

**CORPORATE GOVERNANCE
STRUCTURES, CORPORATE
ENTREPRENEURSHIP AND FIRM
PERFORMANCE: A STUDY OF
CHINESE LISTED FIRMS**

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**A Thesis Submitted in Partial Fulfilment of the
Requirements of Nottingham Trent University
for the Degree of Doctor of Philosophy (PhD)**

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IV. Abstract

Corporate governance plays two broad important roles of (i) stewardship and accountability role, that is, it is a mechanism designed to monitor managers and enhance performance of the firm; and (ii) entrepreneurship, that is, providing the mechanisms that motivate managers to create and sustain corporate competitiveness, thereby optimizing shareholders' wealth. China, a country that does not align with the Anglo-American or stakeholder models of corporate governance (CG), but which is a major economic force in the transition economy. It is steadily moving away from centralised planning of its innovation system by the state to an increasingly open system involving technology outsourcing and imports, and foreign investors' involvement makes it an interesting context to examine the relationship between CG structures, corporate entrepreneurship (CE) and firm performance. Consequently, this thesis aims to investigate the effects of CG structures and CE on firm performance among Chinese listed firms. Specifically, its objectives are to examine the relationship between (1) CG and CE; (2) CG and firm performance; (3) CE and firm performance; and (4) whether CG and CE interact to influence firm performance in the Chinese listed firms.

In addressing the research objectives, a multi-theoretical approach (i.e. agency, stewardship, and resource dependence theories) is used in this thesis to investigate the relationships between CG, CE and firm performance in Chinese listed firms. Several hypotheses were developed, and these are tested using panel regression models, in particular, the two-step system GMM. The panel analyses employ a data sample of 5,118 firm-year observations for Chinese listed firms covering the period 2007 – 2015. CG is operationalised using board and ownership structures; CE is measured using R&D intensity, patent applications and granted patents; and performance is measured using Tobin's Q and return on assets (ROA).

Several findings are reported. First, R&D intensity is negatively related to managerial ownership, but positively related to board size and CEO duality. Second, patent applications have a negative relationship with state ownership, but positively related to foreign and managerial ownership, and supervisory board size. Third, granted patents exhibit a negative association with state ownership and board size, and positive association with managerial ownership. Fourth, firm performance as measured by Tobin's Q is positively related to one person acting as both CEO and chairman measured by CEO duality, but negatively related to board size and supervisory board size. Fourth, when firm performance is measured by ROA, it is positively related to board size and managerial ownership, but negatively related to the proportion of independent directors. Fifth, Tobin's Q is positively related to R&D intensity, but negatively related to patent applications. Firm performance measured by ROA is negatively related to R&D intensity, but insignificantly related to patent applications and granted patents. Finally, when firm performance is measured by Tobin's Q, R&D intensity interacts significantly with board size and CEO duality. The results also show that board size, supervisory board size and CEO duality moderate the relationship between patent applications and Tobin's Q. Further, the results show that supervisory board and granted patents interact mutually to influence Tobin's Q. However, with the exception of CEO duality and patent applications, no CG variables are found to significantly moderate the linkage between R&D intensity, granted patents and ROA.

Taken together, this thesis first, extends the literature on the relationship between CG structures and CE in listed firms of a developing country with transitional economy and

particular political and economic system. Second, impact of CG structures and CE on firm performance had also based on panel data. Third, this thesis provides the first evidence suggesting that CG structures and CE are complementary in how they impact on firm performance in the Chinese context. As the Chinese special two-tier board system and acceptance of non-state, foreign and managerial ownership are different from those in other countries, these empirical results had provided important managerial implications for the practice and are important for policy-makers seeking to improve CG in China.

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Chapter 1: Introduction

1.1 Introduction

This thesis aims to investigate the effects of corporate governance (CG) structures and corporate entrepreneurship (CE) on firm performance among Chinese listed firms. CG is defined as the structures by which a firm sets its strategic objectives as well as determining the means of attaining those objectives and monitoring performance (Tricker, 2012) and CE is defined as the innovativeness of the firm as reflected in the R&D intensity, patent registrations, and granted patents (Classen, *et al.*, 2014; Dong and Gou, 2010; Munari *et al.*, 2010).

CG is central to how firms allocate resources, and therefore, shapes the strategic choices that managers make in achieving the firm's objectives. Keasey and Wright (1993) view the role of CG from two broad dimensions. One dimension emphasises the stewardship and accountability role, stressing the need for CG as a mechanism to monitor managers and enhance performance. The other dimension emphasises the CE role, considering CE as providing the mechanisms that motivate management to optimise shareholders' wealth by sustaining corporate competitiveness. Thus, the two dimensions are highly relevant to each other as they both aim to ensure that corporate resources are used to secure the firm's long-term performance, therefore, protecting and enhancing shareholders' wealth (O'Connor and Rafferty, 2012).

In this context, whereas promoting CE is relevant to access critical resources to sustain the long-term success of the firm, the stewardship and accountability role of CG is to prevent corporate resources from being exercised in ways that diminish a firm's success. For example, boards of directors should ensure that firms have adequate access to a range of resources for CE but should also ensure that such resources are harnessed

and well-used to create value (Barker and Chiu, 2018). Board members with diverse professional background could contribute to firm strategy (e.g. corporate entrepreneurship) by providing valuable and relevant external information (Azeez, 2015; Guest, 2009). Given the highly complex and uncertain nature of the strategic decision-making process, such additional board capabilities not only improve the quality of strategic decisions but also contribute to improved firm performance. Moreover, a board of directors with considerable independence (e.g. separate leadership and a high proportion of independent directors) might influence CE primarily by its involvements in setting the long-term strategic direction and strengthen the board's overall monitoring responsibilities (Krause et al., 2014; Yu and Ashton, 2015). Hence, this thesis advocates that the design of CG structures should strike a balance between accountability and CE (Keasey and Wright, 1993). In this thesis, the term CE is defined as the innovativeness of the firm as reflected in the R&D intensity and patent registrations (Classen, et al., 2014, Dong and Gou, 2010, Munari et al., 2010).

The question of whether CG affects organisational outcomes has attracted the attention of policy-makers, academics and professionals around the world. Consequently, over the last few decades, there has been extensive literature on the effects of CG on organisational outcomes. Three themes of the literature have been developed. One theme has focused on examining the effects of CG structures on firm performance (e.g. Azeez 2015; Mangena et al., 2012; Shan and McIver, 2011; Guest, 2009; Coles et al., 2008; Ferreira and Matos, 2008; Peng et al., 2007; Gompers et al., 2003; Xu and Wang, 1999). According to agency theory, a better governed firm tends to enjoy better operating performance and higher valuation due to relatively lower agency costs (Jensen and Meckling, 1976). For example, Gompers et al. (2003) found that sound CG structures are related to better operating firm performance and higher market valuation. Brown and

Caylor (2009) found that better-governed firms in America have higher ROA, ROE and Tobin's Q. Therefore, it is argued that aligning interests of owners and managers by adhering to sound CG practices would lead to reduced agency conflicts between owners and managers, and eventually, lead to enhanced firm performance.

The second theme has examined the effects of CG on CE (Shapiro et al., 2015; Aghion et al., 2013; Minetti et al., 2012; Becker-Blease, 2011; Choi et al., 2011; Dong and Gou, 2010; Munari et al., 2010; Zahra, 1996). It has been argued that an effective board of directors should achieve a balance between CE (innovation) and monitoring that is, maintaining rigorous financial controls and being accountable to shareholders (O'Sullivan, 2000; Porter, 1990). Prior empirical studies suggested that some CG mechanisms (e.g. board independence) have a negative impact on CE while other mechanisms (e.g. institutional and managerial ownership) have a positive impact on CE. For example, Zahra (1996) found that innovativeness is positively associated with long-term institutional ownership and executive stock ownership. On the other hand, CE is negatively associated with the proportion of independent directors and short-term institutional ownership.

A third theme has examined the role of CE on firm performance, arguing that CE is critical for firm performance (Bierwerth et al., 2015; Choi et al., 2011; Miller, 2011; Rauch et al., 2009; Tang et al., 2008; Avlonitis and Salavou, 2007; Hult et al., 2003; Lumpkin and Dess, 2001; Zahra et al., 2000). CE is important for firms to exploit changing market conditions, for example, advancing technologies or shortening product life cycles. This theme of studies argues that by developing new process innovation and products, firms can eliminate costly steps and improve quality and efficiency (see Bierwerth et al., 2015). Avlonitis and Salavou (2007) found that firms with active

entrepreneurs perform better than passive entrepreneurs by introducing new products, and contributing to firm performance.

A review of these three themes in the literature demonstrates that the findings are either mixed or inconclusive (see Owusu, 2012 for CG and performance; Bierwerth et al., 2015 for CE and performance; Belloc, 2012 for CG and CE; see also Chapter 2 for the review). Many reasons are provided, including the use of different samples and industry, using different measures of CG, CE and firm performance, failure to control for other factors (e.g. national policies, political connections, and the difference of corporate governance structures) that may have an impact. Another important reason not addressed in the literature is that prior studies have tended to examine the effects of CG and CE on performance independently, with little or no consideration of how the two might interact with each other to impact on firm performance. As argued by Fitzgerald et al. (2008), for firms to succeed, they need to design CG structures that facilitate CE capabilities that in turn enhance firm performance. This suggests that CG and CE are complementary in how they impact on firm performance. To this extent, examining the effects of CG and CE on performance separately might lead to wrong conclusions.

The aim of this thesis is to address this gap in the existing literature by examining the relationship among CG, CE and firm performance in China, and how CG and CE interact to influence firm performance. China presents a unique context in which to examine these issues. It has strikingly different characteristics from those in Anglo-Saxon countries in which many studies are undertaken. First, corporate governance (CG) structures and systems in China are significantly different from other countries with specific characteristics of higher stock holding proportions by the largest shareholder, a relatively higher proportion of state-owned stock, combined two-tier board system between that in Japan, Germany and the US, independence deficiency of independent

directors as well as special legal restrictions on managerial ownership by Chinese economic laws (Cendrowski, 2015; Jiang et al, 2015; Chen et al., 2011; Ding et al., 2010; Bai et al., 2004). All those characteristics could exert impacts upon firm performance from the theoretical view of corporate governance. Additionally, the most significant uniqueness comes from the two-tier board system involving both board of directors and supervisory board. Unlike German system, supervisory board is not responsible for daily operations of the company, which has no power to appoint and dismiss board members. However, it serves as one of the two monitoring organs, together with the independent directors who are part of the board of directors (Tricker, 2012; Xiao et al., 2004; Dahya et al., 2003). Hence, combined with both previous theoretical and empirical evidence, this thesis will try to find out the relationship between those corporate governance factors and firm performance.

Second, the Chinese economy is in transition from planned to market economy, along with the fact that central government controls resources, finances investment, industry structure, materials distribution, business formation and bank loans (Choi et al., 2011; Tang et al., 2008). The Chinese government views CE as one of the top national priorities and encourages firms to promote CE through the provision of funding and favourable policies (Zhou et al., 2017; Chen et al., 2014a; Choi et al., 2011). Thus, managers, particularly those in firms with state ownership, are likely to pursue the government agenda, which might influence firms' decisions to implement China's ambitious CE plan. In addition, they are more likely than non-state-owned firms to access financial resources to engage in CE. For most entrepreneurial firms without government connections, availability of capital is one of their major challenges. Commercial banks in China have much more stringent levels of regulations in terms of giving loans to entrepreneurial firms, in particular, the small-to-medium size entrepreneurial firms, than

do banks in other countries (Tang et al., 2008). This makes the pursuit of CE strategies difficult because CE is resource-consuming (Zhang et al., 2014). That is, the innovativeness and risk taking of firms all involve making large resource commitments to risky activities, new products or services, untried technologies on the market. With access to limited financial resources, the implementation of CE will most likely go awry and will not help entrepreneurial firms build competitive advantages and compete with their high-quality innovative products and services (Shapiro et al., 2015). Corporate entrepreneurship (CE) is one of the top national priorities on the Chinese government agenda. Firms with or without a connection with the state might differ in terms of financial resources, competitive advantages and implementation of CE. In addition, the Chinese economy is at a developmental stage (Zhang et al., 2014), whereby Chinese firms are transforming from state-owned to private sector organisations. They need innovativeness and CE to improve firm value. Hence, it is meaningful to find out the relationship between CE and firm performance under Chinese background.

Third, controlling owners in Chinese listed firms are commonly on the board of directors and significantly influence decision-making and firm strategy due to their absolute stock controlling and voting power. Board members and top management team usually have an incentive to take an active role to fulfil shareholders' welfare for the benefit of their future political or business career (Tong et al., 2013; Choi et al., 2011). To this extent, firms' decisions are more likely to be driven by the owner's incentives with implications for CG, CE and performance. In addition, due to independence deficiency of independent directors as well as the particular two-tier board system of parallel board of directors (BoDs) and board of supervisors (BoSs), and the universal phenomenon of CEO duality in China, relevant hypotheses are also developed to ascertain

whether those factors could moderate the relationship between corporate entrepreneurship and firm performance in Chinese listed firms.

Finally, in China, due to relatively high rights held by governmental and regulatory authorities, the members of the management usually have political incentives to take an active role to fulfil government requirements (Tong et al., 2013, Choi et al., 2011). In this case, for state-owned firms or firms with board members with political connections, obtaining resources for CE (more R&D investment) is likely to be much easier as the state controls most resources. This is different in most of the developed world as firms are not state-owned and the state plays a diminished role in how firms are funded. These characteristics imply that findings from developed countries might not apply in the unique institutional environment in China, thus providing the opportunity to make a significant contribution to the literature.

Although studies on the impact of CG on organisational outcomes are starting to be seen in China (e.g. Chen et al., 2014a; Choi et al., 2012), these are still limited and similar to other literature across the world, have yet to consider how CG and CE interact to influence firm performance. With regard to the interaction effects, it is reasonable to suspect that there are moderating effects of CG and CE on performance. As CG has implications on CE and CE affects performance, it is expected that the ability of the firm to innovate and improve performance must depend on how CG promotes CE in the firm. Although the Chinese capital market had only enjoyed 30 years' development, there are numerous firms that emerged under the particular Chinese socialist market economy system. Hence, there are various factors in the corporate governance system and using a multi-factor framework can better capture the background of China and allow for analyses that are more precise. Thus, this thesis explores these issues in the context of China and uses a multi-theoretical framework to allow for a more thorough understanding of CG

and CE in the Chinese context to different variables (e.g. ownership structures, board structures, R&D investment and patent data). Using such a framework allows the study to bring together different perspectives to provide an understanding of the impact of CG and CE on firm performance.

1.2 Research Aim and Objectives

The aim of this thesis is to examine the relationship between CG, CE and firm performance in Chinese listed firms by adopting a multiple theoretical approach, applying agency theory (e.g. Jensen and Meckling, 1976), stewardship theory (Donaldson and Davis, 1991), and resource dependence theory (Pfeffer and Salancik, 1978). Specifically, the thesis addresses the following research objectives:

- 1) To study and analyse the relationship between firm-level CG structures and CE in Chinese listed firms;
- 2) To study and analyse the relationship between firm-level CG structures and firm performance in Chinese listed firms;
- 3) To study and analyse the relationship between CE and firm performance in Chinese listed firms;
- 4) To explore whether and how firm-level CG structures and CE interact to influence firm performance in Chinese listed firms.

1.3 Summary of Research Methodology

This thesis is based on panel analyses of a data sample of 5,118 firm-year observations from 2007 to 2015. The timespan of the data was chosen to capture direct R&D investment of firms since 2007 when the new Chinese Accounting Standards (CAS) commenced in 2006, given that listed firms were encouraged to report direct R&D investment from 2007 in the annual report. The data is accessible mainly from two

databases in China: The China Stock Market and Accounting Research (CSMAR) and the State Intellectual Property Office (SIPO) databases. Where data was unavailable from CSMAR and SIPO, annual reports of the selected firms were used. The CSMAR database mainly provides data at firm level in relation to CG structures (board and ownership structures) and CE (R&D investment), firm performance indicators (ROA and Tobin's Q), and firm profile (industry, firm age, firm size, leverage), whilst the SIPO database provides data at the firm level of patent data (the number of patent applications and the number of granted patents each year). The patent applications are defined as the number of patents applied for by firm per year (Yu and Ashton, 2015), and the granted patents defined as the number of patents granted to firms per year (Aghion et al., 2013). The annual report was used mainly to collect data missing from the two databases, for example, CEO duality, board size, supervisory board size, R&D investment, ownership types, and firm size.

To answer the research's aim and objectives, three empirical research models were developed. The first model is used to examine the effects of CG structures on CE, thus, addressing the first research objective. The second model is used to test the effects of CG and CE on firm performance and address the research objective (2) and (3). The third model is used to examine the interaction between CG and CE on firm performance and address the last research objective.

Following the literature, CG is measured using board structure and ownership structure variables (e.g. state ownership, non-state domestic ownership, foreign ownership, executive ownership, board size, board independence, supervisory board size, and CEO duality) which were developed from prior studies (e.g. Yu and Ashton, 2015; Dong and Gou, 2010; Munari et al., 2010). The R&D intensity, the number of patent applications, and the number of granted patents were used to measure CE (Shapiro et al.,

2015; Zhang et al., 2014; Choi et al., 2011). Firm performance was measured using ROA and Tobin's Q (Yu and Ashton, 2015; Tong et al., 2013). The firm-specific factors included in the analyses were firm size, firm age, leverage and industry (Chen et al., 2014a; Munari et al., 2010; Zahra, 1996).

The data analyses included the descriptive analysis, univariate, and multivariate analysis. The descriptive analysis of the sample for the dependent and independent variables provided a preliminary understanding of the data and its distribution. The data transformation was carried out when variables were not normally distributed. The univariate analysis examined the correlations between the dependent and independent variables for each model, separately using Spearman's rho correlations to evaluate the monotonic relationships between two continuous or categorical variables and to find the potential multicollinearity problem. Multivariate regression (i.e. two-step system GMM) was used to test the hypotheses and to fix the two main econometric problems for the dynamic panel models, which are the causality problem, and the fixed effects problem. Regression analysis was based on a set of assumptions which must be tested before the analysis, in order to ensure the validity of the results and the inferences drawn from the analysis. The assumptions refer to the normality, linearity, homoscedasticity, and independence of error terms. Various checks were discussed to examine the data from this thesis against the assumptions of the multivariate regression.

1.4 Summary of the Key Findings

This section summarises the findings. First, with regard to objective 1, this study finds that CEO duality and board size affect R&D intensity positively and significantly, meaning that a larger board and combined chairman and CEO role facilitate more R&D intensity. The other CG variables are not significantly related to R&D intensity. The results also show that firms with a high level of leverage and managerial ownership have

lower R&D intensity, but firm size, firm age, state ownership, domestic non-state ownership, foreign ownership, board independence, and supervisory board size have no impact on R&D intensity. When CE is measured using the number of patent applications, the results indicate strong evidence that firm size, foreign ownership, managerial ownership and supervisory board size have a significant and positive link with patent applications, whilst listing age and state ownership are negatively related to the number of patent applications. Leverage, non-state domestic ownership, board size, board independence and CEO duality have no impact on the number of patent applications. In terms of the number of granted patents, this study also finds strong evidence that firm size and managerial ownership have a significant and positive link with granted patents. Listing age, board size and state ownership are negatively related to the number of granted patents whilst leverage, domestic non-state ownership, foreign ownership, board independence, supervisory board size, and CEO duality have no influence on the number of granted patents.

Second, in relation to objectives (2) and (3), the study finds that the impacts of CG structures and CE on firm performance depend on the measures of firm performance. Both of ROA and Tobin's Q have been applied in this thesis to measure firm performance. Factors within CG and CE reflected by difference variables correlate with ROA and Tobin's Q so as to find out their relationships. The main difference between ROA and Tobin's Q lies in effects from market performance. While ROA reflects the profitability of firm from the perspective of financial data in financial statements, Tobin's Q reflects market valuation of the firm which is closely correlated with both profitability of the firm as well as the booming degree of the overall capital market. When firm performance was measured using ROA, which is an indicator of how profitable a firm is relative to its total assets, the results of this thesis showed that ROA in Chinese listed firms was mainly

related to board size, board independence, state ownership, managerial ownership and R&D intensity (controlling for firm size, leverage, firm age, and industry). In terms of Tobin's Q, which reflects the market's expectations about future profitability, the results indicate that Tobin's Q is related to board size, board independence, supervisory board size, CEO duality, state ownership, R&D intensity as well as the number of patent applications.

Finally, for objective (4), the results suggest that when firm performance was measured using Tobin's Q, board size negative and significantly moderates the relationship between R&D intensity and firm performance. However, a positive and significant moderating relationship is found when CE is measured as patent applications. The result does not support the argument that firms with bigger boards are often considered to be more capable of monitoring the actions of management, as it is more difficult for CEO to dominate a large board or to obtain consensus for making decisions that harm shareholders' value. Moreover, the results do not support the idea that as the board size grows, it would also be expected that the board's collective experience and skills would also grow. However, larger boards are likely to increase cognitive diversity, which leads to increased creativity in decision-making and favour investment in patent applications for firm development.

Supervisory board size moderates the relationship between CE (patent applications and granted patents) and Tobin's Q positively, indicating that supervisors transfer specific knowledge, skills and experience to the board. They also improve monitoring and advice competencies in terms of qualified and sustainable R&D investment strategies that lead in turn to a higher innovation output (e.g. granted patents). This thesis finds that the proportion of independent directors does not interact the relationship between CE (R&D intensity, patent applications and granted patents) and

firm performance (ROA and Tobin's Q). Results suggest that independent directors do not directly affect firm's CE investment, patents and firm performance.

Results also show that high level of R&D intensity or a greater number of patent applications will lead to better firm performance (Tobin's Q) when both roles of CEO and chairman are held by the same person. The market responds favourably to the combination of two roles. The results also echo stewardship theory, which stresses the beneficial consequences on shareholder returns with unifying command by combining CEO-chairman roles. On the other hand, when firm performance is measured as ROA, a greater number of granted patents will lead to better profitability when both roles of CEO and chairman are held by the different persons. The results indicated that a separation role of CEO and chairman helps firms to achieve a higher number of patents granted, and it leads to better profitability.

1.5 Contribution of this Thesis

The study makes several important contributions to the literature. First, this thesis extends the literature on the impact of corporate governance and corporate entrepreneurship on firm performance in listed firms to a transition economy based on panel data. Most studies (e.g. Barker and Chiu, 2018; Honoré et al., 2015; Aghion et al., 2013; Brossard et al., 2013; Munari et al., 2010; Guest, 2009; Wright et al., 1996; Zahra, 1996) have examined these issues in developed countries. This thesis contributes to these studies by demonstrating that similar to findings found in developed countries, CG variables and CE are important for firm performance also in developing countries, such as China.

Second, this thesis extends a developing stream of literature on China (Shapiro et al., 2015; Chen et al., 2014; Choi et al., 2011; Dong and Gou 2010), which focuses mainly

on the effects of ownership structures and hardly consider board structures. China presents a unique context in which to examine this issue. It has strikingly different characteristics from those in Anglo-Saxon countries from which many studies are undertaken. This thesis provides evidence that some findings from developed countries might not be applied in China. For example, the separation of the two roles, chairman and CEO, does not necessarily contribute to entrepreneurship decisions. Firms invest heavily on R&D would be beneficial from a combined leadership structures in Chinese listed firms.

Third, this thesis provides the first evidence suggesting that CG and CE are complementary in how they impact on firm performance in the Chinese economic and financial environment. Previous studies have tended to examine the effects of CG and CE on firm performance independently, with little or no consideration of how those two might interact with each other to impact on firm performance. As argued by Fitzgerald et al., (2008), for firms to succeed, they need to design CG structures that facilitate CE capabilities, and in turn, enhancing firm performance. To this extent, examining the effects of CG and CE on performance separately might lead to wrong conclusions.

Fourth, at the methodological level, unlike previous studies (e.g. Zhang et al., 2014; Zeng and Lin, 2011), this thesis uses panel data covering a 9-year period (from 2007 to 2015), a system generalised method of moment (SGMM) - a statistical technique is adopted for data analysis. System GMM is considered more appropriate to estimate panel data because it removes the contamination through an identified finite-sample corrected set of equations which are robust to panel-specific autocorrelation and heteroscedasticity (Capezio et al., 2011). It is also a useful estimation tool to tackle the endogeneity and fixed effect problems (Arellano and Bond, 1991).

1.6 Policy and Practical Implications of the Thesis

In addition to theoretical and empirical contributions, this thesis also has several policy and practical managerial implications, which could facilitate decision-making by different market entities.

First, as for policy makers, this thesis demonstrates that several institutional and historical factors, rather than agency problems, shape the corporate governance arrangements for listed firms in China. It does not support the viewpoint that the standard Anglo-American corporate governance (CG) model can be applied in the context outside the U.S. and UK. The findings provide important implications for the Chinese government, which could be used to employ a modern CG model when issuing policies for public-held firms. For instance, the findings do not support the current policies, which encourage firms to separate the top two positions (CEO and chairman) and require them to recruit more independent directors onto the boards. Therefore, this thesis calls for special attention to the current trend of non-CEO duality and independent directors (Ye and Li, 2017; Wang, 2008; Peng et al., 2007). Although CEO duality could improve CE significantly, it exerts negative impacts upon firm performance. Possible reasons could be the findings of this thesis implicitly indicate that the government may reconsider several policies relating to CG as applied to high-tech listed firms due to the fact that existing policies have not been applicable for Chinese firms. However, the findings do not indicate that agency problems are entirely absent in the context of transition economies. Agency costs do exist, but they are not as high as they are in developed economies. Instead, stewardship culture may help reduce these costs and the board members mainly include inside directors and supervisors may play their role as resource providers to a certain extent (Miller et al., 2008; Davis et al., 1997). This thesis reasserts that a CG structure is a dynamic concept that is heavily dependent on the specific context,

particularly, in high-tech industries. These findings imply that the government should develop and revise policies with scrutiny and caution especially during institutional transition, as well as giving more attention to the role played by non-state owned and foreign capital, which could increase economic vitality (Mattlin, 2007).

Second, this thesis could also provide empirical evidence and decision support for corporate managers, CE policy makers and investors in a non-mandatory disclosure market of R&D investment. Because different R&D accounting choices have different market reactions, managers can choose a favourable method of reporting R&D investments to raise their firm's market prospects. Of course, firms may also just cater to investors and other information seekers by disclosing more R&D information. This requires policy makers to do more work on R&D policy to prevent this greenwashing behaviour and earnings management (Chen et al., 2006). Policy makers should standardise accounting treatment of R&D investment, strengthen the disclosure of R&D information and develop a detailed, workable R&D capitalisation accounting policies and procedures. At the same time, investors can make the right judgment and decisions on business CE capability and future development by obtaining more R&D investment information (Chen and Hsu, 2009).

There are no objectively comparable conditions between different enterprises for the patent applications and R&D spending in China. In accounting practices, professional judgment is required to ascertain the accounting treatment of R&D as well as to ensure whether the economic benefits created by the intangible assets are likely to flow into the enterprise, which produces artificially manipulative space for R&D investment and patent data (James and McGuire, 2016; Song et al. 2015). Due to the fact that the provisions of new CAS (Chinese Accounting Standards) for the accounting treatment of R&D investment is only principle-oriented and not mandatory, coupled with the uneven level

of practice of the accounting personnel and improper use of the criteria, R&D investment and patent information to investors delivered by financial reports is very limited (Bracker and Ramaya, 2011). Therefore, it is suggested that a mandatory disclosure policy of R&D investment needs to be developed, which can help regulate and constrain managers' earning management behaviour in R&D accounting treatment and provide investors with more accurate R&D information.

Third, findings of this thesis could also encourage managers to think more broadly about their CG structures so as to improve firm performance. The CEO and the board of directors as well as shareholders should take into account all aspects in corporate governance. Findings of this thesis indicate that a firm should properly select the board size and the number of supervisors on the board under different circumstances (Kajola, 2008; Neely and Al Najjar, 2006; Conyon and Peck, 1998). In addition, findings of this thesis also indicate that there is a significantly negative correlation between state ownership and patent applications, but significantly positive impacts of managerial ownership and foreign ownership on patent applications and granted patents. Hence, managers should attach great importance to the role of independent directors and the proportion of non-state-owned and foreign stocks, because a reasonable and proper participation by those entities could restrict behaviours by the managers and thus benefit the interests of shareholders and firm value maximisation.

Given that firms are making significant investments in their CG structures and that they appear to pay less attention to the way they use the data generated from these structures, the findings of this thesis encourage managers to invest in data analysis skills, processes, and infrastructure in their firms (Neely and Al Najjar, 2006). The findings of this thesis also suggest that using CG structures is conducive to CE. Managers should possess the skills for managing CG structures.

Finally, the government should make substantial improvements in external corporate governance mechanisms, as suggested by Jiang and Kim (2015) because internal governance is only part of the package of governance practices (Yoshikawa et al., 2014). As such, instead of forcing firms to adopt common rules, the government should strive to strengthen external corporate governance, for example, developing a strong capital market, building an effective market for corporate control and active take-over market, and issuing strong regulations to protect interests of minority investors.

1.7 Structure of the Thesis

This chapter (Chapter 1) has presented the research problems and the overall research objectives. The summary of research methodology and key findings were then provided. Finally, the chapter summarises the contributions of this thesis and outlines its structure.

Chapter 2 presents a description of the development of CG in Chinese listed firms. In addition, it discusses Chinese legal systems, the development and supporting policies for facilitating CE activities, and their implication for the determination of better firm performance. This Chapter also reviews the literature on CG and CE, focusing on several important theoretical paradigms, known linkages between CG and CE, the effects of CG, CE on firm performance, as well as the influence of institutional environment. The review shows that using a multiple theoretical approach (agency theory, stewardship theory, and resource dependence theory) is appropriate to explain and analyse the relationship between CG, CE and firm performance in Chinese listed firms. The extensive existing research also shows that there is less work on the moderating effects of CG on the relationship between CE and firm performance and in emerging and transition economies.

Chapter 3 develops the theoretical framework used for this current thesis, which is based on contrasting perspectives in CG and CE research. This chapter will focus on the relationships between CG and CE, CG and firm performance, CE and firm

performance, and inject the moderating influence of CG on the relationship between CE and firm performance into the analysis. The model and hypotheses are outlined in this chapter.

Chapter 4 introduces the methodology, which is based on a quantitative research approach. With respect to the quantitative analysis of archive data, the data population, sampling process, and data collection effort are explained, as are the operationalisation of all variables, the model specification and statistical techniques.

Chapter 5 reports the results of testing the hypotheses on the relationship between CG structures, CE and firm performance. The chapter also reports the testing results of hypotheses on the moderating effects of CG structures on the relationship between CE and firm performance. The dataset used in testing the hypotheses is presented to provide an overall picture of the data. The normality and data transformations are then carried out for further analysis. Finally, the results of univariate and multiple regression analysis are presented.

Chapter 6 discusses the results of hypotheses testing. It will start by presenting the results of discussions on the relationship between CG structures and CE followed by the effects of CG and CE on firm performance. The findings will be compared with prior research findings and any differences explained.

Chapter 7 summarises and draws key conclusions for the current thesis followed by a summary of findings. Furthermore, this chapter outlines the practical implications of the findings for practitioners and regulators. Finally, the chapter discusses the potential limitations of the thesis and potential directions for future research.

Chapter 2: Literature Review

2.1 Introduction

In Chapter 1, the research motivation was discussed, and the research aim and objectives were formulated with a focus on the effects of CG (corporate governance) and CE (corporate entrepreneurship) on firm performance in the contextual environment of China. The CG structures and their effects on firm performance depend upon the environment in which the firm operates (Tang et al., 2008). In particular, La Porta et al. (1998) and Roe (2003) emphasised understanding the environmental factors that shape the efficiency of CG on organisational outcome in any country. These factors have been extensively discussed in the literature, including the political system, the legal system and the extent to which it protects shareholders, the economy and capital markets development, enforcement of regulations, reliability of accounting standards, societal and cultural values (see Yang et al., 2011; Leuz, 2010; La porta et al., 1997; 2000; Roe, 2003). Similarly, CE is influenced by these environmental factors, and consequently impacts on firm performance.

This chapter provides an institutional background of China on how the environmental factors affect the development of securities market and corporate governance internally and externally, and how such development affects the national development (e.g. policies and regulations) of sciences and technology in China. This chapter also reviews the empirical literature and identifies research gaps. Previous empirical literature is reviewed that examines the effects of corporate governance (CG) structures on corporate entrepreneurship (CE), the effects of both CG and CE on firm performance.

The chapter is structured as follows: Section 2.2 provides the concepts of corporate governance and corporate entrepreneurship. Section 2.3 provides an overview of factors impacting on corporate governance and corporate entrepreneurship in China. Section 2.4 demonstrates and discusses the internal and external CG mechanisms of China. The internal CG mechanisms include the board of directors, board composition, leadership, and supervisory board. The external CG mechanisms include stock market development, economic reforms leading to a change in ownership structure and classification of shares in listed firms, the market for corporate control, and the legal environment in China which have resulted from the institutional arrangements and were in effect during the transition and privatisation process of China. Section 2.5 discusses the development of science and technology in China. Section 2.6 presents the existing research, which addresses the relationships between CG structures, CE and firm performance, as well as the moderating effects of CG structures on these relationships. Section 2.7 concludes the chapter and identifies research gaps from the empirical literature.

2.2 The Concepts of Corporate Governance and Corporate Entrepreneurship

2.2.1 Definition of Corporate Governance

There is no single definition of CG. There are various definitions, but these are broadly classified into two main groupings: the narrow definition and the broad definition, and these differ in terms of the perceived obligations of the firm. In the narrow definition, the objective of the firm is viewed so as to maximise shareholder-wealth, that is, the firm exists to serve the interests of its shareholders. This is clearly depicted in the Cadbury Report (1992, p.15), which defines CG as ‘the way in which companies are governed and controlled’, with an emphasis on the relationship between the board and shareholders. In line with the Cadbury definitions, Shleifer and Vishny (1997, p.2) define CG as ‘the ways

in which suppliers of finance to corporations assure themselves of getting a return on their investment'. This approach to CG, which is driven by agency theory (Jensen and Meckling, 1976; Fama and Jensen, 1983), has, for a long time, underpinned CG in Anglo-Saxon countries, for example, Australia, Canada, the UK and the US. However, the approach has been criticised as very narrow by some authors (e.g. Freeman, 2010; Donaldson and Preston, 1995) arguing that firms have a wider range of stakeholders than just shareholders. This approach to CG, underpinned by stakeholder theory (Freeman, 2010), takes the view that the obligation of firms is to a wider group of stakeholders, other than just shareholders, and is defined as any individual or group who could impact on the achievement of the firm's objectives, for example, employees, suppliers, customers, creditors, and even the wider community and competitors. To this extent, Freeman defined CG as the firm itself being a grouping of stakeholders and the purpose of the firm should be to manage their interests, viewpoints, and needs. This approach to CG is prevalent in countries, for example, those in continental Europe and Japan. China's CG system is also designed to protect the interests of the wider stakeholders. For example, Chinese CG Code defined CG in the Preface as the basic principles for corporate governance of listed companies in China, the means for the protection of investors' interests and rights, the basic behaviour rules and moral standards for directors, supervisors, managers and other senior management members of listed companies. Therefore, the definition adopted in this thesis is that which takes the broader approach.

Due to differences in firms' rights and obligations, there are mainly two corporate governance (CG) patterns including the outsider or market-based pattern applied in the UK and the U.S. and the insider or control-based approach found most commonly in emerging economies and in continental Europe. So far, academic research has not arrived at a definite and consistent conclusion regarding the relative superiority of either type

(Anderson and Gupta, 2009; Bai et al., 2004). The key features of the outsider or market-based governance model include dispersed ownership, transparent disclosure, an independent board composed of the majority outsider members, a well-developed legal infrastructure, and active takeover markets. In this model, whilst, the largest shareholders are encouraged to play an active role in the CG of the firms in which they have investments (The Walker Report, 2009), they do not take an active role in the management of firms and do not intervene directly in the day-to-day business. Thus, this type of corporate governance pattern gives more power to managers than the largest shareholders. Advantages of market-based patterns include the more well-established legal framework with more protection of minority shareholders (Griffin et al., 2014). Firms are handled by the market to restrict the behaviour of managers and small shareholders possess great power to change inefficient managers. Nonetheless, this post-supervision pattern also suffers from more frequent variation of controlling power and is most applied in the country with more complete legal system and managerial market, such as the US. Accounting scandals, for example, the Enron Scandal aroused doubts about the over-reliance on external independent directors.

Different from market-based patterns, the insider or control-based model consists of a more concentrated ownership structure and insider board, more voting power by original shareholders in the involvement in firm decision-making as well as limited disclosure with family finance or the banking system for support (Li and Qian, 2013; Matoussi and Jardak, 2012). The market for corporate control is weak or limited as only a small proportion of shares are circulated on the market and it is difficult to acquire sufficient shares to punish existing management teams (Bai et al., 2004). More concentrated ownership structures could prevent hostile takeovers and maintain the stability of ownership structure. Nonetheless, disadvantages of control-based model are

also evident including weak market forces in restricting the rights of the largest shareholders as well as deficiencies in external scrutiny.

