.049*	1	
INDEP	0.0126**	0.096**	-0.129**	-0.111**	-0.072**	-0.136**	-0.091**	0.035	-0.129**	-0.130**	1

Two-tailed test significant at: ** $p<0.01$; *$p<0.05$

5.2.3 Hypotheses testing - multivariable tests

Following the preliminary univariate tests, multiple regressions were used to determine the association among the existence of a separate RMC and a RMC, risk, and the firms' management of risk in terms of firm performance and the probability of financial distress by testing the first and second hypotheses. Before testing the moderating relationship, this study first examined the association between the existence of a RMC and a separate RMC in relation to firm performance and the likelihood of financial distress.

Regression analysis was used in the panel data. As RMC human capital variables, the testing variables, were mostly constant over time, this required that random effects models be adopted to capture the variations among different variables. Even though fixed effects models may generate more robust coefficients in the cases where the time invariant omitted variables are correlated with independent variables, it does permit adequate testing of the variables when there is little variation over time.[19] As a result, random effects models were adopted to test the developed hypotheses. Specifically, Tables 5.7 and 5.8 report the results of testing the first and second hypotheses using random effects models with robust estimation.

[19] This study subsequently adopted a fixed effects regression model in the robustness test.

Table 5.7: Random effects with robust estimation. The existence of a RMC and firm performance

	ROA Coef.(z)				lnTobin's Q Coef.(z)			
	RMC		SRMC		RMC		SRMC	
RMC	0.012	-0.019	-	-	0.002	0.005	-	-
	(2.14)**	(-2.00)**			(1.13)	(1.55)		
SRMC	-	-	0.011	-0.026	-	-	0.004	0.002
			(1.39)	(-1.60)			(1.41)	(0.32)
RMC* STDDEV	-	0.003	-	-	-	-0.000	-	-
		(4.16)***				(-1.09)		
SRMC* STDDEV	-	-	-	0.004	-	-	-	0.0002
				(2.75)***				(0.49)
ROA_{t-1}	0.237	0.237	0.24	0.237	-	-	-	-
	(16.07) ***	(16.10) ***	(16.02)***	(16.05)***				
lnTobin's Q_{t-1}	-	-	-	-	0.093	0.093	0.093	0.094
					(7.16)***	(7.14)***	(7.21)***	(7.17)***
lnMKTCAP	0.063	0.058	0.064	0.068	-	-	-	-
	(2.50)**	(2.32)**	(2.54)**	(2.68)***				
lnTA	-	-	-	-	-0.092	-0.092	-0.092	-0.092
					(-8.13)***	(-8.09)***	(-8.13)***	(-8.10)***
STDDEV	-0.002	-0.004	-0.002	-0.002	-0.000	-0.000	-0.000	-0.000
	(-5.47)***	(-6.77)***	(-5.50)***	(-5.73)***	(-0.61)	(-0.22)	(-0.64)	(-0.69)
INDEP	0.014	0.012	0.014	0.015	0.005	0.004	0.004	0.004
	(1.00)	(0.84)	(1.01)	(1.07)	(0.29)	(0.99)	(0.94)	(0.32)
CEODUAL	0.027	0.028	0.025	0.025	-0.001	-0.001	-0.002	-0.002
	(1.98)**	(2.05)**	(1.83)*	(1.81)*	(-0.28)	(-0.29)	(-0.36)	(-0.37)
BRDSIZE	-0.022	-0.013	-0.023	-0.018	0.005	0.004	0.005	0.005
	(-0.43)	(-0.26)	(-0.45)	(-0.35)	(0.29)	(0.24)	(0.30)	(0.32)
LEV	-0.119	-0.117	-0.118	-0.118	-0.086	-0.086	-0.086	-0.086
	(-7.69)***	(-7.66)***	(-7.63)***	(-7.59)***	(-15.35)***	(-15.37)***	(-15.38)***	(-15.38)***
MTB	0.077	0.083	0.077	0.076	0.388	0.388	0.388	0.388
	(4.36)***	(4.71)***	(4.37)***	(4.31)***	(65.47)***	(65.42)***	(65.48)***	(65.46)***
CONS	-0.110	-0.096	-0.101	-0.115	1.463	1.462	1.462	1.462
	(-1.04)	(-0.91)	(-0.95)	(-1.08)	(26.88)***	(26.87)***	(26.87)***	(26.86)***
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	2312	2312	2312	2312	2310	2310	2310	2310
No. of firms	583	583	583	583	583	583	583	583
Wald chi2	532.76	563.56	527.60	535.45	8756.49	8760.09	8767.72	8764.02
Adjusted R^2	0.30	0.30	0.30	0.30	0.81	0.81	0.81	0.81
Highest VIF	8.90	8.94	8.90	8.91	8.96	8.98	8.94	8.94
Lowest VIF	1.09	1.09	1.08	1.08	1.09	1.09	1.09	1.09

Note: *STDDEV:* total risk calculated as the standard deviation of firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: The financial leverage of the firm, computed as total liabilities to total assets; ln*MKTCAP*: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *BRDSIZE*: number of board members; *RMC*risk:* interaction variables of RMC and risk; *SRMC*risk:* interaction variables of separate RMC and risk; $ROA_{t:}$ current year return on assets; ROA_{t-1}: prior year return on assets; *Tobin's Q*: Market measure of wealth, measured by market value of firm + debt/book value of total assets; *Tobin's* Q_{t-1}: Tobin's Q of previous year; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; S*RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 otherwise; RMC: dummy variable, taking a rate of 1 when firms had a RMC, 0 otherwise.

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

RMC, SRMC, and ROA, Tobin's Q (H1)

Before testing the moderating relationship (H1 and H2), this study investigated the relationship between the existence of a RMC, a separate RMC and a firms' management of risk in terms of firm performance and the likelihood of financial distress. The results are presented in Table 5.8. The results provide no evidence of a significant relationship between the existence of a separate RMC and firms' accounting performance. However, a positive and significant relationship was found between the existence of a RMC and ROA ($p<0.05$). In addition, Tobin's Q was not significantly related to the existence of a RMC or a separate RMC. These results show no evidence that the existence of a RMC or a separate RMC had any significant relationship with firm performance, with the exception of a positive relationship between a RMC and ROA.

The results of regression models 1 to 4 were used to test H1 and the results are presented in Table 5.8. H1 predicted that the association between firm risk and performance would be moderated by RMC or SRMC. Firstly, the relationship between firm risk and performance was examined by excluding the interaction term. The results show there was a negative association between firm risk (STDDEV) and firm's accounting performance (ROA) (B = -0.003; $p<0.01$). After including the interaction term, the results show the association between risk (STDDEV) and accounting performance (ROA) was moderated by firms with a RMC, as STDDEV*RMC was positively associated with firms' financial performance ROA (B = 0.003; $p<0.01$), and the association between risk (STDDEV) and accounting performance (ROA) was moderated by firms with a SRMC, as STDDEV*SRMC was positively associated with firms' financial performance ROA (B = 0.005; $p<0.01$). This result indicates that at higher risk, firms with a RMC or a separate RMC are more likely to have a higher level of accounting performance. Put another way, the negative association between risk and firm accounting performance is weakened for firms with a RMC and firms with a separate RMC. Thus, it indicates that RMC

and separate RMC existence are associated with better risk management and firm performance. This result supports H1 when using ROA as the measurement of firm performance. Alternatively, using Tobin's Q as a measurement of firm value showed no significant results with the existence of separate RMC and RMC.

In addition, the results show that ROA was positively related to the prior year's performance (ROA_{t-1}), suggesting it is necessary to include ROA_{t-1} as a control variable as it was significantly related to ROA_t. In addition, ROA was positively related to firm size (lnMKTCAP), growth opportunity (MTB), and negatively related to firm leverage (LEV). With respect to Tobin's Q, the results show that Tobin's Q was positively related to growth opportunity (MTB), Tobin's Q_{t-1} and negatively related to firm leverage (LEV) and firm size (lnTA), which is consistent with previous results (such as Bhagat and Bolton, 2008; Hutchinson, Mack and Plastow, 2015). The explanatory power of the ROA model was approximately 0.3, whereas the adjusted R-square of the Tobin's Q model was 0.81. In terms of multicollinearity, the results show that all of the VIF values were smaller than 10 for the regression models, suggesting multicollinearity is not an issue in the analysis (Belsley, Kuh and Welsch, 1980).

RMC, SRMC, and likelihood of financial distress

The results of regression models a to d used the test of the second hypotheses using random effects models with robust estimation, which were described in Chapter 4, are reported in Table 5.8. Since a high score of Z-Score indicates lower financial distress and a low score of Z-Score indicates greater financial distress, this study used PBANK as –Z-Score in order to facilitate the interpretation of the results. As a result, PBANK is positively related to the likelihood of financial distress.

The results show that there were no significant results between the existence of a RMC, a separate RMC, and the likelihood of financial distress. Additionally, the results show that the

relationship between risk and the likelihood of financial distress was not moderated by the existence of a RMC or a separate RMC, thus, not supporting H2, which predicted that there would be a negative relationship between risk and the likelihood of financial distress for firms with a RMC or separate RMC. Furthermore, the results show that $PBANK_{t-1}$ was positively related to PBANK, indicating that firms with a high likelihood of financial distress in the prior year were more likely to suffer financial distress in the following year. Firm leverage (LEV) was positively associated with the PBANK and Naïve. This suggests that high leveraged firms were more likely to be financially distressed. In addition, the MTB was negatively associated with PBANK and Naïve, suggesting that low growth firms were more likely to be financially distressed. These results are consistent with previous studies (Bhagat, Bolton and Romano, 2008; Reynolds and Francis, 2000). The explanatory power of the PBANK model was high, with an adjusted R-square of 0.66; whereas the adjusted R-square of the ROA model was approximately 0.12. In terms of multicollinearity, the results show that all of the VIF values were smaller than 10 for the regression models, suggesting multicollinearity is not an issue in the analysis (Belsley, Kuh and Welsch, 1980).

Table 5.8: Random effects with robust estimation. The existence of a RMC and the likelihood of financial distress

	PBANK Coef.(z)				Naïve			
	RMC		SRMC		RMC		SRMC	
RMC	-0.010	-0.022	-	-	-0.000	-0.008	-	-
	(-1.43)	(-2.02)**			(-0.04)	(-0.66)		
SRMC		-	-0.015	-0.018	-	-	-0.019	-0.029
	-		(-1.64)	(-1.00)			(-1.69)*	(-1.35)
RMC*		0.001	-	-	-	0.001	-	-
STDDEV	-	(1.29)				(0.80)		
SRMC*		-	-	0.000	-	-	-	0.001
STDDEV	-			(0.20)				(-0.54)
$PBANK_{-1}$	0.089	0.089	0.089	0.089	-	-	-	-
	(8.58)***	(8.55)***	(8.61)***	(8.61)***				
lnMKTCAP	-0.001	-0.002	-0.000	-0.000	-0.000	-0.001	-0.004	-0.005
	(-0.03)	(-0.06)	(-0.01)	(-0.00)	(-0.01)	(-0.03)	(-0.13)	(-0.15)
STDDEV	0.001	0.000	0.001	0.001	0.000	0.001	0.000	0.000
	(1.96)**	(1.96)**	(1.96)**	(1.96)**	(1.21)	(0.23)	(1.23)	(1.17)
INDEP	-0.002	-0.003	-0.002	-0.002	-0.032	-0.032	-0.031	-0.031
	(-0.12)	(-0.19)	(-0.14)	(-0.14)	(-1.68)*	(-1.71)*	(-1.68)*	(-1.67)*
CEODUAL	-0.004	-0.004	-0.002	-0.002	-0.01	-0.010	-0.047	-0.009
	(-0.28)	(-0.26)	(-0.14)	(-0.15)	(-0.56)	(-0.54)	(-0.69)	(-0.49)
BRDSIZE	-0.038	-0.035	-0.037	-0.036	0.052	0.054	0.047	0.049
	(-0.67)	(-0.62)	(-0.65)	(-0.64)	(0.76)	(0.78)	(0.69)	(0.71)
LEV	0.615	0.616	0.614	0.614	0.151	0.151	0.153	0.153
	(32.56)***	(32.59)***	(32.58)***	(32.57)***	(7.10)***	(7.09)***	(7.21)***	(7.21)***
MTB	-0.500	-0.497	-0.500	-0.500	-0.192	-0.191	-0.193	-0.193
	(-24.77)***	(-24.66)***	(-24.81)***	(-24.81)***	(-7.96)***	(-7.88)***	(-8.01)***	(-8.02)***
CONS	-0.845	-0.841	-0.855	-0.856	0.158	0.162	0.157	0.153
	(-6.98)***	(-6.94)***	(-7.06)***	(-7.06)***	(1.10)	(1.13)	(1.10)	(1.07)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	2235	2235	2235	2235	2312	2312	2312	2312
No. of firms	571	571	571	571	583	583	583	583
Wald chi2	2744.74	2745.64	2750.40	2749.72	306.50	307.10	309.63	309.81
Adjusted R^2	0.66	0.66	0.66	0.66	0.12	0.12	0.12	0.12
Highest VIF	9.53	9.53	9.50	9.50	8.86	8.86	8.87	8.87
Lowest VIF	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09

Note: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: The financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *BRDSIZE*: number of board members; *Z-Score*: probability of bankruptcy calculated using Altman Z-Score; $Z\text{-}Score_{t-1}$: Altman Z-Score of previous year; *Naïve*: the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004); ln*MKTCAP*: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; S*RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 otherwise; RMC: dummy variable, taking a rate of 1 when firms had a RMC, 0 otherwise; *Year*: year dummy variable

Two tailed tests significant at $p<0.01$***; $p<0.05$**; $p\leq 0.10$*

The next section presents the results of testing H3 to H6 in relation to RMC human capital.

5.3 RISK MANAGEMENT COMMITTEE HUMAN CAPITAL

The sample used to examine the relationship between RMC human capital and firms' management of risk was described in Chapter 3. Among the total sample firms, 371 firms of the 1,374 firm-year observations formed a RMC (including a combined RMC and a separate RMC). The analysis in this section uses a panel data approach, and the descriptive statistics for the pooled data are reported in Table 5.9. Specifically, it provides a summary of the descriptive statistics of the variables relating to individual RMC human capital characteristics and RMC human capital factor scores derived from the principle component factor analysis.

5.3.1 Descriptive statistics

Table 5.9 presents the descriptive statistics for the pooled data. For the sample firms with a RMC, the average leverage was 0.5. The mean score for total risk (STDDEV) was 10.33, with a minimum of 0.00 and a maximum of 36.4. On average, firms had 2.56 of growth opportunities (MTB), with Tobin's Q exhibiting a mean of 1.6. Additionally, the board size had a mean of 8.14, ranging from 3 to 16 members and on average 64 percent of the board directors were independent from management.

In relation to RMC human capital data, RMC members had an average board tenure of 5.41 years, ranging from 0 to 24.67 and an average of 3.2 years for RMC tenure. The average number of qualifications held by the members was quite low, with a mean of 1.39, a maximum of 4 and a minimum of 0. Similarly, the average amount of experience held by the members was also low, with a mean of 2.77, a maximum of 4.89 and a minimum of 0. This result demonstrates that the human capital level of RMC is quite low in Australian firms, and there are companies with RMC members that have no qualifications or previous experience.

Table 5.9: Descriptive statistics – RMC human capital
(N = 1,374 observations - 371 firms)

Variable	N	MEAN	STD.DEV	MIN	MAX
STDDEV	1374	10.33	7.96	0	36.4
INDEP	1374	0.64	0.19	0	1
LEV	1374	0.50	0.23	0	1.62
MTB	1369	2.56	2.89	-7.49	25.01
BRDSIZE	1374	8.14	2.23	3	16
Z-Score$_t$	1268	4.82	12	-3.95	90.39
ROA$_t$	1374	0.07	0.08	-0.73	0.47
Tobins' Q$_t$	1374	1.60	1.77	0	21.62
Rescaling	1372	3.80	1.63	0.33	15
lnMKTCAP	1374	2.32	2.89	1.47	2.72
SHARE	1374	0.01	0.03	0	0.55
RMC Tenure	1374	3.20	1.80	0	11
Tenure	1374	5.41	3.04	0	24.67
Quali	1374	1.39	0.73	0	4.00
Exp	1374	2.77	2.59	0	4.89
Naïve	1372	0.14	0.32	0	1

Note: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: The financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; ln*MKTCAP*: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *BRDSIZE*: number of board members; *Z-Score*: probability of financial distress calculated using Altman Z-Score; Z-Score$_{t-1}$: Altman Z-Score of previous year; *ROA*: current year return on assets; *ROA-1*: prior year return on assets; Tobin's Q: market measure of wealth, measured by market value of firm + debt / book value of total assets; Tobin's Q$_{t-1}$: Tobin's Q of previous year; *Naïve*: the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004); ln*MKTCAP*: the natural logarithm of market capitalisation; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; *SHARE*: the average percentage of RMC members shareholding; *Tenure*: Average number of years as a board member of a firm; *RMC Tenure*: average years of risk management experience of RMC members; *Quali*: the average number of qualifications held by RMC members; *Exp:* the average amount of experience of RMC members.

In order to determine the association between RMC human capital and firm performance, as well as the relationship between RMC human capital and the probability of bankruptcy, this study used two models to examine the relationship. First, an overall RMC human capital score was developed, which was derived from all of the identified RMC human capital characteristics by using principle component analysis techniques to test hypothesis 3 and 4. In model 2, this study investigated individual RMC human capital characteristics to examine firm-specific human capital and general human capital, and to test their association with firms' management of risk in relation to H5 and H6.

The following section presents the results of the principle component analysis of all identified RMC human capital characteristics.

5.3.2 Model 1

Principal component analysis - RMC human capital factor score (RMCHC)

Principal component factor analysis was applied to three individual measures of RMC human capital: rescaling, board tenure, and RMC tenure, in order to derive an overall factor score (RMCHC) to represent overall RMC human capital characteristics. When conducting principal component analysis, it is necessary to determine the optimal number of each component. The common criteria suggested by previous research to determine the appropriate number of components is based on eigenvalues, inspection of the scree plot, and whether the components "make sense" (Abdi and Williams, 2010; Eng and Mak, 2003).