The CG model in China can best be characterised as an insider or control-based approach. As will be discussed in detail later in Sections 2.3 and 2.4, in many cases, listed firms in China have a controlling shareholder, in most cases the state government tends to hold about 45% of the shares of listed companies (OECD, 2005). The structure of boards in China is a two-tier system, including the supervisory and management boards. The supervisory board is composed of outside members appointed by the shareholders' meeting and its responsibility is to (1) examine corporate financial affairs; (2) demand that directors and executives redress misconduct damaging corporate interest; (3) supervise directors' and executive's breaches of statutes or Memorandum of Associations in performing their duties; (4) propose special meetings of the shareholders; and (5) other duties as stipulated in the Memorandum of Associations (See the Chinese CG Code, CSRC, 2001a). The management board is all management (internal members) and has the responsibility of formulating business and investment plans, and members are appointed at the shareholders' meeting. This results in a concentrated ownership structure, a management-friendly insider board, inadequate financial disclosure and inactive take-over markets have been the governance norms in the Chinese market (Young et al., 2008). Furthermore, in line with the features of a control-based approach, the stock market is heavily regulated by the Chinese central government and its development is subject to constant government intervention.

2.2.2 Definition of Corporate Entrepreneurship

The concept of corporate entrepreneurship (CE) has evolved over the last few decades (Bierwerth et al., 2015; Miller, 2011; Sharma and Chrisman, 2007; Zahra, 1996; Jennings and Young, 1990). Covin and Slevin (1991) and Miller (2011) defined CE as radical

product innovation, risk taking, and proactiveness. Zahra (1996) followed Guth and Ginsberg's (1990) conclusion that CE has two dimensions: innovation aimed at business creation and venturing, and strategic renewal (Zahra, 1996:1715). More comprehensively, Sharma and Chrisman (2007, p.18) suggested that CE is 'the process whereby an individual or a group of individuals, in association with an existing organisation, creates a new organisation or instigates renewal or innovation within the organisation'. Other researchers conceptualise corporate entrepreneurship as embodying entrepreneurial behaviour requiring finance and resource commitments for the purpose of developing different types of value-creating innovations (Choi et al., 2011; Jennings and Young, 1990; Burgelman, 1983). This conceptualisation of CE is consistent with Damanpour's (1991) perspective that CE includes 'the generation, development and implementation of new ideas or behaviours. An innovation can be a new product or service, an administrative system, or a new plan or program pertaining to organisational members' (Damanpour, 1991, p. 556). In this view, CE focuses on enhancing and re-energising a firm's capability to facilitate the skills through which innovation can be created. Corporate entrepreneurship is key to the efforts of a firm to establish sustainable competitive advantages as the foundation for value creation (Rauch et al., 2009; Tang et al., 2008; Ireland et al., 2003; Zahra, 1996).

A review of the literature by Jennings and Young (1990) observed that there are subjective and objective measures of CE and defined the objective measure of the innovation domain of CE, using archival data; and the use of a self-report questionnaire or interview as a subjective measure for CE. Jennings and Young (1990) further discussed the advantages and disadvantages of using these two measures in CE research. For example, objective measures of CE are difficult or inconvenient to obtain but are measurable and can track the change of innovation over time; on the other hand,

subjective measures may provide inaccurate and biased information but can obtain detailed information about personal feelings, perceptions and opinions.

In this thesis, corporate entrepreneurship is defined as the innovativeness of the firm as reflected in the R&D intensity and patent data. This definition is consistent with other studies (Shapiro et al., 2015; Chen et al., 2014a; Classen et al., 2014; Aghion et al., 2013; Dong and Gou, 2010; Munari et al., 2010).

2.3 Factors Impacting on Corporate Governance and Corporate Entrepreneurship in China

As indicated in the introduction to this chapter, in this section, the factors influencing CG and CE are discussed in the context of China. The key factors addressed in this section are the economy, political system, the legal framework, the stock markets, and the quality of accounting standards.

2.3.1 Chinese Economic Development

Modern Chinese economic development began in the 1970s. In December 1978, the Central Committee of the Chinese Communist Party (CCP) held an historic meeting in Beijing, at which the Leader Deng Xiaoping put forward two important policies. The first policy was the Open-Door Policy (called '*menhu kaifang*'), and the other policy was to invigorate the national economy through reform (called '*jingji gaige*'). The meeting marked a new chapter in the Chinese economy. Since then, China has undergone a great economic reform (Tang et al., 2008).

There have been two stages in Chinese economic reform. The first stage was from 1978 to 1993 and the second stage was from 1993 to the present day. The focus during the first period (1978 to 1993) of economic reform was on reintroducing markets and incentives within the domain of direct state ownership and control. The growth within the

Chinese industrial sector was very fast in the first stage but private ownership and control of firms played a limited role in the reform. At the same time, reforms of state-owned enterprises (SOEs) began in the 1980s. On the one hand, the old system under which people were paid without having to work hard has been abolished. On the other hand, large amounts of foreign capital have been pouring in and joint ventures with SOEs have been mushrooming, in particular, in the coastal areas (e.g. Shenzhen, Zhuhai, Shanghai, Tianjin, Guangzhou) and listed firms in which the government owns major shares (Chen et al., 2009). It is worth mentioning that the growth engine of the economy has also been driven mainly from the new non-state enterprises especially rural collective enterprises known as township-village enterprises (TVEs, also called '*xiangzhen qiye*').

In the Spring of 1992, Deng Xiaoping made his famous Southern China Tour (also called '*jiuer nanxun* ') to mobilise local support for further economic reform and intensify the economic development in the coastal region. After that, the 14th CCP Congress held in September 1992, endorsed the socialist market economy as the Chinese goal of reform for the first time. Since then, the Chinese economy has further integrated into the global economy. After long negotiations, China became a member of WTO in 2001, which is expected to have a significant impact on Chinese economic growth.

Over the last ten years, China has made significant progress in developing the institutional foundations of a modern corporate governance system. More than 80% of all small-and-medium enterprises (SMEs) have been privatised (Chen et al., 2009), with a significant proportion of shares sold to employees and external investors. In 2013, about 2,468 firms (785 are state-owned) have diversified their ownership through public listing. In 1978, GDP in China was U.S. \$44 billion, and in 2016, its GDP was over U.S.\$11.2 trillion with a GDP growth of 6.7%. China has become the world's second-biggest economy. The China Securities Regulatory Commission (CSRC) and the State Economic

and Trade Committee (SETC) have promulgated the Guidelines for introducing Independent Directors to the Board of Directors of Listed Companies, and the Code of Corporate Governance. However, there was a need to further improve good governance practices in Chinese listed firms (Tricker, 2012).

2.3.2 The Political System

Roe (2003) argues that the political system adopted by a country is important in understanding the CG system and its effectiveness. Roe (2003) suggests that the political system is supreme in that it determines the legal framework within which firms operate and how rules and regulations are enforced. As La Porta et al. (1998) remark, the quality of the legal framework and how it protects minority shareholders depends on the quality of enforcement, and the quality enforcement is dependent on the political will within the country. The corporatisation of SOEs is one of the key components in the Chinese political system. In the early 1990s, many SOEs were partially privatised by issuing a minority allocation of shares to individual public investors. Due to capital shortage, many SOEs, especially the ones performing well, were listed on either the Shanghai or Shenzhen stock exchanges in China. Whilst granting more autonomy to the managers in SOEs, central and regional governments often retain sufficient shares to maintain voting control of the firms. The government still retains ultimate decision rights concerning mergers and acquisitions, the assets, the disposal of shares, and the appointment of CEOs of the listed firms.

In addition, the Chinese Communist Party (CCP) retains ultimate control over the appointment of chairmen of the board in state-owned listed firms (OECD, 2011). In western countries, the control power and decision rights are shared amongst the board of directors, especially between CEO and chairman under a combined leadership board structure. However, listed firms in China with dominant state ownership, the control

power and decision rights are shared amongst CEO, chairman and the party secretary of the CCP's committee in the firm. In most cases, chairman and party secretary is the same person to avoid conflicts between the Party secretary and top managers. For example, State-Owned Assets Supervision and Administration Committee of State Council (SASAC) required that if the chairman is a Party member, the chairman should also serve as the Party secretary. The disadvantage of a firm owned by the state is whilst the state is the absolute controlling shareholder, the state representatives are not able to manage the firm on a daily basis and hence, a kind of absent owner forms. Such an ownership structure leads to a lack of managerial initiatives on the one hand, and misinformed business decisions on the other (Young et al., 2008). This causes conflicts between large and minority shareholders.

In addition, the state has incentives to finance the SOEs in achieving economically inefficient objectives rather than profit maximisation, which other minority shareholders pursue. Minority shareholder rights are limited in that they can seldom vote for crucial events or appointment or dismissal of directors in the firms with their investment. Because the management is a political representative of the state, the agency problem of Chinese firms, particularly the SOEs is potentially far more serious than for most western firms (Young et al., 2008).

2.3.3 The Regulatory Legal System and its Enforcement

2.3.3.1 Transition and Current State of the Regulatory System

The regulatory framework for firms in China has changed significantly with the transition in the economy. Prior to the move from planned to market based economy, the legal framework of the firm was the state-owned enterprise (SOEs) with the objective of protecting state property rights. Managers of firms were appointed and/or dismissed by the state and were required to act in ways that achieved the planned objectives of the state

rather than maximising shareholder-wealth. However, this began to change with the transition to the market-based economy, with the role of the SOEs changing to profit making organisations. Consequently, the Chinese government passed the SOEs Law of 1988 (Law of the People's Republic of China on industrial enterprises owned by the whole people) to support this objective. In particular, the SOEs Law specified that SOEs are responsible for their own gains and losses in the market: 'the enterprise shall be a socialist commodity production and operation unit which shall, in accordance with law, make their own managerial decisions, take full responsibility for their profits and losses and practise independent accounting' (The SOEs Law, 1988, Article 2).

Further changes were made with the introduction of the Company Law of 1993. The introduction of the Law was meant to provide legal foundations for the transformation of SOEs into different business corporations, including wholly state-owned corporations, closely held corporations (e.g. wholly foreign-owned enterprises and joint ventures between foreign investors and the Chinese government), and publicly held firms. The Company Law 1993 requires firms to form three statutory and indispensable corporate governing bodies. The first body is the shareholders, acting in the general meeting; the second body is the board of directors; and the third body is the board of supervisors. In addition, the Company Law 1993 introduced two new statutory corporate positions, namely the CEO and the chairman of the board of directors (the two positions can be combined into one person, known as CEO duality).

During the past decades, as China is transitioning from a centrally planned to a market-oriented economy, China has issued a numbers of new company laws and securities regulations. In particular, the latest amendment of the Company Law of 2013 provides a better legal basis for the CG system in China. The Company Law 2013 aims at providing sound legislative protection in the vigorous economic development of China.

The new law mainly focuses on revamping the firm establishment system with the purposes of streamlining the registration formalities and relaxing and simplifying the threshold for setting up a firm in the Chinese market. By doing so, it is expected to encourage more entrepreneurs to start their own businesses, thus fostering the growth of the private economic sector. However, the Company Law 2013 has not yet effectively addressed the fundamental agency problem facing Chinese listed firms, that is, the expropriation of minority shareholders by the controlling shareholders. Controlling sellers and buyers in private sales has meant being able to extract large private benefits at the expense of the minority shareholders of the target firm. Institutional shareholders have to overcome many legal and regulatory barriers that hamper their ability to participate in the governance of their portfolio firms (Jiang and Kim, 2015). Moreover, independent directors have not yet acted with rigorous independence, and a change is necessary to provide effective insight into detecting management wrongdoing or controlling shareholders to whom they owe their appointment.

2.3.3.2 Regulatory Enforcement in China

In a series of studies, La Porta et al. (1997, 1998, 1999, and 2000) emphasise the role played by the legal framework and legal foundation in disciplining managers and controlling shareholders' opportunistic behaviours in over 49 countries. As discussed in Section 2.3.3.1, as China transitioned from planned to market-based economy, a number of changes were made to its regulatory framework. A natural question to ask is what the quality of the legal system in China is and how enforceable the regulations implemented over the last few decades are. Allen et al. (2005) developed measures to test the quality of legal systems and their enforcement in China following the methodology adopted in La Porta et al. (1998). They found that the protection of creditors and shareholders, and law enforcement in China are all below average in spite of the fact that China is one of

the largest and fastest growing economies in the world. In particular, they showed that China's financial system is dominated by a large but underdeveloped banking system that is mainly controlled by the four largest state-owned banks. Allen et al. (2005) also showed that the growth in the private sectors is much faster than firms in state and listed sectors, but the applicable legal protection of minority and outside investors, and financial mechanisms are arguably poorer for the private sectors. Therefore, the system of alternative mechanisms and institutions plays an important role in supporting the growth in the private sector, for example, the Chinese Communist Party remains largely autocratic, government officials, and especially those in the most developed areas play an active supporting role in financing channels and promoting the growth of the private sector. Results from Allen et al. (2005) indicate that the Chinese regulatory and enforcement environment is weak, and, as a consequence, corporate governance is also poor, with potential for expropriation of minority shareholders. In particular, the controlling shareholders and the management act in self-benefit and diverting resources that could be used to invest in operation/activities with potential profit (e.g. CE activities) for their own benefits (Li and Qian, 2013; Young et al., 2008; Peng et al., 2007).

Considering the Chinese government recognises that its laws and enforcement require strengthening, China Company Law was amended for the sixth time in 2013, however, the management system and policy implementation are still far from being effective and efficient. The low effectiveness has been influenced by a lack of coherence amongst regulations, conflicting interests at different levels of the administration, and insufficient technical capacity and resources available to local institutions to carry out their duties. Therefore, further steps are required to continuously improve the policies and regulations and recognise the needs of businesses from different sectors.

2.3.4 The Chinese Stock Market

The stock market is important for economic development because it impacts on the allocation of financial resources (Rajan and Zingales, 1998; Bushman and Smith, 2001; Healy and Palepu, 2001). It is also important as disciplining governance mechanisms on listed firms in that firms that perform according to the market standard are rewarded with an increase in share prices and those that perform poorly are penalised with decreases in share prices. This implies that a well-functioning stock market is important for firms that have alternative sources of capital instead of relying on internal funding to finance growth. In the absence of a well-functioning stock market, firms have to rely on government, influential wealthy families, and banks. Whilst these also monitor and discipline managers, their objectives might be different from those of a purely maximising shareholder-wealth (e.g. minority shareholders), so that their role as a monitoring mechanism might not coincide with that of other shareholders.

The stock markets in China are relatively new. There are two stock exchanges, the Shanghai Stock Exchange (SHSE) established in March 1990 and Shenzhen Stock Exchange (SZSE) formed in November 1991. The stock exchanges were established to improve corporate financial conditions, promote research and development and expand firms' profit bases, and the stock exchanges have rapidly expanded. There were only 10 listed firms in 1990 and 14 in 1991 from both SHSE and SZSE. Since then, the Chinese capital markets have grown rapidly over the past three decades generated by the steady opening up of the Chinese economy. SHSE was ranked the seventh largest Stock Exchange market in the world in terms of market capitalisation in 2014 (China Daily, 2014). By 2015, there were 2,808 listed firms in both stock exchanges.

The Company Law of the People's Republic of China (2013) (revised in 2013 and which came into effect as of March 2014) makes a distinction between two forms of

company, namely Joint Stock Companies (JSC) and Limited Liability Companies (LLC), which roughly corresponded to the UK's distinction between public and private companies. The form of JSC is usually adopted by large companies which intend to offer shares to the public, while LLC is incorporated by small businesses. Therefore, for a company to be listed, it must be incorporated as a JSC either through promotion or public subscription with a required registration capital of at least RMB 5,000,000. For a JSC to be listed on a stock exchange, it must satisfy a number of key requirements laid down by securities law and listing rules relating to their statutes.

Similar to many other stock exchanges, the roles that SHSE and SZSE play are to provide a market for sellers to raise new capital and trade company securities, and for investors to buy shares. However, there are some differences between the listing markets provided by SHSE and SZSE. There are three boards in SZSE: a main board, a board for small and medium sized enterprises (SMEs) (established on 17th May 2004), and a board for young firms, known as the Growth Enterprise Market (GEM) board (established on 30th October 2009) (Jiang and Kim, 2015). In particular, the SMEs board is designed as an exclusive market segment to facilitate small-and-medium-size businesses to trade on the exchange (SZSE, 2016). SMEs in China have historically been denied ready financing from the country's state-owned banks. Consequently, the SME Board has become a key source of capital for independent innovation in emerging industries. Since then, whilst there are no fixed thresholds to differentiate between the sizes of listing companies on the two exchanges, smaller companies satisfying the requirements for listing were exclusively traded on the SMEs board. There is just a main board in the SHSE because firms listed on the SHSE are on average larger and have more government connections than firms listed on the SZSE. Many consider the SHSE to be similar to the New York Stock exchange and the SZSE to be similar to the Nasdaq (Jiang and Kim, 2015).

2.3.4.1 Chinese Securities Regulator

Chinese stock exchanges are not independent of the state despite their self-regulatory nature as defined by the Securities Law of the People's Republic of China (2014). The stock exchanges are under the direct supervision of the CSRC (China Securities Regulatory Commission) (CSRC, 2001a), with the senior personnel, for example, chairman and vice chairman, appointed by the CSRC. It is often said that these stock exchanges are two subsidiaries of the CSRC. Unsurprisingly, there are concerns that they lack sufficient autonomous regulatory authority to enforce their roles in securities markets. The CSRC is also responsible for approving initial public offerings (IPOs) (CSRC, 2001a). Initially, the Chinese government tightly controlled the IPO process (see Huyghebaert and Xu, 2015; Cheung et al., 2009). The government identified sectors that were allowed to bring firms into the public domain, established a quota system, and also even determined offer prices. Later in the late 1990s, investment banks gradually took a larger role in the IPO process, assuming greater responsibility for identifying and developing listing candidates. Today, the CSRC's explicit role in the IPO process is simply to make sure that issuers comply with the rules. However, the reality is that the CSRC still tightly controls the IPO process, as the CSRC has had the final say on which firms, if any, go public. For example, the CSRC put a freeze on all Chinese IPOs in 2012. At the close of 2013, 760 firms had to go public, but during a 14-month stretch in 2012 and 2013, no firm was granted an IPO (Jiang and Kim, 2015). Therefore, the IPO process in China is essentially based on an approval system, which is unlike the registration system that characterises the IPO process in most developed countries. However, this system may soon change, as the CSRC began speaking of moving away from its current approval-based system (seen as distorting the IPO market and encouraging official corruption) to fast-track reform of this system (Yu, 2017).

2.3.4.2 The Efficiency of the Chinese Stock Markets

While the stock market has the potential to be an effective allocator of capital, it will perform well only if it is reasonably efficient. Efficiently functioning stock markets offer easy-to-understand evaluations of the financial conditions of individual firms as well as their future prospects (Gay, 2016). The efficiency of the Chinese stock market is a very important issue given its large capitalisation (\$9.7 trillion as of the end of May 2015 according to Bloomberg data) and China's rapid growth (Beltratti et al., 2016). The size of the Chinese stock market is remarkable when one notes that as of the end of the 1980s, the Chinese corporate sector was overwhelmingly dominated by state-owned enterprises and that the establishment of the two stock exchanges took place only in 1990 and 1991, respectively.

Malkiel and Fama (1970) considered tests of stronger forms of efficiency where the information sets to be reflected in share prices included all the public and private information about the book values and investment opportunities (e.g. CE projects). On the one hand, the Chinese government still has a certain direct or indirect control of financial resources, for example, regulating the number of new listed firms, as well as the quota and initial prices of new listed stocks (Jiang and Kim, 2015). On the other hand, the existence of government policy intervention, insider trading, revilement of misleading information on listed firms, and some irrational behaviour of Chinese individual investors might lead one to expect that the Chinese stock market has not been efficient (Chen and Hong, 2003). A substantial number of studies have attempted to examine the efficiency of the Chinese stock markets, for example, Beltratti et al. (2016), Gay (2016), Gu et al. (2013), Zheng (2006); Chen and Hong (2003), and Groenewold et al. (2003). These studies concluded that China exhibits a weak form of market efficiency. A weak form of efficiency is often associated with the idea that future price changes are independent of

price changes in the past. This means that all current information is reflected in the stock prices and past information has no relationship with current market prices. However, with the improved legal systems and institutional arrangements, one may expect that the Chinese stock market has achieved some form of market efficiency (Beltrati et al., 2016).

2.3.5 Accounting and Reporting in China

The regulatory framework for accounting and reporting rests with company law and accounting standards. The 2006 China accounting standards (CAS) requires all listed firms to publish balance sheets, income statement, and statement of changes in owners' equity. The CAS also encourages firms to report R&D investment as a subcategory of administrative expenses. The responsibility for setting standards is to ensure a minimum level of consistency in listed firms' financial statements, which makes them easier for investors to analyse and extract useful information. In addition, the CAS facilitates the cross comparison of financial information across different firms from different sectors. However, although these standards work to improve the transparency in financial statements, they do not provide any guarantee that firms' financial statements are free from omissions or errors that are intended to mislead shareholders or potential investors.

2.4 Chinese Corporate Governance System

In this section, the corporate governance system in China is discussed, including how it has been influenced by the specific factors of the Chinese environment as discussed in the preceding sections. Focus here is on ownership structure of Chinese listed companies and the board of directors.

2.4.1 Ownership Structure and Classification of Shares in China

China is a country with strong central control, in which the National People's Congress, the State Council and the Communist Party play significant roles in the governance of

enterprises. Before the 1990s, economic reform in China involved the corporatisation of state-owned-enterprises (SOEs) and the adoption of profit sharing plans, for instance, the introduction of a Contract Responsibility System. While the government gave more autonomy to managers of the corporatised SOEs, it was unwilling to give up ownership rights. Political interference in the running of business was, therefore, rife and the managers' autonomy was emasculated (Tricker, 2012). As a result, the performance of SOEs was below government expectations. More than 42% of all SOEs lost money in 2013, and SOEs' returns were about half those of their non-state peers (Wildau, 2016). At the same time, facilities and technology of SOEs were out of date and the government needed a great amount of capital to support reforms.

In order to address these problems, SOEs were partially privatised and part of the shares were sold to the public. Many of these firms were then listed on the SHSE or SZSE from 1990. However, the government and its associated holding institutions generally retain sufficient shares so as to maintain voting control. It is the unwillingness of the government to give up the controlling rights that results in non-tradable shares and tradable shares of listed companies in the market. Agency conflicts and moral hazard problems can be very severe in this setting, a new agency problem arises from the privatisation of SOEs with dominant state ownership, which is a conflict of interest amongst stakeholders. It is possible that the government has more comprehensive goals other than shareholder value maximisation (Young et al., 2008). For example, the Chinese government may view that social welfare is potentially more essential than that of value maximisation, as a result, controlling state shareholders can achieve their policy goals via listed firms, regardless of the other stakeholders' interests (Tong et al., 2013). Chen et al., (2011) argue that the government either exerts too much influence on listed companies and the company's objectives are affected by political considerations, or a lack of

monitoring of the shareholders. Consequently, insider control in the public held firms in China appears in the form of misusing of their position or power against the interests of shareholders/stakeholders and pursuing of personal objectives by government officials or its appointed company's directors.

In addition, the SOEs mean that the firm's assets are owned by all people of the state but controlled by the government and its agencies. The government and its officials, unlike private shareholders, have no direct economic connection with the performance of the company. It can be understood that their roles in CG largely depend on political incentives and individual utility maximisation instead of shareholder's value (Fan et al., 2007). Furthermore, if the controlling shareholder is an SOE in a listed firm in China, the selection and recruitment of managers are not usually determined by the managerial market forces and expertise related to the organisational development, but by the relationship with the government officials. Inevitably, this approach of selecting and recruiting managers has resulted in the government playing a key role in CG in Chinese listed companies. As a result, on the one hand, the government has the ability to use administrative measures to directly affect the business and encumber the management with public welfares (Dong and Gou, 2011). On the other hand, owing to the political connection, the management often takes action to benefit the government's public interests or government official's personal interests for the benefit of their future political/business career, instead of the interests of shareholders as a whole (Fan et al., 2007). For example, if the state council is promoting the sciences and technology policies, listed firms with significant state ownership might be used as one of the tools to persuade and fulfil the goals of state instead of the stakeholders of the firms.

The CG structure of Chinese listed firms will become a more critical issue as China continues to gradually open its financial markets to foreign investment. It is of

significance to have a deeper understanding of the current CG system in China and the CG studies related to the Chinese market.

2.4.1.1 Multiple Classes of Shares

The non-tradable shares and tradable shares are categorised into four main groups (state share, social legal person shares, A shares, and B shares) based on the characteristics of the investors and the transferability of the different types of shares in the SHSE and SZSE (Gu et al., 2013). The basic rationale under the classification is to control the transferability of different types of shares.

2.4.1.1.1 Non-Tradable Shares

Non-tradable shares (NTS) is a special class of shares entitling the holders to exactly the same rights as holders of ordinary shares, but which cannot be publicly traded. Typically, these shares belonged to the State or to domestic financial institutions ultimately owned by central or local government (see Sun and Tong, 2003). In 2005, the Chinese authorities announced a reform aimed at eliminating NTS to become tradable shares by the end of 2006 (Jiang and Kim, 2015). Policy guidelines stated that the official objective of the reform was not to reduce state holdings, but to eliminate NTS (Mattlin, 2007), and that control would remain tightly in the hands of the government in enterprises deemed strategic (Beltratti et al., 2016).

Non-tradable shares of listed firms can be classified into two types: state-owned share and legal person share. Owners of these shares usually were sponsors when enterprises corporatised before IPO. State-owned shares can be transferred to non-SOEs or foreign institutions to become legal person shares upon respective approval by the China Securities Regulatory Committee (CSRC, 2001b) and Ministry of Finance (MoF).

(1) State-Owned Shares

Due to the different investment entities and equity management entities, state-owned shares comprise of state shares and state-owned legal person shares. The state shares are those obtained by the government institutions or departments representing the central government when they invest capital into stock corporations or acquired through legal procedures (Jiang and Kim, 2015). The state-owned legal person shares are shares obtained by state-owned legal persons, government affiliated institutions, or other enterprises when they invest their owned legal assets into independent stock corporations or acquired through legal procedures (Tong et al., 2013).

(2) Social Legal Person Shares

Social legal person shares are those obtained by non-state-owned legal persons through investing their legal capital into stock corporations or through agreement ownership transfer from other institutions (OECD, 2011). Legal person shares are company issued shares held by domestic institutions, including industrial enterprises, banks, securities companies, construction and real estate development companies, trust and investment companies, transportation and power companies, foundations and funds, and technology and research institutes (Jiang and Kim, 2015). If they are sponsors of the corporations, their shares cannot be transferred to another entity within three years after IPO. If SOEs transfer their state-owned shares to non-SOEs, the state-owned shares will change to social legal person shares after the ownership transfer. Unlike state-owned shares, transfer of social legal person shares is much easier. It does not need joint approval of the MoF and CSRC, only CSRC approval is necessary (CSRC, 2001b). The original purpose of barring state shares and legal person shares from free trading was to maintain the government's leading role in the Chinese economy (Wei et al., 2013).

2.4.1.1.2 Tradable Shares

Tradable shares of listed companies include A shares and B shares. Tradable A shares also called individual shares and may be transferred only between Chinese citizens. Under the Company Law of the People's Republic of China (2013, Article 141), they are issued by companies to Chinese citizens and domestic institutions and the total amount of tradable A shares must exceed 25% of total outstanding shares when a company is listed (Company Law, 2013). There are four types of Qualified Foreign Institutional Investors, which are:

- (1) Fund management institutions;
- (2) Insurance companies;
- (3) Securities companies;
- (4) Other asset management institutions

Everyone is allowed to trade A shares in China's stock markets. B shares are created for foreign investors with the aim of raising funds in foreign currency for companies involved in international trade (Gu et al., 2013).

Apart from the four main types of shares listed in the Shanghai and Shenzhen stock exchanges, there are also other types of shares. For example, employee shares and overseas listing shares. Employee shares are only issued to the incumbent workers and management of a listed company with a substantial discount. They are designed as an incentive stock scheme and can only be traded 6 to 12 months after the date of granting in the stock exchange markets upon approval of the CSRC (2001b). Nevertheless, directors, supervisors and managers of the corporations are required to report their shareholding in the company they serve and are not allowed to transfer their shares during their tenure. Overseas listing shares are issued by companies which are listed outside

China and may only be traded in a special, closed market (CSRC, 2001b). These shares are as follows:

- (1) N shares: China-based companies listed in New York;
- (2) L shares: China-based companies listed in London;
- (3) H shares: China-based companies listed in Hong Kong;
- (4) S shares: China-based companies listed in Singapore.

A typical listed company in China has a mixed ownership structure comprising three predominant groups of shareholders – the state, legal person and the tradable A shareholders. As of the end of 2014, the total number of companies listed on the SSE and SZSE stood at 2,613. The stock market capitalisation of the SSE and SZSE-listed firms, was equivalent to 57.99% of its GDP in 2014 (National Bureau of Statistics of China, 2016). In other words, listed firms are one of the major sources of economic growth in China.

2.4.2 The Split-Share Reform

There is a consensus in the existing literature (e.g. Tong et al., 2013; Hou et al., 2012; Qiu and Yao, 2009) that non-tradable shares are the major drivers of problems in the Chinese stock market due to their restriction on the merger and acquisition activities of domestic firms through the stock market. For example, the holders of non-tradable shares have the controlling power to determine corporate policies, but their wealth is unrelated to the market prices of tradable shares. As a result, the market value as well as investor behaviours would neither reflect nor influence the fundamental values of these listed firms (Tong et al., 2013). It is argued by Wu (2014) that the settlement of stock right splitting issues would resolve 80% of the problems in the stock markets, although Qiu and Yao (2009) suggest that the split share structure (tradable and non-tradable) has impeded the stock market's development and the transformation of Chinese listed firms.

A recent reform that has been taking place since 2005 deserves particular mention, as it has the potential to result in a fundamental change in the ownership and control structure of Chinese listed firms, namely split-share structure reform (Xu and Wang, 1999), which phases out the restriction on the transferability of non-tradable shares by paying compensation either in cash or in shares to tradable shareholders, usually an average of three shares for every 10 tradable shares, despite the fact that these compensation schemes were negotiated on an individual company-by-company basis. Table 1 briefly lists the main reform plans that most listed firms follow.

Table 1: The Split-Share Reform Plans

Plan classification	Plan details
Compensation shares	Mostly non-tradable shareholders make share compensations to the tradable shares and sometimes listed firms make the compensation.
Reverse stock split	Non-tradable shareholders contract their shares according to some ratio.
Cash compensation warrants	Non-tradable shareholders issue warrants to tradable shareholders.
Asset restructure	Major non-tradable shareholders make some asset restructure with the listed firms.

Source: Hou et al. (2012)

As a consequence, a more dispersed ownership structure emerges and the influence of controlling shareholders in many listed firms is being diluted. However, concentrated ownership structure remains a defining feature of Chinese listed firms as the sale of current tradable state-owned shares is still subject to administrative approval. In 2005, the Guidelines on the Reform of Non-Tradable Shares of State-Controlled Companies were released by the State-Owned Assets Supervision and Administration Commission (SASAC, 2011), specifying the requirements on the percentage of state shares to be held by state-controlled firms. It states that the approval of the SASAC is required for any sale of state shares. However, a controlling stake in listed firms should be maintained by the state in the industries which are vital to the national economy or

security. In particular, these firms are required to include a restriction on their proposal of reform that state shareholding cannot be above a particular level.

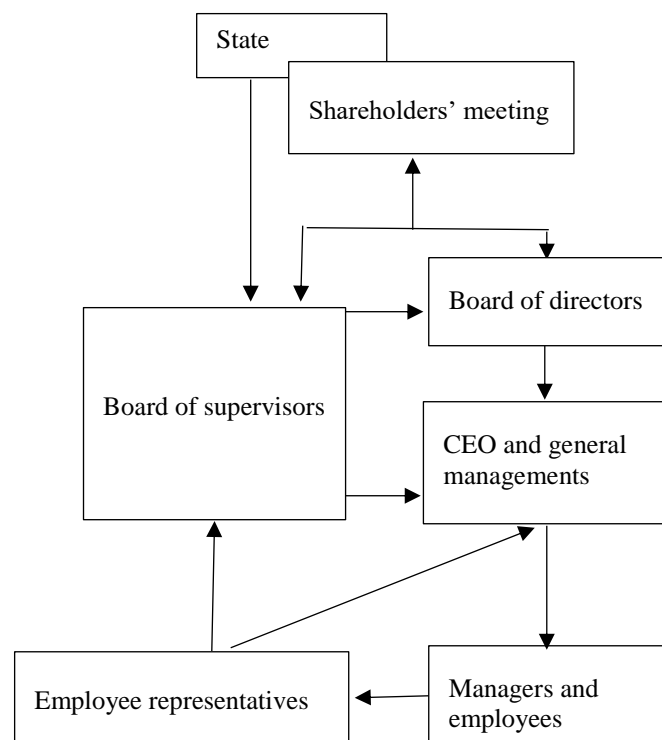
Due to the split-share reform, both the A and B shares can be further classified into two groups: restricted shares and tradable shares. Restricted shares are shares that can only be transferred privately or auctioned, usually at a discount value relative to that of freely tradable shares in the firm, and, are not allowed to trade freely on the Chinese stock exchange (Hou et al., 2012). However, it is worth noting that restricted shares are only non-tradable for a period of time. The reform regulations require that non-tradable shares are not allowed to be sold publicly or transferred within a lockup period of 12 months from the time the firm announced the split-share structure reform implementation plan, and after the lockup period, the non-tradable shares can be actually traded with the restriction that:

- (1) Former holders of non-tradable shares with more than 5% of total shares of a listed firm are only allowed to sell at most 5% of the shares outstanding within 12 months upon the expiry of the lockup period;
- (2) With a maximum of 10% of the shares outstanding within 24 months after lockup period;
- (3) They have the flexibility to sell all the non-tradable shares after 36 months.
- (4) To date, more than 99% of Chinese listed firms in both the Shanghai and Shenzhen stock exchanges have compensated tradable shareholders, the non-tradable share of these firms is gradually becoming tradable. The remaining firms are nominated as S-shares as they have not compensated their tradable shareholders and have been limited in their market prices to fluctuate no more than 5% on any trading day (Yang et al., 2011). It is evidenced by Yang et al.

(2011) that this reform resulted in a statistically significant positive average market adjusted return as well as average abnormal returns for listed firms.

To sum up, the Chinese stock market is in its infancy and was established under a centrally planned economy, and value maximisation is not the sole objective of these Chinese listed firms. The Chinese CG system which is characterised by multiple goals of listed firms, highly concentrated ownership, expropriation of minority shareholders by controlling shareholders, strong insider board and a weak legal system for shareholder protection are found to be the most serious problems in China and have seriously impeded the development of an effective CG system for Chinese listed firms. Therefore, it is interesting to see how these unique features of the Chinese stock markets affect CG practices as well as corporate entrepreneurship and their potential firm performance.

Figure 1: The Model of Corporate Governance in China



Source: Tricker (2012, p. 446)

2.4.3 Board of Directors

During the transition from planned to market-based economy, the Chinese Company Law was amended six times since the 1970s to further improve the efficiency of corporate governance (CG) structures. The most recent one occurred in 2012 and became effective in 2013. The Chinese CG structure of listed firms combines the Anglo-American and the German systems, therefore, requires two monitoring organs, independent directors and supervisory boards (Tricker, 2012). The primary function of a corporate governance (CG) structure is to reduce or resolve the agency problems created by the separation of ownership and control and by the lack monitoring. Theoretically, agency theory highlights the fact that the board of directors (BoDs) has a very important role to play in CG. In China, according to the Company Law 2013 Article 44, a limited liability firm shall have a board of directors of three to nineteen members.

In China, publicly listed companies operate a two-tier board system, which is different from the unitary system applied in the UK or the US. The two-tier board in China consists of a directorate and a supervisory board (see Figure 1), an arrangement transplanted from the German corporate system. In practice, the monitoring role of the BoDs is more decorative than functional (Tricker, 2012; Chen et al., 2011; Liu and Lu, 2007). Article 46 of the Company Law 2013 expressly defines the roles of the BoDs. These roles include: (1) convening the shareholder meeting and reporting on the board's performance to the board of shareholders; (2) implementing resolutions approved at the shareholder meeting; (3) determining the business operation and investment plans of the company; (4) formulating the annual fiscal financial budgets and the final accounts of the corporation; (5) formulating plans for profit distributing and loss recovery; (6) formulating plans for increasing or reducing the registered capital or for the issuance of corporate bonds; (7) formulating proposals regarding merger, dissolution or change of

corporate form of the company; (8) determining the internal management structure of the company, and (9) appointing or removing the general manager, approving nominations of vice general managers and chief financial officer by the general manager, and setting their compensations; and (10) deciding basic regulations of firms. From the directors' perspective, obviously, the Company Law 2013 empowers the board with authority to run the corporation, but problems arise as such a regulatory arrangement has produced limited and insufficient powers to enable the board of directors to supervise and monitor the executives and the management of the companies.