Table 5.10 displays the associated eigenvalues, showing how much each principal component explained the variance in the data. According to Table 5.11, the principal component analysis only extracted one component with an eigenvalue over 1 and it accounted for 67% of the variance of the individual measures. This suggests that 1 may be the appropriate component number. This study further investigated the scree plot, presented in Figure 5.2, which shows that the first component factor explained most of the human capital data and the eigenvalue had a significant drop after the first component. Therefore, since the first component was the only component greater than 1, this study only retained the first factor (Girden, 2001) and used it as the measurement of RMC human capital in the following analysis. In addition, Table 5.11 presents the factor loading of each indicator and the results show that the three RMC human capital components (i.e., rescaling, board tenure, and RMC tenure) were all highly correlated with the RMC human capital factor score, suggesting the RMC human capital factor score can be used as an overall measurement of RMC human capital, as it makes theoretical sense. This study also adopted Cronbach's alpha and Kaiser-Meyer-Olkin test to determine the

internal consistency and sampling adequacy of the three components. The results show that the value of Cronbach's alpha was 0.6, suggesting the internal consistency of the components was moderate [20] (Hair, Black, Babin and Anderson, 2010). The Kaiser-Meyer-Olkin test of sampling adequacy was moderate, with a value of 0.7 (Field, 2005; Kaiser, 1974). Bartlett's test of sphericity was used in this study to determine whether the observed correlation matric diverged significantly from the identity matrix. The result was highly significant (*P<0.000*), suggesting that principal component analysis was appropriate (Field, 2005).

Table 5.10: Eigenvalues – *principal* components analysis – RMC human capital (RMCHC)

Eigenvalues of the *principal* components analysis				
Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.02	1.49	0.67	0.67
Comp2	0.52	0.06	0.17	0.84
Comp3	0.46	-	0.15	1.00

Table 5.11: Principal components analysis (PCA)

Factor	Component Loading	Standard Error
Comp1		
RMC tenure	0.576	0.015
Tenure	0.587	0.014
Rescaling	0.570	0.015
Comp2		
RMC tenure	-0.615	0.130
Tenure	-0.147	0.192
Rescaling	0.775	0.067
Comp3		
RMC tenure	0.538	0.149
Tenure	-0.796	0.037
Rescaling	0.276	0.187

[20]The low Cronbach's alpha may be due to the fact that this study only had three components, previous studies have proceeded with Cronbach's alpha of less than 0.6 (e.g. Larcker, Richardson and Tuna, 2007).

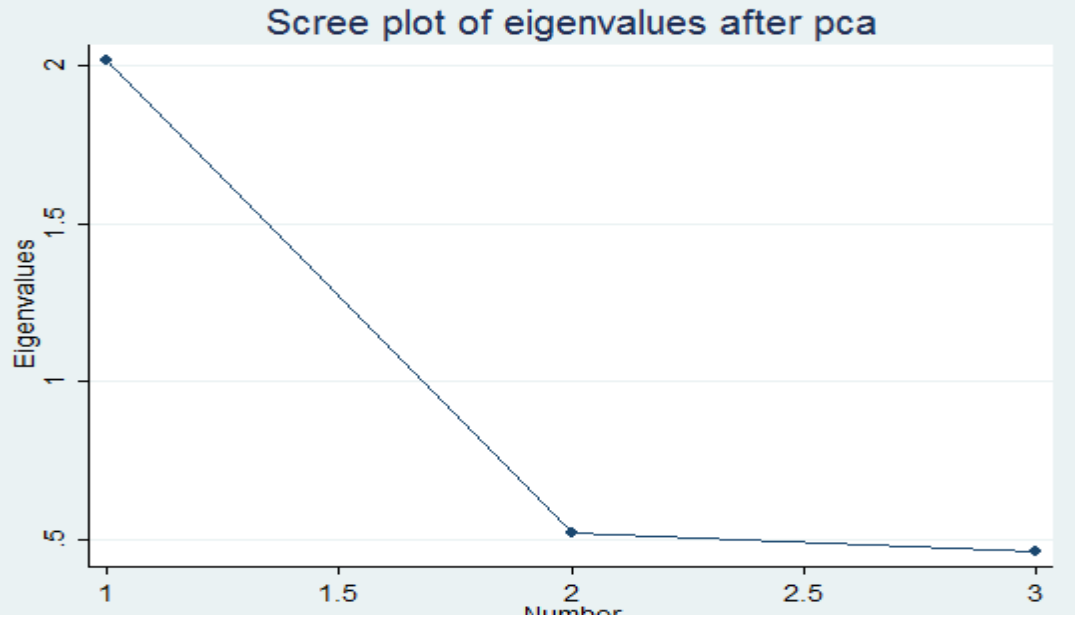

Figure 5.2 PCA scree plot

Univariate test

Before running regressions to test the hypotheses of this study, some preliminary univariate tests were conducted (i.e., correlation) in order to gain a better understanding of the data and to provide preliminary results regarding the association between the RMC human capital factor score and firms' management of risk in terms of firm performance and likelihood of financial distress.

Correlation

The results of Pearson correlations matrices relating to RMC human capital are shown in Tables 5.12 and 5.13. Specifically, Table 5.12 shows the correlation between the RMC human capital factor score and firm performance (ROA and Tobin's Q).

H3 predicted a positive association between RMC human capital and firm performance. Table 5.12 shows a statistically significant and positive correlation between the RMC human capital factor score and ROA ($p<0.01$), indicating firms' RMC human capital factor score was positively related to firms' accounting performance, which provided initial support for H3 when using ROA as the measurement of firm performance. The results also show that RMC

human capital was positively related with ROA_{t-1} ($p<0.01$), indicating firms' accounting performance in the previous year was highly correlated with accounting performance in the following year.

Additionally, the results show that RMC human capital factor had no significant relationship with firms' market performance (Tobin's Q). However, the results show RMC human capital was positively associated with Tobin's Q_{t-1} ($p < 0.01$), indicating the RMC human capital factor score was positively related to firms' previous market performance. Growth opportunity and firm risk were positively correlated with Tobin's Q ($p < 0.01$).

H4 predicted a negative association between RMC human capital and the likelihood of financial distress, and this relationship is shown in Table 5.13. The results show that there was a significant negative relationship between RMC human capital factor score and Naïve ($p<0.05$), suggesting RMC human capital was negatively related to the likelihood of financial distress, which provides initial support for H4 when using Naïve as the measurement of the likelihood of financial distress. In addition, firm size and growth opportunity were negatively correlated with Naïve, whereas firm risk was positively related to Naïve ($p < 0.01$).

Z-Score was positively related to RMC human capital factor score ($p<0.05$), suggesting that RMC human capital factor score was negatively related to the likelihood of financial distress. This supports H4 when using Z-Score as the measurement of the likelihood of financial distress. Additionally, the RMC human capital factor score was positively related to firm size and negatively related to firm leverage and firm risk ($p < 0.01$).

Some of the significant correlations and predicted signs provided initial support for hypotheses 3 and 4. These results then required further investigation in the multiple regressions. Given that some of the correlation coefficients among the independent variables were quite

high, variance inflation factors (VIF) were conducted to ensure multicollinearity did not impact the results of the regression models.

Table 5.12: Correlation statistics – firm performance and RM human capital (PCA)

Variables	ROA	ROA_{t-1}	Tobin's Q	Tobin's Q_{t-1}	MKTCAP	GRTH	BRDSIZE	LEV	STDDEV	INDEP	RMCHC
ROA	1										
ROA_{t-1}	0.279**	1									
Tobin's Q	-0.035	0.001	1								
Tobin's Q_{t-1}	0.136**	0.216**	0.040	1							
MKTCAP	0.267**	0.760**	0.032	0.226**	1						
GRTH	-0.042	0.011	0.742**	0.043	0.081**	1					
BRDSIZE	0.016	0.019	0.009	-0.051	-0.224**	0.008	1				
LEV	-0.005	-0.020	-0.006	0.118**	-0.365**	-0.009	0.528**	1			
STDDEV	-0.058*	-0.044	0.333**	-0.012	-0.018	0.557**	0.004	-0.005	1		
INDEP	-0.002	0.005	0.031	0.039	0.006	0.064*	-0.129**	-0.008	0.116**	1	
RMCHC	0.453**	0.557**	-0.017	0.328**	0.532**	-0.013	0.000	-0.082**	-0.071**	0.047	1

Two-tailed test significant at: ** $p<0.01$; *$p<0.05$

Table 5.13: Correlation statistics – the likelihood of financial distress and RM human capital (PCA)

Variables	Z-Score	Z-Score$_{t-1}$	Naïve	MKTCAP	GRTH	BRDSIZE	LEV	STDDEV	INDEP	RMCHC
Z-Score	1									
Z-Score$_{t-1}$	0.035	1								
Naïve	0.015	-0.158**	1							
MKTCAP	-0.363**	0.181**	-0.058*	1						
GRTH	-0.009	0.028	0.053*	0.081**	1					
BRDSIZE	0.528**	-0.043	0.042	-0.224**	0.008	1				
LEV	1.000**	0.057*	0.015	-0.365**	-0.009	0.528**	1			
STDDEV	-0.005	-0.012	0.127**	-0.018	0.557**	0.004	-0.005	1		
INDEP	-0.008	0.054	0.043	0.006	0.064*	-0.129**	-0.008	0.116**	1	
RMCHC	0.055*	0.262**	-0.058*	0.532**	-0.013	0.000	-0.082**	-0.071**	0.047	1

Two-tailed test significant at: ** p<0.01; *p<0.05

Multiple regressions

Following the preliminary univariate tests, multiple regressions were used to determine the association between RMC human capital and firms' management of risk in terms of firm performance and the probability of financial distress by testing the third and fourth hypotheses. Regression analysis was used in the panel data. The results of testing the third hypothesis using random effects models with robust estimation are reported in Tables 5.14 and 5.15. This study also tested the moderating relationship between risk, RMC human capital, and firms' management of risk. The details of the results are discussed below.

RMC human capital score and firm performance

The results of testing H3, using regression model (1a) and (1b) developed in Chapter 4 are presented in Table 5.14, which indicates that RMC human capital was significantly and positively related to firm accounting performance (ROA) (B = 0.02; $p<0.01$). RMC human capital factor score was also significantly and positively related to firms' market performance (Tobin's Q) (B = 0.003; $p<0.05$). Therefore, the results support H3, which shows that there was a positive relationship between RMC human capital and firm performance (using ROA and Tobin's Q). The economic significance of these results is that if firms increase their RMC human capital by one score, ROA will increase by 0.063%, and their Tobin's Q will increase by 1.90%. These results reveal that firms need to increase their RMC human capital if they want to increase their firm value, and that the market places greater value on firms with a higher level of RMC human capital. The explanatory power of the ROA model was approximately 0.37, whereas the adjusted R-square of the Tobin's Q model was 0.57.

After including the interaction term of RMC human capital*risk (RMCHC*STDDEV), the results suggest that RMC human capital did not significantly moderate the relationship between risk and firm performance, as RMCHC*STDDEV was not strongly associated with ROA ($p<0.1$) and Tobin's Q ($p>0.1$). In addition, firm size (lnMKTCAP), growth opportunity

(MTB), and prior year's ROA (ROA_{t-1}) were found to be significantly and positively related to accounting performance (ROA), whereas firm risk (STDDEV) was significantly and negatively related to accounting performance (ROA). As for Tobin's Q, the results show that firm risk (STDDEV) and firm size (lnTA) were significantly and negatively related to market performance (Tobin's Q), whereas board size (BRDSIZE) and prior year's Tobin's Q were significantly and positively related to market performance (Tobin's Q).

In terms of multicollinearity, the results show that all of the VIF values were smaller than 10 for the regression models, suggesting multicollinearity is not an issue in the analysis (Belsley, Kuh and Welsch, 1980).

RMC human capital score and the likelihood of financial distress

The results of the fourth hypotheses, using regression models (1c) and (1d) developed in Chapter 4, are reported in Table 5.15. H4 predicted that there would be a negative relationship between RMC human capital and the likelihood of financial distress. The results in Table 5.16 reveal that RMC human capital factor score was negatively related to Naïve (B = -1.97; $p<0.05$), suggesting there was a negative relationship between RMC human capital factor score and the likelihood of financial distress. The economic significance of this result is that if firms increase their RMC human capital by one score, Naïve will decrease by 9.01%. This result suggests that firms need to obtain a high level of RMC human capital if they want to lower their likelihood of financial distress. However, the results did not show a significant relationship between the RMC human capital factor score and the likelihood of financial distress when using Z-Score as the measurement. Therefore, the results support H4 when Naïve measurement is used. Most importantly, after including the interaction term of RMC human capital*risk (RMCHC*STDDEV), the results show that the association between risk (STDDEV) and the likelihood of financial distress (Naïve) was moderated by the firms' RMC

human capital, as STDDEV*RMCHC was negatively associated with the firms' likelihood of financial distress (Naïve) (B = -0.05; $p<0.05$).

These results regarding the interaction suggest that at higher risk, firms increasing the level of RMC human capital will decrease their levels in regards to the likelihood of financial distress. In other words, the positive relationship between risk and the likelihood of financial distress was weakened for firms with a high level of human capital in a RMC. This result indicates that RMC human capital is related to better risk management and a lower likelihood of financial distress.

In addition, the result shows that growth opportunity (MTB) and firm size (lnMKTCAP) were negatively related to the likelihood of financial distress (PBANK). Leverage (LEV) and the previous year's likelihood of financial distress ($PBANK_{t-1}$) were positively related to the firms' probability of going bankrupt (PBANK).

The explanatory power of the PBANK model was high, with an adjusted R-square of 0.55, whereas the adjusted R-square of the Naïve model was approximately 0.13. In terms of multicollinearity, the results show that all of the VIF values were smaller than 10 for the regression models, suggesting multicollinearity is not an issue in the analysis (Belsley, Kuh and Welsch, 1980).

Table 5.14: Random effects regressions with robust estimation – RMC human capital and firm performance

	ROA Coef.(z) Model 1a	ROA Coef.(z) Model 1b	ROA Coef.(z) Model 2	lnTobin's Q Coef.(z) Model 1a	lnTobin's Q Coef.(z) Model 1b	lnTobin's Q Coef.(z) Model 2
RMCHC	0.016	0.022	-	0.003	0.003	-
	(2.61)***	(3.10)***		(2.47)**	(2.10)**	
RMCHC*	-	0.000	-	-	-0.000	-
STDDEV		(1.75)*			(-0.32)	
ROA $_{t-1}$	0.182	0.180	0.179	-	-	-
	(16.01)***	(15.69)***	(14.91)***			
Tobin's Q $_{t-1}$	-	-	-	0.108	0.109	0.103
				(4.00)***	(4.00)***	(3.59)***
lnMKTCAP	0.080	0.080	0.839	-	-	-
	(3.20)***	(3.17)***	(3.09)***			
lnTA	-	-	-	-0.157	-0.157	-0.146
				(-5.74)***	(-5.71)***	(-5.00)***
STDDEV	-0.002	-0.001	-0.002	-0.001	-0.001	-0.001
	(-4.14)***	(-3.47)***	(-3.78)***	(-3.07)***	(-1.28)***	(-3.95)***
RMC	-0.004	-0.004	0.005	0.006	0.006	0.008
	(-0.50)	(-0.52)	(0.58)	(0.96)	(0.96)	(1.22)
INDEP	-0.018	-0.019	-0.015	-0.009	-0.009	-0.011
	(-1.62)	(-1.71)*	(-1.15)	(-1.00)	(-0.99)	(-1.05)
CEODUAL	0.012	0.011	0.015	0.013	0.013	0.010
	(0.85)	(0.76)	(1.03)	(1.15)	(1.14)	(0.89)
BRDSIZE	0.033	0.034	0.041	0.047	0.047	0.055
	(1.46)	(1.49)	(1.57)	(2.46)**	(2.47)**	(2.56)***
LEV	-0.010	-0.011	-0.014	-0.090	-0.090	-0.091
	(-0.83)	(-0.95)	(-1.08)	(-8.08)**	(-8.08)***	(-7.78)***
MTB	0.005	0.005	0.004	0.015	0.015	0.015
	(6.10)***	(6.21)***	(4.82)***	(24.90)***	(24.89)***	(23.19)***
Tenure	-	-	0.0002	-	-	-0.034
			(0.01)			(-2.50)**
RMC tenure	-	-	0.0001	-	-	-0.000
			(0.08)			(-0.04)
Exp	-	-	0.002	-	-	0.000
			(2.67)***			(-0.14)
Quali	-	-	0.003	-	-	0.004
			(0.88)			(1.16)
SHARE	-	-	0.167	-	-	0.031
			(1.96)**			(0.41)
CONS	-0.188	-0.193	-0.202	1.889	1.887	1.913
	(-2.70)***	(-2.78)***	(-2.55)**	(17.01)***	(16.95)***	(15.76)***
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	1361	1361	1361	1359	1359	1359
No. of firms	367	367	348	365	365	345
Wald chi2	444.47	448.64	417.81	1541.27	1540.07	1336.66
Adjusted R^2	0.37	0.38	0.38	0.57	0.57	0.56
Highest VIF	9.33		8.81	8.40		8.78
Lowest VIF	1.09		1.12	1.10		1.10

Notes: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; *BRDSIZE*: number of board members; *ROA*: current year return on assets; ROA_{t-1} : prior year return on assets; Tobin's Q: market measure of wealth, measured by market value of firm + debt/book value of total assets; Tobin's Q_{t-1}: Tobin's Q of previous year; ln*MKTCAP*: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *SHARE*: the average percentage of RMC members shareholding; *Tenure*: average number of years as a board member of a firm; *RMC Tenure*: average years of risk management experience of RMC members; *Total Quali*: the average number of qualifications held by RMC members; *Exp:* the average amount of experience of RMC members; *RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 when firms had a combined RMC

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

Table 5.15: Random effects regressions with robust estimation – RMC human capital and the likelihood of financial distress

	PBANK Coef.(z) Model 1a	PBANK Coef.(z) Model 1b	PBANK Coef.(z) Model 2	Naïve Coef.(z) Model 1a	Naïve Coef.(z) Model 1b	Naïve Coef.(z) Model 2
RMCHC	0.013	0.020	-	-1.219	-2.103	-
	(0.88)	(1.19)		(-2.00)**	(-2.97)***	
RMCHC*	-	0.001	-	-	-0.034	-
STDDEV		(0.97)			(-2.45)**	
$PBANK_{t-1}$	0.039	0.039	0.032	-	-	-
	(3.24)***	(3.26)***	(2.62)***			
lnMKTCAP	-0.452	-0.450	-0.474	-2.403	-2.370	-1.995
	(-6.73)***	(-6.67)***	(-7.08)***	(-1.38)	(-1.36)	(-1.07)
STDDEV	0.001	0.001	0.001	0.058	0.040	0.072
	(0.40)	(0.70)	(0.96)	(1.70)*	(1.12)	(1.94)*
RMC	-0.008	-0.009	-0.015	-0.367	-0.335	-0.409
	(-0.41)	(-0.45)	(-0.74)	(-0.67)	(-0.62)	(-0.71)
INDEP	0.029	0.028	0.048	0.484	0.566	-0.203
	(1.02)	(0.99)	(1.65)*	(0.51)	(0.59)	(-0.19)
CEODUAL	-0.033	-0.034	-0.028	-2.100	-1.816	-1.776
	(-0.96)	(-1.00)	(-0.86)	(-1.77)*	(-1.54)	(-1.42)
BRDSIZE	-0.200	-0.202	-0.225	0.227	0.417	0.231
	(-3.54)***	(-3.57)***	(-3.78)***	(0.11)	(0.21)	(0.11)
LEV	1.022	1.023	1.038	3.367	3.436	3.534
	(32.06)***	(31.86)***	(33.29)***	(3.75)***	(3.83)***	(3.70)***
MTB	-0.030	-0.030	-0.029	-0.153	-0.164	-0.148
	(-16.99)***	(-16.84)***	(-16.50)***	(-2.46)**	(-2.64)***	(-2.24)**
Tenure	-	-	0.036	-	-	0.815
			(0.94)			(0.65)
RMC Tenure	-	-	0.008	-	-	0.602
			(0.26)			(0.57)
Exp	-	-	-0.000	-	-	-0.086
			(-0.23)			(-1.23)
Quali	-	-	-0.009	-	-	0.332
			(-1.08)			(1.22)
SHARE	-	-	-0.314	-	-	-3.759
			(-1.54)			(-0.56)
CONS	0.083	0.071	0.089	-5.249	-4.478	-9.315
	(0.45)	(0.38)	(0.46)	(-1.00)	(-0.85)	(-1.58)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	1305	1305	1158	1362	1362	1211
No. of firms	355	355	336	365	365	345
Wald chi2	1716.90	1713.06	1809.49	190.92	197.69	165.28
Adjusted R2	0.55	0.55	0.61	0.13	0.13	0.13
Highest VIF	9.17		8.23	9.15		8.82
Lowest VIF	1.08		1.09	1.12		1.11

Notes: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; *BRDSIZE*: number of board members; *PBANK(-Z-Score)*: probability of financial distress calculated using Altman Z-Score; $PBANK_{t-1}$(-Z-Score $_{t-1}$): Altman Z-Score of previous year; *Naïve*: the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004); lnMKTCAP: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *SHARE*: the average percentage of RMC members shareholding; *Tenure*: average number of years as a board member of a firm; *RMC Tenure*: average years of risk management experience of RMC members; *Quali*: the average number of qualifications held by RMC members; *Exp:* the average amount of experience of RMC members; *RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 when firms had a combined RMC.

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

5.3.3 Model 2

This study used RMC tenure, board tenure, average number of qualifications (diploma, bachelor, masters, PhD, MBA, CA/CPA), average amount of experience (industry, financial, management, governance, accounting, auditing, and tax experience), and RMC share ownership as independent RMC human capital variables to examine the relationship between those five RMC human capital characteristics and firms' management of risk in terms of firm performance and likelihood of financial distress to test hypotheses 5 and 6. Specifically, board tenure, RMC tenure, and RMC's share ownership were recognised as firm-specific human capital, since they were deemed to be the expertise derived from the skills and knowledge gained in a position specific to the firm, whereas the number of qualifications and amount of experience were identified as general human capital, because they could be valued by all potential employers and produce value in different firm settings.

Univariate test

Before running regressions to test the hypothesis of this study, some preliminary univariate tests were conducted (i.e., correlation) in order to gain a better understanding of the data and to provide preliminary results regarding the association between these five individual RMC human capital characteristics, firm performance, and the likelihood of financial distress.

Correlation

The results of correlations relating to the individual RMC human capital characteristics are shown in Tables 5.16 and 5.17. Specifically, Table 5.16 provides the correlation between individual RMC human capital characteristics and firm performance.

The results show that RMC tenure and board tenure were significantly and positively related to ROA ($p < 0.01$), whereas the average number of qualifications (Quali), amount of experience (Exp), and share ownership of RMC members (SHARE) were negatively associated with ROA.

In terms of Tobin's Q, the results were contrary to expectation. The results reveal that Tobin's Q was positively related to the average amount of experiences (Exp), qualifications (Quali) ($p<0.01$), and share ownership of RMC members (SHARE), and negatively correlated with RMC tenure. There was no significant relationship between tenure and Tobin's Q.

Table 5.17 indicates the correlation between individual RMC human capital characteristic and the likelihood of financial distress. The results show that there was a negative relationship between RMC tenure and Naïve ($p<0.01$). However, there was no significant relationship between Naïve and board tenure (Tenure). Moreover, the average number of qualifications and amount of experience did not show significant relationships with Naïve. In addition, firm risk was positively related to the likelihood of financial distress (Naïve) ($p<0.01$), whereas firm size was negatively related to the likelihood of financial distress (Naïve) ($p<0.05$).

In terms of Z-Score, RMC members' share ownership ($p<0.01$) and tenure ($p<0.01$) were significantly and negatively related to Z-Score. RMC tenure, RMC members' average amount of experience, and number of qualifications were not significantly related to Z-Score.

These results required further investigation in the multiple regressions. Given that some of the correlation coefficients among the independent variables were quite high, variance inflation factors (VIF) were conducted to ensure multicollinearity did not impact the results of the regression models.

Table 5.16: Correlation statistics – firm performance and RMC human capital (individual)

Variables	ROA	ROA_{t-1}	Tobin's Q	Tobin's Q_{t-1}	MKTCAP	GRTH	BRDSIZE	LEV	STDDEV	INDEP	SHARE	Tenure	RMC Tenure	Quali	Exp
ROA	1														
ROA_{t-1}	0.279**	1													
Tobin's Q	-0.035	0.001	1												
Tobin's Q_{t-1}	0.136**	0.216**	0.040	1											
MKTCAP	0.267**	0.760**	0.032	0.226**	1										
GRTH	-0.042	0.011	0.742**	0.043	0.081**	1									
BRDSIZE	0.016	0.019	0.009	-0.051	-0.224**	0.008	1								
LEV	-0.005	-0.020	-0.006	0.118**	-0.365**	-0.009	0.528**	1							
STDDEV	-0.058*	-0.044	0.333**	-0.012	-0.018	0.557**	0.004	-0.005	1						
INDEP	-0.002	0.005	0.031	0.039	0.006	0.064*	-0.129**	-0.008	0.116**	1					
SHARE	-0.127**	-0.080**	0.249**	-0.022	-0.040	0.311**	-0.103**	-0.085**	0.458**	0.272**	1				
Tenure	0.094**	0.050	-0.005	0.014	0.028	-0.041	0.419**	-0.118**	-0.066*	-0.056*	-0.056*	1			
RMC Tenure	0.486**	0.047	-0.107**	0.060*	0.068*	-0.171**	0.010	-0.021	-0.304**	-0.041	-0.264**	0.127**	1		
Quali	-0.068*	0.022	0.175**	-0.030	0.062*	0.205**	0.040	-0.044	0.154**	0.003	-0.195**	-0.008	-0.162**	1	
Exp	-0.069*	0.019	0.142**	-0.023	0.044	0.209**	-0.044	-0.016	0.342**	-0.001	0.088**	-0.084**	-0.116**	-0.057*	1

Two-tailed test significant at: ** $p<0.01$; *$p<0.05$

Table 5.17: Correlation statistics – the likelihood of financial distress (NAÏVE) and RM human capital (individual)

Variables	Z-Score	Z-Score$_{t-1}$	Naïve	MKTCAP	GRTH	BRDSIZE	LEV	STDDEV	INDEP	SHARE	Tenure	RMC Tenure	Quali	Exp
Z-Score	1													
Z-Score$_{t-1}$	0.035	1												
Naïve	0.015	-0.158**	1											
MKTCAP	-0.363**	0.181**	-0.058*	1										
GRTH	-0.009	0.028	0.053*	0.081**	1									
BRDSIZE	0.528**	-0.043	0.042	-0.224**	0.008	1								
LEV	1.000**	0.057*	0.015	-0.365**	-0.009	0.528**	1							
STDDEV	-0.005**	-0.012	0.127**	-0.018	0.557**	0.004	-0.005	1						
INDEP	-0.008	0.054	0.043	0.006	0.064*	-0.129**	-0.008	0.116**	1					
SHARE	-0.085**	-0.052	0.037	-0.040	0.311**	-0.103**	-0.085**	0.458**	0.272**	1				
Tenure	-0.118**	-0.013	0.013	0.028	-0.041	0.419**	-0.118**	-0.066*	-0.056*	-0.056*	1			
RMC Tenure	-0.021	0.179**	-0.105**	0.068*	-0.171**	0.010	-0.021	-0.304**	-0.041	-0.264**	0.127**	1		
Quali	-0.044	-0.007	0.001	0.062*	0.205**	0.040	-0.044	0.154**	0.003	-0.195**	-0.008	-0.162**	1	
Exp	-0.016	-0.017	0.061*	0.044	0.209**	-0.044	-0.016	0.342**	-0.001	0.088**	-0.084**	-0.116**	-0.057*	1

Two-tailed test significant at: ** $p<0.01$; *$p<0.05$

Multiple regressions

Following the preliminary univariate tests, multiple regressions were used to determine the association between the individual RMC human capital characteristics and firms' management of risk in terms of firm performance and probability of bankruptcy by testing the fifth and sixth hypotheses. Regression analysis was used in the panel data. The results of testing the fifth and sixth hypotheses using random effects models are reported in Tables 5.14 and 5.15. The details of the results are discussed below.

Human capital variables

Firm-specific human capital – RMC tenure, board tenure, and RMC share ownership

RMC members' board tenure was significantly and negatively related to firms' market performance (Tobin's Q) only, in contrast to H6 (a). Board tenure was not significantly related to accounting performance (ROA) and the likelihood of financial distress (Z-Score and Naïve), which is consistent with previous studies (e.g. Wulf and Singh, 2011). RMC share ownership was significantly and positively related to accounting performance (ROA), indicating that firms that increase the proportion of shares held by the RMC would increase the firms' accounting performance. However, RMC share ownership was not significantly associated with market performance (Tobin's Q) and the likelihood of financial distress (Z-Score and Naïve). In addition, RMC tenure did not show any significant relationship with firm performance (ROA and Tobin's Q) and the likelihood of financial distress (Z-Score and Naïve).

General human capital – qualifications and experience

In terms of general human capital, the results show that average experience (Exp) was significantly and positively associated with firms' accounting performance (ROA) ($p<0.01$), suggesting that RMC members with more experience increased firms' accounting performance, in contrast to H6 (b). However, average experience (Exp) was not significantly related to market performance (Tobin's Q) and the likelihood of financial distress (Z-Score and

Naïve). In addition, the average number of qualifications (Quali) had no significant relationship with firm performance (ROA and Tobin's Q) and the likelihood of financial distress (Z-Score and Naïve).

In conclusion, these results show that average experience, as general human capital, was positively related to firms' accounting performance. Board tenure, as a type of firm-specific human capital, was negatively associated with firms' market performance, which disproved H5. The results show firm-specific and general human capital did not have any significant association with the likelihood of financial distress, which also refuted H6.

Other variables

The results show that leverage was negatively related to market-based firm performance (Tobin's Q) and positively related to the likelihood of financial distress (Z-Score). Firm risk was negatively related to both accounting and market performance. Prior years' accounting performance (ROA_{t-1}) was positively related to the accounting performance in the current year (ROA). Similarly, firms with high past market performance in the prior year tended to have a high level of market performance in the following year. Firm size (MKTCAP) was positively related to accounting performance (ROA) and negatively related to the likelihood of financial distress, measured by Z-Score. Firm size (lnTA) was negatively related to market performance (Tobin's Q). CEO duality (CEODUAL), and RMC members' share ownership (SHARE) showed no significant relationship with firm performance (ROA and Tobin's Q) and the likelihood of financial distress (Z-Score and Naïve).

In terms of multicollinearity, the results show that all of the VIF values were smaller than 10 for the regression models, suggesting multicollinearity is not an issue in the analysis (Belsley, Kuh and Welsch, 1980).

5.4 SUMMARY OF REGRESSION RESULTS

Summary of relationships between RMC human capital and independent variables

Research Hypotheses		Results
H1(a)	There is a positive association between risk and performance for firms that have a RMC	Not Significant
H1(b)	There is a positive association between risk and performance for firms that have a separate RMC	Supported
H2 (a)	There is a negative association between risk and the likelihood of financial distress for firms that have a RMC	Not Significant
H2 (b)	There is a negative association between risk and the likelihood of financial distress for firms that have a separate RMC	Not Significant
H3	There is a positive association between RMC human capital and firm performance	Supported
H4	There is a negative association between the probability of financial distress and RMC human capital.	Supported
H5 (a)	Firm performance is positively associated with RMC firm-specific human capital.	Not supported
H5 (b)	Firm performance is negatively associated with RMC general human capital.	Not supported
H6 (a)	The probability of bankruptcy is negatively associated with RMC firm-specific human capital.	Not Significant
H6 (b)	The probability of bankruptcy is positively associated with RMC general human capital.	Not Significant

5.5 SENSITIVITY ANALYSIS AND ROBUSTNESS TESTS

5.5.1 Sub-sample testing, excluding financials and utilities

For firms within regulated industries – financial and utilities firms, their risk governance is likely to be significantly influenced by regulatory oversight, and risk compliance and risk reporting (Amran, Bin and Hassan, 2009; Jia, Munro and Buckby, 2016). As a result, it was necessary to re-run the regression analysis by excluding those firms from the sample.

The results of regressions using sample firms excluding financials and utilities are presented in Tables 5.18 and 5.19, which demonstrate the results of testing the relationship between the existence of RMC and firms' management of risk, in terms of firm performance

and the likelihood of financial distress. Tables 5.20 and 5.21 show the results of testing the association between RMC human capital and firms' management of risk.

Consistent with the full sample results, the results suggest that the existence of a separate RMC moderated the relationship between risk and firms' accounting performance. RMC human capital was significantly and positively related to accounting and market performance ($p<0.01$), and significantly and negatively related to the likelihood of financial distress (Naïve). Moreover, after including the interaction term of RMC human capital*risk (RMCHC*STDDEV), the results show the association between risk (STDDEV) and the likelihood of financial distress (Naïve) was moderated by firms' RMC human capital, as STDDEV*RMCHC was negatively associated with a firms' likelihood of financial distress (Naïve) (B = -0.05; $p<0.05$). In terms of individual RMC human capital characteristics, the results consistently show that share ownership of RMC members (SHARE) and the average amount of experience (EXP) of RMC members were positively associated with firm's accounting performance ($p<0.05$).

Table 5.18: Random effects with robust estimation. The existence of RMC and firm performance – excluding financials and utilities

	ROA Coef.(z)				lnTobin's Q Coef.(z)			
	RMC		SRMC		RMC		SRMC	
RMC	0.013	-0.035	-	-	0.000	0.001	-	-
	(1.81)*	(-2.69)***			(0.09)	(0.08)		
SRMC	-	-	0.011	-0.011	-	-	0.002	0.001
			(1.53)	(-0.76)			(0.95)	(0.19)
RMC* STDDEV	-	0.003	-	-	-	-0.000	-	-
		(4.53)***				(-0.13)		
SRMC* STDDEV	-	-	-	0.002	-	-	-	0.000
				(2.01)**				(0.34)
ROA_{t-1}	0.230	0.229	0.229	0.230	-	-	-	-
	(13.17) ***	(13.19)***	(4.37)***	(4.36)***				
lnTobin's Q_{t-1}	-	-	-	-	0.062	0.065	0.065	0.065
					(4.05)***	(4.17)***	(4.18)***	(4.15)***
lnMKTCAP	0.091	0.083	0.090	0.095	-	-	-	-
	(2.82)***	(2.60)***	(2.81)**	(2.93)***				
lnTA	-	-	-	-	-0.071	-0.076	-0.076	-0.076
					(-2.85)***	(-2.96)***	(-2.98)***	(-2.98)***
STDDEV	-0.003	-0.005	-0.003	-0.003	-0.000	-0.000	-0.000	-0.000
	(-5.12)***	(-6.81)***	(-1.77)*	(-1.97)**	(-0.41)	(-0.24)	(-0.40)	(-0.41)
INDEP	0.003	0.023	0.031	0.030	0.002	0.002	0.002	0.002
	(1.54)	(1.24)	(1.29)	(1.26)	(0.38)	(0.35)	(0.37)	(0.37)
CEODUAL	0.031	0.031	0.029	0.029	-0.001	-0.001	-0.001	-0.000
	(1.92)*	(1.93)*	(2.06)**	(1.99)**	(-0.26)	(-0.26)	(-0.33)	(-0.33)
BRDSIZE	0.003	0.018	0.001	0.004	0.028	0.028	0.028	0.029
	(0.04)	(0.27)	(0.16)	(0.03)	(1.70)*	(1.72)*	(1.72)*	(1.72)*
LEV	-0.140	-0.144	-0.141	-0.140	-0.088	-0.088	-0.088	-0.088
	(-5.12)***	(-6.95)***	(-0.98)	(-0.97)	(-3.98)***	(-3.98)***	(-3.98)***	(-3.98)***
MTB	0.049	0.058	0.051	0.050	0.412	0.412	0.412	0.412
	(2.19)**	(2.59)***	(1.61)	(1.50)	(26.31)***	(26.40)***	(26.23)***	(26.21)***
CONS	-0.163	-0.144	-0.155	-0.161	1.441	1.441	1.441	1.441
	(-1.18)	(-1.05)	(-2.02)**	(-0.60)	(19.33)***	(19.30)***	(19.31)***	(19.30)***
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	1705	1705	1705	1705	1703	1703	1703	1703
No. of firms	466	466	466	466	466	466	466	466
Wald chi2	395.88	426.26	179.05	183.33	3939.00	3947.08	3976.54	3977.01
Adjusted R^2	0.30	0.30	0.30	0.30	0.88	0.88	0.88	0.88
Highest VIF	8.90	8.94	8.90	8.91	8.96	8.98	8.94	8.94
Lowest VIF	1.09	1.09	1.08	1.08	1.09	1.09	1.09	1.09

Note: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; ln*MKTCAP*: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *BRDSIZE*: number of board members; *RMC*risk:* interaction variables of RMC and risk; *SRMC*risk:* interaction variables of separate RMC and risk; *ROAt*: current year return on assets; ROA_{t-1} : prior year return on assets; *Tobin's Q*: market measure of wealth, measured by market value of firm + debt/book value of total assets; *Tobin's* Q_{t-1}: Tobin's Q of previous year; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; S*RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 otherwise; RMC: dummy variable, taking a rate of 1 when firms had a RMC, 0 otherwise.