Directors have contracts for three years, which can be renewed after the original contract expires. Shareholders have to approve the appointment (and re-appointment) of the directors (Jiang and Kim, 2015; Firth et al., 2007). In addition, it seems that the board of directors has no authority to supervise and monitor the performance of individual directors, the CEO, and other executives, although it has the power to decide on the establishment of the internal management structures of the company and the appointment of the managers of the company.

Although the boards of directors resemble those in the West, their effectiveness differs from the two-tier supervisory and management boards in Germany and insider-dominated boards in Japan. Corporate boards in China are in the hands of large shareholders. Minority shareholders are able to vote on major decisions, but it is the votes of the dominant investors that will be decisive (Jiang and Kim, 2015). Therefore, even if shareholders nominate and elect the board of directors, who are representatives of large shareholders, they do not represent the interests of all shareholders. In fact, they only act in large shareholders' interests and most of the dominant shareholders are linked to the state, the government is able to influence the appointment of directors and top management, and, on occasion, to influence decision-making (Company Law, 2013). In

some cases, the top management team members and directors may be political appointees (Tong et al., 2013) who have a limited understanding of business and who have little empathy with the concepts of financial transparency and sound corporate governance. The responsibilities and duties of directors are somewhat clearly spelled out in the Company Law 2013 and in the Corporate Governance Code, and they closely mirror those in the West. However, as the enforcement of law is somewhat lax, the directors may not be fully cognisant of their fiduciary duties to the shareholders. In practice, the internal governance of firms may not be as strong as the recommendation of good practice, and this may have an impact on the quality of the firm's strategic planning and investment decision-making.

2.4.3.1 Independent Directors

Given the insider control problem in Chinese listed firms, in the early 1990s, China began to introduce the concept of CG, and with its development, much importance has been attached to it. In August 2001, the CSRC (2001b) authorised by the State Council, promulgated the Guidelines for Introducing Independent Directors to the Board of Directors of Listed Companies (the Guidelines in short). The primary intent of this proposal is to encourage listed companies to establish and develop a modern enterprise system, regulate the business operations of listed companies, and promote the healthy development of the securities market in China (CSRC, 2001b).

Independent directors play two important roles in a firm. First, because of their independence, they should be well placed in the boardroom to monitor executive performance and control the conflicts of interest between the controlling shareholders and minority shareholders (Shapiro et al., 2013; Peng, 2004). Second, they provide access to external resources. The second function is likely to be more important for the firms which would like to be entrepreneurial. In general, different types of independent directors, such

as bankers, venture capitalists, professional experts in relevant fields, and politically-connected appointees, can bring different assets to the firm (Tong et al., 2013). In China, for instance, firms with entrepreneurship goals would benefit from appointing industry experts, who are able to contribute their professional expertise in strategy, finance, and technology as independent directors

In Section I (1) of the Guidelines for Introducing Independent Directors to the Board of Directors of Listed Companies (CSRC, 2001b), it defined independent directors as ‘a director who does not hold any position in the company other than director and who has no relationship with the listed company engaging him or its principal shareholders that could hinder his making independent and objective judgments’. In other words, the independent directors shall be independent of their employer and the company’s main shareholders, as well as shall hold no other position but that of independent directors in the company. The Guidelines for Introducing Independent Directors to the Board of Directors of Listed Companies require that by 30th June 2002, at least two members of the board of directors should be independent directors in each listed company, probably as a common law solution to the prevalent powerlessness of supervisory boards. Later, in 2003, at least one-third of the board should be independent directors and it remains the same in Company Law 2013 (Company Law, 2013).

The independent director system was developed to resolve supervisory holes, balance power within the board, and is crucial in ensuring that the influence of large shareholders in a company is kept in check whilst protecting the interests of small investors and other stakeholders. According to the Guidelines for Introducing Independent Directors to the Board of Directors of Listed Companies, the independent director should express an independent opinion on the major events occurring in the listed companies and have some special power other than those stipulated in the Company Law

and other related laws and regulations (CSRC, 2001b). For example, they have power to call extraordinary shareholder meetings and board meetings to approve all major related-party transactions and have power to appoint outside auditors or consulting organisations independently. In addition, the Guidelines stipulate that the independent directors shall earnestly perform their duties and responsibilities in accordance with regulations, laws, and company's articles of association, shall protect the overall interests of the company, and shall be especially concerned with protecting the interests of minority shareholders from being infringed (Shan and McIver, 2011).

However, the role played by the independent directors in China seems limited to monitoring the performance of management and controlling shareholder-related transactions, with particular emphasis on minority shareholder protection. It is unclear whether the independent directors should have any responsibility for reviewing and initiating strategic analysis, formulating strategy (e.g. entrepreneurial strategy) and setting corporate direction.

As of September 2013, there were 5,760 independent directors in companies listed on either the Shanghai or Shenzhen Stock Exchanges. 2,590 (45%) of them had previously been government officials, more than 30 (1.16%) had served as minister-level officials, over 100 (3.86%) as mayors, and no less than 720 (27.80%) as division-level officials (Wu, 2014). This phenomenon is reflective of a common problem within China's independent director system that listed companies wish to exercise leverage on the social resources and networks of retired politicians and attach a lot importance to their relationship with government rather than their professional qualifications and supervisory abilities (Choi et al., 2011).

2.4.3.2 CEO Duality

It has been argued that the separation of the roles of chairman and CEO ensures an adequate system of checks and balances against potential abuse of power by management (Chen and Hsu, 2009). Indeed, from an agency perspective, splitting these two roles can dilute the power of the CEO and reduce the potential for a management-dominated board. Dalton and Kesner (1987, p. 35) state that ‘the real threat to the exercise of independent judgment by the board of directors is the dual role of the CEO as board chairman.’ Bhagat and Bolton (2008) argue that the dual leadership structure creates too much power in the hands of the CEO and makes it harder for a board to replace the CEO if the company appears to perform badly, which potentially results in reduced board flexibility to address large declines in performance (Yu and Ashton, 2015; Chen et al., 2006; Zahra et al., 2000).

In China, *the Basic Norms of State Owned Large and Medium Sized Enterprises in Establishing a Modern Enterprise System and Strengthening Management* were issued by the State Economic and Trade Commission in October 2000 stipulating in principle that the chairperson cannot concurrently serve as CEO. As China has a weak institutional environment and investor protection is poor, CEO duality could result in higher agency costs for Chinese listed companies (Yu and Ashton 2015). However, this is not stressed in the Company Law 2013.

Yu and Ashton (2015) examined the relationship between board leadership structure and performance and the expense ratio. They report that the percentage of Chinese listed firms practising CEO duality has increased since 2005 with 22.5% of firms having CEO duality in 2010. They found that CEO duality is not related to firms’ profitability ratios (ROA and ROE) but is linked to higher agency costs (expense ratio) compared to matched companies with a separate board leadership structure. In addition, the results show that there is a negative relationship between CEO duality and the largest

shareholding percentage, state ownership, board size, firm's listing age and firm size. Yu and Ashton (2015) concluded that a separation board leadership structure is an effective CG arrangement to reduce agency costs for the listed firms in China. It appears that CEO duality will be detrimental to the monitoring of boards and impair the independence of the board of directors.

2.4.4 Board of Supervisors

Two of the most effective CG structures in the world are the Anglo-American governance system and the German two-tier board system, and the board of supervisors (BoSs) is one of the typical features of the German governance system. Both Anglo-American and German governance systems have been codified into the Chinese Company Law since 1993 in a way similar to the Japanese governance system. However, the BoSs in China are designed loosely on the German style, and the major duties of the supervisors in China lie in monitoring the executives and the board of directors. Therefore, the Chinese two-tier board system in CG structures is more likely a combination of the US, German and Japanese systems.

The board of supervisors (BoSs) was first mentioned in the 1994 Company Law in China. In the latest version, the China Company Law 2013 (Article 117), the board of supervisors shall perform the following duties: (1) examine corporate financial affairs; (2) supervise directors' and executives' breaches of statutes or the corporate constitution in performing their duties; (3) demand that directors and executives redress misconduct damaging the corporate interest; (4) propose special shareholder meetings; and (5) other duties as stipulated in the corporate constitution.

According to the Company Law 2013, the BoDs in Chinese listed firms is responsible for its daily operation and possesses the function of execution, whilst BoSs monitor the behaviours of the board and the top management team with the function of

supervision. Both BoDs and BoSs entrusted by shareholders. Moreover, BoSs are required to examine the financial affairs of the firm. However, the Company Law 2013 does not stipulate that the BoDs and management team have to report regularly to the BoSs. Thus, it can be seen that the law provides the BoSs with neither any power in corporate decision-making nor the authority to appoint or dismiss the members of the BoDs. Whilst the Company Law mentioned that a limited liability company shall have a BoSs that is to be composed of at least three members, a smaller firm or one with fewer shareholders may have one or two supervisors instead of a board of supervisors (Article 51). According to Shapiro et al. (2015), among the privately-owned and manufacturing firms in Zhejiang province in China, 72% of firms had a supervisory board, and the average size of the board was 4 supervisors.

Unlike the German model, which calls for an equal number of shareholder and employee representatives under the German Co-Determination Law, the Company Law in China does not specify the proportion of shareholder representatives and employee representatives on the boards of supervisors, other than requiring at least a third to be worker representatives with corporate charters stipulating the proportion. The employee representatives are elected by the corporate employees in democratic elections (Firth et al., 2007). In order to ensure the impartiality of supervisors, the law requires that directors, executives and financial officers may not concurrently serve as supervisors. This requirement serves to recognise the nominal primary status of the working class in the political ideology of China. Thus, a supervisory board has the potential to provide the firm with additional resources via the appointment of appropriate external persons, as well as providing the input of important stakeholders, in particular, the employees.

In practice, the supervisory directors often have low status and limited power because the supervisory board can only suggest members of the BoDs and senior management team

(see 2013 China Company Law, Article 53) or file lawsuits against them, but lack the legal authorisation to decide and carry out such sanctions. Compared to Germany where the supervisory board sits between the shareholders and the management board, in China, the supervisory board has no responsibility on the shareholders' behalf for return on investment. Nor does the supervisory board in China have the power to hire and fire directors as in the German case. Consequently, the supervisory power in Chinese listed companies is relatively soft and seeks to act through influence (Shapiro et al., 2015; Tricker, 2012).

Weakened efficiency from the Chinese two-tier board system had been illustrated by Tricker (2012), who commented that supervisory boards in China are often more decorative than functional, which leaves room for improvement in their effectiveness. Supervisory board members lack independence. Their positions in firms and compensations are subject to inside managers. Under such circumstances, it is hard for them to monitor their boss. Besides, BoSs (Board of Supervisors) are often unable to supervise directors and managers because their members have less professional experience and education, and business management knowledge to carry out their functions (Xiao et al., 2004). Nonetheless, Chinese two-tier board system also enjoyed efficiency, which had incorporated single-tier board system with two-tier board system in Germany with the introduction of independent directors. Although BoSs sometimes could not reveal its function due to restrictions by shareholders or CEO, independent directors could be a supplement to supervise any decision makings by BoDs (Shan and Taylor, 2008; Firth et al., 2007). However, the CG Code states that supervisors should have professional knowledge and work experience in accounting and law. On paper, at least, the supervisors should have a significant influence in ensuring the veracity of the financial statement. Nonetheless, the efficiency of the Chinese two-tier board system

incorporated a single-tier board system with a two-tier board system in Germany with the introduction of independent directors. Although BoSs sometimes could not reveal their function due to restrictions by shareholders or the CEO, independent directors could be a supplement to supervise any decision-making by BoDs (Tricker, 2012).

2.5 The Development of Science and Technology in China

Studies show that science and technological capabilities are the key sources of growth and competitive edge for firms and industries (Chen et al., 2014b; Munari, et al., 2010; Zahra, 1996). In the last decades, the central government of China has been consistently emphasising the importance of technological development in the manufacturing sector and viewing this as an engine for the process of catching up with the advanced industrial economies and industrialisation. It is believed that over the long-term, China's economic performance will ultimately depend upon its ability to acquire, adapt, and create new technologies (Tong et al., 2013). A goal of supporting domestic firms to build indigenous innovation capabilities has been emphasised in the Chinese national Plans, for example, in Chapter 10 of the 10th Five-Year (2001-2005) Plan of China, Chapters 3 and 7 of the 11th Five-Year (2006-2010) Plan of China, Chapters 3 and 7 of the 12th Five-Year (2011-2015) Plan of China, and Chapter 3 and 7 of the 13th Five-Year (2016-2020) Plan of China (The National Development and Reform Commission of China, 2016).

The Chinese government has long been aware of the weakness of its development strategy and has been trying to improve its own technological capacity through investments in basic research, innovations and the application of new technologies. Many national initiatives, for instance, the Torch Programme, the 973 Programme and 985 Programme¹ have been launched over the last decades. Huge investments have been made

¹ The Torch Programme was launched in the 1980s to boost the technological progress in small-and-medium-size enterprises (SMEs), especially the rural township and village enterprises (TVEs). The 973 and 985 Programmes were launched in the 1990s, and in recent years, to boost the research capabilities of

in the Chinese Academy of Sciences (CAS), through the so-called Hundred, Thousand and Ten Thousand Plan², in order to attract as many top scientists as possible from home and abroad to concentrate their research in China. Similar investments have been made through the 211 Programme for the top 100 universities, and the 985 Plan to 38 key universities, in order to make them as competitive as the world's leading research-oriented universities by 2020 to 2030.

Besides, to achieve the innovation and technology-based development, the Chinese government also issues regulations and policies to encourage innovation and investment in technology. For example, the technological development expenditures of a company could be calculated as 150% of the real spending in tax deduction (Dong and Gou, 2010); high-technology start-ups in the national high-tech industrial development zones could enjoy 2-year tax-exemption and a 15% income tax rate from the third year (Ministry of Finance People's Republic of China, 2006).

Table 2: Government Expenditures in Science and Technology (S&T) (100 million yuan)

Year	Total government expenditure	Expenditure in S&T	Share of total expenditure (%)
2007	49781.35	1783.04	3.58
2008	62592.66	2129.21	3.40
2009	76299.93	2744.52	3.60
2010	89874.16	3250.18	3.62
2011	109247.79	3828.02	3.50
2012	125952.97	4452.63	3.54
2013	140212.10	5084.30	3.63
2014	151785.56	5314.45	3.50
2015	175877.77	5862.57	3.33

Source: National Bureau of Statistics of China (2016)

universities through the establishment of national key laboratories and special support for key research scientists attracted from home and abroad.

(http://www.most.gov.cn/eng/programmes1/200610/t20061009_36223.htm)

(<http://www.chinatorch.gov.cn/english/xhtml/Program.html>)

² The "Hundred, Thousand and Ten Thousand" Plan was launched for the Chinese Academy of Sciences from 1990 and has been ongoing until now. It aims to attract one hundred of the best scientists to lead the national key laboratories and institutes, one thousand top scientists to lead research programmes and ten thousand high level researchers to work within the research network covered by the Chinese Academy of Sciences.

Table 2 provides some basic information on government expenditure and its expenditure on S&T in China between 2007 and 2015. The total sum of expenditure in S&T has increased significantly over time, but as a share of total government expenditure, it is actually quite stable. However, this does not mean that China's research capacity has not been improved. China's reform on S&T development was aimed at reducing the expenditure incurred by central government and to increase the production efficiency of research institutes. Research expenses have been shifted from the central budget to regional governments and large-and-medium-size enterprises.

China's Medium to Long Term Science and Technology Development Plan 2016-2020 has two bold aims: one is to raise R&D intensity to the current OECD (Organisation for Economic Cooperation and Development) average by 2020 (increasing spending as a share of GDP from 1.3% to 2.5%), and lift the country's comprehensive innovation capabilities into the world's top 15; another is to sharply reduce reliance on imported technology, obtain advanced core technologies in the equipment manufacturing and the information industry (The National Development and Reform Commission of China, 2016). China's R&D investment is now 33 times what it was in 1995 and accounted for more than 2% (2.08%) of the country's GDP for the first time in 2013, totalling RMB 1.18 trillion. This is an increase of 15% on 2012 and shows that China is on track to achieve its target of R&D spending accounting for 2.2% of GDP by 2015. In 2011, China surpassed Japan to become second in the world in total R&D investment and is also the world's second largest publisher of research (UK Science & Innovation Network, 2015).

As for how technological advance occurs in the modern world, the literature stresses the significance of institutions involved in industrial innovation (Guan et al., 2009). The institutions are not only regulations, policies, markets and networks in a

company's external environment, but also institutions within a firm, especially CG structure. This thesis argues that CG structures play an important role in CE.

2.6 Empirical Literature Review

2.6.1 The Relationship between CG and CE

According to Keasey and Wright (1993), corporate governance (CG) structures are better able to facilitate corporate entrepreneurship (CE) because CE is critical for organisational survival, profitability, growth, and long-term sustainability. In this context, there is growing literature examining CG structures and CE (Shapiro et al., 2015; Minetti et al., 2012; Tribo et al., 2007). These studies have investigated the effects of different individual governance structures on CE (e.g. Chen et al., 2016; Shapiro et al., 2015; Chen et al., 2014a; 2014b; Aghion et al., 2013; Beyer et al., 2012; Minetti et al., 2012; Choi et al., 2011; Zeng and Lin, 2011). In this thesis, CG structures are split into two groups: one is ownership structure, the other one is board structure.

2.6.1.1 Ownership Structure and CE

Studies have examined the relationship between CE and ownership concentration (e.g. Chen et al., 2014; Minetti et al., 2012; Choi et al., 2011; Zeng and Lin, 2011; Tribo et al., 2007; Baysinger et al., 1991). Minetti et al. (2012) tested the impact of firms' ownership structure on firm's innovation decisions using surveys, which cover a rich dataset of about 20,000 Italian manufacturing firms. Minetti et al. (2012) found that ownership concentration negatively affects the probability of CE, especially by reducing a firm's R&D effort, that is, whether the firm has R&D investment, or process-related innovation. For firms that are less entrepreneurial, the main shareholder of the firm is less often an individual person, or a family as opposed to a financial institution or a bank. As expected, firms with more entrepreneurship effort are more often in high-technology industries than

in traditional industries, maintaining a relationship with more banks, and about twice the size of non-entrepreneurship-orientated firms in terms of assets, sales, and number of employees. On the other hand, Choi et al. (2011) found that there is no impact on innovation of firms in China. They provided two reasons: the first reason was that Chinese listed firms are generally highly concentrated and the market is not sensitive enough to distinguish amongst firms according to ownership features; the second reason was firms in China have become characterised by widely dispersed ownership after the large-scale transformation from concentrated state ownership to various non-state entities.

Some studies analysed the relationship between state investors' preferences and CE qualitatively and quantitatively (e.g. Shapiro et al., 2015; Choi et al., 2011; 2012; Dong and Gou, 2010; Munari et al., 2010; Sakakibara and Cho, 2002), for example, the impact of state ownership on CE. Because the government in emerging economies, such as China plays a critical role in influencing firm investment behaviour, a strong state power together with the rapid economic growth has stimulated a rising research stream that revisits state capitalism, focusing on how government control may stimulate CE (Zhou et al., 2017; Mazzucato and Lazzarini, 2015).

According to the institutional perspective (Zhou et al., 2017; Peng et al., 2008), governments are among the most salient institutions in emerging economies, with critical influences on regulatory policies and control over scarce resources. They therefore, profoundly shape firms' competitive environment (Nee and Oppen, 2012; Dong and Gou, 2010; Gao et al., 2010). Because SOEs have better access to policy information, government support, and valuable resources (Musacchio and Lazzarini, 2015; Chen et al., 2014), these advantages presumably could foster CE activities. For example, using a survey method, Dong and Gou (2010) collected 142 samples from Chinese firms in manufacturing industries. They found a statistically positive and significant relationship

between state ownership and CE measured as R&D investment. They further concluded that firms with a high percentage of shares held by the state are more easily influenced by state policies and directions. In particular, Chinese governments (from central to local) are emphasising the importance of innovation and technology by encouraging firms to increase R&D investment as a means of guidelines, providing subsidies, and issuing preferential tax policies. Sakakibara and Cho (2002) compared and evaluated Japanese and Korean industrial policies aimed at promoting CE activities (research activities, and R&D spending) in government-sponsored R&D consortia. They found that states in emerging economies often directly aid firms to effectively increase their CE capability via direct funding (for example, large-scale CE projects for firms to enhance their competitive advantage) and develop targeted specific innovation areas through technology transfer efforts. Other studies found that SOEs produce more patent applications or new products than non-SOEs in China (Choi et al., 2011; Li and Xia, 2008).

On the other hand, other studies documented that state ownership has a negative effect on patent applications, product sales, firms' adoption of product innovation, and revenue from entrepreneurial projects in China (Guan et al., 2009; Xu and Zhang, 2008). Ayyagari et al. (2011) similarly showed that SOEs are less innovative than private firms across 47 emerging markets. Using a firm-level panel data set of 301 firms in eight different industries for the period 2000 to 2003, Choi et al. (2012) failed to discover a positive influence of state ownership on technological innovation in Korean firms.

Briefly speaking, CE is a key to achieving competitiveness. Foreign investors are credited with independence from local management, with holding international diversified portfolios (Chang et al., 2006). Compared with domestic investors, foreign investors have a greater ability to tolerate the failure risk of investing in innovative

projects. In order to absorb foreign investors with advanced technology and managerial experience, countries with invested firms commonly promote more preferential policies including a higher proportion of stock holdings and even controlling rights in some industries, lower tax burdens and returns as well as technology security regulations. For instance, in developing countries, such as China and India, foreign investors have the motivation to invest in R&D due to wide market space and relatively lower labour costs (Huang and Zhu, 2015).

According to Luong et al. (2017) and Aggarwal et al (2011), foreign investors are considered to be one of the key elements necessary for a firm to be entrepreneurial, as they push local partners to invest more in technological development by using their ownership shares as leverage (Chang et al., 2006). When the market cannot observe the full spectrum of managerial actions, dilemmas could induce managers to shirk and avoid investment in risky and costly innovative projects (Hart, 1983), Bertrand and Mullainathan, 2003). Even worse, managers could divert firms' resources for their own private benefit and retain less capital for investment in innovative projects (Young et al., 2008). Throughout this corporate capital-allocation process, institutional investors can act as corporate monitors and actively intervene to create firm value (e.g. Aggarwal et al., 2011; Young et al., 2008; Gillan and Starks, 2003; Burkart et al., 1997). Specifically, Gillan and Starks (2003) argue that because of their independent positions and a lack of conflicts of interest, foreign institutional investors play a more important role in corporate governance than domestic peers (Luong et al., 2017). A reasonable argument is that foreign investors could contribute to the CE of domestic firms through active monitoring and ensure investment in R&D is used appropriately. In addition, foreign investors possess more advanced managerial experience and could improve CG structure in their invested firms. They place more emphasis on promoting corporate governance

mechanisms than domestic investors. Possible reasons could be that firms with complete CG are equipped with complete internal control systems, incentive and constraint mechanisms, an internal and external supervisory system, which could enjoy long-term value growth instead of only short-term returns (Yeh, 2018).

Empirically, Guadalupe et al. (2012) suggested that after being acquired by foreign acquirers, domestic firms are likely to innovate through their access to foreign technologies and widening foreign markets. Similarly, Ferreira et al. (2011) suggested that foreign institutional investors are a driving force behind cross-border mergers and acquisitions (M&As) because they act as facilitators, build bridges between firms, and reduce transaction costs and information asymmetry between bidders and targeted firms in M&As. Based on Guadalupe et al. (2012) and Ferreira et al. (2011), a reasonable argument is that foreign institutional investors could contribute to the innovation of domestic firms through facilitating cross-border mergers and acquisitions and, ultimately, knowledge spill-overs.

Aggarwall et al. (2011) stated that intensive monitoring by foreign institutions can induce managers to invest in long-term, value-enhancing innovative activities. Optimal incentive contracts that motivate innovation should exhibit substantial tolerance for early failure and reward for long-term success (see Manso 2011, and Ederer and Manso, 2013). Aghion et al. (2013) found that foreign institutional investors promote innovation in U.S. firms. Foreign institutional investors are credited with independence from local management, with holding international diversified portfolios, and with expertise in monitoring firms (Luong et al. 2017). Aghion et al. (2013) state that if incentive contracts cannot fully motivate innovation, institutional investors could step in to alleviate managers' career or reputational concerns by providing them with insurance against early failures of their innovative activities. Compared with domestic peers, foreign institutional

investors hold internationally diversified portfolios and therefore, should have a greater ability to tolerate the failure risk of investing in innovative projects. Therefore, foreign investors are more likely to insulate managers from punishment for innovation failures.

Consistent with this conjecture, Luong et al. (2017) examined the effect of foreign institutional investors on firm innovation using firm-level data across 26 non-US economies for the 2000 – 2010 period, documenting a positive effect of independent foreign institutions on firm innovation. Their evidence suggested that foreign institutional investors promote innovation through their active monitoring of firms. Moreover, in a developing country context, the study conducted by Lodh et al. (2014) showed that foreign ownership is positively associated with innovation output in Indian family firms. For example, Li et al. (2010) found that spill over from foreign firms contributes to higher new product sales in domestically owned Chinese firms.

However, some studies prove the exact opposite showing the negative correlation between foreign ownership and CE. For example, Choe et al. (2005) and Dvorak (2005) found a negative relationship between foreign ownership and CE. These two studies argued that domestic investors have an information advantage in domestic markets in the case of Korea and Indonesia. This is certainly convincing as many of these studies have been conducted in developing countries where information is not as transparent or clearly translated for foreign investors.

Some researchers argued that ownership type diversity is a more important factor in explaining CE (e.g. Chen et al., 2014a). Using a panel dataset of 487 and 475 Chinese listed firms during 2004 to 2005 and 2005 to 2006, respectively, they only included investors owning greater than 5% shareholdings in a firm to measure ownership type diversity and group the ownership types into state, foreign, domestic non-state ownerships. They found a significant and positive relationship between ownership type

diversity. Their findings highlighted that ownership type diversity provides an effective CG mechanism by which emerging markets' firms can assemble the resources necessary for CE in the context of inadequate external institutions. For example, non-state domestic investors' localisation advantage complements the technologies and know-how of foreign investors in creating entrepreneurial products (e.g. patents) that fit local markets; to facilitate this CE collaboration, the state could provide long-term capital, tax reductions, and land for building necessary research facilities and provide resident status quotas for attracting highly skilled experts both nationally and internationally.

2.6.1.2 Board Structure and CE

Other studies have investigated the relationship between board structure and corporate entrepreneurship (CE), including board composition (e.g. De Cleyn and Braet, 2012) and leadership (e.g. Azeez, 2015; Yu and Ashton, 2015).

Zahra et al. (2000) argued that board size influences the organisation's CE activities. The size of the board affects the directors' abilities to process information on CE. Smaller boards have the ability to increase directors' participation and promote frequent communication with the company's senior executives. This environment encourages cohesion among directors in monitoring and evaluating CEOs, and thus constraining potential managerial opportunism (Azeez, 2015). As the board size grows, it would be expected that the board's collective experience and skills would also grow. In a similar vein, larger boards are likely to increase cognitive diversity, which leads to increased creativity in decision-making and the emergence of new alternatives for the development of the firm (Shapiro et al., 2015). In addition, a larger board might arguably render individual members more confident to propose new ideas and to promote innovation or strategic changes (Brunninge et al., 2007). In particular, having a larger board may help to include outside directors who have better access to industry

information and more market experience, which according to a study conducted by Zahra (1991), boards with more members are highly conducive to corporate entrepreneurial activities, for example, innovation investment and patents. Similarly, Shapiro et al. (2015) report a significant positive relationship between innovativeness and the size of a firm's board. De Cleyn and Braet (2012) explored the influence of CG on CE (new products) in a sample of 49 small and medium sized firms (SMEs) in the Belgian manufacturing industries. They found a significant positive relationship between CE and the size of a firm's board and stated that larger boards can be more effective in monitoring actions of top management, overseeing duties, and be less dominated by the CEO. Their results support the view that a larger board seems to have benefits through additional perspectives on firm matters.

It was also argued that as the board size increased, it would increase CE until a threshold was reached. Beyond a certain point, the increase in the size of the board could become dysfunctional and would reduce CE activities. The inverse U-shaped relationships suggested by Zahra et al. (2000), where the optimal size of a board is 11 directors in American firms, the board size is positively related to innovativeness, afterwards negatively. They explained that it was due to problems that could occur, for example, communication breakdown, which would lead to a decline in co-ordination among directors, thus causing the decision-making process to slow down, all of which would reduce the level of CE in the organisation. Furthermore, a large board of directors tends to reduce agility and capacity of reaction in the face of complex business situations (Yermack, 1996). Jensen (1993) discovers that large size boards of directors might not be able to operate effectively due to co-ordination and process problems that outweigh the advantages of having a large number of people to draw on. On the other hand, studies,

for example, Galia and Zenou (2012) found that board size has a negative effect on the probability of implementing product innovation.

In addition, addressing the issue of long-term investments, some studies outline how outsider membership of the board increases CE and board involvement in strategic decision-making processes. However, the available evidence suggests that results of the relationship between independent directors and CE are mixed. For example, using a combination of secondary sources and mail surveys, Zahra (1996), referring to a sample of 127 firms listed on the Fortune 500 of 1998, and Zahra et al. (2000), referring to a data sample of 231 medium-size U.S. manufacturing firms, showed statistically significant and negative relationships between the presence of independent directors and CE measured as innovation, product innovation, process innovation, organisational innovation, and venturing. Similar results were also found by Galia and Zenou (2012). From a sample of 176 French firms based on data from a French Community Innovation Survey in 2008, Galia and Zenou (2012) found that the proportion of independent members negatively influences innovation. They indicated that independent directors are less likely to contribute or be involved in a firm's strategic decision-making process compared to inside directors. The reason could be because insiders possess more and better firm information than independent directors; consequently, insiders are in a better position to evaluate a firm's long-term projects (e.g. CE). It may also be that as independent directors tend to lack the time and ability to engage in a firm's strategic decisions, they may not be able 'to understand each business well enough to be truly effective' (Baker and Patton, 1987, p.11).

On the other hand, Hill and Snell (1988) found a positive relationship, indicating that independent directors in the U.S. context play an important role of resource provider. In a German context, Balsmeier et al. (2014) showed a robust and significant positive

influence of independent directors on CE, measured by patent applications. Furthermore, they also found that the results were inconsistent when they grouped firms into entrepreneurial and non-entrepreneurial firms. Independent directors from patenting firms enhance CE activities at the firms they monitor, whilst independent directors from non-entrepreneurial firms were associated with a reduction in the number of patent applications. The results suggested that independent directors can serve as a valuable channel for scarce expertise and specific knowledge. Using a unique sample of 370 mostly private and relatively small Chinese firms in Zhejiang Province, China, for the period 2004 to 2006, Shapiro et al. (2015) found that only 48% of the selected firms had independent directors and the average size of the board was about 4 members. Their research results showed that a firm with independent directors on the board has a positive and significant relationship with CE when it is measured as invention patents, however, no significant relationship was found when CE was measured as new product sales. Shapiro et al. (2015) highlighted that the impact of CG on CE depends on the measure of CE activities. They also found that a large board and the presence of independent directors, contribute positively to corporate entrepreneurship because they help firms to access critical resources and improve monitoring.

In terms of the effects of a supervisory board on CE, Shapiro et al. (2015) found that the existence of a supervisory board variable has a significant and negative effect on patent activity, but no connection with new product sales. In common with previous research, Ning et al. (2014) studied a sample of 1,027 Chinese listed firms and their CE capabilities from 2002 to 2009. They reported an insignificant relationship between supervisory board and CE measured as patent counts and innovation productivity (the transformation of R&D investment into patents). The result implies that a larger board of supervisors may be inefficient in monitoring the board's ability to balance the power of

insiders and might impede CE activity. In the same Chinese context, evidence of weaknesses in, and the ineffectiveness of, listed firms' supervisory boards are shown in the studies, for example, Schipani and Liu (2001), Shan and Taylor (2008), Tam (2002), and Wang (2008). On the other hand, in a German context, based on panel data of the 100 largest German firms from 2000 to 2008, the econometric analysis conducted by Balsmeier et al. (2014) showed that appointing external managers on supervisory boards is in general not related with enhanced CE (patent applications).

In summary, despite the fact that both corporate governance and corporate entrepreneurship have the same objective of improving firm performance and creating value, the two constructs at the conceptual level seem to emphasise different aspects in the firm. For example, the role of corporate governance focuses on control monitoring management performance and ensuring accountability. On the other hand, corporate entrepreneurship places greater emphasis on innovation and creating new products and new opportunities, where entrepreneurial activities require longer investment time horizons with less control and fewer restrictions on decision-making.

2.6.2 The Effects of CG on Firm Performance

CG and its impact on firm performance is a widely-debated area. Empirical research on CG is primarily based on the theoretical framework of agency theory advanced by Jensen and Meckling (1976). As mentioned above, CG could be measured by board structure features including board size, the proportion of independent directors, CEO duality, size of board of supervisors as well as ownership structure features, for example, ownership concentration degree, the proportion of state, private and foreign ownership. As for the measurement of firm performance, ROA or ROE and Tobin's Q are main indicators. ROA is an indicator of how profitable a firm is relative to its total assets, whereas Tobin's Q reflects the market's expectations about future profitability. The main difference between

ROA and Tobin's Q lies in the effects of market performance. While ROA reflects the profitability of the firm from the perspective of financial data in financial statements, Tobin's Q reflects market valuation of the firm which is closely correlated with both profitability of the firm as well as the degree of booming of the overall capital market.

2.6.2.1 Ownership Structure and Firm Performance

Xu and Wang (1999) investigated whether ownership structure significantly affects firm performance amongst Chinese listed firms. Empirical results from Xu and Wang (1999) showed that profitability (ROE and ROA) is positively associated with ownership concentration, but Tobin's Q ratio is significant and negatively correlated with state ownership. It means that a higher degree of ownership concentration could contribute to higher accounting profitability instead of market valuation. Reasons could be attributed to the fact that investors tend to accept firms with a more balanced ownership structure in strategic decision-making. On the other hand, a highly concentrated ownership structure which tends to improve the financial performance of Chinese firms may be due to a more unified strategy and consistent execution. Inconsistently, Shan and McIver (2011), found that the non-financial-sector firms with lower levels of state ownership concentration have higher market growth perspective levels than their counterparts when the study was controlled for firm age. Shan and McIver (2011) used a firm-level panel data set for the period of 2001 to 2005 to examine the effect of corporate governance mechanisms on financial performance (measured by Tobin's Q) and the efficiency of 117 Chinese listed non-financial firms. A possible explanation for the positive coefficient of state ownership is that Chinese state-owned capitals are backed by the Chinese government and it is easier for them to raise funds with relatively lower interest rates and obtain major projects. In order to improve efficiency, the Chinese central government took a series of measures to promote privatisation of the SOEs. The results indicated that

firms have developed their own path through the ongoing nature of China's transition process and investors tend to give higher market valuation for state-owned firms in China.

In a global (non-U.S. centric) view, Ferreira and Matos (2008) conducted research by using a comprehensive data set from 27 countries and concluded that foreign institutional investors can enhance firm performance in countries with weak shareholder protection (Aggarwal., 2011). Foreign investors are able to act in the interests of shareholders either through voice (e.g. vote their shares or confrontational proxy fights, using quiet diplomacy to persuade management) or through threatening to exit (e.g. selling and depressing stock prices which can hurt management and firm performance) (Bena et al. 2014). This statement is further supported by Aggarwal et al. (2011) who found that foreign institutional investors are proactively involved in monitoring investee firms worldwide, positively correlated with firm performance, and better firm-level corporate governance standards that align the interests between shareholders and managers. Aggarwal et al. (2011) obtained firm-level institutional ownership and CG data for 23 countries for the period from 2003 to 2008. They split firms into U.S. and non-U.S. firms and found that foreign institutions from countries with strong shareholder protection play an influential role in promoting governance improvements outside of the U.S, in turn, facilitating CE activities by increasing R&D intensity. Moreover, Yudaeva et al. (2003) compared Russian firms with foreign direct investment and domestically owned firms. It turned out that an increase in foreign shares suggests a greater value added to the firms. These foreign-owned firms were further analysed by size, and results showed that smaller firms tend to be easier for a foreign owner to manage because small firms are often more flexible. On the other hand, the empirical results of Shan and McIver (2011) also revealed a non-significant relationship between the level of foreign ownership concentration and firm performance. Shan and McIver observed that on average the concentration of foreign

ownership in the top 10 large shareholders is 14.08%, and further explained that a low level of shareholding by foreign investors does not allow them to effectively enhance CG and improve firm performance. In addition, foreign investors might have lost confidence because of the bearish security markets in China between 2002 and 2005.