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

Table 5.19: Random effects with robust estimation. The existence of a RMC and the likelihood of financial distress – excluding financials and utilities

	PBANK Coef.(z)				Naïve			
	RMC		SRMC		RMC		SRMC	
RMC	-0.004	-0.007	-	-	-0.005	-0.014	-	-
	(-0.65)	(-0.58)**			(-0.56	(-0.87)		
SRMC		-	-0.008	-0.011	-	-	-0.014	-0.027
	-		(-0.80)	(-0.57)			(-0.99)	(-0.95)
RMC*		0.000	-	-	-	0.002	-	-
STDDEV	-	(0.26)				(1.45)		
SRMC*		-	-	0.000	-	-	-	0.001
STDDEV	-			(0.19)				(0.52)
$PBANK_{-1}$	0.073	0.073	0.073	0.073	-	-	-	-
	(6.69)***	(6.67)***	(6.68)***	(6.68)***				
lnMKTCAP	-0.035	-0.036	-0.035	-0.035	-0.020	-0.024	-0.017	-0.016
	(-1.05)	(-1.07)	(-1.05)	(-1.04)	(-0.49)	(-0.57)	(-0.41)	(-0.39)
STDDEV	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	(0.31)	(0.40)	(0.29)	(0.31)	(0.97)	(0.42)	(0.94)	(0.89)
INDEP	-0.001	-0.001	-0.001	-0.001	-0.012	-0.015	-0.012	-0.012
	(-0.04)	(-0.06)	(-0.04)	(-0.04)	(-0.53)	(-0.62)	(-0.53)	(-0.52)
CEODUAL	-0.001	-0.001	-0.002	-0.002	-0.012	-0.012	-0.011	-0.011
	(-0.08)	(-0.08)	(-0.14)	(-0.14)	(-0.59)	(-0.59)	(-0.56)	(-0.56)
BRDSIZE	-0.082	-0.081	-0.082	-0.082	0.045	0.051	0.040	0.042
	(-1.37)	(-1.35)	(-1.37)	(-1.36)	(0.54)	(0.61)	(0.48)	(0.51)
LEV	0.700	0.695	0.670	0.700	0.158	0.155	0.159	0.159
	(32.90)***	(32.84)***	(32.91)***	(32.90)***	(6.03)***	(5.92)***	(6.08)***	(6.09)***
MTB	-0.493	-0.492	-0.493	-0.493	-0.136	-0.133	-0.137	-0.137
	(-23.01)***	(-22.91)***	(-23.02)***	(-23.01)***	(-4.81)***	(-4.68)***	(-4.83)***	(-4.83)***
CONS	-0.748	-0.747	-0.750	-0.752	0.105	0.114	0.112	0.107
	(-5.75)***	(-5.73)***	(-5.77)***	(-5.77)***	(0.61)	(0.66)	(0.65)	(0.62)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	1628	1628	1628	1628	1705	1705	1705	1705
No. of firms	434	434	434	434	442	442	442	442
Wald chi2	2448.00	2446.88	2448.56	2446.51	145.67	147.89	146.35	146.56
Adjusted R^2	0.67	0.67	0.67	0.67	0.08	0.08	0.08	0.08
Highest VIF	9.53	9.53	9.50	9.50	8.86	8.86	8.87	8.87
Lowest VIF	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09

Note: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *BRDSIZE*: number of board members; *Z-Score*: probability of bankruptcy calculated using Altman Z-Score; $Z\text{-}Score_{t-1}$: Altman Z-Score of previous year; *Naïve:* the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004); ln*MKTCAP*: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; S*RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 otherwise; RMC: dummy variable, taking a rate of 1 when firms had a RMC, 0 otherwise; *Year*: Year dummy variable

Two tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

Table 5.20: Random effects regressions with robust estimation – RMC human capital and firm performance – excluding financials and utilities

	ROA Coef.(z) Model 1a	ROA Coef.(z) Model 1b	ROA Coef.(z) Model 2	lnTobin's Q Coef.(z) Model 1a	lnTobin's Q Coef.(z) Model 1b	lnTobin's Q Coef.(z) Model 2
RMCHC	0.024	0.029	-	0.003	0.003	-
	(2.82)***	(3.05)***		(2.14)**	(1.99)**	
RMCHC*	-	0.000	-	-	-0.000	-
STDDEV		(1.18)			(-0.01)	
ROA $_{t-1}$	0.180	0.177	0.175	-	-	-
	(13.61)***	(13.32)***	(12.79)***			
Tobin's Q $_{t-1}$	-	-	-	0.087	0.086	0.074
				(2.57)***	(2.55)**	(2.16)**
lnMKTCAP	0.133	0.132	0.143	-	-	-
	(4.09)***	(4.07)***	(4.20)***			
lnTA	-	-	-	-0.186	-0.187	-0.182
				(-6.21)***	(-6.20)***	(-5.85)***
STDDEV	-0.002	-0.002	-0.002	-0.001	-0.001	-0.002
	(-3.40)***	(-2.93)***	(-2.77)***	(-3.09)***	(-1.55)	(-3.95)***
RMC	-0.002	-0.003	-0.003	-0.005	-0.004	-0.006
	(-0.22)	(-0.27)	(-0.26)	(-0.57)	(-0.46)	(-0.69)
INDEP	-0.012	-0.013	-0.010	-0.012	-0.013	-0.012
	(-0.78)	(-0.81)	(-0.58)	(-1.03)	(-1.10)	(-0.96)
CEODUAL	0.016	0.015	0.018	0.015	0.015	0.012
	(0.98)	(0.92)	(1.12)	(1.35)	(1.36)	(1.02)
BRDSIZE	0.041	0.042	0.043	0.041	0.042	0.046
	(1.36)	(1.37)	(1.31)	(1.80)*	(1.85)*	(1.89)*
LEV	0.010	0.009	0.009	-0.084	-0.085	-0.083
	(0.67)	(0.60)	(0.56)	(-6.77)***	(-6.80)***	(-6.59)***
MTB	0.002	0.003	0.002	0.016	0.016	0.016
	(2.60)***	(2.68)***	(1.55)	(22.61)***	(22.67)***	(21.72)***
Tenure	-	-	0.010	-	-	-0.015
			(0.47)			(-1.04)
RMC tenure	-	-	-0.001	-	-	-0.017
			(-0.08)			(-1.32)
Exp	-	-	0.002	-	-	-0.001
			(2.07)**			(-1.23)
Quali	-	-	0.005	-	-	0.003
			(0.97)			(0.75)
SHARE	-	-	0.217	-	-	0.026
			(2.15)**			(0.35)
CONS	-0.300	-0.306	-0.320	2.119	2.120	2.179
	(-3.28)***	(-3.33)***	(-3.18)***	(16.12)***	(16.05)***	(15.75)***
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	983	983	920	945	945	925
No. of firms	262	262	253	256	256	252
Wald chi2	346.54	347.21	355.08	1258.84	1257.61	1163.19
Adjusted R^2	0.37	0.38	0.38	0.60	0.60	0.61
Highest VIF	9.33		8.81	8.40		8.78
Lowest VIF	1.09		1.12	1.10		1.10

Note: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; *BRDSIZE*: number of board members; *ROA*: current year return on assets; ROA_{t-1} : prior year return on assets; Tobin's Q: market measure of wealth, measured by market value of firm + debt/book value of total assets; Tobin's Q_{t-1}: Tobin's Q of previous year; ln*MKTCAP*: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *SHARE*: the average percentage of RMC members shareholding; *Tenure*: average number of years as a board member of a firm; *RMC Tenure*: average years of risk management experience of RMC members; *Total Quali*: the average number of qualifications obtained by RMC members; *Exp:* the average amount of experience obtained by RMC members; *RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 when firms had a combined RMC

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

Table 5.21: Random effects regressions with robust estimation – RMC human capital and the likelihood of financial distress – excluding financials and utilities

	PBANK Coef.(z) Model 1a	PBANK Coef.(z) Model 1b	PBANK Coef.(z) Model 2	Naïve Coef.(z) Model 1a	Naïve Coef.(z) Model 1b	Naïve Coef.(z) Model 2
RMCHC	-0.004	-0.004	-	-0.902	-1.943	-
	(-0.93)	(-0.89)		(-1.24)	(-2.30)**	
RMCHC*	-	-0.001	-	-	-0.037	-
STDDEV		(-0.11)			(-2.41)**	
$PBANK_{t-1}$	0.045	0.045	0.031	-	-	-
	(3.10)***	(3.09)***	(2.08)**			
lnMKTCAP	-0.380	-0.380	-0.404	-3.379	-3.446	-2.959
	(-5.10)***	(-5.08)***	(-5.31)***	(-1.62)	(-1.65)*	(-1.35)
STDDEV	0.001	0.000	0.000	0.052	0.028	0.062
	(0.28)	(0.04)	(0.22)	(1.30)	(0.67)	(1.46)
RMC	0.011	0.011	0.015	-0.678	-0.592	-1.010
	(0.48)	(0.48)	(0.65)	(-1.02)	(-0.89)	(-1.41)
INDEP	0.109	0.110	0.107	-0.448	-0.350	-0.877
	(3.24)***	(3.24)***	(2.99)***	(-0.38)	(-0.30)	(-0.69)
CEODUAL	-0.033	-0.033	-0.026	-2.097	-1.818	-1.845
	(-1.00)	(-1.01)	(-0.78)	(-1.75)*	(-1.52)	(-1.46)
BRDSIZE	-0.168	-0.168	-0.212	-0.741	-0.559	-0.721
	(-2.61)***	(-2.61)***	(-3.11)***	(-0.31)	(-0.24)	(-0.29)
LEV	1.050	1.050	1.050	2.993	3.050	3.122
	(29.92)***	(29.91)***	(29.70)***	(2.68)***	(2.72)***	(2.69)***
MTB	-0.030	-0.030	-0.029	-0.154	-0.167	-0.133
	(-15.47)***	(-15.45)***	(-14.30)***	(-2.15)**	(-2.34)***	(-1.75)*
Tenure	-	-	0.031	-	-	0.451
			(0.73)			(0.31)
RMC Tenure	-	-	0.015	-	-	1.400
			(0.42)			(1.14)
Exp	-	-	0.001	-	-	-0.107
			(0.38)			(-1.27)
Quali	-	-	-0.008	-	-	0.331
			(-0.81)			(1.04)
SHARE	-	-	-0.193	-	-	-9.553
			(-0.90)			(-1.29)
CONS	-0.318	-0.318	-0.263	1.052	2.268	-2.962
	(-1.53)	(-1.53)	(-0.17)	(0.17)	(0.36)	(-0.43)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	948	948	902	984	984	922
No. of firms	257	257	249	261	261	252
Wald chi2	1448.82	1447.26	1400.02	116.40	123.04	113.84
Adjusted R2	0.60	0.57	0.59	0.11	0.12	0.12
Highest VIF	9.17		8.23	9.15		8.82
Lowest VIF	1.08		1.09	1.12		1.11

Note: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; *BRDSIZE*: number of board members; *PBANK(-Z-Score)*: probability of financial distress calculated using Altman Z-Score; $PBANK_{t-1}$(-Z-$Score_{t-1}$): Altman Z-Score of previous year; *Naïve:* the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004); lnMKTCAP: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *SHARE*: the average percentage of RMC members shareholding; *Tenure*: average number of years as a board member of a firm; *RMC Tenure*: average years of risk management experience of RMC members; *Quali*: the average number of qualifications obtained by RMC members; *Exp:* the average amount of experience of RMC members; *RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 when firms had a combined RMC.

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

5.5.2 Fixed effects regression models

This study adopted fixed effects regression models, because fixed effects models control for the effects of time-invariant variables with time-invariant effects and are commonly used to mitigate potential omitted variable bias in accounting studies. In addition, this study conducted the Hausman (1978) specification test, which showed that the null hypothesis was rejected (*p=0.00*) for all regression models. This provided evidence of using fixed effects models as an alternative robustness check method. The results of regressions using fixed effects models with robust estimation are presented in the following tables. Tables 5.22 and 5.23 show the results of testing the relationship between the existence of RMC and firms' management of risk, in terms of firm performance and the likelihood of financial distress. Tables 5.24 and 5.25 show the results of testing the association between RMC human capital and firms' management of risk.

The results remained constant when using fixed effect models. In relation to RMC existence and firms' management of risk, the results show that the interaction variable (SRMC*STDDEV) was significantly and positively related to firms' accounting performance.

As for RMC human capital, consistent with random effects regression results, RMC human capital was positively related to firm accounting-based performance (ROA) and firms' market performance (Tobin's Q) and negatively related to Naïve, suggesting there was a negative relationship between the RMC human capital factor score and the likelihood of financial distress. The association between risk (STDDEV) and the likelihood of financial distress (Naïve) was moderated by firms' RMC human capital, as STDDEV*RMCHC was negatively associated with firms' likelihood of financial distress.

Table 5.22: Fixed effects with robust estimation. The existence of a RMC and firm performance

	ROA Coef.(z)				lnTobin's Q Coef.(z)			
	RMC		SRMC		RMC		SRMC	
RMC	0.006	-0.004	-	-	0.001	0.001	-	-
	(0.85)	(-0.33)			(0.71)	(0.42)		
SRMC	-	-	0.014	-0.032	-	-	0.002	-0.001
			(1.53)	(-1.76)*			(0.63)	(-0.24)
RMC*STDDEV	-	0.0009	-	-	-	0.00	-	-
		(1.08)				(0.02)		
SRMC*STDDEV	-	-	-	0.005	-	-	-	0.0003
				(2.98)***				(0.66)
ROA_{t-1}	0.098	0.097	0.099	0.101	-	-	-	-
	(5.07) ***	(5.01) ***	(5.11)***	(5.22)***				
lnTobin's Q_{t-1}	-	-	-	-	0.074	0.074	0.074	0.073
					(5.42)***	(5.42)***	(5.44)***	(5.39)***
lnMKTCAP	0.060	0.055	0.058	0.059	-	-	-	-
	(1.14)	(1.06)	(1.11)	(1.14)				
lnTA					-0.173	-0.173	-0.173	-0.172
					(-8.64)***	(-8.61)***	(-8.63)***	(-8.61)***
STDDEV	-0.003	-0.003	-0.003	-0.003	-0.0003	-0.0003	-0.0003	-0.0003
	(-4.76)***	(-4.34)***	(-4.79)***	(-5.01)***	(-1.57)	(-1.24)	(-1.58)	(-1.63)
INDEP	0.007	0.006	0.007	0.008	0.002	0.002	0.002	0.002
	(0.38)	(0.34)	(0.38)	(0.43)	(0.38)	(0.38)	(0.37)	(0.38)
CEODUAL	0.046	0.046	0.046	0.046	-0.003	-0.003	-0.003	-0.003
	(2.63)***	(2.62)***	(2.59)**	(2.58)**	(-0.49)	(-0.49)	(-0.51)	(-0.51)
BRDSIZE	-0.078	-0.07	-0.075	-0.06	0.029	0.029	0.030	0.030
	(-1.26)	(-1.17)	(-1.22)	(-1.05)	(1.60)	(1.60)	(1.62)	(1.66)*
LEV	-0.305	-0.305	-0.305	-0.31	-0.062	-0.062	-0.062	-0.062
	(-13.00)***	(-13.02)***	(-13.01)***	(-13.10)***	(-9.10)***	(-9.10)***	(-9.09)***	(-9.10)***
MTB	0.090	0.093	0.09	0.089	0.375	0.375	0.375	0.375
	(3.22)***	(3.29)***	(3.23)***	(3.18)***	(55.16)***	(55.14)***	(55.13)***	(55.13)***
CONS	0.163	0.164	0.069	0.048	1.677	1.717	1.676	1.714
	(0.99)	(0.99)	(0.49)	(0.34)	(24.43)***	(23.45)***	(24.41)***	(23.42)***
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	2312	2312	2312	2312	2310	2310	2310	2310
No. of firms	583	583	583	583	583	583	583	583
Wald chi2	13.38	12.89	13.46	231.33	246.48	236.49	246.46	236.54
Adjusted R^2	0.07	0.07	0.06	0.07	0.76	0.77	0.76	0.77
Highest VIF	8.90	8.94	8.90	8.91	8.96	8.98	8.94	8.94
Lowest VIF	1.09	1.09	1.08	1.08	1.09	1.09	1.09	1.09

Note: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; ln*MKTCAP*: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *BRDSIZE*: number of board members; *RMC*risk:* interaction variables of RMC and risk; *SRMC*risk:* interaction variables of separate RMC and risk; *ROAt*: current year return on assets; ROA_{t-1}: prior year return on assets; *Tobin's Q*: market measure of wealth, measured by market value of firm + debt/book value of total assets; *Tobin's* Q_{t-1}: Tobin's Q of previous year; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; S*RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 otherwise; RMC: dummy variable, taking a rate of 1 when firms had a RMC, 0 otherwise.

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

Table 5.23: Fixed effects with robust estimation. The existence of a RMC and the likelihood of financial distress

	PBANK Coef.(z)				Naïve			
	RMC		SRMC		RMC		SRMC	
RMC	-0.011	-0.022	-	-	0.001	-0.008	-	-
	(-1.43)	(-1.77)*			(0.13)	(-0.53)		
SRMC		-	-0.008	0.0006	-	-	-0.011	-0.01
	-		(-0.79)	(0.03)			(-0.93)	(-0.38)
RMC*STDDEV		0.001	-	-	-	0.0009	-	-
	-	(1.15)				(0.77)		
SRMC*STDDEV		-	-	-0.001	-	-	-	-0.0002
	-			(-0.03)				(-0.11)
$PBANK_{-1}$	0.055	0.054	0.055	0.055	-	-	-	-
	(4.75)***	(4.76)***	(4.76)***	(4.76)***				
lnMKTCAP	-0.023	-0.028	-0.023	-0.023	0.08	0.072	0.08	0.08
	(-0.41)	(-0.49)	(-0.41)	(-0.41)	(1.07)	(1.00)	(1.09)	(1.09)
STDDEV	0.003	0.002	0.003	0.003	-0.001	-0.002	-0.001	-0.001
	(3.89)***	(2.32)**	(3.93)***	(3.95)***	(-1.61)	(-1.74)*	(-1.60)	(-1.59)
INDEP	0.025	0.023	0.025	0.025	-0.022	-0.022	-0.022	-0.02
	(1.31)	(1.25)	(1.32)	(1.32)	(-0.92)	(-0.95)	(-0.94)	(-0.94)
CEODUAL	0.01	0.007	0.007	0.007	-0.01	-0.010	-0.01	-0.01
	(0.35)	(0.35)	(0.38)	(0.38)	(-0.41)	(-0.42)	(-0.40)	(-0.40)
BRDSIZE	-0.09	-0.088	-0.09	-0.095	0.06	0.07	0.006	0.058
	(-1.39)	(-1.29)	(-1.38)	(-1.41)	(0.72)	(0.78)	(0.70)	(0.69)
LEV	0.726	0.727	0.726	0.726	0.22	0.22	0.22	0.221
	(25.27)***	(25.28)***	(25.24)***	(25.24)***	(6.85)***	(6.83)***	(6.87)***	(6.87)***
MTB	-0.450	-0.447	-0.45	-0.45	-0.24	-0.242	-0.245	-0.245
	(-14.47)***	(-14.34)***	(-14.46)***	(-14.46)***	(-6.36)***	(-6.28)***	(-6.37)***	(-6.37)***
CONS	-0.860	-0.86	-0.866	-0.94	0.158	0.149	0.151	0.152
	(-5.52)***	(-5.49)***	(-5.56)***	(-5.18)***	(0.66)	(0.66)	(0.67)	(0.67)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	2235	2235	2235	2235	2312	2312	2312	2312
No. of firms	571	571	571	571	583	583	583	583
Wald chi2	52.33	50.30	52.22	50.12	12.20	11.72	12.25	11.73
Adjusted R^2	0.58	0.58	0.58	0.58	0.05	0.05	0.05	0..05
Highest VIF	9.53	9.53	9.50	9.50	8.86	8.86	8.87	8.87
Lowest VIF	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09