Prior studies also investigated the relationship between managerial ownership and organisational performance. Mangena et al. (2012) have shown, in an institutional environment of severe political and economic crisis during the period of 2002 and 2005, that managerial ownership was negatively related to firm performance in the post-presidential election period, but positively related in the pre-presidential election period. This indicates that firms operate in a severe political and economic environment. Issuing more shares to managers might advance them, expropriating firm resources due to their investment might be confiscated by governmental politicians. On the other hand, studies, for example, McConnell and Servaes (1990) and Morck et al. (1988) demonstrated an inverse relationship between managerial ownership and firm profitability. They focused more as a primary problem on the possibilities of managerial entrenchment within the incumbent management and the potential consumption of pre-requisites. One important note, prior studies focus neither on the ownership structure of insider ownership nor on other types of insider ownership, such as employees.

2.6.2.2 Board Structure and Firm Performance

The role of the CEO is critical for the survival of any firm as well as the chairman of the board, however, whether to allow the combination of CEO and chairman is a question for debate amongst researchers, regulators and law makers internationally. Prior studies investigate the causal link between firm leadership and firm performance. On the one hand, agency theory suggests that splitting the roles of CEO and chairman is likely to facilitate pro-organisational action and would as a consequence improve firm

performance. The positive relationship between a separation leadership and firm performance is evident in developed economies, for example, Australia (Kiel and Nicholson, 2003), Canada (Bozec, 2005); U.S. (Pi and Timme, 1993; Rechner and Dalton, 1991), the UK (Dahya et al., 1996), and in developing economies, for example, China (Peng et al., 2007; Bai et al., 2004), Malaysia (Haniffa and Hudaib, 2006), Russia (Judge et al., 2003), and Nigeria (Ujunwa, 2012). Those studies argued that CEO duality may lead to the implementation of the decisions that favour the CEO's personal interests at the expense of shareholders and consequently harm firm performance. In particular, findings from Dahya et al. (1996) highlighted that when an announcement was made regarding separating the role of CEO and chairman, the news had a positive effect on firm's share prices.

In contrast, other studies found that CEO duality has a positive impact on firm performance which supports the view of stewardship theory that CEO duality may be good for firm performance due to the unity of command it presents. Using various firm performance measures, for example, ROA, ROE, sales growth, share price, and Tobin's Q, the positive relationship is evident both in developed economies (for example, Guilet et al., 2012; Dey et al., 2011; Coles et al., 2001; Brickley et al, 1997; and Donaldson and Davis 1991), and in developing economies (for example, Azeez, 2015; Liu and Fong, 2010; Peng et al., 2007). Donaldson and Davis (1991) analysed 264 firms using data collected from the Wall Street Journal and found that CEO duality could lead to higher returns (ROE) for shareholders compared to the firms with one person occupying the two roles. This result supported stewardship theorists that a dual leadership establishes strong, unambiguous leadership embodying in a unity of command and that firms react fast and make better decisions, and therefore, firms perform better. Based on an archival database covering 403 public-held firms and 1,202 firm-years in China, Peng et al. (2007) offered

strong evidence that CEO duality, on the one hand, enhances firm performance in SOEs, and on the other hand, can weaken firm performance in privately-owned enterprises. In addition, state ownership is found to play an influential role in the relationship between CEO duality and firm performance in the transitional context. In the study conducted by Tong et al. (2013), it was found that comparing both firms in state and private sectors, the chairman jointly holding the CEO position actually benefits the SOEs more than the private firms. This indicates that the friction between the chairman and CEO is mitigated, which would help manage SOEs more efficiently. Among those studies, Dey et al. (2011) provided an interesting point of view that firms with the roles of CEO and chairman separated due to investor pressure would have significantly lower announcement returns and subsequent lower profitability, and lower contributions of investments to shareholder wealth. There are also studies that have found insignificant relationships between CEO duality and firm performance, for example Mashayekhi and Bazaz, (2008), Weir et al., (2002), and Daily and Dalton (1992). Hence, there seems to be no obvious distinction between ROA and Tobin's Q when exploring the effects of CEO duality on financial performance.

The board of directors is also one of the CG mechanisms that has been examined in many prior studies. Researchers studied the effects of board composition by examining the relationship between independent director ratio and firm performance nationally and internationally. The evidence of the impact of independent directors on firm performance is mixed. By measuring firm performance variously as ROA, ROE, earnings per share, and Tobin's Q, some existing studies have found a positive and significant relationship (e.g. Gupta and Fields, 2009; Coles et al., 2008; Cho and Kim, 2007; Weir et al., 2002; Daily and Dalton, 1993; and Pearce and Zahra, 1992). Financial measurement (e.g. ROA and ROE) is to measure how the board composition affects a firm's current profitability.

On the other hand, a market-based measurement (e.g. Tobin's Q) is used to indicate how successfully the firm has leveraged its investment (e.g. the investment in CE activities) to develop the firm that is valued more in terms of its market-value compared to its book-value. A higher Tobin's Q ratio also reflects the effectiveness of the firm's governance structure (Weir et al., 2002).

Studies (e.g. Cho and Kim, 2007; Pearce and Zahra, 1992) argue that a high proportion of independent directors is beneficial for firms to obtain current profitability and more effective use of assets is to the advantage of shareholders. For example, using a research sample of 119 American Fortune 500 industrial firms from 1983 to 1989, Pearce and Zahra (1992) found the proportion of independent directors on the board to have a statistically significant and positive impact on organisational outcome (ROA, ROE and earnings per share). They suggested that the presence of independent directors on the board would enhance the decision-making process through their different expertise, independent mind and judgement. Consistently, in a sample of 347 Korean listed firms in 1999, Cho and Kim (2007) showed that outside directors had a weak positive impact on firm performance (ROA). These findings supported the perspective of agency theory that boards dominated by independent directors offer higher firm performance as well as ensuring the executive directors are accountable to shareholders' value. In contrast, studies also found a negative relationship between board composition and firm performance, for example, studies in the U.S. (Yermack, 1996), and studies outside of the U.S. (Mangena et al., 2012; Guest, 2009; Bozec, 2005).

In a sample of 157 Zimbabwean listed firms from 2000 to 2005, Mangena et al. (2012) reported a statistically negative and significant correlation between independent director ratio and firm performance (Tobin's Q), and the proportion of independent directors fell in the post-presidential election period as a result of coping with the threats

posed by the worsening political crisis. The results indicated that the market does not favour firms with a high proportion of independent directors in a non-stable political environment. The results also indicated that the benefit of board independence, objectivity and experience expected from the non-executive directors to influence board decisions appears to hold back managerial initiatives through over monitoring.

Studies also found that there is no convincing evidence to prove that a board with greater independence would result in creating a higher long-term firm performance (Wintoki et al., 2012; Sanda et al., 2010; Haniffa and Hudaib, 2006; Weir et al., 2002; Daily and Dalton, 1992). For example, Daily and Dalton (1992) observed no connection between independent director's ratio and ROA in a sample of 100 American listed firms during 1989. In a larger sample of 6,000 American listed firms from 1991 to 2003, Wintoki et al. (2012) found a similar result that the proportion of independent directors presented in the board has no impact on firm performance (ROA). Their evidence is also supported by the studies conducted by Ghosh (2006) and Sanda et al. (2010) who found a statistically insignificant relationship between the presence of independent directors on the board and firm performance in India and Nigeria, respectively. The possible explanation could be independent directors are external and part-time, thus do not possess all the information that executive directors have (Filatotchev and Nakajima, 2010). The information asymmetry problem is likely to cause some difficulties for effective business involvement and monitoring.

In terms of the impact of board size on firm performance, Yermack (1996) was one of the first researchers to investigate the relationship between board size and firm performance. Using a sample of 452 large American firms from 1984 to 1991, Yermack (1996) found an inverse relationship and showed that the statistical evidence was robust with regard to firm characteristics, for example, firm size, growth potential, managerial

ownership and industry. Yermack (1996) also suggested that board size between eight and nine is more effective, but when board size was beyond ten, no relationship was found. In a cross-countries study, Conyon and Peck (1998) also found negative effects of board size on firm performance across a number of European countries (i.e. Denmark, France, Italy, Netherlands, and the UK) in a sample of 701 listed firms from 1992 to 1995. Similarly, but using a larger sample size of 2,746 UK listed firms from 1981 to 2002, Guest (2009) found board size was negatively associated with firm performance (Tobin's Q, ROA and share returns).

On the other hand, there are findings to support the view that larger boards offer greater exposure to the external environment than smaller boards by improving the access to various resources and therefore, positively impacts on firm performance. This result was found in developed economies, for example, Belgium (De Cleyn and Braet, 2012; Van den Berghe and Levrau, 2004) and the United States (Dalton and Dalton, 2005; Pearce and Zahra, 1992; Zahra and Pearce, 1989), and emerging economies, for example, Zimbabwe, Nigeria and India (e.g. Mangena et al., 2012; Sanda et al., 2010; Jackling and Johl, 2009; Kajola, 2008;). For example, in a Nigerian context, Kajola (2008) found a positive and statistically significant relationship between board size and organisational performance measured by ROE, in a sample of 20 Nigerian listed firms from 2000 to 2006. Similar results were found by Sanda et al. (2010) with a sample size of 93 Nigerian listed firms from 1996 to 1999, and the firm performance was measured using Tobin's Q. The two Nigerian studies hold the view that a larger board increases board diversity in terms of skills, experience, and the style of management and opinions, leading to more effective monitoring. Indeed, in a meta-analysis of 131 samples, systematic evidence was provided by Dalton et al. (1999) that a larger board increases firm performance in both large and small firms. Results from those studies are not consistent with the agency theory

proposition that a smaller board is more effective than a larger one (Jensen, 1993). However, there are studies that found no significant relationship between board size and firm performance. In particular, Wintoki et al. (2012) used the dynamic system GMM (generalised moments of methods) and found no causal relationship between board size and ROA amongst 6,000 American listed firms from 1991 to 2003.

Some countries, including China, have two-tier board systems (Tricker, 2012). In China, the Company Law requires limited-liability firms to have a two-tier system, consisting of a board of directors and supervisory board (CSRC, 2001b). The supervisory board is there to provide protection for employee rights and channels for employee participation in CG (Shan and McIver, 2011). However, the supervisory directors often have low status and limited power because the supervisory board can only suggest sanctions on members of the board of directors and senior management but lack the legal authorisation to decide and carry out such sanctions (China Company Law, 2013). Supervisory directors in Chinese listed firms were also found to have played a limited role in determining corporate strategies, merger and acquisition decisions, selecting CEOs, and appointing boards of directors (Chen, 2009). Therefore, the supervisory board has received less attention in previous studies, for example, Peng (2004), Peng et al. (2007), and Shapiro et al. (2015). Although a few studies have analysed the supervisory board, they have consistently reported the inefficiency of the performance of supervisory board members. For example, Tam (2000, p.86) found that ‘about one-quarter of supervisors did not regularly inspect company activities and financial affairs, and 78% of supervisors were not prepared to investigate company affairs’. Similar findings are also reported by Xiao et al. (2004) and Dahya et al. (2003). After interviewing 16 listed Chinese firms, Dahya et al. (2003) proposed that most supervisory boards are nominal and costly organisations rather than effective independent monitors. On the other hand,

Ding et al. (2010) held that, supervisory boards in German listed firms have the power to appoint and dismiss board directors. Also, using panel data on 275 German listed firms and 1,701 firm-year observations, Andres (2008) examined the relationship between founding-family ownership and firm performance measured by Tobin's Q. Andres (2008) found that the performance of family businesses is only better in firms in which the founding-family members are still active either on the executive or the supervisory board.

To sum up, the findings of these studies suggest that there is a relationship between CG structures and firm performance. However, the results vary depending on how the researchers measure firm performance, especially the effects of the level of ownership concentration on firm performance. While financial accounting indicators like ROA and ROE place emphasis on financial performance from the perspective of financial statements, market indicators, for example, Tobin's Q reflects market valuation of firms which may not always be consistent with the trend of financial indicators in different industries. Nonetheless, there are no significant distinctions in respect to effects of board structure including board size and CEO duality on firm performance between measured by ROA and Tobin's Q. In addition, research outcomes are also influenced by different research methods (questionnaires, interviews, archive data) and factors, such as overall economic environment (Sorour and Howell, 2013), firm-specific factors, or industry. For example, Brickley et al. (1997) failed to control for firm characteristics that generate conflict of interest between shareholders and managers.

2.6.3 The Effects of CE on Firm Performance

Corporate entrepreneurship (CE) is an important practice for a firm's growth and survival (Zahra, 1996). Therefore, the mainstream of research in CE scrutinises the firm performance implications of CE under different institutional environments (Miller, 2011).

The literature suggests that CE is highly associated with superior performance (Bierwerth et al., 2015; Rauch et al., 2009; Hult et al., 2003; and Zahra et al., 2000). For example, Hult et al. (2003) investigated the role of CE in establishing cultural competitiveness in 764 American strategic business units through examining the interaction effect of four variables (entrepreneurship, innovativeness, market orientation and organisational learning) on performance using an extended survey. The results show that compared to other variables, entrepreneurship is the most significant and proactive means of developing a market-based culture. Ho et al. (2005) examined the relationship between firm financial performances and the R&D intensity and advertisement intensity using Generalised Method of Moments (GMM) regression analysis. Their results revealed that R&D investment is positively related to holding period returns for manufacturing firms only. Their study found that manufacturing firms benefit more from investment in R&D and non-manufacturing firms benefited from advertisement. These results therefore suggest that R&D investment and advertisement indeed create value for firms but depending upon whether the firm is manufacturing or non-manufacturing. In a different context, based upon a sample of 149 Greek manufacturing firms by using a cluster analysis, Avlonitis and Salavou (2007) examined the effect of variations in CE (measured by product innovativeness) in SMEs on performance. For a sample of 149 manufacturing companies in Greece, the study divides companies into two groups using cluster analysis (the active and the passive entrepreneurial companies). The results suggest that active entrepreneurial firms perform better than passive entrepreneurial firms in terms of introducing new products. Avlonitis and Salavou (2007) further highlighted that the uniqueness of these products significantly contributes to firm performance. Zahra et al. (2000) collected data from 231 medium-size manufacturing companies in America using a combination of secondary sources and mail surveys to targeted firms' CEOs. The results show that commitment to CE (innovation and venturing) is high due to the CE

being positively associated with future company performance. These results indicate that CE can help improve company performance and enhance shareholders' value creation. A recent meta-analysis study by Bierwerth et al. (2015) synthesised prior literature regarding the relationship between CE and firm performance of 43 independent samples including 13,237 firms. Their study showed general support for the argument that CE (i.e. strategic renewal, innovation and corporate venturing) has a stronger effect on firm performance in high-technological as opposed to low-technological industries.

Chadha and Oriani (2009) investigated the stock market valuation of R&D investment in India. They estimated a classical absence of a weak hedonic model for a sample of 219 domestic and foreign firms publicly traded at the Bombay Stock Exchange for the period of 1991 – 2005. Their empirical findings revealed that the stock market positively values the firm's R&D investment even in the intellectual property rights. They found a positive and significant coefficient of R&D capital adjusted with total tangible assets. Thus, their study argues that investment in R&D has a higher market value than investment in tangible assets. Their study also found that in the techno-based industries, the R&D investments of the firms are positively evaluated by the stock market. Kavida and Sivakoumar, (2009) investigated whether stock price reflected in market value of firms fully incorporate the value of intangible assets for 20 Indian pharmaceutical firms for the period of 1997 to 2006. Their study treated the expenditure incurred in R&D, advertisement, and marketing as investment in intangible assets. Their empirical results show that R&D capital significantly and positively related to the market value of a firm.

Interestingly, Megna and Klock (1993) examined the contribution of a firm's intangible capitals, such as the R&D investment and patents to variation in firm value as measured by Tobin's Q. A sample of 11 firms operating primarily in the semiconductor industry for the period of 1972 to 1990 was taken for their analysis. Their empirical results

revealed that both firms owning R&D stock as well as rivals' R&D stocks positively influences Tobin's Q. However, the stock of patents of rival firms negatively and significantly influences Tobin's Q. This study argued that patents and R&D are distinct measures of intangible assets since patents are marketable commodities and R&D is inchoative or just a beginning. Thus, their results suggested that intangible capital contributes to the variation in Tobin's Q but does not explain it completely.

Whilst some studies have found firms that adopt CE perform much better than firms that do not adopt CE, other studies reported lower correlations between CE and performance (Rauch et al., 2009; Tang et al., 2008; Lumpkin and Dess, 2001; Zahra, 1991; Burgelman, 1983). For example, Zahra (1991) examined the association between CE and performance using data from 119 of the Fortune 500 industrial firms between the period from 1986 to 1989. Zahra (1991) found a moderate relationship between CE and firm performance and explained the moderate coefficient is the fact that some CE projects are still in their infancy. It would take several years before the market recognises the value of CE projects. Similarly, Lumpkin and Dess (2001) related two dimensions of CE (proactiveness and competitive aggressiveness) to firm performance using a survey covering 124 executives from 94 firms in America. The findings suggest that competitive aggressiveness exhibits a negative correlation with performance, but proactiveness is positively associated with firm performance. Lumpkin and Dess (2001) also concluded that the relationship between these CE (proactiveness and competitive aggressiveness) and firm performance are contingent on the external environmental (i.e. dynamic and hostile environments) and organisational conditions (i.e. industry life cycle).

Previous studies also found a non-linear relationship between R&D and firm performance. Huang and Liu (2005) examined the relationship between innovation capital and firm performance for the top 1,000 Taiwanese firms using a multiple

regression model. The authors included both R&D intensity and its squared term in their regression equation to examine the existence of a non-linear relationship between R&D investment and firm performance. Their analysis found that R&D intensity has a curvilinear inverted U-shape relationship with firm performance measured by return on assets as well as return on sales. Similarly, a recent study by Bracker and Krishnan (2011) examined the impact of R&D intensity on Tobin's Q using the S&P Compustat database from the period of 1975 to 2007 for the US. Their study too found an inverted U-shaped relationship between R&D intensity and firm value as measured by Tobin's Q. These studies suggest the concept of diminishing marginal returns to each dollar invested on R&D.

There are other studies that fail to find a significant relationship between CE and performance (Covin et al., 1994; Hoskisson and Hitt, 1988). Take the study completed by Covin et al., (1994) as an example, who investigated the moderating effect of strategic missions on the relationship between adopting CE and organisational performance via a survey, using questionnaires covering 330 senior executives of manufacturing firms in America. Their results indicated that, in general, adopting CE is insignificant related to organisational performance. However, they also found that firms with build-oriented strategic missions perform better than those with more hold- and harvest-oriented strategic missions when they adopt CE. Tang et al., (2008) used a two-study approach by demonstrating the power of two independent studies addressing the same research question using different data sets to investigate the nature of the relationship between CE and firm performance in the Chinese context. Data in study one collected from 1,100 enterprises (located in Shangdong, Inner Mongolia, Hebei and Tianjim) through on-site interviews and mail surveys with members of top management teams; in study two, data was collected from a field survey and archival industry data on China's two stock

exchanges. Both studies demonstrate an inverted U-shape relationship between CE and firm performance (raw sales rate, market share, and pre-tax profit growth rate).

Findings from previous studies also suggested that some variables could moderate the relationship between CE and performance, for example, strategic mission (Covin et al., 1994), environmental hostility (Zahra and Garvis, 2000), firm size (Rauch et al., 2009) and CG structure (e.g. independent outside board members and institutional investors) (Le et al., 2006). However, there is little agreement on what constitutes suitable moderators, the area which needs further research (Rauch et al., 2009; Le et al., 2006).

2.6.4 Limitations of Previous Research and the Necessity for Further Research

Although the studies discussed above have provided useful insights into the relationships between CG and CE, CG and firm performance, and CE and firm performance, research has not yielded conclusive evidence on any particular corporate governance structures producing a higher firm performance or inducing higher levels of corporate entrepreneurship activities (see Owusu, 2012 for CG and performance, Belloc, 2012 for CG and CE, and Bierwerth et al., 2015 for CE on firm performance). Furthermore, the studies have some limitations (e.g. the use of different samples and industry and examine the effect of CE over a short period) so as to warrant further research on the relationship between CG structures, CE and firm performance. A number of reasons are provided as follows:

First, given the mixed findings, further work is required to understand the effects of CG structures on CE (Bierwerth et al., 2015; Balsmeier et al., 2014; Miller, 2011; La Porta et al., 2000; Zahra, 1996). The evidence suggests that CG practices perceived to be effective in developed countries may not be readily translated to emerging market economies, such as China (Shapiro et al., 2015; Chen et al., 2014; Dong and Gou, 2010).

For example, China's CG structures are different in that share ownership is highly

concentrated, the government is a significant shareholder and often appoints the key management and board members. Also, its economy is in transition from planned to market economy, along with the fact that the government controls resources, financing and materials distribution (Choi et al., 2011; Tang et al., 2008). Moreover, in an environment where agency problems exist between controlling owners and minority shareholders, the controlling owners often have great influence on their firm's decision-making, so that managerial opportunism is largely restricted in firms with controlling owners. If this is the case, in the Chinese context, a firm's CE investment, to a large extent, depends on controlling owners' intentions. Existing studies in China focus mainly on the effects of ownerships structures (Chen et al., 2014a, Choi et al., 2011) on CE and hardly consider board structures. An exception is Shapiro et al. (2015) who found an inverse U-shaped relationship between board size and CE, but no relationship between the type of investors and CE. The understanding of the general effects of CG on CE in emerging economies, including China, is therefore, very limited.

Second, CG practices differ amongst countries depending on the nature of the firms (Yu and Ashton, 2015). For example, unlike Anglo-Saxon countries which are under a unitary board system, China has a two-tier board system and follows an insider-dominated system with a concentrated share ownership. Evidence from studies (Mangena et al., 2012; Coles et al., 2008) has shown that the effects of CG on performance depend upon the institutional environment of the firm, and they shape firms' entrepreneurial posture and CG structures. Limited work has been done into the relationship between CG and performance in a Chinese contextual environment.

Another important reason not addressed in the literature is that prior studies have tended to examine the effects of CG and CE on performance independently (i.e. either the effects of CG structures on performance or the effects of CE on performance), with

little or no consideration of how the two might interact with each other to impact on performance. As argued by Fitzgerald et al. (2008), for firms to succeed, they need to design CG structures that facilitate CE capabilities, and in turn, enhance firm performance. This suggests CG structures have an influence on the relationship between CE and firm performance. To this extent, examining the effects of CG and CE on performance separately might lead to wrong conclusions.

2.7 Summary

This chapter has discussed the institutional background in China. During the last 25 years, China's securities market has made considerable progress. Based on the number of listed companies, the total market value and the securities market in China is becoming an oriental giant. The Chinese government has shifted its focus from administrative control toward market coordination. In addition, as an emerging economy and the second largest economy in the world, China recognises the critical importance of corporate entrepreneurship and has adopted policies to encourage scientific and technological activities both nationally and internationally.

In China, due to the complex ownership structure of firms, the CG systems for Chinese listed firms are still developing. Establishing an efficient CG system for Chinese firms is a pressing issue as part of the government's efforts to develop financial markets. The major challenge to CG reform is that China began its CG reform efforts before the elements of a well-functioning financial market were in place. There are some agency problems in listed firms in China, for example the conflicts between controlling shareholders and minority shareholders result from concentrated ownership, weak independence of the board of directors and board of supervisors, and highly bureaucratic and corrupt legal-political governance. Having an appropriate CG structure is key for the

firm to obtain resources to facilitate CE activities and mitigate the negative consequences of inadequate institutions for firm CE activities.

This chapter has also reviewed empirical literature on the relationship between CG structures, CE and firm performance, and discovered gaps. Research into the elements of CG, CE and firm performance has not yielded conclusive evidence of any particular factor inducing higher levels of risk-taking or producing a higher organisational outcome. The main inference of this examination of the literature is that most of the evidence presented has focused on developed countries, and it has demonstrated that little empirical attention has been given to these issues in the context of firms in transition economies. Furthermore, the use of different samples and industry, failure to control for other factors (e.g. national policies and political connections) may have an impact. National institutions, for example, have certain effects on CG effectiveness, perhaps not only enabling some CG structures whilst hampering others but also distributing power differently within different firms (Yong et al., 2008; La Porta et al., 2000). The research into CG structures is therefore, very context-dependent, and conducting it in each different institutional environment is important to the avoidance of bias and irrelevance in decision-making processes. In addition, existing studies that have examined some aspects of CG structures in isolation, for example, institutional share ownership or board composition, negate other CG mechanisms or have not examined ownership structure and board structure compositely. In particular, not much is known as to what constitutes suitable moderators on the relationship between CE and firm performance; this is an area which needs further research.

Based on this review, it can be suggested that this thesis can contribute to the body of knowledge in three ways. First, it adds to the existing studies by using a composite measure of CG structures, including board structure and ownership structure, to capture

the impact of overall governance at firm-level. Second, it specifically adds to a developing stream of literature on the relationship between CG structures, CE and firm performance on Chinese listed firms. Finally, this thesis explores whether firm-level CG structures moderate the relationship between CE and firm performance in Chinese listed firms.

Chapter 3: Theories and Hypotheses

3.1 Introduction

Chapter 3 offered an extensive review of literature relating to the impacts of CG, CE and firm performance. This chapter extends the theoretical background by using a multiple theoretical approach (agency theory, stewardship theory, and resource dependence theory) and laying the foundation for the development of the hypotheses to come. First, theoretical literature, including agency theory, stewardship theory, and resource dependence theory are reviewed in Section 3.2. Section 3.3 presents the conceptual framework of the thesis, developed from the theories discussed in Section 3.2 and the research context and the literature review in Chapter 2. Section 3.4 turns to the discussion of hypotheses arising from prior empirical work and the practice of CG, CE in China. Section 5.5 summarises the chapter.

3.2 Theoretical Literature

3.2.1 Agency Theory

Chapter 3 reviewed several studies examining the relationship between CG and performance, CE and performance and, CG and CE. These studies have underpinned their analyses with a number of theoretical perspectives. These include agency theory (Yu and Ashton, 2015; Song, 2015; Brossard et al., 2013), stewardship theory (Peng et al., 2007; Davis et al., 1997b), resource dependence theory (Shapiro et al., 2015; Choi et al., 2011), institutional theory (Tang et al., 2008), grounded theory (Sorour and Howell, 2013), and transaction cost theory (Chen et al., 2014b; Coles 2008). In this chapter, these theoretical perspectives are summarised and then applied to develop the hypotheses of the thesis.

Among these theoretical perspectives, agency theory dominates CG research (Young et al., 2008; Hoskisson et al., 2002; Hill and Snell, 1988). The agency theory makes the assumption that managers are self-serving and individualistic and may manifest opportunistic behaviours at the expense of shareholders' interests (Brossard et al., 2013; Wiseman et al., 2012; Eisenhardt, 1988). For example, agency theory considers that individuals are self-interested, risk-averse. On the other hand, shareholders usually hold a diversified investment portfolio, they might prefer risky projects that potentially lead to high return on their investment. Consequently, incongruent goals and differences in risk preferences exist between shareholders and managers. This divergence in interests results in agency costs when managers engage in opportunistic behaviours (Chen et al., 2014b; Fama, 1980, Jensen and Meckling, 1976). In other words, managers may act in their own interests at the expense of the firm's shareholders (Fama and Jensen, 1983) and make decisions in opposition to maximise shareholders' wealth (Jensen and Meckling, 1976). In capitalist firms, the owners' goal is to maximise firm value, however, due to the difference in risk tolerance and utility functions, managers may wish to pursue growth maximisation through diversification to reduce the risk to their personal power, security, wealth and social status (Brossard et al., 2013; Jensen and Meckling, 1976). According to Jensen and Meckling, managers tend to be aware of employment risks, and pursuing the goal of building up their own empire (Jensen and Meckling, 1976). On the other hand, shareholders may be risk neutral by holding a diversified investment portfolio (Minetti et al., 2012; Tribo et al., 2007; Fama and Jensen, 1983). However, these assumptions may not hold true in all contexts (e.g. Dalton et al., 2003, Daily et al., 2003, Frankforter et al., 2000).

In the countries with high concentrated ownership, the conflict of interests is amongst shareholders themselves. Controlling shareholders tend to extract benefits of

control from firm resources (Chen et al., 2014a; Young et al., 2008). Such benefits are not shared with other shareholders, hence, creating tensions between large and minority shareholders. For example, controlling shareholders are able to appoint family members or friends who might not be qualified as senior managers. Controlling shareholders and their appointed managers might engage in self-interest trades that only maximise their personal and political agendas but do not create financial value to the firm (Chen et al., 2014a). The conflicts of interests amongst shareholders happen more often in emerging countries, as a result of a lack of external and internal mechanisms that are able to mitigate such conflicts (Young et al., 2008). Such missing mechanisms are, for example, legal protection of small shareholders based on strong legal monitoring, and an efficient financial market for potential takeovers if firm value drops.

According to agency theory, shareholders and managers may choose different strategies to implement CE, based on their conflicting interests. From the shareholder's perspective, innovation, new product creation and entering new markets lead to growth, and their investment will pay off in the long-term. From the manager's perspective, however, CE involves risky investments, product failures and lower short-term earnings, hence, leading to higher employment risks and lower income (Zahra, 1996). The board of directors therefore, has an important role in aligning the interests of owners and managers (Baysinger et al., 1991; Fama and Jensen, 1983). To ensure that managers pursue strategies consistent with maximising shareholders' value, agency theory casts the board in the role of guardian of shareholders' wealth (Fama and Jensen, 1983). Firms with institutional investors and a high level of board independence may be able to do a better job in monitoring and controlling management (Liu et al., 2014; Chen and Hsu, 2009). Consequently, they help firms to improve their CE capabilities (e.g. more R&D investment and more number of patents) (Choi et al., 2012; Hoskisson et al., 2002).

Agency theory also suggests that the high level of ownership concentration and insider ownership are effective mechanisms to reduce an agency problem and thus, enable owners to monitor management because of their sufficient financial shares and organised power. In addition, to ensure that managers pursue strategies consistent with maximising shareholders' value, agency theory casts the board in the role of guardian of shareholders' wealth (Fama and Jensen, 1983). Specifically, in this thesis, hypotheses 3a, 4a, 5a, 6a, 8a, 10c, 13a and 13b are informed by agency theory.

3.2.2 Stewardship Theory

Another theory used to explain the implications for CG on organisational outcomes is the stewardship theory. Stewardship is developed to explain the relationship between managers and principals in which managers (as stewards) protect and maximise shareholders' wealth through firm performance. By so doing, the stewards' utility functions are maximised when the shareholders' wealth is maximised (Donaldson and Davis, 1991). Contrasting with agency theory, stewardship theory posits that individuals on the one hand, are motivated not only by the economic and financial value of the firm and their self-interest. On the other hand, individuals are also motivated by self-actualisation through intrinsic rewards attained via work and the achievement of personal goals and values (Davis et al., 1997b, Donaldson, 1990). Stewardship theory states that agents act as stewards whose behaviour is collective, and who are committed to achieve the firm's objectives. The theory further argues that if the interests are not aligned between stewards and owners, the stewards would place a higher value on cooperation than defection (Davis et al., 1997b, p. 24). Stewards would be more inclined to pursue (Donaldson and Davis, 1991) and prioritise organisational objectives (Peng et al., 2007).

In listed firms, shareholders can be a mixed group of institutions or individuals with widely varying goals (Chen et al., 2014a). Stewardship theory therefore, argues that

the managers as stewards react to diffuse interests of various shareholders by focusing on organisational objectives and maximising long-term success, reflecting the majority interest (Davis et al., 1997b). These managers are willing to sacrifice their own interests and invest in the firm to make sure the firm becomes sustainable and wealthy. Also, these managers are keen on enhancing the firm's value for the benefit of all shareholders (Yu and Ashton, 2015). From a risk preference perspective, stewards might have high risk tolerance and are more willing to invest in long-term projects (e.g. CE). As a result, shareholders will be rewarded.

Stewardship theory focuses on the intrinsic motivation, designing structures that empower and facilitate opportunities (the entrepreneurial actions of stewards) for achievement rather than control and monitoring (Davis et al., 1997b). The implications of stewardship theory for CG are profound, particularly, the alternative view it presents of managerial behaviour. Empirical evidence exists which shows that stewardship theory may better explain firm decisions and performance (e.g. Miller et al., 2008; Zahra et al., 2008; Eddleston and Kellermanns, 2007; Peng et al., 2007). In a family business context, for example, most controlling shareholders are family owners, Miller et al. (2008) reported total support for stewardship perspective and find long-term orientation in strategic investments, a firm's reputation and relationships with employees and customers in family firms. Using data from 248 family firms in the food processing industry, Zahra et al. (2009) discover that stewardship-oriented organisational culture is conducive to strategic flexibility and positively moderate the relationship between family commitment and strategic flexibility. Eddleston and Kellermanns (2007) by utilising stewardship theory argued that altruism in family firms is conducive to breeding a participative strategy process in which firms are more likely to have long-term orientation in their business activities and to improve performance. In addition, Peng et al. (2007) find that

CEO duality is positively associated with the market value of firms in China and further stresses the point that whilst CEO duality may indeed reduce board independence, it may not necessarily imply that the firms with duality status would perform worse than their peers.

Given the weakness of external CG in emerging economies (e.g. China), internal CG mechanisms have become more and more essential to mitigate the potential agency problem. However, in most cases in those listed firms which are transformed from a state-owned enterprise, managers still act in the government's best interests by maintaining economic stability, including job preservation (Dong and Gou, 2010). In contrast, shareholders, for example, private owners, institutional investors and foreign investors might have higher demands on CE projects and financial value. Moreover, managers from state-owned enterprises tend to maintain their political connections and pursue their own political agendas, and these do not necessarily create economic return. Consequently, agency problems faced by listed firms in China may differ from those faced by listed firms in developed countries. In this sense, the difference of interest between shareholders and managers in transition economies needs to be carefully analysed to obtain a better view of CG and a proper explanation of the relationship between CG, CE and performance.

From the above discussion, this thesis argues that the integration of stewardship and agency theory would clarify the different roles of boards and shareholders in listed firms in China. Agency and stewardship theories are complementary rather than conflicting and each is more applicable to executive directors and in situations where the other theory is less applicable (Wasserman, 2006). Therefore, the two theories together are likely to be more robust in explaining the complexities of human behaviour (Davis et

al., 1997a; 1997b). Specifically, by using these two theories, this thesis developed hypotheses 2a, 2b, 3b, 4b, 8b, 10b, and 10d.

3.2.3 Resource Dependence Theory

Resource dependence theory considers that a firm operates within an open system and is dependent on the external environment (Pfeffer and Salancik, 1978a). Resource dependence theory suggests that the function of the boards of directors is to extract resources (Pfeffer, 1972) to manage firms' dependency (Pfeffer and Salancik, 1978b). In addition, the function of the boards is to cooperate with external firms (Hillman et al., 2009). Each member of the board can bring different resources and connections to the firm. Pfeffer and Salancik (1978b, p. 163) states that "when an organization appoints an individual to a board, it expects the individual will come to support the organization, will concern herself/himself with its problems, will variably present it to others, and will try to aid it". There are four main types of resources which a board can bring to the firm: (1) reputation and legitimacy; (2) advice and counsel to management; (3) assistance in accessing essential resources from the external environment; and (4) channels for disseminating information across firms (Bertoni et al., 2014; Hillman et al., 2009, Baysinger and Butler, 1985). Therefore, apart from the monitoring and controlling function, the board of directors is also able to increase the value generated by bringing resources to firms.

Resource dependence theory also looks closely at the underlying patterns of board composition. Resource dependence theory suggests that pro-active behaviour by independent directors and shareholders depends not only on the extent of board independence and ownership diversity, but also on their experience, skills and networks (Bertoni et al., 2014; Tong et al., 2013). Thus, resource dependence theory views state

shareholders, foreign ownership, independent directors and board size as boundary spanners who extract resources from the environment (Pfeffer and Salancik, 1978b).

The resource dependence view emphasises that in addition to control functions, the board may also play service and strategic roles in the decision-making process (Zahra and Pearce, 1989; Pfeffer, 1972). In particular, independent directors may provide firms with significant advantages, for example, alliance formation (Gulati and Westphal, 1999), facilitating firm borrowing (Tong et al., 2013), and information acquisition. Empirically, resource dependence literature (e.g. Hillman et al., 2009) provides much evidence consistent with the argument that independent directors help to improve a firm's performance through the provision of essential resources. For example, Tong et al. (2013) find that for state-owned firms in China, hiring independent directors who have accounting skills is beneficial to a firm's financial performance.

CE relates to R&D investment and new products, all of which require significant capital for long-term investment, and independent directors with good connections can help their firm to access financial resources and hook up experts with specific knowledge (Tong et al., 2013). Independent directors are normally embedded in critical resource and information networks which can enable them to help firm managers identify directions for growth and to acquire the resources needed for the pursuit of new entrepreneurial initiatives (Hillman et al., 2009; Pfeffer, 1972). Importantly, independent directors can bring goodwill and new business ties with industry players into the firm, helping the firm to detect emerging opportunities in its field. Furthermore, independent directors with industry experience may have the experience necessary to complement and support managers in strategic decision-making, for example, R&D investment, long-term investments and competitive dynamics (Shapiro et al., 2015). They can also bring a

positive influence to bear upon corporate strategy and entrepreneurial actions (Fried et al., 1998), hence, enhancing firm performance (Kroll et al., 2007).