Note: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *BRDSIZE*: number of board members; *Z-Score*: probability of bankruptcy calculated using Altman Z-Score; $Z\text{-}Score_{t-1}$: Altman Z-Score of previous year; *Naïve*: the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004); ln*MKTCAP*: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; S*RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 otherwise; RMC: dummy variable, taking a rate of 1 when firms had a RMC, 0 otherwise; *Year*: year dummy variable

Two tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

Table 5.24: Fixed effects regressions with robust estimation – RMC human capital and firm performance

	ROA Coef.(z) Model 1a	ROA Coef.(z) Model 1b	ROA Coef.(z) Model 2	lnTobin's Q Coef.(z) Model 1a	lnTobin's Q Coef.(z) Model 1b	lnTobin's Q Coef.(z) Model 2
RMCHC	0.02	0.009	-	0.003	-0.021	-
	(2.24)***	(0.64)		(2.07)**	(-2.06)**	
RMCHC*STDDEV	-	0.0006	-	-	0.001	-
		(0.53)			(1.18)	
ROA_{t-1}	0.18	0.18	0.18	-	-	-
	(5.04)***	(5.02)***	(4.99)***			
Tobin's Q_{t-1}	-	-	-	0.073	0.08	0.07
				(2.62)***	(2.84)***	(2.26)**
lnMKTCAP	0.16	0.16	0.15	-	-	-
	(3.68)***	(3.65)***	(3.02)***			
lnTA	-	-	-	-0.25	-0.24	-0.23
				(-5.30)***	(-5.07)***	(-4.50)***
STDDEV	-0.0016	-0.002	-0.001	-0.0007	-0.002	-0.001
	(-3.44)***	(-1.62)	(-2.66)***	(-2.03)**	(-1.73)*	(-2.83)***
RMC	0.018	0.017	0.03	0.0009	0.0009	0.006
	(1.69)*	(1.57)	(2.03)**	(0.12)	(0.11)	(0.62)
INDEP	0.009	-0.02	0.01	-0.019	-0.02	-0.02
	(1.67)*	(-1.30)	(1.64)	(-1.84)*	(-1.82)*	(-1.75)*
CEODUAL	0.003	0.004	0.005	0.013	0.01	0.015
	(0.20)	(0.22)	(0.31)	(1.05)	(1.03)	(1.19)
BRDSIZE	0.007	0.004	0.02	0.06	0.06	0.077
	(0.27)	(0.13)	(0.60)	(2.90)***	(2.95)***	(3.11)***
LEV	-0.026	-0.03	-0.04	-0.0007	-0.10	-0.11
	(-1.52)	(-1.50)	(-1.97)**	(-2.03)**	(-7.76)***	(-7.37)***
MTB	0.003	0.003	0.003	0.01	0.014	0.013
	(3.38)***	(3.33)***	(2.77)***	(20.31)***	(20.19)***	(18.41)***
Tenure	-	-	0.03	-	-	-0.06
			(1.34)			(-3.33)***
RMC tenure	-	-	-0.01	-	-	0.02
			(-0.62)			(1.54)
Exp	-	-	0.003	-	-	0.0005
			(3.29)***			(0.63)
Quali	-	-	0.008	-	-	0.006
			(1.51)			(1.48)
SHARE	-	-	-0.19	-	-	0.035
			(-1.41)			(0.30)
CONS	-0.30	-0.28	-0.3	2.33	2.30	2.30
	(-2.78)***	(-2.63)***	(-2.37)**	(15.32)**	(15.17)***	(13.79)***
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	1361	1361	1361	1359	1359	1359
No. of firms	367	367	348	365	365	345
F statistics	10.96	9.87	8.04	56.17	51.34	37.68
Adjusted R^2	0.22	0.22	0.19	0.48	0.49	0.48
Highest VIF	9.33		8.81	8.40		8.78
Lowest VIF	1.09		1.12	1.10		1.10

Notes: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; *BRDSIZE*: number of board members; *ROA*: current year return on assets; ROA_{t-1} : prior year return on assets; Tobin's Q: market measure of wealth, measured by market value of firm + debt/book value of total assets; Tobin's Q_{t-1}: Tobin's Q of previous year; ln*MKTCAP*: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *SHARE*: the average percentage of RMC members shareholding; *Tenure*: average number of years as a board member of a firm; *RMC Tenure*: average years of risk management experience of RMC members; *Total Quali*: the average number of qualifications obtained by RMC members; *Exp:* the average amount of experience obtained by RMC members; *RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 when firms had a combined RMC

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

Table 5.25: Fixed effects regressions with robust estimation – RMC human capital and the likelihood of financial distress

	PBANK Coef.(z) Model 1a	PBANK Coef.(z) Model 1b	PBANK Coef.(z) Model 2	Naïve Coef.(z) Model 1a	Naïve Coef.(z) Model 1b	Naïve Coef.(z) Model 2
RMCHC	0.02	0.02	-	-1.97	-2.72	-
	(1.08)	(0.65)		(-2.50)**	(-3.16)***	
RMCHC*STDDEV	-	-0.0006	-	-	-0.05	-
		(-0.25)			(-2.18)**	
$PBANK_{t-1}$	0.03	0.03	0.03	-	-	-
	(2.57)**	(2.52)**	(2.26)**			
lnMKTCAP	-0.78	-0.79	-0.76	-6.34	-6.04	-3.48
	(-8.12)***	(-8.14)***	(-7.78)***	(-1.28)	(-1.22)	(-0.69)
STDDEV	0.002	0.003	0.002	-0.09	-0.12	-0.09
	(1.76)*	(0.86)	(1.71)*	(-1.64)	(-2.17)**	(-1.62)
RMC	-0.001	-0.004	-0.009	-1.26	-1.30	-0.77
	(-0.05)	(-0.17)	(-0.33)	(-1.03)	(-1.06)	(-0.68)
INDEP	0.04	0.03	0.07	-0.02	0.005	-0.33
	(1.19)	(1.11)	(2.08)**	(-0.01)	(0.00)	(-0.17)
CEODUAL	-0.06	-0.06	-0.007	2.60	-2.10	-2.35
	(-0.83)	(-1.52)	(-0.32)	(2.29)**	(-1.08)	(-1.76)*
BRDSIZE	-0.14	-0.13	-0.16	-0.59	-0.44	-1.20
	(-2.27)**	(-2.14)**	(-2.39)**	(-0.18)	(-0.14)	(-0.30)
LEV	1.14	1.14	1.16	1.46	1.64	3.13
	(27.79)***	(27.72)***	(28.01)***	(0.73)	(0.82)	(1.22)
MTB	-0.024	-0.02	-0.023	-0.11	-0.12	-0.09
	(-11.81)***	(-11.74)***	(-11.14)***	(-1.07)	(-1.15)	(-1.15)
Tenure	-	-	0.014	-	-	-2.30
			(0.30)			(-0.86)
RMC Tenure	-	-	0.02	-	-	2.56
			(0.40)			(1.19)
Exp	-	-	0.002	-	-	-0.19
			(0.09)			(-1.82)*
Quali	-	-	0.003	-	-	0.01
			(0.29)			(0.01)
SHARE	-	-	-0.04	-	-	-17.72
			(-0.11)			(-1.12)
CONS	0.52	0.51	0.40	8.31	9.46	2.10
	(2.17)**	(2.09)**	(1.56)	(0.68)	(0.77)	(0.15)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	1305	1305	1158	1362	1362	1211
No. of firms	355	355	336	365	365	345
F statistics	62.4	61.96	51.72	8.14	8.05	5.15
Adjusted R2	0.43	0.43	0.57	0.07	0.06	0.07
Highest VIF	9.17		8.23	9.15		8.82
Lowest VIF	1.08		1.09	1.12		1.11

Notes: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: The financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; *BRDSIZE*: number of board members; *PBANK(-Z-Score)*: probability of financial distress calculated using Altman Z-Score; $PBANK_{t-1}$(-Z-$Score_{t-1}$): Altman Z-Score of previous year; *Naïve*: the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004); lnMKTCAP: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *SHARE*: the average percentage of RMC members shareholding; *Tenure*: average number of years as a board member of a firm; *RMC Tenure*: average years of risk management experience of RMC members; *Quali*: the average number of qualifications obtained by RMC members; *Exp:* the average amount of experience of RMC members; *RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 when firms had a combined RMC.

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

5.5.3 Heckman (1978) test – Self-selection bias (Endogenous issues)

Self-selection may be a concern for this study, as Australian firms can choose whether or not to establish a RMC (ASXCGC, 2013). A firm's choice of having a separate RMC or a combined RMC may introduce bias into the results, as firms with high performance are more likely to choose to establish a RMC or a separate RMC than firms with low performance. In addition, some of the factors that are correlated with a firm's choice of adopting a RMC may also be correlated with the observed firm performance and the likelihood of financial distress. Therefore, these non-observable factors may potentially bias results. In order to verify the results, this study adopted two-stage Heckman tests. The two-stage Heckman procedures were used to control for problems of selection bias and omitted variables. In the first stage, a probit regression was conducted. The dependent variable was a RMC, and similar to previous research, the test included board size, CEO duality, and board independence, as the previous studies have indicated that these three variables influence firms' establishment of a RMC and separate RMC (Hines and Peters, 2015; Ling, Zain and Jaffar, 2014; Subramaniam, McManus and Zhang, 2009). Using the parameters from this model, the inverse Mills ratio was computed for all sample firms (Heckman, 1978; Johnston and DiNardo 1997). The INVMILL (Mills) coefficient was then used as an additional control variable to account for the omitted variable and self-selection bias in the stage 2 model. This method for correction of self-selection bias is robust. In addition, two different sets of variables make the inverse Mills methods less sensitive to the assumption of normality (Johnston and DiNardo, 1997). In the second stage, an OLS model was run and included the Mills ratio obtained from the first stage in the regression analysing as a control variable to control for the endogeneity of the choice of RMC.

A firm's choice of establishing a separate RMC may introduce bias into the results, as firms with high performance may be more likely to choose to establish a separate RMC than firms with low performance. Heckman tests were also used to control firms' choice of

establishing a separate RMC. Similarly, in the first stage, a probit regression was conducted. The dependent variable was separate RMC (SRMC), and similar to the previous studies, the test included board size, CEO duality, and board independence, as these three variables influence firms' establishment of a separate RMC (Subramaniam, McManus and Zhang, 2009). Using the parameters from this model, the inverse Mills ratio was computed for all sample firms (Heckman, 1978; Johnston and DiNardo 1997). The INVMILL coefficient was then used as an additional control variable to account for the omitted variable and self-selection bias in the stage 2 model. In the second stage, an OLS model was run and included the Mills ratio obtained from the first stage in the regression analysing as a control variable to control for the endogeneity of the choice of separate RMC.

The results of Heckman tests are presented in Tables 5.26 and 5.27. In stage 1, consistent with Subramaniam, McManus and Zhang (2009), the results show that board size, board independence, and CEO duality were significantly associated with the existence of a RMC and the existence of a separate RMC. After controlling for selection bias and omitted variables, the results remained the same. The results consistently show the association between risk (STDDEV) and accounting performance (ROA) was moderated by firms' with a SRMC, as STDDEV*SRMC was positively associated with firms' financial performance ROA (B = 0.005; $p<0.01$). The results show there was no relationship between the existence of a RMC and separate RMC and firm performance (ROA). Alternatively, using Tobin's Q as a measurement of firm value achieved no significant results.

Consistent with the regression results, the Heckman tests suggest that RMC and SRMC did not have any association with the likelihood of financial distress (PBANK). The unchanged results suggest that the choice of a separate RMC or a RMC did not bias the result, and the Heckman tests further validated the regression results.

Table 5.26a: Stage 1 of the Heckman Test – RMC

	ROA	Tobin's Q	PBANK	Naïve
	RMC Coef(Z)	RMC Coef(Z)	RMC Coef(Z)	RMC Coef(Z)
BRDSIZE	0.07 (6.13)***	0.067 (6.13)***	0.064 (5.81)***	0.067 (6.13)***
INDEP	0.70 (5.30)***	0.70 (5.30)***	0.70 (5.24)***	0.70 (5.30)***
CEODUAL	-0.73 (-5.42)***	-0.73 (-5.42)***	-0.72 (-5.35)***	-0.73 (-5.42)***
CONS	-0.69 (-5.58)***	-0.69 (-5.58)***	-0.68 (-5.45)***	-0.69 (-5.58)***
No. observations	2312	2310	2235	2312
Wald Chi 2	810.19	5160.90	2186.45	159.08

Note: STDDEV= total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; BRDSIZE= number of board members; INDEP= the percentage of board members who were independent calculated as the independent board total/total number of board; CEODUAL = dummy variable 1 if the CEO was also the chair, 0 otherwise; Tobin's Q= the market value of equity and debt divided by the book value of total assets

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

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Table 5.26b: Stage 1 of the Heckman Test – separate RMC

	ROA	Tobin's Q	PBANK	Naïve
	SRMC Coef(Z)	SRMC Coef(Z)	SRMC Coef(Z)	SRMC Coef(Z)
BRDSIZE	0.12 (7.77)***	0.12 (7.77)***	0.11 (7.16)***	0.93 (4.67)***
INDEP	0.93 (4.67)***	0.93 (4.67)***	0.86 (4.28)***	0.12 (7.77)***
CEODUAL	0.32 (1.75)*	0.32 (1.75)*	0.33 (1.83)*	0.32 (1.75)*
CONS	-2.96 (-15.24)***	-2.96 (-15.24)***	-2.89 (-14.66)***	-2.96 (-15.24)***
No. observations	2312	2310	2235	2312
Wald Chi 2	151.72	490.58	365.69	63.60

Note: STDDEV= total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; BRDSIZE= number of board members; INDEP= the percentage of board members who were independent calculated as the independent board total/total number of board; CEODUAL = dummy variable 1 if the CEO was also the chair, 0 otherwise; Tobin's Q= the market value of equity and debt divided by the book value of total assets.

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

Table 5.27a: Stage 2: Heckman test – RMC, separate RMC, and firm performance

	ROA Coef.(z)				lnTobin's Q Coef.(z)			
	RMC		SRMC		RMC		SRMC	
RMC	0.006	-0.005	-	-	0.001	0.002	-	-
	(0.81)	(-0.48)			(0.67)	(0.29)		
SRMC	-	-	0.015	-0.03	-	-	0.002	-0.001
			(1.59)	(-1.74)*			(0.56)	(-0.23)
RMC*STDDEV	-	0.001	-	-	-	-0.0001	-	-
		(1.24)				(-0.29)		
SRMC*STDDEV	-	-	-	0.005	-	-	-	0.0003
				(2.99)***				(0.61)
ROA_{t-1}	0.10	0.10	0.10	0.10	-	-	-	-
	(5.14)***	(5.07)***	(5.12)***	(5.24)***				
lnTobin's Q_{t-1}	-	-	-	-	0.08	0.07	0.07	0.07
					(5.52)***	(5.51)***	(5.50)***	(5.45)***
lnMKTCAP	0.06	0.06	0.05	0.05	-	-	-	-
	(1.17)	(1.07)	(1.01)	(1.05)				
lnTA	-	-	-	-	-0.18	-0.17	-0.17	-0.17
					(-8.78)***	(-8.71)***	(-8.67)***	(-8.65)***
MILLS	0.02	0.02	-0.02	-0.02	0.002	0.002	0.006	0.006
	(0.19)	(0.97)	(-1.84)*	(-1.74)*	(0.30)	(0.29)	(1.41)	(1.44)
STDDEV	-0.003	-0.004	-0.003	-0.003	-0.0003	-0.0003	-0.0003	-0.0004
	(-4.78)***	(-4.46)***	(4.73)***	(4.94)***	(-1.92)*	(-1.29)	(-1.96)**	(-2.00)**
LEV	-0.31	-0.31	-0.31	-0.31	-0.06	-0.06	-0.06	-0.06
	(-13.14)***	(-13.17)***	(-13.19)***	(-13.28)***	(-9.05)***	(-9.05)***	(-9.10)***	(-9.12)***
MTB	0.09	0.10	0.10	0.09	0.37	0.37	0.37	0.37
	(3.13)***	(3.22)***	(3.41)***	(3.36)***	(55.11)***	(55.10)***	(55.13)***	(55.13)***
CONS	0.02	0.03	0.09	0.07	1.73	1.77	1.72	1.72
	(0.19)	(0.25)	(0.65)	(0.58)	(28.36)***	(26.92)***	(28.04)***	(28.04)***
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	583	583	583	583	583	583	583	583
No. of firms	2312	2312	2312	2312	2310	2310	2310	2310
Wald chi2	14.19	13.64	14.43	14.26	268.25	256.45	268.60	256.85
Adjusted R-square	0.07	0.07	0.07	0.07	0.76	0.76	0.76	0.76

Note: STDDEV: total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; INDEP: the percentage of board members who were independent calculated as the independent board total/total number of board; LEV: the financial leverage of the firm, computed as total liabilities to total assets; MTB: market to book ratio. The ratio of year-end market capitalisation to total common equity; BRDSIZE: number of board members; Z-Score: probability of bankruptcy calculated using Altman Z-Score; Z-Scoret-1: Altman Z-Score of previous year; Naïve: the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004); lnMKTCAP: the natural logarithm of market capitalisation; lnTA: the natural logarithm of total assets; CEODUAL: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; SRMC: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 otherwise; RMC: dummy variable, taking a rate of 1 when firms had a RMC, 0 otherwise; Year: year dummy variable

Two-tailed tests significant at $p<0.01$***; $p<0.05$**; $p\leq 0.10$*

Table 5.27b: Stage 2: Heckman test – the existence of RMC, SRMC, and the likelihood of financial distress

	PBANK Coef.(z)				Naïve			
	RMC		SRMC		RMC		SRMC	
RMC	-0.01	-0.02	-	-	0.002	-0.01	-	-
	(-1.45)	(-1.82)*			(0.18)	(-0.78)		
SRMC		-	-0.008	0.0005	-	-	-0.012	-0.009
	-		(-0.80)	(0.02)			(-0.92)	(-0.36)
RMC*STDDEV		0.001	-	-	-	0.001	-	-
	-	(1.20)				(0.13)		
SRMC*STDDEV		-	-	-0.001	-	-	-	-0.0003
	-			(-0.47)				(-0.13)
$PABNK_{t-1}$	0.06	0.056	0.05	0.05	-	-	-	-
	(4.80)***	(4.80)***	(4.77)***	(4.76)***				
lnMKTCAP	-0.02	-0.03	-0.02	-0.02	-0.24	0.076	0.09	0.085
	(-0.37)	(-0.47)	(-0.39)	(-0.39)	(6.37)***	(1.06)	(1.20)	(1.20)
MILLS	-0.02	-0.02	-0.02	-0.025	0.02	0.02	0.02	0.022
	(-0.90)	(-0.82)	(-1.61)	(-1.62)	(0.61)	(0.67)	(1.24)	(1.24)
STDDEV	0.003	0.002	0.003	0.003	-0.0008	-0.002	-0.0008	-0.0008
	(3.99)***	(2.27)**	(4.03)***	(4.05)***	(-0.98)	(-1.48)	(-0.99)	(-0.98)
LEV	0.73	0.73	0.73	0.73	0.22	0.22	0.22	0.22
	(25.30)***	(25.32)***	(25.33)***	(25.32)***	(6.89)***	(6.87)***	(6.87)***	(6.87)***
MTB	-0.45	-0.45	-0.45	-0.45	-0.24	-0.24	-0.25	-0.25
	(-14.55)***	(-14.42)***	(-14.56)***	(-14.56)***	(-6.37)***	(-6.25)***	(-6.43)***	(-6.42)***
CONS	-0.98	-0.97	-0.96	-0.96	0.20	0.21	0.17	0.17
	(-8.79)***	(-8.63)***	(-8.39)***	(-8.38)***	(0.12)	(1.18)	(0.93)	(0.93)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	2235	2235	2235	2235	2312	2312	2312	2312
No. of firms	571	571	571	571	583	583	583	583
Wald chi2	57.01	56.73	57.04	54.54	13.13	12.59	13.24	12.63
Adjusted R^2	0.58	0.58	0.58	0.58	0.05	0.05	0.05	0.05

Note: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *BRDSIZE*: number of board members; *Z-Score*: probability of bankruptcy calculated using Altman Z-Score; $Z\text{-}Score_{t-1}$: Altman Z-Score of previous year; *Naïve*: the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004); ln*MKTCAP*: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; S*RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 otherwise; RMC: dummy variable, taking a rate of 1 when firms had a RMC, 0 otherwise; *Year*: year dummy variable

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

5.5.4 Two Stage Least Square regression (2SLS) - Endogeneity issue

This study suggests that RMC human capital may influence firm performance and the likelihood of financial distress; however, firms' performance and likelihood of financial distress may also have an impact on RMC turnover, which affects firms' RMC human capital. In order to control for this reverse causality issue and address the potential endogeneity problem, the 2SLS method is frequently used in accounting research. The Hausman (1978) test has been utilised to justify whether 2SLS is more appropriate than OLS regression. Specifically, the Hausman test provides the formal test on whether there is a significant

difference between the IV estimator from the OLS estimator and from 2SLS. The Hausman results strongly rejected the null hypothesis of there being no endogeneity problem, implying 2SLS generated more robust results than OLS. As a result, 2SLS was adopted in this study.