Given the fact that CE relates to risk-taking, new products, and innovation (Bierwerth et al., 2015), resources brought in by investors are critically important for promoting CE activities. For example, foreign investors can provide advanced foreign technology and sophisticated managerial know-how whilst helping the firm they control to have access to the foreign market. Likewise, a firm with a high proportion of shares held by the state can be in a better position to access non-tradable resources and internalise them in their controlled firms, for example, knowledge of the local market, state-owner's legitimacy and policy support, and access to financial resources and property rights of land which might better help firms to seize CE opportunities, and in turn, enhance firm performance (Tang et al., 2008). Compared to the state and foreign investors, domestic non-state investors typically possess larger social networks in the home market, blended within their families, kin, and other interpersonal relationships (Chen et al., 2014a; Filatotchev et al., 2011). These social relationships are found to be more reliable in weak institutional environments where formal, contractual relations are hard to build. Therefore, firms with a high proportion of shares held by domestic non-state investors can find timely and accurate information relevant to technology localisation and local innovation opportunities (Chen et al., 2014).

Hillman et al. (2009) suggest that the explanatory power of agency theory could be enhanced by integrating with resource dependence theory (Pfeffer and Salancik, 1978b). More recently, the integration of multiple theories has been employed more widely (e.g. Dalziel et al., 2011; Arthurs et al., 2009; Peng, 2004), in studies which argue that boards/shareholders deal with agency problems and resource dependence issues simultaneously. This thesis thus, integrates agency theory and resource dependence

theory to explore the ways in which the boards of directors and different types of investors contribute to the relationship between CE and firm performance in Chinese listed firms. Hypotheses 1a, 1b, 2a, 2b, 4b, 5a, 5b, 6a, 6b, 7a, 7b, 9, 10a, 10b, 11a, 11b, 12a, and 12b.

3.3 Conceptual Framework

This thesis is underpinned by three related literature themes: CG and performance, CG and CE, and CE and performance. As noted in Chapter 2 (Literature Review), the previous literature has tended to examine these independently, for example, the effect of CG on firm performance (e.g. Azeez 2015; Ammann et al., 2011); the effect of CG on CE (e.g. Shapiro et al., 2015; Minetti et al., 2012; Munari et al., 2010; Zahra, 1996) or the effect of CE on firm performance (e.g. Bierwerth et al., 2015; Rauch et al., 2009).

Agency theory suggests that principals are the residual claimant of profits, therefore, they might benefit from the CE activities related to aggressive R&D spending because they can diversify risk through a portfolio of investments. On the other hand, agents have low risk appetites because they have to bear the uncertainty of CE activities without being able to diversify the risk and are only rewarded on the basis of salary (Munari et al., 2010). Given this reward scheme, agents will have no incentive to act entrepreneurially and undertake risky projects (e.g. more investment on new product creation). Instead, agents might prefer short-term gains through less risky projects, which might hamper a firm's long-term returns. To solve the agency problem, firms must design CG structures that facilitate CE capabilities, and in turn, enhance firm performance. For example, firms with high foreign ownership have resource-rich shareholders that can help firms bring in necessary resources for CE activities (Chen et al., 2016). In addition, foreign investors would provide specific technological and managerial resources to

motivate and help firms intensify their CE efforts, thereby maintaining the quality of CE activities and improving firm performance.

The conceptual framework of this thesis is that to achieve a greater firm performance, the firm should adopt a set of corporate governance structures to ensure accountability, but also to allow the management of the firm to engage in entrepreneurial activities that lead to value creation and therefore, better performance. Thus, given that CE is fraught with risk and uncertainty, affecting a firm's competitive advantages and sustainable long-term success, CG structures should facilitate CE and avoid project failures, and in turn, enhance performance. In addition to drawing from the literature on the three themes (the effects of CG on CE; the effects of CG on performance; and the effects of CE on performance), the conceptual framework attempts to capture the Chinese contextual environment. For example, issues related to state ownership and supervisory board (see Figure 2) and how they may influence CE and therefore, influence performance.

The conceptual framework developed in this thesis (see Figure 2) comprises three elements (CG structures, CE, and firm-specific factors) that would influence firm performance. These three elements are related to each other. The argument presented in the framework is that the CG (i.e. ownership and board structures) impact on firm performance directly (see Arrow A), and via its impact on CE (see Arrow B). Also, CE directly affects firm performance (see Arrow C), but the relationship between CE and firm performance might be moderated by the governance structures in the firm (see Arrow D). However, the impact of both CE and CG on firm performance is also contingent on other factors specific to the firm, for example firm size, firm age, capital structure, industry and political connection (see Arrow E and Arrow F). Figure 2 shows the diagram of conceptual framework and discussed in detail in Sections 4.4 - Hypotheses.

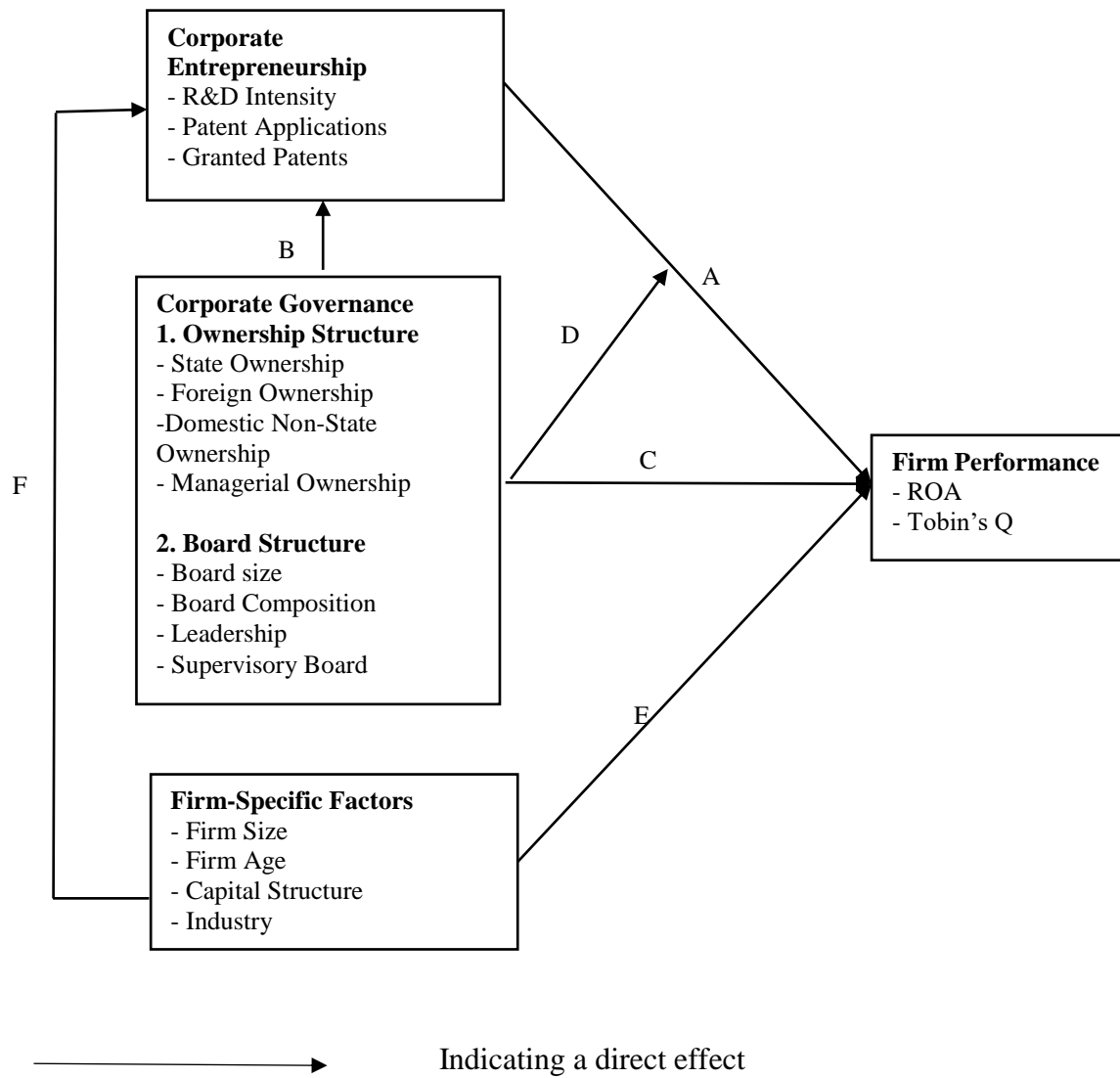


Figure 2 Conceptual Framework

3.4 Hypotheses

The relative applicability of different theories is scarcely understood, and research into the relationship between CG, CE and firm performance is very limited. Theoretical predictions or combinations of predictions which are most likely to hold true in the Chinese context are similarly very limited. It is, therefore, entirely plausible that what has been found for other countries will not be applicable to China.

This thesis addresses four research objectives to understand the effect of (1) CG on CE, (2) CG on firm performance, (3) CE on firm performance, and the moderating effects of (4) CG on the relationship between CE and firm performance in the Chinese context. Based on the theoretical model, hypotheses were developed and classified into four groups to test the relationships and achieve the research objectives. The first group of hypotheses relates to the relationships between ownership structures and CE, in addition to the association between ownership structures and firm performance. The second group of hypotheses relates to the relationships between board structures and CE, in addition to the association between board structures and firm performance. The third group of hypotheses relates to the effects of CE on firm performance. The fourth group of hypotheses relates to the moderating effects of CG (ownership structures and board structures) on the relationship between CE and firm performance. The final section relates to the impact of firm-specific factors on CE and firm performance.

3.4.1 Board Structure Hypotheses

As noted earlier, institutional differences across countries provide one explanation for differences in various corporate governance (CG) systems (James and McGuire, 2016; Anderson and Gupta, 2009). In addition, organisational differences can lead to differences in internal CG structures. Given the strong market friction present in transition economies, the ways in which internal CG structures (e.g. independent directors and the

separation of the roles of CEO and chairperson) can be effective substitutes for external governance tools is an important question.

3.4.1.1 Board size

Agency theory suggests that a small board size reduces the costs of insufficient communication (Haniffa and Hudaib, 2006), closely monitors management and helps the decision-making process to perform faster and be more cohesive. Existing empirical studies support the agency perspective and have demonstrated a negative relationship between board size and firm performance (e.g. Azeez, 2015; Guest, 2009) and CE (Wang, 2012), and a positive relationship between board size and diversification (Kiel and Nicholson, 2003; Hoskisson et al., 2002; Bosworth et al., 1999). Azeez (2015) suggested that small boards are associated with higher firm performance through closely monitored management. This logic could be extended to firms in transition economies, when the board becomes larger as greater heterogeneity among its members could make it difficult to agree on decisions. Importantly, as making entrepreneurial decisions always requires cohesion among the board members, having a large board may thus cause delays. In addition, the propensity of each member for risk-taking is likely to differ, hence, consensus may be more difficult to achieve if the board is too large.

On the other hand, studies found that firms with a larger board outperform compared to the firms with a smaller board (De Cleyn and Braet, 2012; Magena et al., 2012; Jackling and Johl, 2009; Van den Berghe and Levrau, 2004; Zahra and Pearce, 1989). These studies argue that firms with a larger board are often considered to be more capable of monitoring the actions of management, as it is more difficult for the CEO to dominate a large board or to obtain consensus for making decisions that harm shareholders' value. Moreover, large boards increase the diversity of skills, experience, knowledge and styles of management, providing firms with more and better advice and

ideas (Dalton et al., 1999) in particular, in complex external environments (De Cleyn and Braet, 2012; Mangena et al., 2012), thereby improving the quality of strategic decisions and increasing firm performance. These arguments seem to indicate that larger boards are beneficial from a resource dependence perspective, but dysfunctional from the agency and strategic decision-making perspective.

On the question of what is considered an ideal size for a board, there appears to be no consensus view. Yermack (1996) suggests an optimal board size is seven directors, whilst Lipton and Lorsch (1992) consider a board size between seven and nine directors is better for firm performance. Guest (2009) argues that there is no one board size that is best for all companies. Countries, for example, the CG Code 2014 in the UK does not specify the recommended number of directors on the board. Similarly, the Chinese Company Law (Company Law of People's Republic of China, 2013) has no specific recommendations or requirements regarding the size of boards other than suggesting that board size should range from 5 to 19. It does not propose an optimal size or any specific criteria for setting up the board. Although in developed countries, it may be desirable to have a small board to maintain board quality, as they are more likely to have more sophisticated and well-developed mechanisms, in developing countries, such as China which is at a developmental stage, the opposite holds true. In this thesis, therefore, it is argued that a large board can increase firm performance.

Hypothesis 1a: Board size is positively associated with firm performance in Chinese listed firms.

Zahra et al. (2000) argue that board size also influences the organisation's CE activities. The size of the board affects directors' abilities to process information on CE.

Smaller boards have the ability to increase directors' participation and promote frequent

communication with the company's senior executives. This environment encourages cohesion among directors in monitoring and evaluating CEOs, and thus constraining potential managerial opportunism (Azeez, 2015). However, it was argued that when a board was too small, it lacked expertise and skill diversity, and had limited information processing capabilities. Furthermore, it was inclined to over-emphasise financial controls and encouraged the use of quantifiable quotas and short-term goals to help the board monitor management actions (Baysinger et al., 1991), and this, in turn, led executives to overlook CE (Shapiro et al., 2015).

As the board size grows, it would also be expected that the board's collective experience and skills would also grow. In a similar vein, larger boards are likely to increase cognitive diversity, which leads to increased creativity in decision-making and the emergence of new alternatives for the development of the firm (Shapiro et al., 2015). In addition, a larger board might arguably render individual members more confident to propose new ideas and to promote innovation or strategic changes (Brunninge et al., 2007). In particular, having a larger board may help to include outside directors who have better access to industry information and more market experience, which according to the studies (e.g. Shapiro et al., 2015; De Cleyn and Braet, 2012; Zahra, 1991), boards with more members are highly conducive to corporate entrepreneurial activities, for example, innovation investment and patents.

It was also argued that as the board size increased, it would increase CE until a threshold was reached. Beyond a certain point, the increase in the size of the board could become dysfunctional and would reduce CE activities. The inverse U-shaped relationships suggested by Zahra et al. (2000), where the optimal size of a board is 11 directors in American firms, the board size is positively related to innovativeness, afterwards negatively. They explained that it was due to problems that could occur, for

example, communication breakdown, which would lead to a decline in co-ordination among directors, thus causing the decision-making process to slow down, all of which would reduce the level of CE in the organisation. Furthermore, a large board of directors tends to reduce agility and capacity of reaction in the face of complex business situations (Yermack, 1996). Jensen (1993) discovers that large boards of directors might not be able to operate effectively due to co-ordination and process problems that outweigh the advantages of having a large number of people to draw on.

Considering that CE involves seeking new opportunities and advantages, this leaves no doubt that external resources are essential for firms wanting to promote strategic entrepreneurship. Moreover, given the disadvantages embedded in Chinese firms which have recently transformed from state-owned to private sector organisations, and the challenges arising from the business environment in which they operate, it is likely that those firms face a high demand for the resources needed to carry out the corporate entrepreneurial activities. One effective way to assist them to better access these critical resources is to increase their number of board members. Furthermore, the majority of firms in China often pursue network-based strategies (Tang et al., 2008), hence having a larger network is critically important, especially for threshold firms, for example, privatised firms. Firms can use their network to obtain market information and new opportunities. Importantly, given the unique context of privatised firms, a high proportion of directors in these firms' boards are affiliated directors who are state representatives. These directors may be particularly helpful because they help to facilitate the ties between the firms and their external network. Therefore, large boards with more directors might provide more resources, enabling firms to have more opportunities for CE. Here, the contention of this thesis is that a larger board is more beneficial for firms pursuing CE activities and improving firm performance.

Hypothesis 1b: Board size is positively associated with CE in Chinese listed firms.

3.4.1.2 Independent Directors

In a firm, independent directors are there to monitor management on behalf of shareholders (Tong et al., 2008; Fama, 1980) and offer access to critical resources (Chen and Hsu, 2009; Pfeffer and Salancik, 1978a). These two functions are used to discuss in the perspectives of agency theory and resource dependence theory.

Agency theory suggests that shareholders delegate the role of control to professional managers (Jensen and Meckling, 1976). However, to ensure that the managers pursue strategies that are consistent with shareholders' interest, agency theory casts the board in the role of guardian of shareholders' interest (Fama and Jensen, 1983). In particular, based on the resource dependence perspective, the presence of independent directors with their unique expertise enhances board decision-making process via their independent judgement.

The evidence of the impact of independent directors on firm performances is mixed. Some existing studies have found a positive and significant relationship, for example, Gupta and Fields (2009), Coles et al. (2008), Weir et al. (2002), and Daily and Dalton (1993). In contrast, other studies have reported a negative relationship between independent director and firm performance, for example, studies in the U.S. (Yermack, 1996), and studies outside of the U.S. (Mangena et al., 2012; Guest, 2009; Bozec, 2005). These studies indicate that board independence, knowledge and expertise of the independent directors appear to hold back managerial initiative through over-monitoring. However, studies also found that there is no convincing evidence to prove that a board with greater independence would result in creating a higher long-term firm performance

(Wintoki et al., 2012; Sanda et al., 2010; Haniffa and Hudaib, 2006; Weir et al., 2002; Daily and Dalton, 1992).

In China, Guidelines for Introducing Independent Directors to the Board of Directors of Listed Companies (CSRC, 2001b, Section I.3) require at least one-third of board should be independent directors. However, the main role played by independent directors in China is to protect minority shareholders' rights, whilst monitoring the performance of management is subsidiary. It is unclear whether the independent directors should have any responsibility for reviewing and initiating strategic planning, formulating strategies and setting corporate direction. In fact, many listed firms had already tried to appoint outside directors, in particular, listed firms were more likely to appoint independent directors with a view to increase the independence of the board. In statistical data from Yu and Ashton (2015) and Liu and Fong (2010), Chinese listed firms from 2003 to 2010 were all compliant with this legal requirement to have on average at least 33.3% independent directors' ratio on the board. This percentage remained stable between 2007 and 2015 from the data sample used in this thesis. In 2013, for example, there were 5,760 independent directors in listed firms, over 60% of whom had previously been government officials or had had government related roles (Wu, 2014). This phenomenon is reflective of a common problem within China's independent director system that listed companies wish to exercise leverage on the social resources and networks of retired politicians and attach considerable importance to their relationship with government rather than their professional qualifications and supervisory abilities (Choi et al., 2011). This leads to:

Hypothesis 2a: The proportion of independent directors on the board is positively associated with firm performance in Chinese listed firms.

A firm's CE investment decisions can be subject to agency problems due to the high level of risks involved in sunk-cost investments. In particular, managers may be reluctant to make CE investments that will pay off in the long-term rather than in the short-term (Baysinger et al., 1991; Fama and Jensen, 1983). Therefore, mechanisms, for example monitoring managerial actions by independent directors become essential to mitigate potential agency problems (Kor, 2006). However, the available evidence suggests that the results on the relationship between independent directors and CE are mixed. For example, Balsmeier et al. (2014) found a positive relationship, indicating that independent directors in these contexts play an important role of resource provider. However, Zahra (1996) found a negative association between independent directors and CE as measured by innovation, venturing and renewal strategies, suggesting that effective independent directors help to constrain over-investment in unproductive CE projects (e.g. R&D spending and new products). The negative effects of independent directors on CE also produce a view that whilst the role of independent directors promotes accountability, they might have adverse implications for CE on the firm.

However, research from other countries may be difficult to interpret in the Chinese context due to the difference in the nature of board structure. Resource dependency theory suggests that independent directors provide access to external resources (Shapiro et al., 2015) which are typically important to CE. Generally speaking, different types of independent directors, for example, politically-connected appointees, venture capitalists and bankers can bring different assets and opinions to the firm. For example, in China, firms appoint former and current state officials for networking purposes.

Hypothesis 2b: The proportion of independent directors on the board is positively associated with CE in Chinese listed firms.

3.4.1.3 CEO Duality

The role of the CEO is critical for the survival of any firm as well as the chairman of the board, however, whether to allow the combination of CEO and chairman is a question for debate amongst researchers, regulators and law makers internationally. In China, where this thesis is based on, the role of the CEO is advocated by the CG Code of best practices to be separated from that of the chairman (CSRC, 2001a). In this view, will the separation of CEO and chairman enhance firm performance more than the firms with CEO duality? Agency theory argues that splitting the roles between CEO and chairman in a firm is positively related to long-term decision-making and in turn, improves firm performance. This is because paying one person as CEO/chairman, he/she might use the power to select directors who are not expected to challenge his/her actions independently (Yu and Ashton, 2015). In this case, the board of directors will be incapable of effectively evaluating and monitoring the CEO because CEO duality ‘signals the absence of separation of decision management and decision control’ (Fama and Jensen, 1983, p. 314). This suggests that a board controlled by two separate roles of CEO and chairman is expected to have better independence which may reduce agency problems, and eventually, maximise firm value (Peng et al., 2007; Donaldson and Davis, 1991).

In line with the agency perspective, empirical studies provide evidence of the significant and negative effects of CEO duality on firm performance (Ujunwa, 2012; Peng et al., 2007; Haniffa and Hudaib, 2006; Bozec, 2005; Bai et al., 2004; Kiel and Nicholson, 2003; Judge et al., 2003; Dahya et al., 1996; Pi and Timme, 1993; Rechner and Dalton, 1991). In contrast, other studies found a positive relationship between CEO duality and firm performance which support the view of stewardship theory that CEO duality may be good for firm performance due to the unity of command it presents (for example, Guilet et al., 2012; Dey et al., 2011; Coles et al., 2001; Brickley et al., 1997; Donaldson and

Davis 1991), and in developing economies (for example, Azeez, 2015 and Peng et al., 2007).

Existing studies, on which this thesis is based, examining the relationship between CEO duality and firm performance, have also found mixed results. Using propensity-score matching methods for 1,379 Chinese listed firms from 2003 to 2010, Yu and Ashton (2015) reported that 22.5% of firms had a combined board leadership structure in 2010. They found that whilst CEO duality is not related to profitability ratios (ROA and ROE), it is linked to higher agency costs (expense ratio) compared to firms without CEO duality. They suggested that a separation between CEO and chairman is an effective CG structure to reduce agency costs for listed firms in China. On the other hand, Chen et al. (2008) reported an insignificant association between CEO duality and firm performance by controlling for firm characteristics, for example, ownership structure, agency costs and CEO compensation. They also reported an increased number of firms changing from a combined to non-combined board leadership structure, though their findings did not show that the change of leadership structure would help improve firm performance.

In China, the Basic Norms of State Owned Large and Medium Sized Enterprises in Establishing a Modern Enterprise System and Strengthening Management were issued by the State Economic and Trade Commission in October 2000 and stipulates in principle that the chairperson cannot concurrently serve as CEO. Given that China has a weak institutional environment and poor investor protection, CEO duality could result in higher agency costs and act as a barrier to firms achieving effective corporate governance for Chinese listed companies (Yu and Ashton, 2015). However, this is not stressed in the 2013 Chinese Company Law. Although the board leadership structure data indicate that the majority of listed firms in China have split the roles of CEO and chairman (Yu and Ashton, 2015; Chen et al., 2014b; Liu and Fong, 2010), it is argued that the title of CEO

and chairman can be very misleading in China, due to many chairpersons working full-time for the appointing firms and are executives in all but are still called chairman. In this aspect, it suggests that a separated leadership structure seems to put the CEO in the hot seat that the CEO may be overawed by such a chairman and may feel constrained in the day-to-day business operation without frequent reference to the chairman. However, consistent with agency theory, the Chinese CG Code suggests a separation of the roles as best practice (CSRC, 2011a). This may be seen to be more effective in terms of enhancing firm performance as well as limiting the power of the CEO.

Hypothesis 3a: CEO duality is negatively related to firm performance in Chinese listed firms.

With regard to the impact of CEO duality on investment decisions in CE activities, Zahra et al. (2000) demonstrated the negative effect of CEO duality on CE, noting that it provides the opportunity for opportunistic behaviour on the part of the CEO, who might as a result reject investment in CE. Bai et al. (2004) claim that when boards are under the influence of CEOs and other executives, firms are more likely to limit the level of investments in long-term CE projects that may not deliver return quickly. Shapiro et al. (2015) provide empirical evidence that an effective and well-structured board of directors, including one that splits the positions of chair and CEO and has independent members, could remind managers that developing and maintaining CE capability is a company priority, and one that also enhances invention patents by providing monitoring and access to outside resources.

In fact, to study the impact of a separated leadership structure, it is worth looking at the role of executives in firms. First, Jensen and Meckling (1976) argued that firms in their early years present a classic case of union rather than separation of ownership and control. The Chinese stock exchanges are in the developmental state (the listed firms with

the longest listing age was 27 in 2017), and listed firms have emerged as a result of their transformation from state-owned enterprises (SOEs) and moved to an entirely new competitive environment. Listed firms in China, therefore, could be considered as young firms. The boundaries between control and ownership are thus somewhat blurred. Executives in this case tend not to consider themselves as agents but rather as company owners.

Second, stewardship perspective seems to be more applicable to firms which operate under weak control systems, in other words, trust is the basis of collective and collaborative work (Peng et al., 2007). Given the underdeveloped nature of Chinese market institutions, trust is more likely to exert a significant force among actors in a business relationship (*Guanxi*) than in economies where market institutions are better established (Yu and Ashton, 2015).

Third, in terms of culture, collectivism is prevalent in China (Hofstede, 2011). The success of one's firm may thus be considered more important than individual achievements. Moreover, people are influenced by Confucian philosophy considering intrinsic rather than extrinsic values to be of greater significance. Therefore, one individual may be more willing to invest in CE activities (e.g. new products, new markets) to enhance his/her reputation with the expectation of bringing long-term profitable opportunities to the firm. The tenure of a CEO is also another impact factor. Having a long tenure would normally increase the sense of duty to the firm as a collective organisation, even after privatisation (Zhang et al., 2014). CEOs might therefore, be inclined to sacrifice their personal interests for the success of the firm, which eventually, is beneficial to their careers and taking the credit for managing a successful firm would make them less likely to forego long-term CE activities for the firm.

Taken together, these factors may suggest that stewardship theory is more suitable to the Chinese context and CEO duality in Chinese listed firms may be motivated to act on behalf of their shareholders' interest. In particular, Peng et al. (2007) found that CEO duality improves firm performance in SOEs but not in the case of private firms. As the state is still actively holds shares in the majority of listed firms, Peng et al. (2007) point out that a non-combined board leadership structure may prevent unity and efficiency in decision-making. Considering the above discussion and the overall pattern of empirical results, the following hypothesis states.

Hypothesis 3b: CEO duality is positively associated with CE in Chinese listed firms.

3.4.1.4 Board of Supervisors

In China, the Company Law requires limited-liability companies to have a two-tier system, consisting of a board of directors and a supervisory board (Shapiro et al., 2015; Shan and McIver, 2011). The board of directors is responsible for the immediate governance of the firm, while the supervisory board is supposed to monitor the board of directors and to protect the rights and interests of the firm and the stakeholders (Tricker, 2012). To ensure separation of the personnel on the two boards, the Company Law 2013 stipulates that members of the board of directors and senior managers cannot serve as members of the board of supervisors. Under the Company Law, supervisors have the power to investigate their firm's operating status without interference and to report directly to the CSRC and related regulatory authorities. In addition, the law requires at least one third of the supervisory board members to be representatives of employees (Company Law of People's Republic of China, 2013). Apart from providing protection for employee rights and channels for employee participation in corporate governance, as in the case of some European countries, this requirement serves to recognise the nominal

primary status of the working class in the political ideology of China. Thus, a supervisory board has the potential to provide the company with additional resources through the appointment of appropriate external persons, as well as providing the input of important stakeholders, notably employees.

Based on panel data of the largest German companies, Balsmeier et al. (2014) used econometric analysis, and the results show a robust and significant positive influence of the supervisory board on innovative firm performance (patent applications), in particular, the supervisory boards with outside directors from patenting firms would enhance innovative activities in the firms they monitor.

Shapiro et al. (2015), who investigate Chinese firms in one unusually entrepreneurial province (Zhejiang) with a predominance of smaller, non-state-controlled firms, argue that CE (R&D investment and patents) is increased with board size, for firms with independent directors on their boards and with stronger supervisory boards. However, they find evidence that the existence of a supervisory board does not enhance a firm's patenting. Ning et al. (2014) tested in a larger sample, across the full spectrum of board structures (i.e. board size, board composition and supervisory board size) in Chinese listed firms. The results seem to indicate that larger supervisory boards may be inefficient in monitoring the board's ability to balance the power of insiders, because both the board of directors and supervisors might be affiliated with the controlling shareholders (Wei, 2007). Promoting greater independence for directors on boards and independent supervisory boards would all help to enable commercially-minded judgments to be made over long-term investment decisions (e.g. investment in CE activities) and to give incentives and disciplinary mechanisms over top management of firms that assist in that process.

In practice, the supervisory directors often have low status and limited power because the supervisory board can only suggest sanctions on members of the board of directors and senior management (Company Law of People's Republic of China, 2013) or file lawsuits against them, but lack the legal authorisation to decide and carry out such sanctions. Compared to Germany where the supervisory boards are first-tier boards (Balsmeier et al., 2014; Tricker, 2012), the supervisory boards in China are considered as second-tier boards with limited capacity. Therefore, supervisory boards in China are likely to be less effective in monitoring the board of directors and the management. However, based on the functions of attracting potential external resources and offering stakeholder representation, this thesis hypothesises:

Hypothesis 4a: Supervisory board size is not directly associated with firm performance in Chinese listed firms.

Hypothesis 4b: Supervisory board size is positively associated with CE in Chinese listed firms.

3.4.2 Ownership Structure Hypotheses

3.4.2.1 State Ownership

In many emerging countries (e.g. China) where firms are not fully privatised, and the government tends to invest heavily in listed firms, for mainly political reasons, state ownership is considered as an influential factor that affects firm decision-making in general and strategic direction in particular (Song et al., 2015). State-owners are likely to have fewer budget constraints, and more patience regarding returns on investment, especially in technology-intensive industries, therefore, are more likely to favour longer-term risk-taking strategies for entrepreneurial purposes. Song et al. (2015) pointed out that firms in which the government holds substantial shares have profit and non-profit

goals, hence, maximising shareholders' wealth may not be their priority. In other words, CE investment, where the state is controlling shareholders may not be directly related to firm performance objectives but to the state-determined social and political goals.

From a resource dependence theory perspective, firms with many government-held shares have easier access to the resources they need, especially those related to financing needs, because they primarily rely on the state when seeking additional funding or applying for loans (Chen et al., 2014a). In addition, firms with higher state ownership would take advantage of the state being a major owner and easily raise external funds from local providers at a preferred rate, which may not encourage them to drive entrepreneurial projects forward. Similarly, associated political interference in appointing managers and directors may make the market for corporate control less effective in disciplining them, as the government is expected to be a major long-term investor.

However, developing domestic innovation capabilities is one of the national development priorities of the Chinese government. In order to reduce the divergence of interests between state investors and other shareholders, the government may pressurise firms to provide more information since the state is accountable to stakeholders at large. Hence, political control by government as a major investor and the conflict between its interests and other shareholders' interests are expected to motivate firms to follow the government's political agenda.

Indeed, firms with a high proportion of state ownership are easily influenced by state policies and political agenda. In China, administrative agents are motivated by political performance evaluations that consider a firm's CE capabilities as an important criterion (The National Development and Reform Commission, 2011). The governments encourage firms to increase R&D investment by releasing guidelines, providing subsidies, and issuing preferential tax policies. For example, one of the main goals of China's 13th

Five-Year Program (2016-2020) adopted in 2016 is scientific development and a determined emphasis to encourage an entrepreneurial-oriented nation. As the main group to fulfil and achieve the government will, state-controlled listed firms may have to invest in CE. In addition, state-owned large-and-medium-enterprises have advantageous access to government support, including fiscal subsidies and bank loans. Indeed, Guan (2009) found that most R&D appropriations and public technological resources are deployed in these enterprises (Dong and Gou, 2010). This special environment and the SOEs' natural inertia in CE make the state play an important role in CE. Dong and Gou (2010) using the data from Chinese listed firms, find a positive correlation between the degree of shares held by the state and R&D intensity. This thesis, therefore, proposes:

Hypothesis 5a: State ownership is positively related to CE in Chinese listed firms.

Whilst evidencing a variety of forms of ownership which appear in the transition period (e.g. foreign, institutional non-state domestic ownership), statistically, the state is still the major shareholder, especially the top 12 Chinese listed companies are all state-owned (Cendrowski, 2015; Chen et al., 2014a; Dong and Gou, 2011). This has resulted in a highly-concentrated ownership structure, an outcome of China's partial privatisation. A dominant feature of the concentrated ownership by state is the non-tradable nature of the equity ownership of the state, either through direct investment or indirectly through holdings of domestic institutions. These institutions are entirely or partially owned by either China's central or its provincial governments (Tang et al., 2008). The ongoing nature of China's transition process suggests the importance of continued study of the impact and change of ownership concentration, particularly that of the state, and the way in which this has changed over time.

Wei (2007) finds that amongst Chinese listed firms, when the proportion of state-owned shares is on average over 50%, state-owned shareholdings have a significant and negative impact on firm performance. They also found that when non-state-owned shareholdings are relatively small, they have a significantly positive effect on firm performance. However, other studies have different results. For example, Shan and McIver (2011) and Dong and Gou (2011) find that state shareholding is significantly positive related to firm performance. They find a high level of state control of enterprises would be associated with better performance. Meanwhile, Zeng and Lin (2011) also found that firms with a higher level of state ownership spend more on R&D in Chinese listed firms. One explanation is that state ownership provides an incentive for state shareholders to closely monitor management and therefore, ensure that managers pursue long-term sustainable goals (Shan and McIver, 2011). It could also mean that a good reputation of more investment in CE activities benefits managers to the extent that managers with such a good reputation are more likely to have a promising political career and be promoted. Considering the above discussion, this thesis forms the hypothesis:

Hypothesis 5b: State ownership is positively related to firm performance in China.

3.4.2.2 Domestic Non-State Ownership

The domestic non-state investors primarily include corporate founders and their family and affiliates, domestic firms, and institutional investors (Choi et al., 2011; 2012; Douma et al., 2006). Compared to the state and foreign investors, domestic non-state investors typically possess larger social networks in the home market, blended within their family, kin, and other interpersonal relationships (Filatotchev et al., 2010). These social relationships are found to be more reliable in weak institutional environments, where formal, contractual relations are hard to build. They enable local non-state investors to be

quickly informed about local trends and thus more responsive to local environments (Chen et al., 2014a). Therefore, domestic non-state investors are more capable of finding timely and accurate information relevant to technology localisation and local innovation opportunities, especially in niche markets (Claessens et al., 2000). Douma et al. (2006) found domestic corporate ownership positively affects firm performance (ROA and Tobin's Q).

In addition, the founders and their families are likely to care more about their family business and to prefer the achievement of their long-term goals with the firm's stability to mere short-term financial profits. Families prefer the achievement of long-term goals because the owner-managers have the tendency and obligation to pass on wealth to the next generation and thus, they possess longer-term commitment compared to non-family firms where the professional managers may be short-term orientated in their management approach (Choi, et al 2012; Hess et al., 2010). Founding families view their firms as an asset to pass on to their descendants rather than wealth to consume during their lifetime. In other words, firm survival is an important concern for families, suggesting that they are potential advocates of CE activities and long-term value maximisation. Therefore, families can have longer horizons than other shareholders and subsequently, they possess a willingness to invest in long-term projects, for example, CE.

Local knowledge possessed by domestic non-state investors is difficult to purchase from the market because China lacks such a competitive market with professional consultants who specialise in technology localisation and local market intelligence (Chen et al., 2014a). Moreover, since local knowledge is embodied and tacit in prior experiences and complex social networks (Chen et al., 2014a; Filatotchev et al., 2010), foreign owners, are at a disadvantage because of their liability of foreignness and the lack of deep understanding of the Chinese culture. Foreign owners might find it,

therefore, very challenging to enter the trust circle of local firms and build information-sharing social networks.

The above discussion suggests that domestic non-state investors relate to long-term investments in CE and to the disciplining of management according to performance criteria. This thesis expects domestic non-state investors promoting longer term investments to have better firm performance.

Hypothesis 6a: Domestic non-state ownership is positively related to firm performance in Chinese listed firms

Hypothesis 6b: Domestic non-state ownership is positively related to CE in Chinese listed firms.

3.4.2.3 Foreign Ownership

Foreign shareholders are more likely to face higher levels of information asymmetry because of distance and language obstacles (Chen et al., 2014a; Haniffa and Cooke, 2002). This suggests that they require greater effort to reduce asymmetric information and monitor actions taken by management. In this view, domestic firms with a high proportion of shares held by foreign investors should be motivated to disclose more information (e.g. strategic plans on CE) to fulfil expectations of foreign investors. This may be especially true in emerging markets where countries open their stock markets to foreign investors to enhance the efficiency of their capital markets (Elsayed, 2010). Support for this argument is given by Tricker (2012) who pointed out that investors tend to invest more in the countries with sound governance and a stable political system. Descriptive evidence was reported by Leuz et al. (2010) that U.S. investors do not invest significantly in countries with weaker governance.