In the 2SLS regressions, potential endogeneity was controlled by using instrumental variables. The instrument variables need to be associated with the endogenous variables but do not have a direct influence on the dependent variables (Kennedy, 2003). This study used the average of the human capital score, matched by industry and year, as the instrument variable. This method has been commonly adopted in previous studies (Larcker and Rusticus, 2010; Lev and Sougiannis, 1996). Specifically, the average RMC human capital score is not directly related to performance and the likelihood of financial distress or the error term in the structural equation, but it is generally highly correlated with firm's RMC human capital (the original variable), as corporate activities are often evaluated by outsiders against industry norms, preventing managers from not following the norms (Larcker and Rusticus, 2010; Lev and Sougiannis, 1996). As a result, firms in the same industry prefer to have their RMC human capital converge to the average one in the industry, indicating a strong relationship between a firm's RMC human capital and the average RMC human capital score matched by industry and year (Lev and Sougiannis, 1996).

2SLS estimation was undertaken in two stages. In the first stage, RMC human capital was regressed against the instrument variable and all of the control variables in order to calculate the predicted value of RMC human capital. In the second stage, firm performance and the likelihood of financial distress were individually regressed against the fitted value of RMC human capital generated from the first stage regressions.

The results of the first stage 2SLS are reported in Table 5.28. The first stage regressed human capital (RMCHC) on the average of human capital (HCmean – the instrument variable) with all other variables. The second stage was estimated using the fitted value for human capital

(RMCHC) from the first stage. The first stage results indicate that the endogenous variable (human capital variable) was significantly related to the instrument variable in all four regression models.

The results of the second stage 2SLS are presented in Tables 5.29 and 5.30. They show that after utilising 2SLS to address the potential endogeneity problem, the results remained stable. RMC human capital was positively related to firm accounting-based performance (ROA) (B = 0.013; $p<0.05$). The association between risk (STDDEV) and firm performance (ROA) was moderated by firms' RMC human capital, as STDDEV*RMCHC was negatively associated with firms' financial performance (ROA) (B = 0.006; $p<0.01$), suggesting RMC human capital was also related to better risk management and better accounting performance of firms. In addition, RMC human capital was positively related to firm market-based performance (Tobin's Q) (B = 0.011; $p<0.01$). The association between risk (STDDEV) and firm performance (Tobin's Q) was marginally moderated by firms' RMC human capital, as STDDEV*RMCHC was negatively associated with firms' financial performance (Tobin's Q) (B = 0.002; $p<0.01$), suggesting RMC human capital also related to better risk management and better market performance of firms.

In terms of the likelihood of financial distress, the results of the 2SLS in Table 5.30 suggest that the RMC human capital factor score was negatively related to Naïve (B = -0.03; $p<0.05$), suggesting there was a negative relationship between the RMC human capital factor score and the likelihood of financial distress. The coefficient for the interaction of risk and RMC human capital was negatively and significantly associated with the likelihood of financial

distress (Naïve) (B = -0.05; $p<0.05$). However, the results do not show a significant relationship between RMC human capital factor score and PBANK[21].

After controlling for potential endogeneity problems, the results show that within the sample of firms that established a separate RMC was negatively related to accounting performance (ROA) and positively related to market performance (Tobin's Q).

This result supports the argument that firms do not choose the right corporate governance structure and challenges the assumption that firms efficiently select themselves into the right governance (Barzuza, 2016). To be specific, firms that could benefit from governance mechanisms often do not adopt them; alternatively firms that may not necessarily benefit from governance mechanisms are normally the first to comply with them (Barzuza, 2016). As a result, firms complying with the ASX CGPR (ASXCGC, 2014) to establish a separate RMC may not necessarily need a separate RMC, and establishing a separate RMC may incur extra costs, leading to low accounting performance. Firms that could benefit from having a separate RMC the most are frequently not adopting this recommendation because they see it as an additional cost. On the other hand, establishing a separate RMC may signal to the market and create a favourable image for firms, thereby flagging their commitment to good risk management practice. As a result, there is a positive relationship between a separate RMC and firms' market performance.

[21] Because a high score of Z-Score indicates lower financial distress and a low score of Z-Score indicates greater financial distress. In order to facilitate the interpretation of the results, this study used PBANK as –Z-Score. As a result, PBANK is positively related to the likelihood of financial distress.

Table 5.28: 2SLS first stage – RMC human capital and firms' management of risk - firm performance and the likelihood of financial distress

	ROA	lnTobin's Q	PBANK	Naïve
	RMCHC Coef.(z)	RMCHC Coef.(z)	RMCHC Coef.(z)	RMCHC Coef.(z)
HCmean	0.938	0.997	1.000	1.019
	(7.98)***	(13.19)***	(15.05)***	(13.89)***
ROA_{t-1}	0.78	-	-	-
	(1.76)*			
Tobin's Q_{t-1}	-	1.171	-	-
		(1.53)		
$PBANK_{t-1}$	-	-		-
lnMKTCAP	1.278	-	-	1.058
	(3.66)***			(3.39)***
lnTA	-	1.022	-	-
		(2.81)***		
STDDEV	-0.010	-0.008	-0.004	-0.002
	(-1.42)	(-1.21)	(-0.69)	(-0.40)
INDEP	-0.228	-0.310	-0.341	-0.235
	(-1.10)	(-1.56)	(-1.82)*	(-1.23)
CEODUAL	0.762	0.818	0.792	0.795
	(2.90)***	(3.58)***	(3.58)***	(3.50)***
BRDSIZE	1.459	1.100	1.191	1.003
	(3.15)***	(2.37)**	(2.94)***	(2.32)**
LEV	0.514	0.424	0.593	0.568
	(3.01)***	(2.33)**	(3.57)***	(3.52)***
MTB	-0.013	-0.003	-0.019	-0.016
	(-0.91)	(-0.19)	(-1.62)	(-1.34)
CONS	-3.883	-6.804	-4.431	-3.539
	(-3.66)***	(-2.74)***	(-4.20)***	(-3.70)***
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
No. of obs.	1361	1359	1305	1362
Adjusted R^2	0.08	0.17	0.18	0.17

Notes: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; *BRDSIZE*: number of board members; *PBANK(-Z-Score)*: probability of financial distress calculated using Altman Z-Score; $PBANK_{t-1}$(-Z-Score $_{t-1}$): Altman Z-Score of previous year; *Naïve*: the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004); lnMKTCAP: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *SHARE*: the average percentage of RMC members shareholding; *Tenure*: average number of years as a board member of a firm; *RMC Tenure*: average years of risk management experience of RMC members; *Quali*: the average number of qualifications obtained by RMC members; *Exp:* the average amount of experience of RMC members; *RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 when firms had a combined RMC.

Two-tailed tests significant at $p<0.01$***; $p<0.05$**; $p\leq 0.10$*

Table 5.29: 2SLS second stage – RMC human capital and firm performance

	ROA Coef.(z)	ROA Coef.(z)	lnTobin's Q Coef.(z)	lnTobin's Q Coef.(z)
RMCHC	0.013	0.019	0.011	0.01
	(2.04)**	(2.23)**	(1.29)***	(3.02)***
RMCHC*STDDEV	-	0.006	-	0.002
		(2.57)***		(1.82)*
ROA $_{t-1}$	0.24	0.24	-	-
	(5.27)***	(18.06)***		
Tobin's Q $_{t-1}$	-	-	0.27	0.26
			(5.44)***	(5.31)***
lnMKTCAP	-0.005	-0.001	-	-
	(-0.24)	(-0.06)		
lnTA	-	-	-0.14	-0.14
			(-4.83)***	(-4.83)***
STDDEV	-0.002	-0.009	-0.001	-0.004
	(-4.89)***	(-3.28)***	(-2.55)***	(-2.44)**
SRMC	-0.02	-0.022	0.015	0.016
	(-4.35)***	(-4.24)***	(3.13)***	(3.32)***
INDEP	-0.013	-0.02	0.003	0.002
	(-1.35)	(-1.78)*	(0.31)	(0.16)
CEODUAL	-0.002	0.006	0.02	0.02
	(-0.12)	(0.44)	(1.52)	(1.76)*
BRDSIZE	-0.003	0.014	0.011	0.02
	(-0.12)	(0.53)	(0.44)	(0.68)
LEV	-0.015	-0.015	-0.07	-0.07
	(-1.23)	(-1.22)	(-3.38)***	(-3.36)***
MTB	0.007	0.008	0.02	0.02
	(5.88)***	(6.05)***	(12.48)***	(12.55)***
CONS	0.09	0.07	1.50	1.51
	(1.21)	(0.96)	(11.37)***	(11.27)***
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
No. of obs.	1361	1361	1359	1359
Wald chi2	226.50	226.42	830.38	829.30
Adjusted R^2	0.34	0.34	0.56	0.56
F-stat first stage (Prob)	0.00	-	0.00	-
Robust F-statistics	64.31	-	174.14	-
Endogeneity test (Prob)	0.08	-	0.06	-

Notes: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; *BRDSIZE*: number of board members; *PBANK(-Z-Score)*: probability of financial distress calculated using Altman Z-Score; PBANK$_{t-1}$(-Z-Score $_{t-1}$): Altman Z-Score of previous year; *Naïve*: the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004); lnMKTCAP: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *SHARE*: the average percentage of RMC members shareholding; *Tenure*: average number of years as a board member of a firm; *RMC Tenure*: average years of risk management experience of RMC members; *Quali*: the average number of qualifications obtained by RMC members; *Exp:* the average amount of experience of RMC members; *RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 when firms had a combined RMC.

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

Table 5.30: 2SLS – RMC human capital and the likelihood of financial distress

	PBANK Coef.(z)	PBANK Coef.(z)	Naïve Coef.(z)	Naïve Coef.(z)
RMCHC	-0.01	-0.012	-0.03	-0.05
	(-0.51)	(-0.42)	(-2.07)**	(-2.14)**
RMCHC*STDDEV	-	-0.0007	-	-0.013
		(-0.12)		(-2.23)**
$PBANK_{t-1}$	0.10	0.10	-	-
	(5.27)**	(5.17)***		
lnMKTCAP	-0.04	-0.045	0.06	0.05
	(-0.67)	(-0.71)	(0.58)	(0.61)
STDDEV	-0.002	-0.0007	0.003	0.02
	(-1.49)	(-0.10)	(1.79)*	(2.65)***
SRMC	-0.02	-0.02	0.039	0.035
	(-1.23)	(-1.28)	(1.43)	(1.38)
INDEP	-0.05	-0.05	-0.007	0.004
	(-1.60)	(-1.58)	(-0.16)	(0.09)
CEODUAL	-0.02	-0.02	-0.04	-0.05
	(-0.56)	(-1.28)	(-1.00)	(-0.95)
BRDSIZE	-0.14	-0.14	0.08	0.043
	(-1.88)*	(-2.06)**	(0.74)	(0.43)
LEV	0.74	0.74	0.18	0.18
	(25.62)***	(25.62)***	(3.92)***	(4.27)***
MTB	-0.045	-0.05	-0.006	-0.006
	(-22.06)***	(-21.28)***	(2.42)**	(-2.10)**
CONS	-0.72	-0.71	-0.18	-0.14
	(-3.51)***	(-3.71)***	(-0.58)***	(-0.55)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
No. of obs.	1305	1357	1362	1211
Wald chi2	1588.25	1589.37	27.43	33.53
Adjusted R^2	0.55	0.55	0.01	0.01
F-stat first stage (Prob)	0.00	-	0.00	-
Robust F-statistics	177.27	-	193.64	-
Endogeneity test (Prob)	0.64	-	0.11	-

Notes: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: The financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; *BRDSIZE*: number of board members; *PBANK(-Z-Score)*: probability of financial distress calculated using Altman Z-Score; $PBANK_{t-1}$(-Z-$Score_{t-1}$): Altman Z-Score of previous year; *Naïve*: the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004); lnMKTCAP: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *SHARE*: the average percentage of RMC members shareholding; *Tenure*: average number of years as a board member of a firm; *RMC Tenure*: average years of risk management experience of RMC members; *Quali*: the average number of qualifications obtained by RMC members; *Exp:* the average amount of experience of RMC members; *RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 when firms had a combined RMC.

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

5.5.5 Generalised method of moments (GMM) - endogeneity issue

GMM is another method used to investigate the possibility of endogeneity (Arellano and Boad 1991; Arellano and Bover, 1995; Blundell and Bond, 1998). Specifically, the GMM method relies on moment assumption and does not rely on the distributional assumption of maximum likelihood. Therefore, GMM estimators produce more robust estimation, and are less sensitive to parametric requirements (Rassen, Schneeweiss, Glynn, Mittleman and Brookhart, 2009). The results of the GMM estimations are presented in Tables 5.31 and 5.32.

The results show that GMM estimation results were almost identical to the full specification of 2SLS estimates. Specifically, RMC human capital was positively related to firm accounting-based performance (ROA) (B = 0.013; p<0.05). The association between risk (STDDEV) and firm performance (ROA) was moderated by firms' RMC human capital, as STDDEV*RMCHC was negatively associated with firms' financial performance (ROA) (B = 0.006; $p<0.01$), suggesting RMC human capital also related to better risk management and better accounting performance of firms. In addition, RMC human capital was positively related to firm market-based performance (Tobin's Q) (B = 0.011; $p<0.01$). The association between risk (STDDEV) and firm performance (Tobin's Q) was marginally moderated by firms' RMC human capital, as STDDEV*RMCHC was negatively associated with firms' financial performance (Tobin's Q) (B = 0.002; $p<0.01$), suggesting RMC human capital also related to better risk management and better market performance of firms.

In terms of the likelihood of financial distress, the GMM results show that RMC human capital factor score was negatively related to Naïve (B = -0.03; p<0.05). The coefficient for the interaction of risk and RMC human capital was negatively and significantly associated with the likelihood of financial distress (Naïve) (B = -0.013; p<0.05), indicating RMC human capital was associated with better risk management and low level of the likelihood of financial distress.

However, the results do not show a significant relationship between RMC human capital factor score and PBANK[22].

Table 5.31: GMM with robust estimation – RMC human capital and firm performance

	ROA Coef.(z)	ROA Coef.(z)	lnTobin's Q Coef.(z)	lnTobin's Q Coef.(z)
RMCHC	0.013	0.019	0.011	0.01
	(2.04)**	(2.23)**	(3.33)***	(3.02)***
RMCHC*risk	-	0.006	-	0.002
		(2.57)***		(1.82)*
ROA $_{t-1}$	0.24	0.24	-	-
	(5.27)***	(5.40)***		
Tobin's Q $_{t-1}$	-	-	0.27	0.26
			(5.44)***	(5.31)***
lnMKTCAP	-0.005	-0.001	-	-
	(-0.24)	(-0.06)		
lnTA	-	-	-0.14	-0.14
			(-4.83)***	(-4.83)***
STDDEV	-0.002	-0.009	-0.001	-0.004
	(-4.89)***	(-3.28)***	(-2.55)**	(-2.44)**
SRMC	-0.02	-0.022	0.015	0.016
	(-4.35)***	(-4.24)***	(3.13)***	(3.32)***
INDEP	-0.014	-0.02	0.003	0.002
	(-1.35)	(-1.78)*	(0.31)	(0.16)
CEODUAL	-0.002	0.006	0.02	0.02
	(-0.12)	(0.44)	(1.52)	(1.76)*
BRDSIZE	-0.003	0.014	0.011	0.02
	(-0.12)	(0.53)	(0.44)	(0.68)
LEV	-0.015	-0.014	-0.07	-0.07
	(-1.23)	(-1.22)	(-3.38)***	(-3.36)***
MTB	0.007	0.008	0.02	0.02
	(5.88)***	(6.05)***	(12.48)***	(12.55)***
CONS	0.09	0.07	1.50	1.51
	(1.21)	(0.96)	(11.37)***	(11.27)***
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
No. of obs.	1361	1361	1359	1359
Wald chi2	226.50	226.42	830.38	829.30
Adjusted R^2	0.34	0.34	0.56	0.56
F-stat first stage (Prob)	0.00	-	0.00	-
Robust F-statistics	64.31	-	174.14	-
Endogeneity test (Prob)	0.07	-	0.06	-

Notes: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; *BRDSIZE*: number of board members; *PBANK(-Z-Score)*: probability of financial distress calculated using Altman Z-Score; PBANK$_{t-1}$(-Z-Score $_{t-1}$): Altman Z-Score of previous year; *Naïve*: the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004); lnMKTCAP: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *SHARE*: the average percentage of RMC members shareholding; *Tenure*: average number of years as a board member of a firm; *RMC Tenure*: average years of risk management experience of RMC members; *Quali*: the average number of qualifications obtained by RMC members; *Exp:* the average amount of experience of RMC members; *RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 when firms had a combined RMC.

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

[22]Since a high score of Z-Score indicates lower financial distress and a low score of Z-Score indicates greater financial distress. In order to facilitate the interpretation of the results, this study used PBANK as –Z-Score. As a result, PBANK is positively related to the likelihood of financial distress.

Table 5.32: GMM with robust estimation – RMC human capital and the likelihood of financial distress

	PBANK Coef.(z)	PBANK Coef.(z)	Naïve Coef.(z)	Naïve Coef.(z)
RMCHC	-0.01	-0.01	-0.03	-0.05
	(-0.51)	(-0.42)	(-2.07)**	(-2.22)**
RMCHC*risk	-	-0.0008	-	-0.013
		(-0.12)		(-2.32)**
$PBANK_{t-1}$	0.10	0.10	-	-
	(4.94)***	(4.87)***		
lnMKTCAP	-0.04	-0.045	0.06	0.05
	(-0.67)	(-0.70)	(0.58)	(0.51)
STDDEV	-0.002	-0.0007	0.003	0.02
	(-1.27)	(-0.09)	(1.79)*	(2.66)***
SRMC	-0.02	-0.02	0.038	0.035
	(-1.23)	(-1.29)	(1.43)	(1.32)
INDEP	-0.05	-0.05	-0.007	0.004
	(-1.38)	(-1.35)	(-0.16)	(0.10)
CEODUAL	-0.02	-0.02	-0.04	-0.05
	(-0.68)	(-0.76)	(-1.00)	(-1.39)
BRDSIZE	-0.14	-0.14	0.08	0.043
	(-1.73)*	(-1.86)*	(0.74)	(0.40)
LEV	0.74	0.74	0.18	0.18
	(16.89)***	(16.90)***	(3.92)***	(3.91)***
MTB	-0.045	-0.05	-0.006	-0.006
	(-12.39)***	(-12.17)***	(2.42)**	(-2.59)***
CONS	-0.72	-0.71	-0.18	-0.14
	(-3.39)***	(-3.51)***	(-0.58)***	(-0.45)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
No. of obs.	1305	1357	1362	1211
Wald chi2	886.07	895.31	27.43	27.54
Adjusted R^2	0.55	0.55	0.01	0.01
F-stat first stage (Prob)	0.00	-	0.00	-
Robust F-statistics	177.27	-	193.64	-
Endogeneity test (Prob)	0.60	-	0.11	-

Notes: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; *BRDSIZE*: number of board members; *PBANK(-Z-Score)*: probability of financial distress calculated using Altman Z-Score; $PBANK_{t-1}$(-Z-$Score_{t-1}$): Altman Z-Score of previous year; *Naïve*: the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004); lnMKTCAP: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *SHARE*: the average percentage of RMC members shareholding; *Tenure*: average number of years as a board member of a firm; *RMC Tenure*: average years of risk management experience of RMC members; *Quali*: the average number of qualifications obtained by RMC members; *Exp:* the average amount of experience of RMC members; *RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 when firms had a combined RMC.

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

5.5.6 Testing the validity of the instrument variable

In order to test the hypothesis that the endogenous variables were exogenous after using 2SLS and GMM, Wooldridge's (1995) robust score test and a robust regression-based tests were adopted, which is the robust version of the Durbin (1954) and Wu–Hausman (Hausman, 1978; Wu 1974) statistics. The variable was endogenous if $p < 0.05$ (Vieira, MacDonald and Damasceno, 2010). The results are presented in Tables 5.29 and 5.30.

The results of the tests did not reject the null hypothesis that RMCHC is exogenous in ROA ($p>0.05$), Tobin's Q ($p>0.05$), Z-Score ($p>0.1$), and Naïve ($p>0.1$) model. In addition, the results show that the first stage F statistics for all four models were above 10, suggesting the instrument variable used in this study was valid in all models (Staiger and Stock, 1997).

5.5.7 Other RMC human capital characteristics - gender diversity

This study further examined another characteristic of RMCs in relation to the likelihood of financial distress and gender diversity. A considerable body of work has suggested that board gender diversity affects board dynamics, decision making, monitoring, and in turn, affects firm outcomes. Specifically, Gul, Hutchinson and Lai (2013) documented that the gender diversity of boards may lead to more board discussion and monitoring of company issues, inducing managers to disclose more information on the operations, transactions, and strategy. Higgs (2003) and Tyson (2003) argued that gender diversity may improve board effectiveness, organisational value, and performance by offering new insights and perspectives. Adams and Ferreira (2009) documented that female directors have better attendance records than males, the more gender-diverse a board is, the higher the attendance of male directors. They also found that women directors are more likely to join monitoring committees, indicating gender-diverse boards allocate more effort to monitoring (Adams and Ferreira, 2009). Huang and Kisgen (2013) suggested that females are more risk averse than males. Specifically, they found that female CFOs make fewer and higher return requisitions than male CFOs (Huang and Kisgen,

2013). Nielsen and Huse (2010) found that gender diverse boards have less conflict and a higher level of strategic control and board development activities.

On the other hand, a number of studies have examined the association between board gender diversity and firm performance. Carter, Simkins and Simpson (2003) found that in the US, there is a positive relationship between the proportion of women on the board and firm performance, measured by Tobin's Q. Similarly, Erhardt and Werbel (2003) documented that board diversity levels were positively associated with firm performance, measured by return on asset. Nguyen and Faff (2006) found the same results in the Australian context, which indicates the presence of female directors is significantly related to firm value. Reddy, Locke, Scrimgeour, and Gunasekarage (2008) documented that small capitalisation New Zealand firms showed that female directors were associated with higher Tobin's Q. Adams and Ferreira (2009) found that firms with a low percentage of females on boards tended to have more volatile stock prices, suggesting a higher proportion of women on the board has a positive impact on the stock market. In contrast, Rose (2007) found that female board representation was not significantly linked to firm performance in Danish firms. Scholars have offered a number of reasons as to why there are conflicting results, such as a low number of observations (Shrader, Blackburn and Iles, 1997), endogenous factors of board composition (Adams and Ferreira, 2009), and industry or cultural differences (Arfken, Bellar and Helms, 2004).

Many governance reform proposals indicate that gender diversity is an important factor that increases corporate governance and firms' financial performance. For example, ASX CGPR (ASXCGC, 2014) recommends that Australia companies should have a gender diverse board, which also highlights the importance of gender diversity. Therefore, since gender diversity can offer new insights, enhance board monitoring, and increase the knowledge base, a high level of gender diversity within RMC members may enhance risk management practices. Thus, it is expected that firms with a female on the RMC, or a high proportion of females on a

RMC, may have a higher level of firm performance and lower level of the likelihood of financial distress.

In this study, gender diversity was measured as a dummy variable, taking a value of 1 if there were females on a RMC, 0 otherwise. The results are presented in Table 5.33, and indicate that there was a negative relationship between PBANK and females on a RMC (B = -0.02; p<0.05), indicating RMCs with female members were negatively associated with the likelihood of a firm experiencing financial distress. This is consistent with the previous argument that women are more risk averse and less likely to engage in excessive risk-taking behaviours (Carter, Simkins and Simpson, 2003; Erhardt and Werbel., 2003). However, females on a RMC showed no significant relationship with firm performance (ROA and Tobin's Q) and Naïve.

In unreported results, the percentage of females as another measurement of gender diversity was used, and the results showed the percentage of females on an RMC was not significantly associated with firm performance and the likelihood of financial distress.

Table 5.33: Females on a RMC and firms' management of risk - firm performance and the likelihood of financial distress

	ROA Coef.(z) Model 1	lnTobin'S Q Coef.(z) Model 2	PBANK Coef.(z) Model 1	Naïve Coef.(z) Model 2
ROA_{t-1}	0.15 (9.68)***		-	-
$lnTobin'S\ Q_{t-1}$	-	0.07 (2.64)***	-	-
$PBANK_{t-1}$	-	-	0.03 (2.56)**	-
lnMKTCAP	0.16 (3.71)***	-	-0.78 (-8.10)***	-6.48 (-1.31)
lnTA	-	-0.26 (-5.35)***	-	-
STDDEV	-0.002 (-3.46)***	-0.0007 (-2.02)**	0.002 (1.73)*	-0.09 (-1.62)
RMC	0.02 (1.66)*	0.0004 (0.06)	-0.001 (-0.05)	-1.15 (-0.94)
INDEP	-0.02 (-1.26)	-0.02 (-1.85)*	0.04 (1.20)	-0.03 (-0.02)
CEODUAL	0.0003 (0.20)	0.01 (1.06)	-0.06 (-1.54)	-2.23 (-1.15)
BRDSIZE	0.003 (0.10)	0.06 (2.93)***	-0.14 (-2.27)**	-0.74 (-0.23)
LEV	-0.03 (-1.50)	-0.10 (-7.60)***	1.15 (27.84)***	1.32 (0.66)
MTB	0.003 (3.38)***	0.01 (20.23)***	-0.02 (-11.89)***	-0.10 (-0.94)
Gender	-0.004 (-0.96)	0.003 (0.92)	-0.02 (-1.91)**	-0.50 (-0.94)
RMCHC	0.016 (2.32)**	0.003 (2.12)**	0.02 (1.08)	-1.91 (-2.40)**
CONS	-0.30 (-2.88)***	2.33 (15.20)***	0.51 (2.14)**	-9.09 (-0.75)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
No. of obs.	1305	1357	1362	1211
No. of firms	355	366	365	345
F statistics	9.90	50.58	65.67	7.86
Adjusted R^2	0.21	0.49	0.43	0.07
Highest VIF	9.32	8.46	9.17	9.15
Lowest VIF	1.09	1.10	1.08	1.12

Notes: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; *BRDSIZE*: number of board members; *PBANK(-Z-Score)*: probability of financial distress calculated using Altman Z-Score; $PBANK_{t-1}$(-Z-$Score_{t-1}$): Altman Z-Score of previous year; *Naïve*: the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004); lnMKTCAP: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *SHARE*: the average percentage of RMC members shareholding; *Tenure*: average number of years as a board member of a firm; *RMC Tenure*: average years of risk management experience of RMC members; *Quali*: the average number of qualifications obtained by RMC members; *Exp:* the average amount of experience of RMC members; *RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 when firms had a combined RMC; *Gender:* dummy variable, taking a rate of 1 if there were females on a RMC, 0 otherwise.

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

5.5.8 Other RMC human capital characteristics – qualification score

This study adopted another measure for qualifications, coding qualifications based on a 4-point scale (1=diploma degree, 2=bachelor degree, 3=masters degree, 4=PHD degree). After calculating all of the qualification scores for each RMC member, the average qualification score of each firm was computed, and the average qualification score was then used in the fixed effects regression models to test the relationship between this average qualification score, firm performance, and the likelihood of financial distress. The results are presented in Table 5.34. The results show that qualification score was not significantly related to firm performance and the likelihood of financial distress.

Table 5.34: Qualification score and firms' management of risk - firm performance and the likelihood of financial distress

	ROA Coef.(z) Model 1	lnTobin'S Q Coef.(z) Model 2	PBANK Coef.(z) Model 1	Naïve Coef.(z) Model 2
ROA_{t-1}	0.14 (8.73)***	-	-	-
lnTobin'S Q_{t-1}	-	0.07 (2.49)**	-	-
$PBANK_{t-1}$	-	-	0.03 (2.20)**	-
lnMKTCAP	0.15 (3.19)***	-	-0.76 (-7.77)***	-3.52 (-0.66)
lnTA	-	-0.23 (-4.57)***	-	-
STDDEV	-0.04 (-2.65)***	-0.001 (-2.77)***	0.002 (1.70)*	-0.10 (-1.59)
RMC	0.03 (2.02)**	0.006 (0.66)	-0.01 (-0.40)	-0.82 (-0.58)
INDEP	-0.02 (-1.37)	-0.02 (-1.67)*	0.07 (2.04)**	-0.08 (-0.04)
CEODUAL	0.005 (0.28)	0.014 (1.16)	-0.06 (-1.76)*	-2.36 (-1.19)*
BRDSIZE	0.02 (0.53)	0.075 (3.13)***	-0.16 (-2.35)**	-1.64 (-0.44)
LEV	-0.04 (-1.94)*	-0.11 (-7.33)***	1.17 (27.79)***	2.95 (1.39)
MTB	0.003 (2.71)***	0.013 (18.15)***	-0.023 (-11.16)***	-0.08 (-0.68)
Tenure	0.03 (1.44)	-0.05 (-3.04)***	0.012 (0.24)	-2.20 (-0.80)
RMC Tenure	-0.01 (-0.70)	0.02 (1.36)	0.02 (0.40)	2.48 (1.08)
Exp	0.003 (3.28)***	0.0004 (0.50)	0.0001 (0.04)	-0.19 (-1.60)
Qualiscore	0.003 (0.96)	0.002 (1.00)	-0.002 (-0.39)	-0.09 (-0.27)
SHARE	-0.19 (-1.18)	0.018 (0.15)	-0.03 (-0.10)	-18.32 (-1.01)
CONS	-0.3 (-2.33)**	2.30 (13.62)***	0.41 (1.59)	-1.14 (-0.08)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
No. of obs.	1361	1359	1305	1362
No. of firms	367	365	355	365
F statistics	8.30	37.35	53.71	5.38
Adjusted R^2	0.20	0.48	0.53	0.07
Highest VIF	8.86	8.72	7.95	7.98
Lowest VIF	1.12	1.10	1.09	1.12

Notes: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: The financial leverage of the firm, computed as total liabilities to total assets; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise; *BRDSIZE*: number of board members; *PBANK(-Z-Score)*: probability of financial distress calculated using Altman Z-Score; PBANKt-1(-Z-Score t-1): Altman Z-Score of previous year; *Naïve*: the probability of bankruptcy using the Naïve model developed by Bharath and Shumway, (2004); lnMKTCAP: the natural logarithm of market capitalisation; *lnTA*: the natural logarithm of total assets; *SHARE*: the average percentage of RMC members shareholding; *Tenure*: average number of years as a board member of a firm; *RMC Tenure*: average years of risk management experience of RMC members; *Quali*: the average number of qualifications obtained by RMC members; *Exp:* the average amount of experience of RMC members; *RMC*: dummy variable, taking a rate of 1 when firms had a separate RMC, 0 when firms had a combined RMC.

Two-tailed tests significant at p<0.01***; p<0.05**; p≤ 0.10*

5.5.9 Non-linear relationship-risk and firm performance

This study examined whether there was a curvilinear relationship between risk and firm performance, and the likelihood of financial distress. A quadratic regression was adopted by including the square of risk as an additional regressor in this study. The main advantage of the quadratic regression is that the turning point is determined endogenously (S. S. Chen, Ho, Lee and Shrestha, 2004). Table 5.35 shows the results, which suggest that there is a significant positive relationship between ROA and STDDEV; $STDDEV^2$ was significantly and negatively related to ROA, suggesting that there is a non-linear relationship between firm risks and accounting performance. As firm risk increases, firm performance increases until it reaches the peak point, after that, as firms take more risk, firm performance starts to decrease. This study calculated the peak point using the derivation method. The results suggest that STDDEV<8.33, ROA increases as STDDEV increases. However, STDDEV > 8.33, ROA decreases as STDDEV increases, indicating a curvilinear relationship between risk (STDDEV) and firms' accounting performance (ROA). However, this study did not find a non-linear relationship between risk and the likelihood of financial distress.

Table 5.35: Non-linear results – risk and firm performance

	ROA Coef.(z)
ROA_{t-1}	0.09
	(4.44)***
lnMKTCAP	0.05
	(0.93)
STDDEV	0.005
	(3.01)***
$STDDEV^2$	-0.0003
	(-5.39)***
INDEP	0.002
	(0.14)
CEODUAL	0.04
	(2.38)**
BRDSIZE	-0.07
	(-1.12)
LEV	-0.30
	(-13.11)***
MTB	0.11
	(3.84)***
CONS	0.02
	(0.13)
Year fixed effects	Yes
Industry fixed effects	Yes
No. of obs.	2310
No. of firms	582
Wald chi2	14.79
Adjusted R^2	0.08
Highest VIF	8.90
Lowest VIF	1.08

Note: *STDDEV:* total risk calculated as the standard deviation of a firm's daily stock returns for each fiscal year; *$STDDEV^2$:* total risk squared, computed as STDDEV*STDDEV; *INDEP*: the percentage of board members who were independent calculated as the independent board total/total number of board; *LEV*: the financial leverage of the firm, computed as total liabilities to total assets; ln*MKTCAP*: the natural logarithm of market capitalisation; *MTB*: market to book ratio. The ratio of year-end market capitalisation to total common equity; *BRDSIZE*: number of board members; *ROAt*: current year return on assets; *ROA_{t-1}*: prior year return on assets; *CEODUAL*: dummy variable, taking a rate of 1 if the CEO was also the chair, 0 otherwise;

5.6 DISCUSSION OF THE RESULTS

5.6.1 RMC existence, firm performance, and the likelihood of financial distress

H1 (a): there is a positive relationship between risk and firm performance for firms with a risk management committee.

H1 (b): there is a positive relationship between risk and firm performance for firms with a separate risk management committee.

According to agency theory, previous studies have consistently suggested that a RMC, as a monitoring mechanism, leads to higher firm performance relative to a firm

without a RMC. This is because a RMC ensures that risks of diversification or non-focused strategy are managed effectively (Kallamu and Saat, 2014). Specifically, the board, through its RMC platform, can monitor the risk-taking activities of managers, review the overall risk exposure of the firm (Ng, Chong and Ismail, 2012; Tao and Hutchinson, 2013), and provide advice on how to deal with firms' present and future risks to identify potential risk opportunities. Therefore, a RMC plays a crucial role in monitoring managers' risk-taking behaviours (Subramaniam, McManus and Zhang, 2009) and in minimising the agency conflicts between shareholders and managers (Carter, D'Souza, Simkins and Simpson, 2010), leading to a decrease in agency costs and an increase in firm performance, according to agency theory.

Although there is a strong theoretical relationship between the existence of a RMC and firm performance, to date, research in this area is sparse. A number of papers have examined the determinants of a RMC and suggested that leverage, board size, and board independence determine the formation of a RMC and separate RMC (Hines and Peters, 2015; Ling, Zain and Jaffar, 2014; Subramaniam, McManus and Zhang, 2009). Hines and Peters (2015) investigated the impact of RMC existence on firms. They found that in the US, RMC formation is not significantly associated with profitability and short-term risk outcomes (level of loan charge-offs and the presence of a Chief Risk Officer).