Drawing from the resource dependence perspective, foreign firms in emerging economies have resource-rich foreign investors that can help firms in the host market bring in necessary resources for CE activities (Choi et al., 2012). Specifically, foreign firms holding equity shares of local firms tend to prioritise their strategic interests, for example, attracting skilled employees and searching for new markets. Foreign firms usually focus on the overseas market, in particular, when the investment relates to their core business (Choi et al., 2012). To achieve competitive advantage in the overseas market, foreign firms require more advanced technology capabilities than other domestic firms in host markets. In this vein, a firm with substantial shares held by foreign investors will motivate the investor to provide specific technological and managerial resources in technology development activities, and eventually, help the local firm intensify its CE efforts (Chen et al., 2016).

Studies on the Chinese economic transition have shown that increasing foreign ownership and foreign inward investment is positively associated with successful industrial growth (Chen et al., 2016; Choi et al., 2011). Foreign investors provide specific relational resources and a network abroad. Chen et al. (2016) have found that this positive association originates from the commitment of resources to technology transfer, managerial resource sharing, technical collaborations, intellectual exchange, and the appointment of foreign directors to boards. Firms with a foreign investor as controlling shareholder may be in a better position to access advanced foreign innovation resources than firms with no foreign investors. This also explains why the Chinese government encourages foreign firms to be involved more actively in CE with measures (Choi et al., 2012; 2011) such as tax exemption, subsidies and permits for domestic market access. Furthermore, the interactive learning organised by foreign firms in the CE process is

expected to generate knowledge spill-over from the foreign sector to the domestic sector.

Therefore, it is hypothesised:

Hypothesis 7a: Foreign ownership is positively related to CE in Chinese listed firms.

There is a substantial body of international evidence evaluating the influence of foreign ownership on firm performance (e.g. Chen et al., 2014a; Ning et al., 2014; Mishra and Ratti, 2011; Zeng and Lin, 2011; Douma et al., 2006). For example, Yudaeva et al. (2003) investigated firms in Russia and showed that firms with foreign ownership have higher productivity than domestic firms. Indeed, Bai et al. (2004) and Mishra and Ratti (2011) provided empirical evidence that issuing shares to foreign investors in Chinese market helps improve a firm's valuation, partly due to the monitoring effect of the relatively more sophisticated foreign investors, and partly due to more transparent financial disclosure required for cross-border listings. Foreign investors with a substantial shareholding of a firm provide specific managerial knowledge and have a high commitment of resources to technology transfer. Similarly, based on a multi-theoretical perspective (agency theory, resources-based view and institutional theory), Douma et al. (2006) found that foreign ownership has a positive impact on firm performance (ROA and Tobin's Q) in India. They argue that firms with a high proportion of foreign ownership may be in a better position to access advanced foreign resources than firms with non-foreign investors, in particular, firms in emerging markets with an inefficient and less developed institutional environment.

In addition, Kim (2011) argues that when the foreign investor is the controlling shareholder, this helps reduce agency problems, which, in turn, increases the firm's value. In the case of Chinese firms, Mishra and Ratti (2011) advocate that foreign ownership is valuable when foreign owners are part of controlling shareholders due to the availability

of inside monitoring. This evidence explains why the Chinese government has supported the entry of foreign investment into the domestic market by providing various financial incentives and tax benefits. Given the positive predictions of the theoretical and empirical literature, foreign shareholders are expected to positively influence firm performance in China. Therefore, the hypothesis of this thesis is:

Hypothesis 7b: Foreign ownership is positively related to firm performance in Chinese listed firms.

3.4.2.4 Managerial Ownership

Ownership structure is an effective dimension of CG and prior research has found that different ownership types influence CE (e.g. Chen et al., 2014a; Beyer et al., 2012; Choi et al., 2011; Zahra, 1996; Hill and Snell, 1988) and firm performance (e.g. Filatotchev and Nakajima, 2010) differently. Prior research employed agency and stewardship theory to explain the relationship between managerial ownership, corporate strategic direction and firm performance, and lends support to both theories.

Agency theory argues that stock-based compensation schemes are a device for reducing agency costs (Short et al., 1999; Hill and Snell 1988; Jensen and Meckling, 1976). Typically, stock-based compensation schemes are introduced in an attempt to align the interests of management and shareholders. The logic is that when managers receive a substantial proportion of their income through stock holdings in the firm, the managers are not only a manager but also a shareholder. They will then be likely to take decisions consistent with maximising shareholder's wealth through forward-looking and sustainable strategy. For example, Jones and Butler (1992) argued theoretically that issuing top executives shares can facilitate innovative and risky investments chosen by the CEO, thus helping to increase entrepreneurial orientation (Zahra et al., 2000). Singh and Davidson III (2003) found that in large listed firms, manager owned shareholdings in

a firm significantly alleviate principal-agent conflicts, even in the presence of other agency deterrent mechanisms, for example independent outsiders' ratio and outside block ownership. However, Short and Keasey (1999) found a non-linear relationship between managerial ownership and firm performance in UK firms. Cui and Mak (2002) found that when firm performance is measured by Tobin' Q, a W-shaped relationship appeared, that is the relationship initially declines with managerial ownership, then increases, then declines again, and finally increases again.

In China, research results are also mixed when examining the relationship between managerial ownership and firm value. Managerial ownership in China has two main features, firstly, managerial ownership is small compared to Western countries; secondly, managers receiving null shareholdings is still very common (Dong and Gou, 2010; Wei, 2007). Managers cannot sell their shares during their tenure in Chinese listed firms (Company Law of the People's Republic of China, 2013), therefore, Wei (2007) argued that managerial ownership in China is more like a benefit to management rather than an incentive. Such a benefit is a reward for the managers' job title with a lump sum reward for previous year firm performance rather than an incentive for long-term performance. However, this thesis suggests that senior management tends to increase the value of their shares by maintaining good firm performance. A hypothesis is generated in the context of China:

Hypothesis 8a: Managerial ownership is positively related to firm performance in Chinese listed firms.

To increase the value of shares, managers tend to support and invest more in CE activities that are good for the firm's long-term development. Empirically, Zahra (1996) found that substantial amounts of own-firm stock ownership helped align the interests between management and shareholders with respect to CE as measured by innovation.

Zahra et al. (2000) showed that managerial ownership is consistently and positively related to CE in a study of 239 medium-size manufacturing firms in U.S. In a recent study, Beyer et al. (2012) found an inverse u-shaped relationship between the degree of managerial ownership and R&D investment in a sample of 1,406 Belgian firms. The results indicated that managers become entrenched when holding a sufficient amount of a firm's shares.

There is evidence that stock-based compensation schemes have been widely adopted and studies found that the managerial shareholders are significantly and positively related with the corporate performance (Zahra 1996). He argued that higher job security allows managers to pursue their own interests, for example, to over-invest in CE projects.

Agency assumptions have, however, been criticised by a number of earlier researchers (e.g. Beyer et al., 2012; Breton-Miller and Miller, 2009; Miller et al., 2009), because they ignore social forces and relationships, and mitigate the complexity of human behaviour. In the special, unique context of listed firms in China, it is worth considering the applicability of stewardship theory while examining the effect of managerial ownership on CE. When managers behave as guardians, ownership does not provide sufficient incentive to encourage them to take more risks. Notably, during the privatisation process, the Chinese government produced a managerial ownership scheme which allows managers to buy shares at a discounted rate at the time of going public and based on the number of years they have worked for the firm. Empirically, Choi et al. (2011) and Zeng and Lin (2011) found that insider ownership leads to lower R&D investment. Chen et al. (2009) argued that for family-owned firms, a dominant owner manager will capture excess benefits and thus, have greater potential for rent extraction from the firm. Such self-serving behaviour may have a negative effect on CE. Here,

equity ownership seems less likely to be an incentive mechanism. This thesis therefore, proposes:

Hypothesis 8b: Managerial ownership is not directly related to CE in Chinese listed firms.

3.4.3 Corporate Entrepreneurship and Firm Performance

Corporate entrepreneurship (CE) is an important practice for a firm's survival and growth (Choi et al., 2011; Tang et al., 2008; Zahra, 1996) and business success (Miller, 2011). Accordingly, the mainstream of research in CE scrutinises the organisational performance implications of CE or under different institutional factors (e.g. cultural factors, technological sophistication, financial factors, and political factors) (Kreiser et al., 2010; Kearney et al., 2008; Hornsby et al., 1993) and strategies (Miller, 2011).

The literature suggests that CE is highly associated with superior organisational performance (Chadha and Oriani, 2009; Kavida and Sivakoumar, 2009; Avlonitis and Salavou, 2007; Hult et al., 2003; Zahra et al., 1996) studies reported lower correlations between CE and performance (Rauch et al., 2009; Tang et al., 2008; Lumpkin and Dess, 2001; Burgelman, 1983; Zahra, 1991). Other studies found a non-linear relationship (e.g. Bracker and Krishnan, 2011; Huang and Liu, 2005). However, some studies fail to find significant relationship between CE and performance (Tang et al., 2008; Covin et al., 1994; Hoskisson and Hitt, 1988).

The significance of the relationship between CE and business success varies among studies (Bierwerth et al., 2015; Guan et al., 2009; Rauch et al., 2009). Whilst some studies conclude that firms that are entrepreneurially active perform better than the firms that are less entrepreneurial (Avlonitis and Salavoub, 2007; Hult et al., 2003). On the other hand, other studies found a lower correlation (e.g. Avlonitis and Salavoub, 2007;

Zahra, 1991) or even no relationship between CE and performance (e.g. Covin et al., 1994). Nevertheless, the results in general support the argument that firms adopting CE affect firm performance positively (Rauch et al., 2009).

Hypothesis 9: Corporate entrepreneurship is positively related to firm performance in Chinese listed firms.

3.4.4 Moderating Effects

From the literature discussed above, it is reasonable to argue that the effect of CE on firm performance is likely dependent on CG structures (ownership structures and board structures). Both CG and CE have the same objective of improving performance and creating value but play different roles in firms, specifically, CG plays two roles - a monitoring role, emphasising control, and an entrepreneurial role. The problem is maintaining a high level of CE activities has a negative impact on a firm's current surplus, which, in turn, leads to firm performance pressure on managers (Baker and Chiu, 2018). Another problem is that managerial CE activities require less control and fewer restrictions on decision-making (Tricker, 2012), and as Belloc (2012) pointed out, too much focus on the monitoring and control role might encourage managerial myopia, thus hindering the development of entrepreneurial activities and affecting the firms' competitive advantage and sustainable long-term success.

In developing countries, for example, China, the economy is at a developmental stage (Zhang et al., 2014), whereby Chinese firms are transforming from state-owned to private sector organisations. This means that they face challenges arising from the business environment in which they operate. Since innovation is key to sustaining long-term growth and involves seeking new opportunities and advantages, this leaves no doubt that external resources are essential for firms wanting to promote innovation. It is likely, therefore, that Chinese listed firms face a high demand for the resources needed to carry

out the innovative activities, and in turn, this influences a firm's performance in a long-term. One effective way to assist them to better access these critical resources is to increase their number of board members. This is because larger boards enable local firms to better process complex and uncertain market information including the viability and legitimacy of emerging innovations (Abebe et al., 2018). In such a scenario, having a larger corporate board enhances the firm's ability not only to cope with the uncertainty of innovative activities but also better firm performance (Chen et al., 2016). Therefore, board size is chosen as a moderator in this thesis.

Hypothesis 10a: Board size moderates the relationship between corporate entrepreneurship and firm performance in Chinese listed firms.

Drawing from the resource dependence theory, boards with a high proportion of independent directors are more likely to terminate managers in cases of poor performance and this threat provides an incentive to managers to work hard (Fama, 1980). Increased monitoring from independent boards may alleviate agency problems, for example, shirking of responsibilities or tunnelling of corporate resources. Managers should also take actions that are and appear to be closer to the interests of shareholders (Jensen and Meckling, 1976). In addition to their monitoring and consulting role, independent directors can also play a political role in China and indeed firms in China need them to play such a role (Ye and Li, 2017) since China offers weak legal protection for investors. To gain private benefits of control, the largest shareholders in a firm are often able to manipulate the selection process of independent director candidates and dismiss those incumbent, who are unfriendly and therefore, likely to monitor them strictly (Ye and Li, 2017; Tang et al., 2010). China is also characterised by strong government intervention, which means that firms' business strategies are severely affected by frequent policy changes and political disturbances. When under increased scrutiny and demands for

results from R&D investment, managers will also focus on quantifiable results, for example, a greater number of patents. They will adduce an increase in patent counts to satisfy demands for firm performance (Balsmeier et al., 2017). Therefore:

Hypothesis 10b: Independent directors moderate the relationship between corporate entrepreneurship and firm performance in Chinese listed firms.

Given that very few countries have a board of supervisors (BoSs), their impact on corporate entrepreneurship and firm performance has not been previously examined. According to China's Company Law (2013), the BoSs has the responsibility to monitor the firm's strategic direction and the financial statements. The BoSs should examine the draft financial statements, ask questions about them, and insist on changes being made to them when necessary (Dahya et al., 2003). The BoSs can report directly to the regulatory authorities if they learn of any violation of laws, regulations, accounting standards, or the company's charter. This direct approach to the regulator is important as the managers and the controlling shareholder could be the perpetrators of fraud, malfeasance, or improper investment. The BoSs is able to call on outside experts to help it undertake its role and the expenses of these outside experts are to be paid for by the firm (SASAC, 2011). This thesis argues that, other things being equal, a larger SB will have greater expertise in financial accounting. In addition, it is more likely to successfully apply pressure on the firm (Firth et al., 2007) to improve the quality of its investment (e.g. entrepreneurship projects) and in turn, enhance firm performance in the long-run. A large BoSs is more likely to stand up to a CEO who wants to adopt aggressive or even fraudulent investment behaviour (Ding et al., 2010; Xiao et al., 2004). Thus, a large BoSs should have a greater independence and expertise and these attributes will help improve CE, and in turn, positively affect firm performance.

Hypothesis 10c: The board of supervisors moderates the relationship between corporate entrepreneurship and firm performance in Chinese listed firms.

In this thesis, it is proposed that CEO duality enhances the relationship between innovation and firm performance. First, Jensen and Meckling (1976) argued that young firms present a classic case of union rather than separation of ownership and control. Given the fact that the Chinese stock exchanges are developing (see Table 8, the average firm age in this thesis is about 9 years). In addition, listed firms have emerged as a result of their transformation from state-owned enterprises (SOEs) and moved into an entirely new competitive environment. Listed firms in China, therefore, could be considered as young firms. The boundaries between control and ownership are thus somewhat blurred. Executives, in this case, tend not to consider themselves as agents but rather as company owners. Second, stewardship perspective seems to be more applicable to a firm which operates under weak control systems, in other words, trust is the basis of collective and collaborative work (Peng, 2004). Given the underdeveloped nature of Chinese market institutions, trust is more likely to exert a significant force among actors in a business relationship (*Guanxi*) than in economies where market institutions are better established (Yu and Ashton, 2015). Third, in terms of culture, collectivism is prevalent in China (Hofstede, 2011). The success of one's firm may thus be considered more important than individual achievements. Moreover, people are influenced by Confucian philosophy considering intrinsic rather than extrinsic values to be of greater significance. Therefore, one individual may be more willing to invest in innovation to enhance his/her reputation with the expectation of obtaining long-term profitable opportunities for the firm. Therefore, the following hypothesis is proposed:

Hypothesis 10d: CEO duality moderates the relationship between corporate entrepreneurship and firm performance in Chinese listed firms.

3.4.5 Firm-Specific Factors

To identify the specific effect of the relationship between CG, CE and firm performance, it is necessary to include firm-specific factors as control variables in order to limit potential omitted variable bias in the conceptual framework (Figure 2). These factors account for alternative determinants in the relationship between CE and performance of firms. To mitigate for the omitted variables bias, this thesis employed appropriate firm-specific factors that are potential determinants of CG, CE and firm performance. This approach is integrated into the design of the current thesis, but the selection of the firm-specific factors is dictated by the extant literature and data availability. In the conceptual framework, four firm-specific factors are used including firm size, firm age, capital structure, and industry/location. The rationale for each of these factors is described below.

3.4.5.1 Firm Size

Firm size may be positively related to CE investments because it captures a firm's scale of resources available for CE activities. Large firms have economies of scale, market power, and capacity to devote more resources to CE activities and exploit new technology (De Cleyn and Braet, 2012; Choi et al., 2011), they tend to perform better than small firms.

Mixed results have been found in the literature, for example, Ning et al. (2014) reported a positive relationship between firm age and CE and conclude that larger firms have higher innovation productivities and research output (patents) given their resources and capabilities accumulated over time. Rauch et al. (2009) showed the effect of firm size on CE is significantly higher in micro firms (less than 50 employees) than small firms (50-499 employees), but the difference between small and large firms (more than 500 employees) is not significant. On the other hand, Covin and Slevin (1989) found that compared with large firms, the very small firms may not generally benefit from CE in

hostile environments. Covin and Slevin (1989) further explained that small firms may need to have a minimum size to be able to benefit from adopting CE in hostile environments.

In addition, researchers argue that the level of organisational complexity will increase when firms become larger (Guan, 2009), which might hinder CE management. However, studies generally show a positive relationship between firm size and performance (Ning et al., 2014; De Cleyn and Braet, 2012; Choi et al., 2011; Zahra, 1996).

Hypothesis 11a: Firm size is positively related to firm performance in Chinese listed firms.

Hypothesis 11b: Firm size is positively related to CE in Chinese listed firms.

3.4.5.2 Firm Age

Firm age is another important control variable that needs to be considered in this thesis. Firm age reflects a firm's experience and knowledge intensity and entrepreneurial flexibility, which in turn, affects a firm's ability and willingness to take risks, such as CE investment and activities. According to Classen et al. (2014), CE practices of older firms may differ from their younger counterparts. Older firms may become more bureaucratic, inward-looking and be less entrepreneurial (Ning et al., 2014, Beyer et al., 2012). Moreover, age may also be connected with firm performance, as its profitability is expected to rise and then fall at the maturity stage (Ning et al, 2014).

The number of years a firm has been listed on the stock market after IPOs is used to control for the effects of firm age, as in (Classen et al., 2014; Ning et al., 2014, Beyer et al., 2012; Choi et al., 2011). When a firm is first listed, it attracts a lot attention from investors and the media, which plays an important role in monitoring the firm's resource

allocation. Firms listed on the stock market for longer are more likely to focus on their financial performance rather than their long-term development. In this sense, a positive effect of firm age on firm performance, and a negative effect of firm age on CE are expected.

Hypothesis 12a: Firm age is positively related to firm performance in Chinese listed firms.

Hypothesis 12b: Firm age is negatively related to CE in Chinese listed firms.

3.4.5.3 Leverage

Capital structure can influence both CE and firm performance. Whereas CE requires slack resources, firm performance may be affected by a change in the cost of capital (Chen et al., 2014).

Different capital structures imply different levels of financial risk and prompt different levels of supervision from the creditors (usually banks), which consequently affect source allocation decision (e.g. CE investment) (Zahra, 1996). The higher risk arising from increases in the leverage ratio could lead risk averse firms to expect more investment in CE. However, as debt increases, creditors may begin to exercise more supervision over the firm, making it difficult for management to entrench by spending money on risk projects (i.e. CE) (Tribo et al., 2007). In China, most banks are state-owned and play an important role in providing debt financing. Given the political and economic environment, banks are more likely to have strong incentives to monitor managers to ensure that they adhere to debt covenants, fulfil the communist agenda and maximise a firm's profitability. Therefore, the relationship between leverage ratio, CE and performance could be either positive or negative.

Hypothesis 13a: There is a relationship between leverage and firm performance

in Chinese listed firms.

Hypothesis 13b: There is a relationship between leverage and CE in Chinese listed firms.

3.5 Summary

This chapter has provided the theoretical underpinning for the analysis of the relationship between CG, CE and firm performance. It has reviewed relevant theories (i.e. agency, resource dependency, and stewardship theory). In addition, a conceptual framework for the relationship between CG structures, CE and firm performance was developed from previous studies and based on the unique Chinese contextual environment. This chapter and the previous chapter (Chapter 2) have reviewed the theoretical and empirical literature, together with the unique Chinese contextual environment, hypotheses of this thesis have developed (see Table 3) to analyse the relationship between CG and CE, CG and firm performance, and CE and firm performance, covering firm-specific factors.

Table 3: Summary of the Link between Theories and Hypotheses

Group	Key variable	Predicted sign and theory			
		Theory	Firm performance	Theory	CE
Board structure	Board size	Resource dependence theory	H1a: +	Resource dependence theory	H1b: +
	Board composition	Resource dependence theory and stewardship theory	H2a: +	Resource dependence theory and stewardship theory	H2b: +
	CEO duality	Agency theory	H3a: -	Stewardship theory	H3b: +
	Supervisory board	Agency theory	H4a: Indirect	Resource dependence theory and stewardship	H4b: +
Ownership structure	State ownership	Agency theory and resource dependence theory	H5a: +	Resource dependence theory	H5b: +
	Domestic non-state ownership	Agency theory and resource dependence theory	H6a: +	Resource dependence theory	H6b: +
	Foreign ownership	Resource dependence theory	H7a: +	Resource dependence theory	H7b: +
	Managerial ownership	Agency theory	H8a: +	Stewardship theory	H8b: Indirect
CE	R&D intensity	Resource dependence theory	H9: +	\	\
	Patent applications				
	Granted patents				
Firm performance	ROA	\	\	Resource dependence theory	H9: +
	Tobin's Q				
Moderating effects	CG, CE	H10a: Resource dependence theory; H10b: Stewardship theory and resource dependence theory H10c: Agency theory; H10d: Stewardship theory			
Firm-specific factors	Firm size	Resource dependence theory	H11a: +	Resource dependence theory	H11b: +
	Firm age	Resource dependence theory	H12a: +	Resource dependence theory	H12b: -
	Leverage	Agency theory	H13a: +/-	Agency theory	H13b: +/-

Note: For the predicted signs, '+' means 'there is a positive relationship between the dependent variable and the independent variable'; '-' means 'negative', '+/-' means 'there is a relationship between the dependent variable and the independent variable'; while 'indirect' means there is an insignificant relationship but might indirectly affect dependent variables.

Chapter 4: Research Methodology and Modelling

4.1 Introduction

In Chapter 1, the aim of this thesis was specified to examine the relationship between corporate governance (CG) structures, corporate entrepreneurship (CE) and firm performance in Chinese listed firms. Four research objectives were also specified in Chapter 1, which are: 1) To study and analyse the relationship between firm-level CG structures and CE in Chinese listed firms; 2) To study and analyse the relationship between firm-level CG structures and firm performance in Chinese listed firms; 3) To study and analyse the relationship between CE and firm performance in Chinese listed firms; 4) To explore whether firm-level CG structures and CE interact to influence firm performance in Chinese listed firms.

To support the aims and objectives, the contextual setting of China was discussed, and the related empirical studies were reviewed in Chapter 2. The theories underpinning the research objectives were discussed and hypotheses developed in Chapter 3. This chapter explains the research methodology to test the hypotheses developed in chapter 3, thus addressing the research objectives specified in chapter 1.

The chapter is divided into 7 sections. Section 4.2 will explain the main paradigms used in research in general and the rationale for adopting a positivist paradigm in this thesis. Section 5.3 will discuss the research methodology, including the rationale for adopting a panel methodology in the current thesis. In Section 4.4 the empirical research models are developed, and the measurement of variables are discussed and justified in Section 4.5. In Section 4.6, the research population and the sampling process, and data collection methods including archive data will be explained in detail. Section 4.7 will provide a summary of the chapter.

4.2 Research Paradigms

A research paradigm is a philosophical framework that guides the implementation of scientific research (Collis and Hussey, 2013). The philosophy (research paradigm) adopted in research embeds critical assumptions about the researcher's view of the world (Saunders et al., 2012). These assumptions underpin the methodology (research strategy) and the research methods used by a researcher as part of that research strategy.

There are philosophies that researchers adopt in doing research, for example, instrumentalism (Friedman, 1953), positivism (Hempel, 1935), critical realism, pragmatism, interpretivism (Burrell and Morgan, 2017; Schwandt, 1994), hermeneutism (Bleicher, 2017), and social constructivism (Berger and Luckmann, 1991).

Positivism and interpretivism are the two main research paradigms that are commonly used to conduct research and acquire knowledge in social sciences (Collis and Hussey, 2013). Positivism and interpretivism represent two extremes of a continuum of paradigms and along this continuum many other paradigms exist with different philosophical assumptions (Collis and Hussey, 2013). Table 4 summarises the assumptions of the positivist and interpretivist paradigms.

Table 4: Assumptions of the Positivist and Interpretivist Paradigms

Philosophical assumption	Interpretivism	Positivism
Axiological assumption (the role of values)	Researcher acknowledges that research is value-laden and biases are present.	Research is value-free and unbiased.
Epistemological assumption (what constitutes valid knowledge)	Researcher interacts with that being researched.	Research is independent of that being researched.
Ontological assumption (the nature of reality)	Reality is subjective and multiple, as seen by participants.	Reality is objective and singular, separate from the researcher
Rhetorical assumption (the language of research)	Researcher writes in an informal style and uses the personal voice, accepted qualitative terms and limited definitions.	Researcher writes in a formal style and uses the passive voice, accepted quantitative words and set definitions.
Methodological assumption (the process of research)	Process is inductive.	Process is deductive.
	Study of mutual simultaneous shaping of factors with an emerging design (categories are identified during the process).	Study of cause and effect with a static design (categories are isolated beforehand).
	Research is context bound.	Research is context free.
	Patterns and/or theories are developed for understanding (theoretical abstraction).	Generalisations lead to prediction, explanation understanding (hypotheses and deduction).
	Findings are accurate and reliable through verification.	Results are accurate and reliable through validity and reliability.
Sampling requires	Small numbers of cases chosen for specific reasons.	Large number selected randomly.

Source: Adapted by Saunders et al. (2013) and Bryman (2012)

4.2.1 Positivism

Positivism is an epistemological position that advocates the application of the methods of the natural sciences to the study of social reality and beyond (Bryman, 2012). Positivism is underlined by the assumption that researcher is independent from the data and maintains an objective stance (Collis and Hussey, 2013). Positivists view that knowledge is acquired by gathering facts that provide the foundation for laws and the purpose of theory is to generate testable hypotheses (Bryman, 2012).

Saunders et al. (2012) explained that positivism is associated with the use of a deductive approach, in which theories and hypotheses are developed first and data is then collected to test these hypotheses. Positivists tend to use quantifiable data from a large sample size that then allows statistical analysis (Saunders et al., 2012).

Researchers who adopt positivism as their paradigm thus derive two crucial benefits, the first being that it allows for research to be conducted in considerably less time than do other paradigms. Second, it is easier to defend their position owing to the broader acceptance of this particular paradigm in social science research. However, the position is criticised by several researchers (e.g. Hussey and Hussey, 1997) for its inability to consider the way humans behave, and to accept that humans' social lives cannot be explained via quantitative measures. Moreover, the natural sciences endeavour to quantify phenomena through methods that are repetitive, but this approach does not generally fit in well with research on human science.

4.2.2 Interpretivism

Interpretivism advocates that it is important for the researcher to understand differences between objectives and independent reality, which requires him/her to grasp the subjective nature of social action. Interpretivism emphasises the assumption of the subjective social reality affected by the reception of researcher rather than objective truth (Collis and Hussey, 2013). Opposing positivists, interpretivists contend that the social world of business is too complex to allow theorising using definite laws, as in the case of physical sciences (Saunders et al., 2012). Thus, obtaining useful insights into this complex world can be sacrificed if this complexity is reduced to a series of law-like generalisations (Burns and Burns, 2000).

In contrast to positivism, which emphasises measuring social phenomena, interpretivism focuses on exploring the complexity of social phenomena to obtain

interpretive understanding (Collis and Hussey, 2013). Therefore, positivists tend to employ quantitative methods to identify the occurrence frequency of phenomena in the social world. On the other hand, interpretivists tend to use a set of methods (e.g. case studies, interviews, and ethnographic studies) to describe and interpret these phenomena. In other words, interpretivism is associated with the use of the inductive approach, where data is collected and used in developing theory (Saunders et al., 2012). As a result, theory is the outcome of the research and the processes of induction that involve drawing general conclusions from specific observations (Bryman and Bell, 2015).

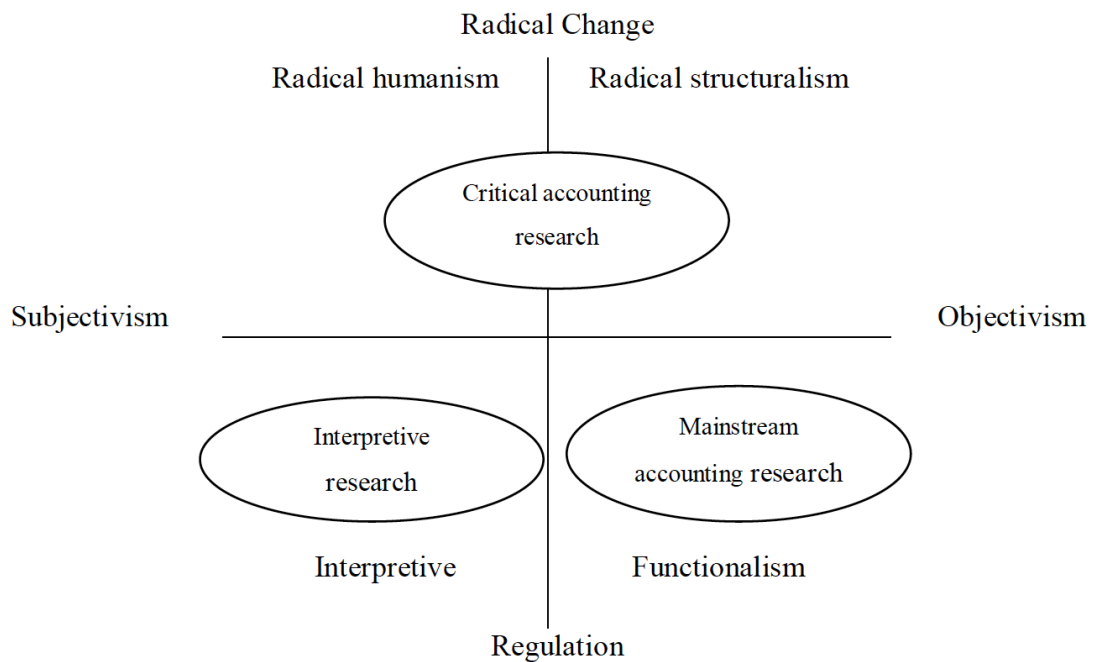
By using an inductive method, the researcher will start the project with an open mind, collecting all relevant information and then eventually systematising and analysing the results, which might be further developed into new theories and contributions to existing research (Martin and McIntyre, 1994). Research using an inductive approach is likely to be particularly concerned with the context in which such events were taking place. Therefore, the study of a small sample of subjects might be more appropriate than a large number as associated with the deductive approach (Saunders et al., 2012). Researchers in this tradition are more likely to use a variety of methods to collect these data (e.g. case study, interviews, and observation) to collect data in order to establish different views of phenomena.

However, it is important to note that there is no paradigm better than another and preferring one paradigm depends on the research problem and objectives, or the traditions in a discipline (Collis and Hussey, 2013; Lee, 1991; Lin, 1998). Therefore, it is important to know the traditions in accounting research, so that the appropriate paradigm can be adopted in the current thesis.

4.2.3 Research Paradigms in Accounting Research

Following Burrell and Morgan's (2017) classification for organisational research, Hopper and Powell (1985) provide a taxonomy for accounting research. Burrell and Morgan's (2017) framework comprises two independent dimensions based on assumptions concerning the nature of society and social science (Hopper and Powell, 1985).

Figure 3: Taxonomy of Accounting Research



Source: Hopper and Powell (1985, p. 432) in Ryan et al. (2002, p. 40)

Hopper and Powell (1985) combine the two independent dimensions of society and social science to form four mutually exclusive frames of reference that can be used as a taxonomy for accounting research, including radical humanism, radical structuralism, interpretive, and functionalism (see Figure 3).

The radical humanism paradigm lies within the subjectivist and radical change dimensions, allowing researchers 'to articulate ways in which humans can transcend the spiritual bonds and fetters which tie them into existing social patterns and thus, realise their full potential' (Burrell and Morgan, 2017, p. 32). The ontological position

appropriate to this state is subjectivist. In the radical structuralism paradigm, the researcher's concern is to make a major change after analysing specific organisational phenomena (Saunders et al., 2012). Burrell and Morgan (2017, p. 31) state that under the interpretive paradigm, 'everyday life is accorded the status of miraculous achievement'. This state predominantly requires the researcher to form an understanding of what is actually happening. Burrell and Morgan (2017, p. 26) note the functionalism paradigm as 'often problem-oriented in approach, concerned to provide practical solutions to practical problems'. Objectivism is the ontological position that fits with this paradigm.

According to this taxonomy (see Figure 3), there are three main categories of accounting research: mainstream (positivist) accounting research, interpretative research and critical accounting research (Ryan et al., 2002; Chua, 1986). A summary of the underlying epistemological and ontological differences between mainstream, interpretive and critical accounting research is presented in Table 5.

Based on the discussion of the research philosophy, objectivism is adopted as the ontological position of the current thesis. Therefore, the functionalism paradigm would be the appropriate one for the current thesis as it coincides with its nature and philosophy. The rationales are discussed in the next section.

Table 5: Comparison between Mainstream, Interpretive and Critical Accounting Research

	Mainstream accounting research	Interpretive accounting research	Critical accounting research
Beliefs about knowledge	Theory and observation are independent of each other, and quantitative methods of data collection are favoured to provide a basis for generalisation.	Theory is used to provide explanations of human intentions. Its adequacy is assessed via logical consistency, subjective interpretation.	Criteria for judging theories are always temporal and context bound. Social objects can only be understood through a study of their historical development and change within the totality of relations.
Beliefs about physical and social reality	Empirical reality is objective and external to the researcher. Human actors are essentially passive objects, who rationally pursue their goals.	Reality is socially created and objectified through human interaction. Human action is intentional and has meaning grounded in the social and historical context.	Empirical reality as characterised by objective, real relations, but is transformed and reproduced through subjective interpretation.
Relationship between accounting theory and practice	Accounting is concerned with means, not ends. It is value neutral, and existing institutional structures are taken for granted.	Accounting theory seeks to explain action and to understand how social order is produced and reproduced.	Theory has a critical imperative, in particular, the identification and removal of domination and ideological practices.

Source: Chua (1986, p. 611-622) in Ryan et al. (2002, p. 41-43)

4.2.4 Rationale for Adopting a Positivist Paradigm

This thesis draws on the premise of a multiple theories approach to develop a conceptual framework, as a result to help understand, explain and predict the relationship between corporate governance (CG), corporate entrepreneurship (CE) and firm performance. In line with previous research, for example, research on the relationship between CG and CE (see Brossard et al., 2013; Beyer et al., 2012; De Cleyn and Braet, 2012; Choi et al., 2011; Chen and Hsu, 2009), CE and performance (see Bierwerth et al., 2015; Rauch et al., 2009; Avlonitis and Salavou, 2007), and CG and firm performance (see Azeez, 2015;

Ammann et al., 2011; Anderson and Gupta, 2009; Guest, 2009), this thesis adopts the positivist paradigm for the following reasons.

First, the ontological assumptions of the positivist paradigm objectivism better match the assumptions that this thesis already has regarding reality. Objectivism depicts the situation that social entities exist in reality, external and independent of social actors concerned with their existence (Bryman and Bell, 2015; Saunders et al., 2012). This thesis assumes that a phenomenon, for instance, compliance with the Corporate Governance Code and company law, is an external reality that exists in a social world composed of different propositions, realities and laws. This view stresses the structural and formal aspects of firms in responding to the context in which the firms operate, rather than stressing their organisational value, culture and beliefs.

Second, it enables the use of the adopted theories (i.e. agency, resource dependence, and stewardship theories) to address the research objectives and develop hypotheses. In addition, observing the phenomenon by means of archive data, can help produce credible data to test the developed hypotheses.

Third, the epistemological assumptions of the positivist paradigm better match the assumptions that this thesis already has regarding what constitutes knowledge and how knowledge can be gained. This thesis assumes that a phenomenon, for example, compliance with the Corporate Governance Code and Company Law, as a social reality, can be observed independently searching for regularities and causal relationships between this phenomenon and other elements of the phenomenon. The thesis can then be concluded with 'law-like generalisations similar to those produced by the physical and natural scientists' (Remenyi et al., 1998, p. 32).

Fourth, a positivist approach is relevant to the research aims and objectives, because this research attempts to develop an empirically-based theoretical framework to

explain empirical results by identifying a general and significant relationship between corporate governance, corporate entrepreneurship and firm performance, and firm-specific factors, which can be generalised to a large number of firms. This positivist paradigm enables the researcher to test the adopted theories against a unique and large sample of observations that makes findings more generalisable to the entire population of the thesis.

Fifth, the theoretical framework developed in this thesis is based on a multi-theories approach. It has been argued that the positivist paradigm is an appropriate and commonly used paradigm in multiple theories research (e.g. James and McGuire, 2016; Honoré et al., 2015; and Tang et al., 2008) within the management accounting discipline (Ryan et al., 2002; Otley, 1984).

Sixth, the current thesis is multidisciplinary and contains constructs from different disciplines (e.g. corporate governance and corporate entrepreneurship). The literature suggests that the positivist paradigm is dominant particularly in corporate governance disciplines (Clark, 2004) and corporate entrepreneurship disciplines (Bierwerth et al., 2015; Rauch et al., 2009).

4.3 Research Methods

After identifying the research paradigm, it is important to decide the research strategy or methodology, which corresponds to the philosophical assumptions of the adopted paradigm (Collis and Hussey, 2013).

4.3.1 Qualitative and Quantitative Research Methods

Quantitative research is “predominantly used as a synonym for any data collection technique (e.g. structured interviews, questionnaires, archival collection) or data analysis procedure (e.g. graphs or statistics) that generates or uses numerical data. In contrast,

qualitative research is used predominantly as a synonym for any data collection technique (e.g. unstructured interviews, case studies, and participant observation) or data analysis procedure (e.g. categorising data) that generates or uses non-numerical data” (Saunders et al., 2012, p. 151).

As reviewed in the previous sections, quantitative research is generally underpinned by positivism. Quantitative research is further closely related to a deductive approach where hypotheses based on the theory are tested and analysed. In contrast, qualitative approaches allow researchers to avoid the limitations of the positivism through a greater capacity to investigate how events and activities are linked together. Further, the individual interpretations of the activities will be included (Bryman, 2012).

As noted above, quantitative research will typically be deductive. Qualitative research is often inductive in its manner. In quantitative research, hypotheses are normally derived at the outset of the research project. This is not necessary in a qualitative approach. Further, the role of the researcher differs substantially. In quantitative research, the researcher is ideally an objective observer that neither participates in, nor influences, what is being studied. In qualitative research, however, it is presupposed that the researcher can learn the most about a situation by participating and/or being immersed in it. These basic underlying assumptions of both methodologies guide and sequence the types of data collection methods employed (Lin, 1998).

Qualitative data typically involve words and quantitative data involve numbers, some researchers might propose that one is better (or more scientific) than the other (Lin, 1998). A more neutral consideration will be that each method fits in its own context, and that a detailed contextual interpretation should be conducted before selecting the best method for research. This statement was already supported by Glaser and Strauss (1967, p. 17-18): ‘we concluded that both quantitative and qualitative methods are important for

verification and generating of the theories, independently of what the focus is. The focus is just dependent on the context of the research, the interests and abilities of the researchers and what sort of materials which are required to generate or verify theories’.

This thesis is mainly based on agency, resource dependence, and stewardship theories. These prior theories and empirical literature offer a valid basis to develop the hypotheses, and the hypotheses test will be conducted through analysing secondary numeric data which will be collected via professional databases (e.g. the CSMAR database) and annual reports of listed firms. Therefore, this thesis is carried out taking an objective positivist and deductive stance with a quantitative research method.

4.3.2 The Conduct of Quantitative Approach

Many appropriate research designs can be used within the positivist paradigm of quantitative research, for example, the cross-over comparative experimental design, the replicated cross-sectional design, cohort studies, experiment, blind studies, survey and longitudinal studies (Collis and Hussey, 2013; Saunders et al., 2012).

In line with the positivist approach adopted in the current thesis and similar to most of the management accounting studies that are based on agency theory (Azeez, 2015; Mangena et al., 2012; Filatotchev and Nakajima, 2010; Munari et al., 2010; Peng et al., 2007), resource dependence theory (Shapiro et al., 2015; Chen et al., 2014; Zahra, 1996), and stewardship theory (Chen, 2011; Peng et al., 2007), this thesis adopts a panel methodology for a large number of firms, to test the developed hypotheses permitting a greater generalisability of the research findings. For practical reasons, including time limitation and having access to confidential information of listed firms, other methodologies (e.g. survey and case study) were not possible or efficient to use.

The archival research method is a common methodology in CG research and is normally connected to the deductive approach (Saunders et al., 2012). It is also a commonly used methodology for theory testing within the management accounting discipline. The main purposes of using archive data in management accounting research include description (large-scale, secondary numerical data), and explanation (theory testing through examining the relationship between CG, CE, firm performance and other firm-specific factors guided by theoretical expectations about how they are connected). The archival research method is particularly useful in its ability to examine trends in large-scale data. Thus, external validity is particularly high in studies using archival research methods, as such studies use data pertaining to naturally occurring events. The archival research method is particularly appropriate for examining macro-level patterns (broad economic trends), for example, general economic trends over time. This analysis is useful to accounting researchers who examine large-scale trends of naturally occurring events, for example, the stock market's reaction to a new accounting standard (Hageman, 2008).

4.4 Research Model Development

In order to address the research objectives, three econometric models are specified below. Model (1) analyses the relationship between firm-level CG structures and CE in Chinese listed firms; Model (2) analyses the relationship between CG, CE and performance in Chinese listed firms; Model (3) explores whether firm-level CG structures and CE interact to influence firm performance in Chinese listed firms. Firm-specific factors are considered, they are firm size, leverage, firm age, and industry types. See Table 6 for the definition of variables.

Model (1):

$$CE = i_1 + \beta_1 Firm\ size + \beta_2 Leverage + \beta_3 Firm\ age + \beta_4 State\ Ownership + \beta_5 Domestic\ non\text{-}state\ ownership + \beta_6 Foreign\ ownership + \beta_7 Managerial\ ownership + \beta_8 Board\ size + \beta_9 Independent\ director\ ratio + \beta_{10} Supervisory\ board\ size + \beta_{11} CEO\ duality + (Industry\ dummy) + \epsilon_1$$

Model (2):

$$Performance = i_2 + \beta_1 Firm\ size + \beta_2 Leverage + \beta_3 Firm\ age + \beta_4 State\ Ownership + \beta_5 Domestic\ non\text{-}state\ ownership + \beta_6 Foreign\ ownership + \beta_7 Managerial\ ownership + \beta_8 Board\ size + \beta_9 Independent\ director\ ratio + \beta_{10} Supervisory\ board\ size + \beta_{11} CEO\ duality + \beta_{12} R\&D\ intensity + \beta_{13} Patent\ applications + \beta_{14} Granted\ patents + (Industry\ dummy) + \epsilon_2$$

Model (3):

$$Performance = i_3 + \beta_1 Firm\ size + \beta_2 Leverage + \beta_3 Firm\ age + \beta_4 State\ ownership + \beta_5 Domestic\ non\text{-}state\ ownership + \beta_6 Foreign\ ownership + \beta_7 Managerial\ ownership + \beta_8 Board\ size + \beta_9 Independent\ director\ ratio + \beta_{10} Supervisory\ board\ size + \beta_{11} CEO\ duality + \beta_{12} R\&D\ intensity + \beta_{13} Patent\ applications + \beta_{14} Granted\ Patents + \beta_{15} (State\ ownership, Domestic\ non\text{-}state\ ownership, Foreign\ ownership, Managerial\ ownership, Board\ size, Independent\ director\ ratio, Supervisory\ board\ size, and CEO\ duality) * (R\&D\ intensity, Patent\ applications, and Granted\ patents) + (Industry\ dummy) + \epsilon_3$$

Where i represents the constant and is the slope of the independent variable which reflects a partial explanation or prediction for the value of the dependent variable. β is the independent variable and ϵ is an error term.

Table 6: Definition of Variables in Model (1), Model (2) and Model (3).

Variables	Definition	Sources of Data
Corporate Governance Variables		
State ownership	The proportion of shares held by state (state shares and state legal person shares) over the ten largest shareholders for firm (Munari et al., 2010).	Annual report, CSMAR
Domestic non-state ownership	The proportion of shares held by domestic non-state investors (A shares, domestic non-state legal person shares, domestic natural person shares) over the ten largest shareholders for firm (Chen et al., 2014a).	Annual report, CSMAR
Foreign ownership	The proportion of shares held by foreign investors (B shares, H shares, S shares, foreign legal person shares, and foreign natural person shares) over the ten largest shareholders for firms (Dong and Gou, 2010).	Annual report, CSMAR
Managerial ownership	Percentage of shares held by firm's executives (Chen et al., 2014a).	Annual report, CSMAR
Board size	The total number of directors on the Board (De Cleyn and Braet, 2012).	Annual report, CSMAR
CEO duality	CEO also holds a chairperson position. The CEO duality dummy equals to one when the two positions are combined and zero otherwise (Azeez, 2015; Yu and Ashton, 2015; Peng et al., 2007).	The Annual report, Bloomberg
Independent director ratio	The proportion of independent directors to the total number of directors on the board (De Cleyn, 2012).	Annual report, CSMAR
Supervisory board size	The number of members on the board of supervisors (Shapiro et al., 2015).	Annual report, CSMAR
Corporate Entrepreneurship Variables		
R&D intensity	A measure of CE proxied by the ratio of a firm's annual R&D investments to its operating income (Zhang et al., 2014; Baysinger et al., 1991; Dong and Gou, 2010; Munari et al., 2010; Zeng and Lin, 2011).	Annual report, CSMAR
Patent applications	This is a measure of CE activities and is proxied by the number of patents applied by firm per year in the Chinese listed firms (Bena et al., 2014).	Annual report, SIPO (The State Intellectual Property Office), CSMAR
Granted patents	This is a measure of CE activities and is proxied by the number of patents awarded per year in Chinese listed firms (Guan et al., 2009).	Annual report, SIPO, CSMAR
Control Variables		
Firm age	The number of years since it is listed on Stock Exchange (Yu and Ashton, 2015; Zhang et al., 2014).	Annual report, CSMAR, Osiris, annual report
Firm size	Logarithm of total assets of firms (Zhang et al., 2014; Munari et al., 2010).	Annual report, CSMAR, Osiris, annual report
Leverage	The ratio of total debts to total assets (Chen et al., 2014a; Zhang et al., 2014).	Annual report, CSMAR, Osiris,
Industry dummy	Four industries were classified in the sample based on the CSRC (China Securities Regulatory Commission) industry classification (Yu and Ashton, 2015), as follows: 1) agriculture, forestry, mining, and construction; 2) manufacturing; 3) IT; 4) services, retails, and diversified industries.	Annual report, CSMAR, annual report
Firm Performance		
ROA	Earnings before interest and tax divided by the total assets (Yu and Ashton, 2015).	Annual report, CSMAR, Osiris, Bloomberg
Tobin's Q	The sum of market value of equity and book value of debt, divided by book value of assets (Tong et al., 2013)	CSMAR

4.5 Variable Measurements

4.5.1 Board Structure Variables

The board structure variables included in this thesis are size, composition, leadership, and independence. This thesis uses variables of board size, the proportion of independent directors, CEO duality, and the size of supervisory board to present the board structure in Chinese listed firms.

4.5.1.1 Board Size

Many previous studies found a significant relationship between board size and CE (Shapiro et al., 2015), and a significant relationship between board and firm performance (Azeez, 2015). Previous studies generally used the total number of the board of directors during each fiscal year to measure the size of a board (e.g. Mangena et al., 2012; Coles et al., 2008). Board size in this thesis refers to the total number of directors on the board of each sample firm which is inclusive of the CEO and Chairman for each fiscal year. This will include executive directors, independent directors, and non-executive directors.

4.5.1.2 The Proportion of Independent Directors

In 2002, the China Securities Regulatory Commission (CSRC) issued Guidelines for Introducing Independent Directors to the Board of Directors of Listed Companies (hereinafter “the Guidelines”). The Guidelines defined independent directors as ‘the directors who hold no posts in the company other than the position of director, and who maintain no relations with the listed company and its major shareholders that might prevent them from making objective judgment independently’. In the management accounting literature, independent directors are defined as a member of a firm’s board of directors who was brought in from outside the firm (Liu and Fong, 2010). Because the independent director has not worked with the firm for a period of time, he or she is not

an existing manager and is generally not tied to the firm's existing way of doing business.

Previous studies used the proportion of independent directors to measure board independence and found its relationship with CE and firm performance. Similar to other studies (Chen and Al-Najjar, 2012; Chen and Hsu, 2009; Guest, 2009; Basinger et al., 1991), this thesis measures the board composition by the number of independent directors divided by the total number of board directors in Chinese listed firms.

4.5.1.3 Supervisory Board Size

Having a two-tiered board system, a supervisory board is another important monitoring mechanism for firms in China. Studies used the size of the supervisory board to measure its quality and investigate its impact on firm performance and corporate entrepreneurship (Ran et al., 2015). The size of the supervisory board is defined as the number of members on the board of supervisors (Ning et al., 2014). This thesis measures the supervisory board size as the number of members on the board of supervisors in a Chinese firm.

4.5.1.4 CEO Duality

CEO duality is when a firm combines the role-holders of the chairman and CEO positions, which is also a critical CG mechanism. Previous studies have discussed how CEO duality has an impact on CE and firm performance (Azeez, 2015; Chen and Hsu, 2009; Dalton et al., 1998, Zahra, 1996). CEO duality is defined as CEO/chairman roles held jointly in a firm (Zhang et al., 2014). This thesis measures CEO duality by using a dummy variable coded one when the two positions are combined and zero otherwise for listed firms in China.

4.5.2 Ownership Structure Variables

There are different types of block shareholders in Chinese listed firms, for example, the state, foreign investors, private investors, institutional investors (Shapiro et al., 2015;

Chen et al., 2014a; Choi et al., 2011). This thesis divides the top 10 block shareholders amongst Chinese listed firms into state, domestic non-state investors, foreign investors, and managers. The ownership structure in Chinese listed firms is much more concentrated compared with western developed countries. Although China is currently in a transition period, the largest shareholder is the state, which as the dominant shareholder has a considerable influence on a firm's strategic decision-making process, and ultimately on firm performance.

4.5.2.1 Managerial Ownership

Managerial ownership is defined by previous studies as the shares held by top managers and the board of directors (Beyer et al., 2012). This information can be found on the CSMAR database and in a firm's annual reports. This thesis measures the managerial ownership by using the percentage of shares held by the top managers and board of directors in Chinese listed firms.

4.5.2.2 State Ownership

According to previous studies, state ownership in this thesis is estimated as the percentage of total shares held by governmental entities, including state shares, state legal person shares, and shares held by other governmental related institutions (Zhou et al., 2017; Song et al., 2015; Hou et al., 2012; Choi, 2011).

4.5.2.3 Foreign Ownership

Previous studies argue that foreign investors provide domestic firms with advanced technical, managerial knowledge and resources (Bena et al., 2014; Choi et al., 2011). Studies examined the relationship between foreign ownership, CE and firm performance in Chinese listed firms (Chen, 2011). They measure foreign ownership by the proportion of firm shares owned by foreign corporation and institutional investors (Chen et al., 2016;

Dong and Gou, 2010). Therefore, this thesis measures foreign ownership by the proportion of shares held by foreign investors (total portion of B shares, H shares, S shares, foreign legal person shares, and foreign natural person shares).

4.5.2.4 Domestic Non-State Ownership

In this thesis, domestic non-state ownership is the total percentage of equity ownership held by domestic non-state investors composed of insurance companies, securities firms, merchant banks, and individuals in a Chinese listed firm (Chen et al., 2014a).

4.5.3 Corporate Entrepreneurship Variables

The concerns of the use of CE variables have been touched upon earlier in this thesis (see Section 3.2.3). Different studies propose different measures of CE. The most common measures of CE are R&D investments and patents. As previous studies and discussions point out, input parameters can only serve as an indication or proxy for CE (Acs and Audretsch 1989; Hagedoorn and Cloudt 2003; Kleinknecht et al. 2002). Amongst others, Trajtenberg (1990, p. 172) indicated that ‘patent counts cannot be informative about CE output’. Kleinknecht et al. (2002) demonstrate that the most frequently used CE parameters (R&D investments and number of patents) suffer severe shortcomings as a measurement for CE, as they are indirect measures. Therefore, scholars (Hagedoorn and Cloudt 2003; Kleinknecht et al., 2002) suggest the combined use of several innovation parameters or at least the use of direct measures (such as market introduction of new innovative products).

This thesis argues that R&D expenses intended to result in applications and awards of patents may constitute CE. Therefore, there are three firm-level measurements of CE. The first CE measurement is R&D investments scaled by operating income, an input-oriented measure of CE. The second measurement is the number of patents that the

firm applies every fiscal year. The third measurement is the number of patents granted every fiscal year of the firm. The latter two measurements are output-oriented measures of CE.

4.5.3.1 R&D Intensity

One of the CE measurements in this thesis is R&D intensity which is measured by the ratio of a firm's annual R&D investments to its operating income, an input-oriented measure of CE (Shapiro et al., 2015; Zhang et al., 2014; Dong and Gou, 2011). This measure shows the firm's willingness to invest in CE activities by using their income.

4.5.3.2 Patent Data (Patent Applications and Granted Patents)

Previous studies have used patent data as an indicator of CE output of firms (Bena et al., 2014; Aghion et al., 2013). As widely used by previous studies (Choi et al., 2012; Almeida et al., 2002), the patent data (i.e. the number of patent applications and granted patents) is used as an output-oriented measurement of CE in this thesis. Researchers have argued that patent counts are the most important measure of a firm's CE output (Bena et al., 2014). Two variables were generated for the patent data, one was patent application, since firms have increasingly recognised the need to patent their inventions to protect their copyrights to use their intellectual property (Bena et al., 2014). The other variable was awarded patents, which was estimated as the number of patents that were ultimately granted per year in a firm (De Cleyn and Braet, 2012). This variable shows the quality of the applied patents and how successful the patent applications were of a firm. In this thesis, domestic patent data was used rather than internationally recognised patent data, for example, U.S. patent data or European patent data in order to measure a firms' overall CE output without bias caused by high costs of different registration processes, which may favour large firms (Bena et al., 2014). Moreover, when using patent data as the

dependent variable, at least one-year lag was applied in order to capture the lead-lag effect of explanatory variables.

There are certain limitations in using patent data. Firstly, as Almeida et al. (2002) argued, not all CE activities lead to patents; Secondly, not all patent data can represent the capacity of CE in a firm; thirdly, patents can represent only codified and explicit technological knowledge. Furthermore, there is a structural bias inherent in the size of firm regarding patenting, because of the high registration and maintenance costs of patenting, as well as different administrative processes for patent applications.

Regardless of the aforementioned limitations, using patent data for China in this thesis has a number of advantages. First, patent data constitutes the most detailed and systematically compiled and managed data about CE in China. Data is maintained through a uniform and rigorous process of examination and registration across firms, time periods, and types of technology. China has ratified all major international conventions on intellectual property rights including the WIPO (World Intellectual Property Organisation, 1980), the Madrid Agreement (1989), the Paris Convention (1985), and has signed the Integrated Circuits Treaty (1989) (Yang and Clarke, 2005). Second, China has been transitioning from an economy of imitation to one of entrepreneurial-orientated (Guan et al., 2009; Rongping and Wan, 2008). During the transition, policies stimulating patenting activities have been put in place. Consequently, productivity of CE, as measured in terms of patents, has increased rapidly since the mid-1990s. Given the historically weak institutional environment, amendments to patent law and ownership reform have encouraged patenting by indigenous firms (Keister and Hodson, 2009). In addition, as part of its joining of the World Trade Organisation (WTO) in 2005, China signed up to the agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) in 2001 and enhanced its enforcement of patent law (Yang and Clarke, 2005).

Third, external stimulus has also prompted indigenous firms in China to engage in patenting. For example, competitive patenting in China has increased at a rate of over 31% per year from 2011 to 2014, and this has been influenced by foreign firms' competitive and innovative activities in China (Hu and Jefferson, 2009).

4.5.4 Firm Performance Variables

The empirical evaluation of the relationship between CG, CE and firm performance necessitates the selection of suitable firm performance measures for the analyses. Nevertheless, there has been no consensus on which firm performance measures are more appropriate (Al-Matari et al., 2014). Prior studies evaluating the relationship between CG, CE and firm performance have traditionally used various firm performance covering: return on investment, ROE (Zhang et al., 2014), ROA (Price et al., 2013; Larcker et al., 2007; Core et al., 2006; Daily and Dalton, 1992), earning per share (Zahra, 1992), Tobin's Q (Bhagat and Bolton, 2008; Gompers et al., 2003; Weir et al., 2002; Yermack, 1996), price earnings ratio, sales growth (Choi et al., 2012), and net profit margin. These firm performance measures used in the existing literature can be grouped into accounting-based and market-based firm performance measures.

The market-based measurement is characterised by its forward-looking aspect and its reflection of the expectations of the shareholders concerning the firm's future performance, whilst the accounting-based measure presented past organisational performance (Al-Matari et al., 2014). In this respect, firm performance measures from the perspective of insiders (management) and outsiders (investors) of a particular firm are needed for the purpose of this thesis. As a result, this thesis is consistent with previous studies (e.g. Azeez, 2015; Yu and Ashton, 2015; Zhang et al., 2014; Choi et al., 2012) which used accounting-based measures of ROA as indicators to capture the value effects of CG mechanisms from the point of view of insiders, whilst the market-based measure

of Tobin's Q is used to demonstrate firm valuation resulting from effective CG structures from the perspective of outsiders. This thesis does not employ return on equity (ROE) as a performance measure since it is often manipulated to satisfy a seasoned equity offerings (SEOs) requirement (Liu et al., 2014). One of the rules imposed by the China Securities Regulatory Commission (CSRC) concerning SEOs is that firms must achieve a minimum average ROE of 10% three years before the SEO and a minimum ROE of 10% one year before the SEO. Many firms aggressively manipulate their ROEs in order to meet the SEO requirement.

4.5.4.1 ROA

ROA refers to earnings before interest and tax divided by the total assets. ROA, as an accounting-based measurement, gauges the operating and financial performance of the firm which would influence the firm's strategic decisions directly (Al-Matari et al., 2014). Many empirical studies, for example, Zhang et al. (2014); Choi et al. (2012), showed support for it. The measurement is such that the higher the ROA, the more effective is the use of assets to the advantage of shareholders, as well as in serving the economic interests of its shareholders (e.g. to facilitate more CE projects) (Ibrahim and Samad, 2011).

4.5.4.2 Tobin's Q

Tobin's Q, as a market-based measurement refers to a traditional measure of expected long-term firm performance. In this thesis, Tobin's Q is calculated as the sum of market value of equity and book value of debt, divided by book value of assets (Tong et al., 2013). This measurement for Tobin's Q has been extensively used for empirical research (Aghion et al., 2013; Tong et al., 2013; Coles et al., 2012; Mangena et al., 2012) and makes the findings of this thesis more valid. A high Tobin's Q ratio indicates success in a way that the firm has leveraged its investment (e.g. the investment in CE activities) to develop the firm that is valued more in terms of its market-value compared to its book-

value. A higher Tobin's Q ratio also reflects the effectiveness of the firm's governance structures (Weir et al., 2002).

4.5.5 Firm-Specific Variables

4.5.5.1 Firm Age

Firm age reflects a firm's experience and knowledge intensity and entrepreneurial flexibility, which in turn, affects a firm's ability and willingness to take risks, such as R&D investment and patenting. Following previous studies (Chen et al., 2014a; Choi et al., 2011; Wu, 2008; Zahra et al., 2000), a firm's age is measured as the number of years elapsed since a firm was listed.

4.5.5.2 Firm Size

Firm size captures a firm's scale of resources available for CE activities and the level of organisational complexity that might hinder CE (Chen et al., 2014). Many previous studies found a significant relationship between CE and firm size (Core et al., 1999). Previous studies generally used the book value of total assets (e.g. Mangena et al., 2012; Coles et al., 2008), total sales (e.g. Core et al., 1999), and the number of employees (e.g. Brossard et al., 2013; De Cleyn and Braet, 2012; Lee et al., 2011; Tang et al., 2008; Covin et al., 2000; Zahra, 2000) to measure the size of a firm. This thesis uses the book value of assets to measure firm size, which is widely used by other researchers (Ammann et al., 2011; Azeez, 2015), in particular, in the studies of CE (e.g. Shapiro et al., 2015; Zhang et al., 2014; Choi et al., 2011; Zahra, 1996).

4.5.5.3 Leverage

Leverage is measured as the book value of total debt divided by total assets (Choi et al., 2012). This measure has been utilised by other researchers, such as Chen et al. (2014a); Choi et al. (2012); Munari et al. (2010), and Tribo et al. (2007). This approach to the

measuring of leverage focuses on the capital employed and best represents the effects of past financing decisions. A highly-leveraged firm may not be in position to fund long-term projects (e.g. CE projective) as it affects investment decisions on CE resources and firm performance, due to the fact that it increases the likelihood of bankruptcy and the burden on CE investment.

4.5.5.4 Industry Classification

The other control factor in this thesis is industry classification which is considered to control the influence of industry on CE. Many previous studies controlled the influence of industry on CE, for example, Shapiro et al. (2015), Guan et al. (2009), Zahra and Garvis (2000), and Francis and Smith (1995). It is reasonable to account for industry effect, since variances in industrial structure lead to different conditions for competition in CE activities and product markets (Choi, 2011). Different industries have different technological and learning regimes shaping specific patterns of CE (Shapiro et al., 2015; Guan et al., 2009), for example, the importance of CE investment to the industry of food products and beverages is different to its importance to the chemistry industry and IT.

Exogenous effects, therefore, are accommodated by controlling for industry and market specific factors using the China Securities Regulatory Commission (CSRC) industry classification. The industries of manufacturing and IT were selected in this thesis, and further divided into four industrial groups classified by the technology intensity which were then created through dummy variables. The grouping was based on the CSRC (China Securities Regulatory Commission) classification of industries. They are as follows:

Group 1: agriculture, forestry, mining and construction

Group 2: manufacturing

Group 3: IT

Group 4: retail, and diversified industries.

4.6 Sample Selection and Data Collection Procedures

4.6.1 Data Source

The required data is accessible mainly from two databases in China, namely China Stock Market and Accounting Research (CSMAR) and the State Intellectual Property Office (SIPO) of People's Republic of China databases, and firm's annual reports are also used to collect data. These two databases have been used in many previous studies (Choi, 2011; Shapiro et al., 2015; Yu and Ashton, 2015; Zhang et al., 2014).

The CSMAR database is designed by the China Accounting and Finance Research Centre of the Hong Kong Polytechnic University and developed by Shenzhen GTA Information Technology Corporation Limited. The CSMAR database covers all corporations listed on the Shanghai Stock Exchange and Shenzhen Stock Exchange for their financial statements since 1990. Data include firm profile, financial ratios (e.g. ROA and Tobin's Q), ownership structure, top ten shareholders, R&D investment, and board structures. The selected firms in this thesis meet the condition that financial statements are available from the CSMAR database for nine consecutive years from 2007-2015.

In addition, the online database managed by the State Intellectual Property Office (SIPO) of the People's Republic of China, was comprehensively used for the collection of patent data of Chinese listed firms. The SIPO was founded in 1980 to protect intellectual property and encourage invention and creation. It is a governmental institution under the control of the State Council. The main responsibilities of the SIPO are administrative and research functions related to patent affairs, for example, receiving, examining, and granting patent applications. This institution offers detailed information

on patents registered in China since 1980. Patents have been widely used in CE studies to capture CE capacity (; Shapiro et al., 2015; Bena et al., 2014; Aghion et al., 2013; Choi, 2011).

The annual reports are considered to be the common communication instrument employed by firms to disclose relevant information regarding the CG and CE practices. In this thesis, the annual report mainly provides the missing data from the above two databases, particularly for the variable of R&D intensity. There are potentially sample selection issues due to the voluntary nature of R&D disclosure since there has historically been some variation in national accounting standards. According to the 2006 Chinese Accounting Standards (CAS) and accounting convention, disclosure of R&D investment information by listed firms is not mandatory. There are mainly two ways listed firms disclose their R&D investment, one way is by disclosing in the body of the balance sheet, the other method is by way of notes to financial statements. The R&D investment is disclosed in the body of the balance sheet as Development Expenditure. It indicates the amount of capitalised R&D investment during the fiscal year (Wang and Fan, 2014). Managers can choose a favourable method or a favourable description of reporting R&D investments to raise their firm's stock price or public interests.

Only listed firms in China were selected for this thesis because (1) it is difficult to access reliable financial performance and CE data from unlisted firms in China; (2) although a large proportion (over 45%) of R&D investment data on CSMAR was missing or incomplete, listed firms cover the most economically important firms for data collection purposes and will, therefore, make this thesis comparable to other empirical studies (e.g. Zhang et al., 2014); and (3) the China CG Code is formally imposed on listed firms rather than non-listed firms. The data for this thesis was mainly gathered via

screening and arranging those hand-collected raw data of capitalised and expensed R&D from public reports and the relative information disclosed in financial statements.

Chinese firms may issue three types of tradable shares. Tradable A shares are listed on the two domestic stock exchanges (Shanghai and Shenzhen Stock Exchanges) to domestic investors and denominated in Chinese currency Renminbi (RMB). Tradable B shares are issued for foreign investors traded in either American or Hong Kong dollars. A Chinese firm may also trade on the Hong Kong Stock Exchange and issue H shares. This thesis deals with Chinese listed firms that only issue A shares in domestic stock exchanges (Shanghai and Shenzhen). Firms which issue B shares are not considered.

This thesis used the non-financial Chinese firms listed on the Shanghai and Shenzhen Stock Exchanges to construct the sample data. The timespan of the data was from 2007-2015 and was chosen to capture direct R&D spending of firms since 2007 when the new Chinese Accounting Standards (CAS) commenced in 2006³, given that R&D investment can either be expensed as incurred as a whole or partly capitalised and partly expensed from 2007 (Wang and Fan, 2014).

4.6.2 Sampling Process

The sample size selected was based on a compromise between limitations of manual data collection and the need to have sufficient data to achieve the objectives of this thesis. As the study period was from the 31st December 2007 to 31st December 2015, a number of factors dictated the selection of the final sample. An important point concerning the

³ China issued new Accounting Standards (CAS) in 2006, and the new CAS No.6 made two significant changes to the accounting treatment of intangible assets. First, internal research and development expenses are divided into research expenditures and development expenditures, while adding a new accounting item: Development Expenditure. Second, it prescribes full expensing for all research expenditures and capitalisation of development outlays only if the technical and commercial feasibility of the sale or use of the asset concerned has been established. If a R&D project does not fulfil certain conditions, then its costs must be expensed when incurred. This reform is consistent with the international standards (Wang and Fan, 2014).

statistical problem is survivorship bias (see the next paragraph) during the study period where a specific part of the sample required to be selected as at the beginning of the study period disappears from the listing of the stock exchanges over the study period (Ammann et al., 2011). To ensure a representative analysis of the relationship between CG, CE and firm performance over the study period, it is important to include firms delisted or newly listed firms during the study period.

The survivorship bias is a common form of a sample-selection bias where information on firms that are no longer in existence or due to the unavailability of data for a study period are excluded from the sample. In this thesis, CG, CE and firm performance data are analysed over a period of 9-year grading the specific governance mechanisms, firm characteristics, R&D investment and patent activities and firm performance. During this period, firms entered and exited the Shanghai Stock Exchange (SHSE) and Shenzhen Stock Exchange (SZSE). To avoid focusing on firms that survive during the study period, CG, CE and firm performance data gathered were from firms listed on the SHSE and SZSE at the end of each financial year during the 9-year period. For example, firm code 000522 was delisted in 2013, therefore, data from the financial year end 2007 to 2012 were used.

One option would have been to select firms that were listed on the SHSE and SZSE at the end of the study period, but this would have failed to account for firms that disappeared between 2007 and 2015. However, all firms that were listed on the SHSE and SZSE at the end of each financial year end during the study period were selected. Furthermore, to be selected in the research sample, the annual reports of a particular firm that has been listed on the SHSE and SZSE during the study period must be available through either hand collection, databases and the official websites.

The panel is unbalanced as the number of firms grows considerably over time (from 1,527 listed firms in 2007 to 2,808 listed firms in 2015). The sampling process for the data sample can be seen in Table 7 below:

- (1) The firm is included in the CSMAR database and the accounting data required for the study variables are reported in CSMAR.
- (2) Eliminating firms with incomplete or no data on CE (R&D investment or patents);
- (3) The firm has a December fiscal year end each year. This criterion is set because Smith and Pourciau (1988) showed that firms with a December fiscal year end and non-December fiscal year end have significant differences in financial characteristics. This thesis chooses only the firms with a December fiscal year end as our sample to reduce noise.
- (4) Excluding all financial firms as financial firms have different regulatory regimes compared to non-financial firms;
- (5) Eliminating firms from low technology industry (e.g. wholesale & retail, beverage, food, education, resident services, utilities, hotel & catering, and real estate industries), leaving a final sample size of 5,118 observations.

Table 7: Sampling Process of Data Sample

Year	2007-2015	2015	2014	2013	2012	2011	2010	2009	2008	2007
1) Initial observations	19,526	2,808	2,592	2,468	2,472	2,320	2,041	1,696	1,602	1,527
2) Minus observations without R&D investment data	12,973	1,924	1,734	1,628	1,633	1,521	1,318	1,121	1,069	1,025
3) Minus observations without December fiscal year end	0	0	0	0	0	0	0	0	0	0
4) Minus observations in financial industry	24	3	3	3	3	3	3	2	2	2
5) Minus observation in low-technology industries (e.g. wholesale & retails, beverage, food, education, resident services, utilities, hotel & catering, and real estate industries)	1,411	175	172	170	167	163	155	136	136	131
Final data sample	5,118	706	683	667	669	633	565	437	395	369
Initial observations/final data sample	39.5%	36.7%	39.4%	41%	41%	41.6%	42.9%	39%	37%	36%

4.7 Summary

This chapter discussed in detail the research philosophy and methodology underpinning the current thesis. As this thesis uses a multi-theoretical approach (agency theory, stewardship theory, and resource dependence theory), such an approach and empirical literature offer a valid base to develop hypotheses, and the hypotheses tests will be conducted through analysing the secondary numeric data which will be collected through two professional databases (i.e. the CSMAR and the SIPO) and annual reports of Chinese listed firms. Therefore, this thesis adopted the positivist paradigm and the panel methodology to test the research hypotheses that were previously developed based on the theoretical framework in Chapter 4.

Secondly, three empirical research models were developed based on the literature to address the aims and objectives of this thesis. Model (1) is to address whether there is a relationship between firm-level CG structures and CE in Chinese listed firms; Model (2) is to address whether there is a relationship between CG, CE and performance in Chinese listed firms; Model (3) is to explore whether firm-level CG structures and CE interact to influence firm performance in the Chinese listed firms.

Thirdly, this chapter provided development of the variable measurement, covering variables for CG structures (i.e. board structure and ownership structure), CE (i.e. R&D intensity, the number of patent applications, and the number of granted patents), firm performance (i.e. ROA and Tobin's Q), and firm specific factors (i.e. firm size, firm age, leverage and industry). Fourthly, population, sampling process, and data collection (archive data) were discussed and presented.

Chapter 5 Data Analysis

5.1 Introduction

Chapter 5 has laid out the research philosophy underpinning the thesis, as well as the empirical research models which were developed and the measurement of variables was justified. In addition, the sources of the data used, sample selections and data collection procedures were presented. This Chapter will discuss the diagnostic analysis of parametric assumptions for each model to determine their suitability and relevance in Section 5.2. Section 5.3 will explain the statistical techniques used in data analysis. The statistical methods used, and the reports of empirical results will be highlighted in Section 5.4. Section 5.5 will provide a summary of the chapter.

5.2 Data Analysis

5.2.1 Descriptive Statistics

Descriptive statistics is a necessary initial step in data analysis which enables an understanding of the nature of the variables, their underlying statistical distribution. The statistical analyses included the maximum, minimum, mean, 25th quantile, median, 75th quantile, standard deviation, skewness and kurtosis for (1) corporate governance structures; (2) corporate entrepreneurship; (3) the firm characteristics; and (4) firm performance.

5.2.2 Normality

The multiple regressions are built on the assumption of normally distributed variables. In fact, the assumption is that the errors from the regression model are normally distributed. This will normally mean that the variables themselves should be normally distributed as well. However, analyses where the variables do not satisfy the criteria of a normal

distribution, but where the errors are still normally distributed, do exist (Field, 2009; Gujarati and Porter, 2009).

Skewness and kurtosis are commonly used to measure the fit of the data compared with the normal distribution. While skewness measures the distribution of observations on the left (positive) vs. right (negative) side of the mean, the kurtosis measures the values of the observations compared with values from the normal distribution. A positive kurtosis indicates a piling up of values around the mean, thus more peaked than a normal distribution, whereas negative kurtosis means a flatter distribution than the normal distribution. Using mathematical terms, the skewness represents aberrations on the x-axis, while the kurtosis shows the aberrations on the y-axis, all compared with the normal distribution. If a distribution is normal, the values for both skewness and kurtosis should be zero or close to zero. According to Field (2009, Appendix, p.800), data is statistically considered to be normally distributed if the skewness value is ± 1.96 and the kurtosis value is within ± 3 . For coefficients with values higher or lower than the two indices, there will be a significant bias in the distribution of the variable, representing an aberration from the normal distribution. Alternatively, the Kolmogorow-Smirnov test allows checks for this normality fit. A significant result ($p < 0.05$) indicates that the distribution differs significantly from a normal distribution (Field, 2009). In addition, visual inspection of data plots, and P-P plots can also give researchers information about normality. However, with a high number of observations it is very easy to have significant biased results for this test. Based on the size of the sample in this thesis, data is tested for skewness, kurtosis and the Kolmogorow-Smirnov test.