In addition, previous research has suggested that delegating a separate RMC instead of a combined committee to oversee risk activities is a better way for companies to manage risk (Aebi, Sabato and Schmid, 2012; Brancato, Tonello, Hexter and Newman, 2006; Kirkpatrick, 2009; Mongiardino and Plath, 2010, Subramaniam, McManus and Zhang, 2009). This is due to the overload of the audit committee, as they may have insufficient skills for overseeing non-financial risks, such as

operational, strategic, reputation, and regulatory risk (Brown, Steen and Foreman, 2009; Daly and Bocchino, 2006). As a result, having a separate RMC may be better to control for managers' opportunistic behaviour regarding risks, leading to a decrease in agency costs and an increase in firm performance. A number of studies have examined the relationship between enterprise risk management (ERM) and firm performance; however, the results have been mixed. Hoyt and Liebeneberg (2011) determined a positive relationship between firm value and the use of ERM. Pagach and Warr (2010) found little impact of ERM adoption on firms' outcomes. Gordon, Loeb and Tseng (2009) showed that the relationship between firm performance and ERM is contingent on the match between risk management and firm characteristics. To the best of the researcher's knowledge, there is currently no research that has examined the relationship between a separate RMC or a RMC and firm performance or the likelihood of financial distress.

This study investigated the existence of a RMC and separate RMC on firm performance and the likelihood of financial distress. Firstly, after controlling for the possibility of self-selection bias, the results showed that the existence of a RMC and separate RMC were not significantly associated with firm performance, indicating that RMC existence may represent a symbolic governance practice. Firms could use this symbolic practice to manage their reputational legitimacy, even though the formation of a RMC or SRMC may not be associated with performance (Westphal and Graebner, 2010), which corresponds with the argument by Hines and Peter (2015). Secondly, the results further document that the relationship between risk and firms' accounting performance was moderated by the existence of a separate RMC, indicating that the existence of a RMC is associated with better risk management and better firms'

accounting performance, which supports the agency theory regarding monitoring and control.

H2(a): there is a negative relationship between risk and the likelihood of financial distress for firms with a risk management committee.

H2(b): there is a negative relationship between risk and the likelihood of financial distress for firms with a separate risk management committee

Previous literature has suggested that risk management reduces the likelihood of financial distress. Specifically, Smith and Stulz (1985) provided the initial financial distress arguments regarding risk management, arguing that efficient risk management can reduce the likelihood of financial distress and increase firm value by reducing allocative inefficiency (i.e., deadweight costs) and increasing debt capacity, which in turn benefits the firm through valuable tax shields or by decreasing agency costs in excess free cash flow. As a RMC can help firms identify potential risks and effectively manage risks, this thereby decreases the probability of financial distress.

In addition, signalling theory also suggests that firms disclose the existence of a RMC to signal the market and create a favourable image in the market. Even though RMC formation is not mandatory, firms may establish a RMC to flag their commitment to good risk management practice. In turn, such disclosure is expected to minimise any issues in relation to debt capacity and investors' devaluation of the firm (Subramaniam, McManus and Zhang, 2008), therefore reducing the likelihood of financial distress (Cotter, Lokman and Najah, 2011). This study found no significant relationship between the existence of a RMC or SRMC and the likelihood of financial distress. Furthermore, the relationship between risk and the likelihood of financial distress was not moderated by the existence of a RMC or separate RMC after controlling for the self-selection bias. This result may suggest that the mere the

existence of a RMC or separate RMC does not decrease firms' likelihood of financial distress, which confirms the view that RMC establishment may serve as a symbolic practice or as a signal to the market (Hines and Peters, 2015; Rodrigue, Magnan and Cho, 2013).

5.6.2 RMC human capital, firm performance, and the likelihood of financial distress

H3: there is a positive association between RMC human capital and firm performance.

Human capital theory indicates that the crucial aspects of human capital and resource dependence theory highlight the importance of skills and experience of individuals. Although the literature regarding RMC human capital is sparse, a number of studies have highlighted that human capital in the audit committee is positively associated with performance outcomes (Chan and Li, 2008; DeFond, Hann, and Hu, 2005; Tao and Hutchinson, 2013). Since both the audit committee and the RMC are monitoring mechanisms within firms, the characteristics of the audit committee can be applied to a RMC (Ng, Chong and Ismail, 2012). In addition, a number of studies have examined some RMC attributes in relation to firm performance. Kallamu and Saat (2014) found that independent RMC members are positively related to market performance and negatively related to accounting performance and an independent RMC chair is positively associated with accounting performance. Lastly, they found management experience to be significantly and positively related to both market and accounting performance (Kallamu and Saat, 2014). These results highlight the importance of some RMC human capital characteristics in relation to firm performance.

After controlling for potential endogeneity, the results of this study show that RMC human capital was positively related to accounting performance, indicating RMC human capital is related to better risk management and higher firm performance, which is in line with the human capital theory and resource dependence theory.

H4: There is a negative association between the probability of financial distress and risk management committee human capital.

A RMC has been regarded as an important platform to specifically address risk management issues within firms. As a result, the level of RMC human capital may also influence firms' likelihood of bankruptcy (Ng, Chong and Ismail, 2012). Specifically, a number of studies have indicated a negative relationship between some RMC characteristics and the likelihood of financial distress (Berk, Stanton and Zechner, 2010; Dimov and Shepherd, 2005; Jaggia and Thakor, 1994). Ng, Chong and Ismail (2012) found that RMC size and independence were negatively associated with underwriting risk, leading to a low likelihood of financial distress. The results of this study show that RMC human capital was negatively related to the likelihood of financial distress, which is consistent with human capital theory and resource dependence theory, indicating that RMC human capital is associated with better risk management and lower likelihood of bankruptcy. In addition, after controlling for potential endogeneity problems, the results show the relationship between risk and the likelihood of financial distress was negatively moderated by RMC human capital. These results suggest that at higher risk, firms that increase the level of RMC human capital will decrease the likelihood of financial distress.

H5 (a): Firm performance is positively associated with risk management committee firm-specific human capital.

H5 (b): Firm performance is negatively associated with risk management committee general human capital.

Previous studies have suggested that firm-specific human capital is more valuable to firms than general human capital because it can retain companies' value through competitive advantage and performance advantage, and competitors are not able to purchase such resources (Crook, Todd, Combs, Woehr and Ketchen, 2011; Datta, Guthrie and Wright, 2005). As a result, firms with greater firm-specific human capital are more likely to generate benefits for firms (Carpenter and Westphal, 2001; Crook, Todd, Combs, Woehr and Ketchen, 2011). This study examined three types of firm-specific human capital: risk management tenure, board tenure, and share ownership of RMC members. The results show that there was a negative relationship between board tenure and firms' market performance (Tobin's Q). This result suggests that the market is discontent with the risk management monitoring of long-tenured directors, which corresponds with Hillman, Shropshire, Certo, Dalton and Dalton (2011). In addition, tenure may serve as an indicator of age, as the longer RMC members serve on the committee, the older they are. Therefore, an alternative explanation of the finding is that there is a negative relationship between RMC members' age and firms' market performance and the market penalises firms with older RMC members.

However, the literature shows inconclusive results between board tenure and firm performance. For example, Kor and Sundaramurthy (2009) found director tenure to be positively related to annual sales growth, while other studies found no association (Johnson, Hoskisson and Hitt, 1993; Sundaramurthy, 1996). These inconclusive results may be due to tenure having a nonlinear effect. In fact, Musteen, Datta and Kemmerer (2010) found an inverted U-relationship between tenure and firm outcomes.

This study further examined the association between RMC general human capital (i.e., experience and qualifications) and firm performance. The results show that the amount of experience of RMC members was positively related to firms' accounting performance, which is consistent with previous literature (Carpenter and Westphal, 2001; Dalziel, Gentry and Bowerman, 2011; Khanna, Jones and Boivie, 2014). Specifically, research has suggested that previous experience is valuable, as directors need to understand and evaluate the actions taken by managers and analyse the potential impact of those actions (Kallamu and Saat, 2014). More experienced directors have more relevant skills and are able to generate abstract principles from specific situations (Dalziel, Gentry and Bowerman, 2011). Experience can help an RMC member to understand large and complex risk management information, thereby improving their risk management efficiency, leading to an increase in firm performance (Carpenter and Westphal, 2001).

This study found no significant association between RMC qualifications and firm performance, which is consistent with Daily and Dalton (1994) and Rose (2007), who found that qualifications had no impact on firm performance. In contrast, Kim and Lim (2010) documented a positive relationship between the education of outside directors and firm value in Korea, which may be due to country-specific factors.

H6 (a): The probability of bankruptcy is negatively associated with risk management committee firm-specific human capital.

H6 (b): The probability of bankruptcy is positively associated with risk management committee general human capital.

The results show that RMC firm-specific human capital and general human capital were not significantly related to the likelihood of financial distress, which was contrary to expectations. The literature suggests that the greater the level of directors'

firm-specific human capital, the more costly the event of bankruptcy for the directors (Chemmanur, Cheng and Zhang, 2013; Rose, 1992). This is due to the fact that firm-specific human capital reduces the employability of individuals, as such human capital is not perfectly marketable (Berk, Stanton and Zechner, 2010).

In addition, research suggests there is a negative association between general human capital and the likelihood of bankruptcy, as people may protect their reputation for future employment (Aivazian, Lai and Rahaman, 2010). Previous literature has suggested that firms with less likelihood of bankruptcy tend to have more directors with CEO experience than bankrupt organisations (Platt and Platt, 2012), indicating a negative relationship between general human capital and the likelihood of bankruptcy. Even though individual RMC human capital was not significantly related to the likelihood of financial distress in this study, the results show the RMC human capital factor score was associated with a lower likelihood of financial distress, indicating that individual RMC human capital characteristics may have much less explanatory power, leading to insignificant results.

5.7 SUMMARY

The results discussed in this chapter provide evidence about the relationship between the existence of a RMC and firms' management of risk in terms of firm performance and the likelihood of financial distress, and about the relationship between RMC human capital and firms' management of risk. In terms of RMC existence, this study found that separate RMC existence moderated the relationship between risk and firms' accounting performance. This illustrates that at higher risk, firms with a separate RMC are associated with better firm performance, indicating the importance of firms having a separate RMC. However, this study failed to find that RMC existence moderated the relationship between risk and firm performance. This

may suggest the importance of having a separate RMC instead of merely having a RMC. When testing the existence of a separate RMC or a RMC on the relationship between risk and the likelihood of financial distress, this study failed to find significant results. This may suggest that merely having a RMC or a separate RMC does not play a significant role in managing firms' likelihood of financial distress. It is the human capital of RMC members that matters. Accordingly, this study paid particular attention to RMC human capital.

With respect to RMC human capital, this study determined that RMC human capital was positively related to firm performance and negatively related to the likelihood of financial distress, which indicates the importance of having a high level of RMC human capital in firms. In addition, this study determined that the association between risk and the likelihood of financial distress was moderated by firms' RMC human capital. This result suggests that at higher risk, firms that increase the level of RMC human capital will decrease the likelihood of financial distress. Results of testing general and firm-specific RMC human capital highlighted the association between these characteristics and the outcome variables. Specifically, board tenure, as a type of firm-specific human capital, was found to be significantly and negatively related to firm's market performance. The average amount of experience of the RMC members, as a type of general human capital, was positively related to firms' accounting performance.

This study conducted a number of robustness tests. The results remained constant after control for self-selection bias and endogeneity problems. By comparing the results of fixed effects models and random effects models, this study determined that the results remained constant.

The next chapter presents a summary of the thesis and main findings, contributions, limitations, and avenues for future research.

Chapter 6: Conclusion

6.1 INTRODUCTION

Motivated by a lack of research on risk management governance and human capital, this thesis has examined risk management governance from the human capital perspective by investigating RMC human capital in Australian firms, based on human capital theory and resource dependence theory. The purpose of this chapter is to provide a brief summary of this thesis, including the objective and overall research question. A summary of the main findings of testing RMC existence, RMC human capital, and firm-specific and general RMC human capital characteristics in relation to firms' management of risk is then presented. Finally, the chapter provides the contributions of this study, followed by the limitations and a discussion on future research opportunities.

6.2 SUMMARY OF THE RESEARCH

The objective of this study was to provide evidence regarding firms' risk management human capital and firms' management of risk, in terms of firm performance and the likelihood of financial distress. This was motivated by the lack of risk management research, the significant role that risk management practice plays in the market and firms, and the recent CGPR guideline (ASXCGC, 2014), which begins to address the importance of RMC human capital. In order to achieve the objective, an overall research question was raised:

> *Is firms' risk management committee human capital associated with firms' management of risk?*

Six hypotheses were developed to answer this research question, and they were embedded within human capital theory, resource dependence theory, and agency theory. Specifically, human capital theory provides insight on the overall theoretical relationship among risk management human capital, firm performance, and the likelihood of financial distress, suggesting that firms with a high level of risk management human capital may increase risk management efficiency and generate positive outcomes for firms. Secondly, resource dependence theory highlights the importance of firms' human capital, such as experience and qualifications, and its positive association with firms' outcomes. Thirdly, according to agency theory, firms' risk management human capital is expected to contribute to the reduction of agency costs and enhance monitoring of managers' risk-taking behaviours.

Before examining the association between RMCs' human capital, this study firstly examined the relationship between the existence of a RMC, a separate RMC, and firms' management of risk, in terms of firm performance and the likelihood of bankruptcy, based on a sample of top 300 ASX listed firms between 2007 to 2014. This study then examined the association between RMC human capital and firms' management of risk in terms of firm performance and the likelihood of bankruptcy. Data were analysed using a quantitative approach – regression analysis. This study also controlled for self-selection bias and potential endogeneity issues.

6.3 SUMMARY OF THE RESEARCH FINDINGS

6.3.1 The existence of RMC and separate RMC

The analysis of the existence of a RMC revealed that the number of firms with a separate RMC remained stable, whereas there was an increasing trend of combined RMC formation of sampled companies, and a decreasing trend of the number of companies that did not have a RMC. Although the regression results regarding the

association between the existence of a RMC and firms' management of risk revealed that the existence of a RMC and separate RMC were not significantly related to firm performance and the likelihood of financial distress, the existence of a RMC moderated the relationship between risk and firm performance. This illustrates that at higher risk, firms with a separate RMC are associated with better firm performance, indicating the importance of firms having a separate RMC.

6.3.2 RMC human capital

By developing an overall risk management human capital score utilising principal component analysis, the results regarding the association between risk management human capital and firms' management of risk revealed that RMC human capital was positively related to firm performance and negatively related to the likelihood of financial distress. These results are consistent with human capital theory and resource dependence theory. In addition, this study determined that the association between risk and the likelihood of financial distress was moderated by firms' RMC human capital. This results suggests that at higher risk, firms increasing the level of RMC human capital will decrease the likelihood of financial distress.

The results of the model using individual risk management human capital characteristics to test the association between firms' firm-specific, general risk management human capital and firms' management of risk found that total amount of experience, as a type of general human capital, was positively related to firms' accounting performance, indicating previous experience is crucial to enhancing firm performance. Additionally, the results show that RMC members' board tenure, as a type of firm-specific human capital, was negatively related to market performance. However, this study failed to find any significant results regarding the association

between individual risk management human capital characteristics and the likelihood of financial distress.

6.4 CONTRIBUTION

This paper contributes to human capital literature in several ways. Firstly, to the researcher's knowledge, this is the first study to examine firms' risk management human capital. The literature has suggested that there is a lack of research on risk management governance. Therefore, this study contributes to the literature by providing evidence regarding the human capital theory from a risk management point of view. This study drew on research that has attempted to determine whether human capital is associated with firm performance (e.g. G. Chen and Hamrick, 2012; Crook, Todd, Combs, Woehr and Ketchen, 2011) and research that has determined the association between risk management and firm performance.

Secondly, while some research has examined board human capital, this study focused on the role of RMC human capital, and captured five facets of human capital factors: tenure, experience, education, share ownership, and tenure. In doing so, this study provides a more comprehensive approach to investigating human capital than that undertaken in prior research. These factors allowed this study to examine a much more comprehensive range of RMC human capital characteristics. The comprehensiveness of the RMC human capital measures contributes to the board literature, as most board capital research has relied on only a few indicators (such as board independence and board education). In addition, a number of studies have called for future research to examine board human capital in a more detailed and comprehensive way (Johnson, Schnatterly, and Hill, 2012). Therefore, this thesis has responded to this call, and has investigated beyond the limited characteristics identified

in previous studies. Thereby, this study provides a more comprehensive picture of RMC human capital.

Thirdly, this study also has practical contributions. It provides valuable information to the ASXCGC regarding the current RMC human capital practice in Australia and provides implications to policy makers in relation to regulating firms' risk management human capital. In addition, the results provide firms with information about the benefits of RMC human capital. The results will be of interest to a range of shareholders. Directors may give consideration to these results when there is a change of RMC members. For regulators, these results highlight the importance of RMC human capital in firms. As a result, future reviews of corporate governance recommendations may consider providing improved guidance to Australian firms about the human capital level of RMC members.

6.5 LIMITATIONS AND OPPORTUNITIES FOR FUTURE RESEARCH

As with any research, this study has several limitations. Firstly, this study examined RMC human capital based on the risk information gathered from companies' annual reports. It could be argued that companies may not disclose all of their risk management human capital information through annual reports, as other avenues may be utilised, such as social media and the company's website. Consequently, if the annual report is not considered the dominant form of RMC human capital information disclosure, then this study may not comprehensively capture firms' risk management human capital. However, this study included a manual check of the RMC information on each firm's website, and found that firms disclosed identical RMC information through their companies' website, compared to annual report disclosure. Therefore, this study shows that annual report disclosure is still the main source of RMC human capital disclosure. Secondly, due to some missing variables in

the annual report, this study was unable to collect some RMC human capital characteristics, such as age. This may have led to the omission of some important variables. Thirdly, this study did not control for board human capital when investigating the relationship between RMC human capital and firms' management of risk. As a result, the results may be influenced by board human capital. However, it is generally believed that the board of directors would normally appoint members with a high level of risk management human capital into the RMC. Therefore, RMC human capital is the main factor that affects firms' management of risk. Finally, the sample was drawn from the top 300 ASX companies, which excludes small firms. Thus, the results may not be generalised to the whole Australian market. In addition, this study only analysed Australian firms, therefore, the results may not be applied to other countries.

However, these limitations do provide opportunities for future research. Research could be undertaken by examining RMC human capital, not only limited to the information in annual reports, but also including firms' risk management human capital information on social media (i.e., social media releases), to provide a more comprehensive picture of firms' RMC human capital. In addition, this study adopted a quantitative research method; however, examining RMC human capital through the application of a qualitative method, such as surveys and interviews, could provide interesting and in-depth insights into the relationship between RMC human capital and firms' risk management. In addition, future research could also examine the role Chief Risk Officer plays in managing firm risks.

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