If the tests reveal that the distribution of the data is not normally distributed, methods (e.g. outlier removal and data transformation) are suggested to normalise data (Field, 2009). Outlier removal is straightforward in most statistical software. However, it

is not always desirable to remove outliers. In this case, transformations (e.g. reciprocal, square root, natural log, winsorising) can improve normality, but complicate the interpretation of the results, and should be used deliberately and in an informed manner (Osborne, 2012). Another advantage of data transformation is that it reduces the influence of outliers and other failures of the assumptions (Tabachnick and Fidell, 2007). Which type of data transformation is appropriate to remedy normality deviations depends on the strength and direction of the normality violation. The data transformations used in this thesis are natural log, square root, and winsorisation of the data.

5.2.3 Univariate Analysis

Univariate analysis examines the correlation between the dependent and the individual independent variables. This thesis uses Spearman's rho correlations which are appropriate for not perfectly normally distributed data after data transformation. The strength and direction of the correlation between the variables is given by the correlation coefficient r , which lies between -1 and +1, where a positive (negative) value signals a positive (negative) association. A higher value means a stronger association (Field, 2009). The coefficients and signs of correlation provide a basic understanding of the direction and magnitude of the correlations between dependent and independent variables. In addition, the univariate analysis allows a first assessment of potential multicollinearity problems within the variables.

5.2.4 Multivariate Analysis

The third step in the analytical process is multivariate regression which covers the cases in which the dependent variable is hypothesised to depend on more than one explanatory variable, to allow for isolating the contribution of each independent variable to explain variation in the dependent variable by holding the effect of the other variables constant (Gujarati and Porter, 2009). Regression analysis relies upon a set of assumptions about

the variables used in the analysis to ensure the validity of the results and the inferences drawn from the analysis. When these assumptions are not met, the results may not be trustworthy. As Pedhazur (1997, p. 33) notes: ‘Knowledge and understanding of the situations when violations of assumptions lead to serious biases, and when they are of little consequence, are essential to meaningful data analysis’. However, as Osborne (2012) observes, few articles report having tested assumptions of the statistical tests they rely on for drawing their conclusions.

There are four important assumptions which have to be met for multivariate regression to guarantee the validity of the results of analysis (see e.g. Gujarati and Porter, 2009; Tabachnick & Fidell 2007; Greene, 2003; Studenmund, 2001). The four assumptions are normality, linearity, homoscedasticity, and independence of error terms. The various checks discussed in this section are used to examine the research sample against the assumptions of the multivariate regression.

5.2.5 Linearity

This assumption requires that the model should have linear parameters, meaning that there is a straight-line relationship. In other words, the relationship between the independent variables (X) and the dependent variable (Y) should be linear. It is important to check for outliers in each of the variables, since multiple linear regression is sensitive to outlier effects. The linearity assumption can be best be tested with scatted plots. When this assumption is violated, for example, a curvilinear relationship appears or no and little linearity relationship, using parameter methods will results in biased estimates. However, the violation can be corrected by appropriate data transformations (Tabachnick and Fidell, 2007).

5.2.6 Homoscedasticity

Homoscedasticity means that the variance of errors (the noise or random disturbance in the relationship between the independent and dependent variables) is the same across all values of the independent variables. When the variance of errors differs at different values, heteroscedasticity is indicated. According to Berry and Feldman (1985) and Tabachnick and Fidell (2007), slight heteroscedasticity has little effect on significance tests, however, when heteroscedasticity is marked, it can lead to serious distortion of findings and seriously weaken the analysis.

This assumption can be checked by visual examination of a plot of the standardised residuals (the errors) by the regression standardised predicted value. Most modern statistical packages (e.g. STATA and SPSS) include this as an option. Ideally, residuals are randomly scattered around 0 (the horizontal line) providing a relatively even distribution. Heteroscedasticity is indicated when the residuals are not evenly scattered around the line. There are many forms heteroscedasticity can take, such as a bow-tie or fan shape. When the plot of residuals appears to deviate substantially from normal, more formal tests for heteroscedasticity should be performed. Possible for this are Breusch-Pagan and White tests to detect the problem of heteroscedasticity. These two tests assume the variance of residuals is constant, if it is not, it indicates an existing problem of heteroscedasticity, transformation of variables can thus, be useful to reduce the heteroscedasticity.

5.2.7 Independence of Error Terms

This assumption requires that error terms must be independent from each other, and therefore, no serial correlation exists. In other words, parameter models demand that the error terms are uncorrelated and therefore, observations are uncorrelated. Otherwise, there is autocorrelation. The Wooldridge test is used to detect the autocorrelation issue,

as the test assumes that there is no first-order autocorrelation, if violated, autocorrelation exists.

In addition, it is important to account for the problem of multicollinearity in the econometric models. Multicollinearity is a state of very high inter-correlations or inter-associations among the independent variables. Multicollinearity is therefore, a type of disturbance in the data, and if present in the data, the statistical inferences made about the data may not be reliable (Belsley et al., 1980).

Multicollinearity thus exists when there is a strong correlation between two or more variables in the regression model. Perfect multicollinearity is rare, but a certain multicollinearity is however usual in most surveys. The existence of multicollinearity represents an untrustworthy regression coefficient since the standard error of them increases, and the size of R square, the measure of multiple correlations, is limited, since the variation in one variable implies a variation in the other multicollinearities variables. Multicollinearity can therefore result in several problems (Hair et al., 2006, p. 202):

- (1) The partial regression coefficient may not be estimated precisely due to multicollinearity, since the standard errors are likely to be high
- (2) Multicollinearity may result in a change in the signs as well as in the magnitudes of the partial regression coefficients from one sample to another sample
- (3) Multicollinearity makes it tedious to assess the relative importance of the independent variables in explaining the variation caused by the dependent variable

As a consequence, in the presence of high multicollinearity, the confidence intervals of the coefficients tend to become very wide and the statistics tend to be very small. It thus becomes difficult to reject the null hypothesis of any study when multicollinearity is present in the data under study. Multicollinearity is checked by a scan

of the correlation matrix of the variables, for example the Spearman's rho correlation. This correlation should not be higher than 0.8 (Gujarati and Porter, 2009, p. 338). The variance inflation factor (VIF) is a more exact measure. The VIF indicates whether a variable has a strong linear relationship with the other variables. To assess multicollinearity, two measures were evaluated: tolerance and VIF. Tolerance is the amount of variability of the selected independent variable not explained by other independent variables and VIF is the inverse of the tolerance value (Hair et al., 2006). Tolerance is calculated for the independent variable by running an OLS regression with the independent variable as a function of the other independent variables and calculating the variance of the independent variable that is explained by the other independent variables (R^2). The tolerance of the dependent variable is $1 - R^2$ and the VIF is the inverse of $1 - R^2$ (Hair et al., 2006). Hair et al. (2006) note that a common cut-off threshold is a tolerance value of 0.10, which corresponds to a VIF value of 10 (Hair et al., 2006: 205).

Spearman's rho correlation and VIF-tests will be conducted in this thesis. If a multicollinearity problem appears (Spearman's rho correlation coefficient greater than 0.8 or a VIF greater than 10), one or more highly correlated variables will be dropped; if one of the variables is not logically essential to the research models or if one variable has substitute explanatory power for the other one, this will reduce or eliminate multicollinearity.

5.3 Statistical Techniques

5.3.1 An Unbalanced Panel Data

This thesis employs a panel data analytical framework to investigate the relationship between the specific governance mechanisms, CE and firm performance with a proposal to address the potential problems of endogeneity. The benefits of using panel data analysis in this thesis cannot be underestimated. For example, the increased number of

observations based on n , x , and t are defined in equation 1 help to improve the efficiency of the estimators because the larger the sample size the lower the bias found in the estimations. Moreover, the problem of multicollinearity faced by time series studies is eased when using panel data set which provides more informative data, more variability, less collinearity among the variables, a higher degree of freedom and efficiency. Moulton (1987) noted that the time series and cross-section studies do not control for individual heterogeneity and run the risk of obtaining biased results. In this respect, a panel data analytical framework makes a distinction between a residual heterogeneity related to changes over time (period effects) and across a firm (group effects). This allows for a better identification of the issues leading to changes in CG, CE and firm performance data.

5.3.2 Estimation Methodology

The method of analysis is that of multiple regressions and the method of estimation may be pooled ordinary least squares (OLS), random effects or fixed effects, and system generalised method of moment (system GMM) as described later in this section.

In a panel data set, the regression analysis with both a spatial and temporal dimension is appropriate. The spatial dimension in a panel data set is a composite of the cross-section dimension and in this case consists of Chinese listed firms in this thesis. In contrast, the temporal dimension in this thesis relates to a number of observations of a set of variables representing these firms over a particular period of time. As indicated earlier, data for 2007 to 2015 on CG practices, CE and firm performance measures was collected for this thesis and therefore, covers a period of 9 years. Initially, the panel data regression model in its general form was estimated as follows:

$$\text{Equation 1 } Y_{it} = \beta_0 + \beta_1 X_{it} + \dots + \beta_k X_{kit} + v_{it}$$

Where Y_{it} is a dependent variable, X_{it} represents an explanatory variable, $i = 1 \dots, N$ firms

$t = 1 \dots, T$ time periods, β_0 represents the constant term, β_1 is the coefficient of the explanatory variables, v_{it} represents the error term.

The error term can further be decomposed into two components in the form of a firm-specific error v_i , and an idiosyncratic error ε_{it} . Thus:

$$\text{Equation 2: } v_{it} = v_i + \varepsilon_{it}$$

However, and depending on the behaviour of the error term v_{it} and whether the explanatory variable is serially correlated with the components of error term v_i , and ε_{it} would determine the empirical model specification. Fundamentally, there are three standard panel data regression models that arise from the general model described in equation 1 above with specific assumptions in relation to the explanatory variables, the properties of the error term, and the association between the explanatory variables and the error term. In addition, further assumptions need to be made regarding the variability of the regression coefficient across firms. In this respect, and as has been indicated earlier, a panel data regression model in this thesis may be estimated by pooled OLS, random effects or fixed effects, system GMM and are discussed as follows:

5.3.2.1 Ordinary Least Squares (OLS)

Pooled OLS assumes constant coefficients that is referring to both intercepts and slopes.

In the event that there is neither a significant firm-specific effect nor significant temporal

effects, it could be possible to pool all of the data and run a pooled OLS regression model. Thus, the typical assumptions of constant variance and uncorrelated observations must continue to hold. However, this model is not appropriate if t , the time period is small (Gujarati and Porter, 2009). In this thesis, the pooled OLS regression is estimated in the following general form:

$$\text{Equation 3: } Y_{it} = \beta_0 + \beta_1 X_{it} + v_{it}$$

Basically, the estimated pooled OLS regression will be biased and inconsistent because of unobserved heterogeneity (X_{it} and v_{it} are correlated), meaning that the common variations in the series are not taken into account across all cross-sectional entities and over time in a pooled OLS model. This can be a result of a measurement error, omitted variable bias and reverse causality. In order to deal with this problem, a random effect model or fixed effect model is considered for panel data analysis. The main difference between the two models is in their interpretations about unobserved individual specific effects.

5.3.2.2 Random Effect

A random effect model assumes that the unobserved differences are not correlated with any of the explanatory variables. That is, v_i is treated as random constant terms (Greene, 2003) where the intercept is a random outcome variable. The specific benefit of using the random effects model is that, the repressors allow time-invariant variables to be included. In this instance, the random error v_i is heterogeneity specific to a cross-sectional unit and in this case, firms. This random error is assumed to be constant over time. The equation of the random effects regression becomes:

$$\text{Equation 4: } Y_{it} = \beta_0 + \beta_1 X_{it} + v_i + \varepsilon_{it}$$

Where v_i is between-firm error and ε_{it} is within-firm error. Thus, v_i are assumed to be random variables.

5.3.2.3 Fixed Effect

The fixed effect model assumes constant slopes but different intercepts for cross-sectional units, and in this case individual firms. Thus, the intercept is the cross-section specific that differs from firm to firm. Further, the error term (ε_{it}) is assumed to be correlated with the explanatory variables. Even though there are no significant temporal effects when using the fixed effects model, there are significant differences among firms. Therefore, the fixed effects model is employed whenever one is only interested in analysing the impact of variables that may vary over time. In this respect, it may be used to explore the relationship between explanatory variables (CG variables), CE, and performance within a firm. This means that each firm has its own individual characteristics that may or may not affect the explanatory or the dependent variables. If these individual characteristics within a firm may impact or bias the explanatory variables or the dependent variables, then one needs to control for these individual firm characteristics. In this thesis, the fixed effects model is in the following general form:

$$\text{Equation 5: } Y_{it} = \beta_1 X_{it} + v_i + \varepsilon_{it}$$

Where Y_{it} is the dependent variable, X_{it} is a vector of explanatory variables, v_i is a fixed effect for firm i that remains constant over time t and ε_{it} is the error term.

The Hausman test is run to statistically decide whether a fixed or random effects model is the appropriate way to treat the error structure (Baltagi, 2008; Hausman, 1978; Wooldridge, 2002). The random effects model estimates are more efficient under the null hypothesis of the Hausman test. However, if the null hypothesis is rejected, the random effects estimates are inconsistent, and the consistent fixed effects estimates are preferable.

5.3.2.4 System Generalised Method of Moments (SGMM)

This thesis has also considered the econometric analysis of dynamic economic relationships in panel data, meaning the economic relationships in which variables adjust over time. Econometric analysis of dynamic panel data means that researchers observe many different individuals over time. This means that the underlying data contains a total of $n*t$ (the number of firms, times the number of years) individual observations. A typical characteristic of such dynamic panel data is a large n , small t , i.e. that there are many observed individuals, but few observations over time. This is due to the fact that the bias raised in the dynamic panel model could be small when t becomes large. The observed individuals in this thesis are firms (Roodman, 2009). System GMM is considered more appropriate to estimate panel data because it removes the contamination through an identified finite-sample corrected set of equations which are robust to panel-specific autocorrelation and heteroscedasticity (Capezio et al., 2011). It is also a useful estimation tool to tackle the endogeneity and fixed effect problems (Arellano and Bond, 1991).

A dynamic panel data model is written as follows:

$$\text{Equation 6: } y_{it} = \alpha y_{it-1} + \beta X'_{it} + \varepsilon_{it}$$

Equation 7: $\varepsilon_{it} = \mu_i + v_{it}$

Where i is the individual firms, t is time periods respectively. X' represents a vector of independent variables. The error terms contain two components, the fixed effect μ_i and idiosyncratic shocks v_{it} .

In general, there are two main econometric problems for the dynamic panel model which are as follows:

- (1) The causality problem. The effects between independent variables and dependent variables might happen in both directions, for example from CG structures to firm performance and vice versa. These independent variables might be correlated with the error term.
- (2) The fixed effects problem. The time-invariant firm characteristics (fixed effects contained in the error term in equation 6) may be correlated with the independent variables.

Arellano and Bond (1991) presented a method of generalised method of moments estimator (GMM), also known as difference GMM which allows for the existence of lagged dependent variables to correct for simultaneity, control for the fixed effect, and to tackle the endogeneity problem of independent variables.

The difference GMM estimator first-difference the panel data to remove the time-invariant fixed effect. However, the Arellano-Bond GMM difference method suffers from weak instrument bias when the lagged dependent variables and explanatory variables are highly persistent over time. This results in a weak correlation between the lagged instruments and first-differences, and the lagged levels of variables (the instruments) providing little information about the first-differenced variables (Arellano and Bover,

1995). Arellano and Bover (1995) and Blundell and Bond (1998) proposed the SGMM estimator to overcome this problem. The SGMM estimator instruments level variables with differences to remove fixed effects from the instruments. This will result in less biased estimates and enhancing precision, assuming the instruments are uncorrelated with the errors. The key to SGMM is to simultaneously include the lagged levels and difference of variables as instruments (Roodman, 2006; Roodman, 2009).

According to Arellano and Bond (1991), the SGMM requires that there is first-order serial correlation, but no second-order serial correlation in the residuals. In other words, the null hypothesis must be rejected in the MA (1) test but not rejected in the MA (2) test. The Sargan test (Sargan, 1958) and Hansen test (Hansen, 1982) can be used to test for the joint validity of the identifying restrictions when the model is over-identified. These tests the validity of instruments. The Sargan test is inconsistent if heteroscedasticity is present in the sample (Roodman, 2009), therefore, the Hansen test is considered to be more reliable. Baum (2006) also stated that the most commonly used diagnostic for SGMM to investigate the suitability of model specification is the Hansen J-statistics test. The validity of the instruments is, therefore, tested using Hansen's J statistics test of over-identifying restrictions in this thesis. The Hansen J-test (p value) does not reject the null at significance level of 5% or 10%, which implies that the instruments are valid. It is also suggested by Roodman (2009) that a p value needs to be at least as high as 0.25.

GMM includes one-step and two-step estimators. The two-step procedure is more efficient and robust regardless of heteroscedasticity or autocorrelation. This method uses an estimated weighting matrix based on the residuals from the one-step model but generates downward biased standard errors. Windmeijer (2005) provided a finite-sample correction for the two-step covariance matrix, thus rendering the two-step estimates

preferable to one-step cluster-robust estimates. Therefore, the two-step SGMM is chosen for this thesis.

5.4 Empirical Results

5.4.1 Descriptive Statistics

As explained in Chapter 5, there were 5,118 firm-year observations in total during the period 2007-2015. The summarised statistics of variables for corporate governance (CG), corporate entrepreneurship (CE), firm performance, and firm specific factors across all three research models are discussed in this section (see Table 8).

As can be seen from Table 8, firms in this thesis had an average of RMB 7562.59 million in total book assets. The smallest firm in this thesis was RMB 31.9 million and the largest firm was RMB 511,623.7 million. The average leverage of the sample is 42.58%, which is slightly lower than that of 99 listed IT firms in China's A-stock market during the period from 2007 to 2008 (44.59%, Zhang et al., 2014). Similarly, the average leverage of 42.58% is also lower than the finding of Choi et al. (2011), who report the average leverage of Chinese listed low-to-high-technology sectors in China in 2001 to be 44.17%. As table 8 shows, the average firm age is 9 years old. This demonstrates that Chinese firms have not been listed on stock exchanges for a very long time consistent with the first stock exchange listing in 1990.

Table 8 also includes performance variables. The average ROA of the sample is 4.2%, which is consistent with the outcome of 4.9% in research conducted by Zeng and Lin (2011), and slightly less than the outcome of Zhang et al. (2014) (5%) and Yu and Ashton (2015) (6.5%). This is in contrast with the average 2% ROA from Choi et al. (2011). The average market measure as indicated by Tobin's Q shows that the mean in the research sample is 2.64, which is higher than 1.15 in Shan and McIver (2011).

Table 8 also presents the CG variables examined in this thesis and shows that the number of board members is about 9 and this is consistent with the results from other Chinese studies (Shapiro et al., 2015; Yu and Ashton, 2015; Zeng and Lin, 2011) and smaller than the UK board size of 10 (Coakley and Iliopoulou, 2006), the US board size of 13 (Grinstein and Hribar, 2004), and larger than the Australian board size of 7 (Bugeja et al., 2012). In general, the majority of the firms in this research sample are consistent with the minimum size of the board required by the China Company Law 2013 which was 3 members and a maximum of up to 13 members for listed firms. 0.35% of the firms had more than 15 board members. With respect to board composition, the means ratio of independent directors is 36.85% with a range of 11% to 75% in various firms. 0.88% of the selected firms did not comply with the Guidelines issued by the CSRC in 2003 that Chinese listed firms must have at least one-third of the board members as independent directors. However, the average independent director ratio (36.85%) is smaller than the 55% in UK listed firms (Ozkan, 2007), and 78% in U.S. listed firms (Conyon, 2015). This reflects the fact that boards of directors in China might be less independent compared to the UK and U.S. markets. The proportion of CEOs serving in a dual capacity (i.e. the CEO also works as the Chairman) is 24.2% over the 9 years. This result is larger than the figure of 6% in the UK (Veprauskaitė and Adams, 2013) and 15.3% in the sample of Yu and Ashton (2015) which covered all Chinese public listed firms from 2003-2010 with a sample size of 9,371 firms. However, it is significantly smaller than 79% in U.S. firms (Pathak et al., 2014). Consistent with Conyon and He (2012), the average supervisory board size was about 4 supervisors, which is much smaller than about 8 in German firms (Andreas et al., 2012). This result is consistent with the Company Law 2013 requirement that the supervisory board should be composed of not less than three supervisors. The low proportion of CEO duality suggested the trend of splitting the positions of Chairman and

CEO in Chinese listed firms as CEO duality negatively influenced a firm's efficiency (Yang et al, 2011).

Regarding the ownership structures, the mean concentration of state ownership in the top 10 firm shareholders was 9.43%, with a range from zero to 85.68% from 2007 to 2015. This result was significantly lower than that of Chinese listed firms (34.13%) during the 2001 (Choi et al., 2011), 64.86% for the period from 2001 to 2005 (Shan and McIver, 2011) and 33.25% for Chinese listed manufacturing firms from 2005 to 2007 (Dong and Gou, 2010). It was also observed that state ownership decreased significantly from 25.43% in 2007 to 4.96% in 2015. The main reason for the decline was that the government was reducing its ownership of firms as it continued with its privatisation programme (See Tong et al., 2013). The mean concentration of non-state domestic shareholder ownership in the top 10 firm shareholders was 43.46%, with a range from zero to 91.68% from 2007 to 2015. Table 8 also illustrates that the mean concentration of foreign ownership in the top 10 firm shareholders was only 1.94%, with a range from zero to 73.64%. The mean was considerably lower than 14% in Shan and McIver (2011) and slightly lower than the 4% result in Choi et al. (2011). The mean concentration of executive ownership in the top 10 firm shareholders was 1.38% over the 9 years, with a range from zero to 75%. This figure was higher than the 0.4% in Choi et al. (2011).

Finally, Table 8 also uncovers the CE variables. Over the nine-year period, the average R&D intensity was 4.83% of annual revenue which is slightly higher than Zhang et al. (2014) (4.36%) and the 4% in Zeng and Lin (2011). The average patent applied by firms over the nine-year (2007-2015) was about 71. This result is much more than the figure in Choi (2011) (firm applied for on average 5 patents in 2001). On average, the number of patents successfully awarded was about 84, which is more than that of IT firms in Taiwan from 2002-2005 (23, Chen et al., 2016).

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Table 8: Descriptive Statistics for Dependent and Independent Variables

	Number		Mean	Median	Std. Deviation	Skewness	Kurtosis	Minimum	Maximum	Percentiles		
	Valid	Missing								25	50	75
Firm specific factors												
Firm size	5118	0	7562.59	2339.7385	23328.4261	9.530	125.781	31.866	511630.691	1155.4023	2339.7385	5108.1243
Leverage	5101	17	.4158	.3968	.6848	58.544	3903.781	.0022	46.1594	.2280	.3968	.5617
Industry 1	5118	0	.04									
Industry 2	5118	0	.82									
Industry 3	5118	0	.12									
Industry 4	5118	0	.01									
Firm age	5118	0	9.30	8.00	6.043	.374	-.990	1	26	4.00	8.00	14.00
Firm performance												
ROA	5114	4	.0423	.0395	.0663	-.501	36.303	-.9250	1.0830	.014852	.0395	.0696
Tobin's Q	5073	45	2.6405	2.0098	2.4776	5.896	90.906	.1272	57.0002	1.179	2.0098	3.341
Corporate Governance Structures												
State ownership	5118	0	.0943	.0000	.1871	1.876	2.302	.0000	.8568	.0000	.0000	.03120
Domestic non-state ownership	5118	0	.4346	.4741	.2257	-.305	-1.000	.0000	.9168	.25600	.4741	.6146
Foreign ownership	5118	0	.0194	.0000	.0802	5.448	34.274	.0000	.7364	.000	.0000	.0000
Managerial ownership	5118	0	.0138	.0000	.0722	6.363	42.936	.0000	.7500	.000	.0000	.0000
Board size	5118	0	8.895	9.000	1.8303	.830	2.596	3.0	18.0	8.000	9.000	9.000
Independent director ratio	5118	0	.3685	.3300	.0545	1.319	2.575	.1100	.7500	.330	.3300	.4000
Supervisory board size	5118	0	3.766	3.000	1.2466	1.788	4.194	1.0	12.0	3.000	3.000	5.000
CEO duality	5118	0	.242									
Corporate Entrepreneurship												
R&D intensity	4907	211	.0483	.0334	.0592	3.392	18.231	.0000	.75618	.0118	.03335	.0589
Patent applications	5118	0	70.640	10.000	379.5713	18.967	462.586	0	11527	.000	10.000	37.000
Granted patents	5116	2	84.27	9.00	589.135	21.706	573.688	0	19444	1.00	9.00	38.00

Notes: This table presents a summary of statistics of Chinese listed firms during the financial years from 2007-2015, includes 5,118 firm-year observations between firms listed on the Shanghai or Shenzhen Stock exchanges. Industry 1 includes agriculture, forestry, mining, and construction; Industry 2 includes manufacturing; Industry 3 includes IT; and Industry 4 includes services, retail and wholesale, and diversified industries.

5.4.2 Normality Tests and Data Transformation

The importance of data normality for regression analysis was discussed in Section 6.2.2. This section reports the results of normality tests for both the dependent and the continuous independent variables.

The techniques used to reduce the influence of outliers are usually trimming and winsorising data (e.g. Yu and Ashton, 2015), which are commonly used techniques in corporate governance literature (Yu and Ashton, 2015; Coles et al., 2008). Winsorising or winsorisation is the transformation of statistics by limiting extreme values in the statistical data to reduce the effect of possibly spurious outliers. To winsorise the data, tail values are set equal to some specified percentile of the data. Winsorising is different from simply excluding data, called trimming. Through trimming, the extreme values are discarded. Winsorised estimators are usually more robust to outliers than their unwinsorised counterparts. Consistent with previous literature (e.g. Yu and Ashton, 2015; Coles et al., 2008), this thesis chose to winsorise data. The variables (leverage, foreign ownership, and managerial ownership) were winsorised at the 5th and 95th percentile because of the outliers. That is, values below the 5th percentile were set to the value at the 5th percentile, and values above the 95th percentile were set to the value at the 95th percentile. Using the same method, R&D intensity was winsorised at the 2.5th and 97.5th percentile because of the outliers. That is, values below the 2.5th percentile were set to the value at the 2.5th percentile, and values above the 97.5th percentile were set to the value at the 97.5th percentile. This thesis then used the natural logarithm of assets, supervisory board size, the number of patent applications, because of their positive skewness and strong deviation from normality. After transforming the data, the skewness and the kurtosis were close to ± 1.96 and ± 3 respectively, as indicated in Panel B in Table 9, which improved the normality.

Table 9: Data Transformations

		Mean	Median	Std. Deviation	Skewness	Kurtosis	KS test
Panel A: Untransformed Variables							
Firm size		7562.59	2339.74	23328.43	9.530	125.78	0.00
Leverage		.4158	.3968	.6848	58.544	3903.781	0.00
Firm age		9.30	8.00	6.043	.374	-.990	0.00
State ownership		.0943	.0000	.1871	1.876	2.302	0.00
Domestic non-state ownership		.4346	.4741	.2257	-.305	-1.000	0.00
Foreign ownership		.0194	.0000	.0802	5.448	34.274	0.00
Managerial ownership		.0138	.0000	.0722	6.363	42.936	0.00
Board size		8.895	9.000	1.8303	.830	2.596	0.00
Independent director ratio		.3685	.3300	.0545	1.319	2.575	0.00
Supervisory board size		3.766	3.000	1.2466	1.788	4.194	0.00
CEO duality		.242					0.00
R&D intensity		.0483	.0334	.0592	3.392	18.231	0.00
Patent applications		70.640	10.000	379.5713	18.967	462.586	0.00
Granted patents		84.27	9.00	589.135	21.706	573.688	0.00
Panel B: Transformed Variables							
Firm size	Ln	7.90	7.76	1.21	.85	1.15	0.00
Supervisory board size	Ln	1.28	1.10	.28	1.04	.471	0.00
Patent applications	Ln(x+1)	2.31	2.398	1.885	.367	-.522	0.00
Grant patents	Ln(x+1)	2.36	2.30	1.854	.430	-.290	0.00
Leverage	WS95	.4069	.3968	.24232	2.426	24.412	0.00
Foreign ownership	WS95	.0194	.0000	.08023	5.448	34.274	0.00
Managerial ownership	WS95	.0137	.0000	.07145	6.346	42.621	0.00
R&D intensity	WS97.5	.0483	.0334	.05926	3.392	18.23	0.00

Notes: Ln means natural logarithm of the variables; Ln (x+1) means natural logarithm plus a constant number of the variable, the constant is 1 in this thesis; WS95 means the variables were winsorised at the 5th and 95th percentile, that is values below the 5th percentile were set to the value at the 5th percentile, and values above 95th percentile were set to the value at 95th percentile; WS97.5 means the variables were winsorised at the 2.5th and 97.5th percentile, that is values below the 2.5th percentile were set to the value at the 2.5th percentile, and values above 97.5th percentile were set to the value at 97.5th percentile.

5.4.3 Univariate Analysis

5.4.3.1 Univariate Analysis: CE and CG

This section presents the results of the univariate correlations investigating the relationship between CE and the independent variables (Model 1). The correlation between CE and each independent variable provided a first understanding of how each independent variable is related to CE. In the previous section, the data was tested for normality and measures were taken, where appropriate, to obtain a more normal distribution of variables with normality violations. However, the data transformations were not perfectly achieving normal distribution. Therefore, the analysis was carried out on the transformed variables using the Spearman's rho correlations, which was

appropriate for not perfectly normally distributed data (Field, 2009). Table 10 shows the Spearman's rho correlations between CE variables and the independent variables.

Table 10 presents the correlations of CE with CG structure variables and firm specific variables. In Column 2, R&D intensity shows a significant negative relationship with firm size, leverage, firm age, state ownership, foreign ownership, board size, and supervisory board size, ($p < 0.01$) and a significant positive relationship with domestic non-state ownership, managerial ownership, independent director ratio, and CEO duality ($p > 0.01$). The number of patent applications (see Column 3) presents a significant positive relationship with firm size, leverage, domestic non-state ownership, foreign ownership, managerial ownership and independent director ratio ($p > 0.01$), and significant negative relationship with firm age, and state ownership ($p < 0.01$). There are positive but insignificant correlations found in domestic non-state ownership, and board size. Negative and insignificant correlations are found in supervisory board size and CEO duality. The number of granted patents (see Column 4) in Table 10 shows a significant positive relationship with firm size, leverage, domestic non-state ownership, foreign ownership, managerial ownership and board size ($p > 0.01$), and a significant negative relationship with firm age ($p < 0.01$). Positive but insignificant correlations are found in independent director ratio and supervisory board. Negative but insignificant correlations are found in state ownership and CEO duality.

Table 10: Correlations between CE and the Independent Variables for Model 1

CG structures and firm-specific factors	Model 1(a) R&D intensity	Model 1(b) Patent applications	Model 1(c) Granted patents
Firm size	-.217**	.271**	.256**
Leverage	-.403**	.071**	.058**
Firm age	-.394**	-.086**	-.096**
State ownership	-.241**	-.034*	-0.011
Domestic non-state ownership	.269**	0.023	.029*
Foreign ownership	-.054**	.065**	.104**
Managerial ownership	.148**	.076**	.074**
Board size	-.197**	0.017	.062**
Independent director ratio	.104**	.035*	0.007
Supervisory board size	-.249**	-0.012	0.02
CEO duality	.199**	-0.008	-0.026

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

5.4.3.2 Univariate Analysis: CG, CE and Firm Performance

This section presents the results of investigating the univariate correlations between firm performance and the independent variables for Model 2. Table 11 reports the correlations between firm performance and independent variables. There are two measurements for firm performance, one is ROA (see Column 2) and the other measurement is Tobin's Q (see Column 3). ROA presents a significant negative correlation with firm size, leverage, firm age, state ownership, and supervisory board size ($p < 0.01$), and a significant positive relationship with domestic non-state ownership, managerial ownership, CEO duality, R&D intensity, and the number of patent-applications ($p > 0.01$). However, the correlations in foreign ownership and the number of granted patents are positive but insignificant; the correlations in board size and independent director ratio are negative but insignificant. Tobin's Q presents a significant negative correlation with firm size, leverage, firm age, state ownership, foreign ownership, board size, supervisory board size, and patent applications, and granted patents ($p < 0.01$), and a significant positive

correlation with domestic non-state ownership, managerial ownership, independent director ratio, CEO duality, and R&D intensity ($p > 0.01$).

Table 11: Correlations between Firm Performance, CG, CE and Firm-specific Factors for Model 2

CG and firm-specific factors	Model 2 (a) ROA	Model 2 (b) Tobin's Q
Firm size	-.090**	-.526**
Leverage	-.377**	-.517**
Firm age	-.288**	-.340**
State ownership	-.077**	-.155**
Domestic non-state ownership	.233**	.253**
Foreign ownership	0.02	-.075**
Managerial ownership	.099**	.067**
Board size	-0.02	-.221**
Independent director ratio	-0.007	.071**
Supervisory board size	-.115**	-.236**
CEO duality	.075**	.164**
R&D intensity	.172**	.320**
Patent applications	.066**	-.144**
Granted patents	0.007	-.140**

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

5.4.4 Multiple Regression Analysis

Whilst the correlation analysis provided some insights into the relationship between CG, CE, firm performance, and firm specific factors variables, it cannot be concluded that relationships exist because the univariate analysis suffered from the omitted variables problem. In this case, the relationship observed might be a result of other variables not controlled for. In order to address this problem, multiple linear regression analysis was carried out.

5.4.4.1 Regression Assumptions

Multiple regression analysis is based on a number of assumptions to ensure the validity of the results. These assumptions were discussed in Chapter 5, including normality, linearity, homoscedasticity, and independence of error terms. In addition,

multicollinearity of the data must be ruled out. For regression analysis, the main problem was the multicollinearity amongst the independent variables. In Table 12, the Spearman's rho correlations amongst the independent variables are presented. The results reflect the fact that there were many significant relationships ($p < .01$) amongst the independent variables. Although the correlations were significant, all were below the threshold benchmark 0.8 (Gujarati and Porter, 2009, p.338). Therefore, multicollinearity was not considered to be a major problem.

In addition, the variance inflation factors (VIFs) for each independent variable were computed and analysed. Hair et al., (2006) noted that a common cut-off threshold is a tolerance value of 0.10, which corresponds to a VIF value of 10. Table 13 shows that the tolerance and VIF values of all the independent variables are not close to the recommended cut-off thresholds. The highest VIF in Model 1 (a), (b), and (c) were 3.103, 3.176, and 3.175 respectively. Also, the highest VIF in Model 2(a) and (b) were from non-state domestic ownership (3.124 and 3.113, respectively) (see Table 14). The VIFs for all independent variables were far below the critical value of 10 (Tabachnick and Fidell, 2007; Ryan et al., 2002), indicating that multicollinearity was not a major problem in the regression analyses.

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Table 12: Spearman's Rho Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Firm size	(1) 1												
Leverage	(2) .470**	1											
Firm age	(3) .440**	.468**	1										
State ownership	(4) .165**	.178**	.101**	1									
Domestic non-state ownership	(5) -.164**	-.283**	-.366**	-.617**	1								
Foreign ownership	(6) .120**	0.026	.049**	.075**	-.196**	1							
Managerial ownership	(7) -.185**	-.114**	-.241**	-.086**	-.099**	-.065**	1						
Board size	(8) .276**	.207**	.155**	.208**	-.138**	.049**	-.067**	1					
Independent director ratio	(9) -.033*	-.039**	-.086**	-.044**	.053**	-0.012	0.008	-.428**	1				
Supervisory board size	(10) .268**	.250**	.296**	.258**	-.230**	.049**	-.115**	.326**	-.094**	1			
CEO duality	(11) -.172**	-.161**	-.229**	-.179**	.166**	-.042**	.096**	-.211**	.113**	-.195**	1		
R&D intensity	(12) -.217**	-.403**	-.394**	-.241**	.269**	-.054**	.148**	-.197**	.104**	-.249**	.199**	1	
Patent applications	(13) .256**	.058**	-.096**	-0.011	.029*	.104**	.074**	.062**	0.007	0.02	-0.026	.247**	1
Granted patents	(14) .271**	.071**	-.086**	-.034*	0.023	.065**	.076**	0.017	.035*	-0.012	-0.008	.243**	.696**

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table 13: VIF Test for Model 1

	Model 1(a) R&D intensity		Model 1(b) Patent applications		Model 1(c) Granted patents	
	Tolerance	VIF	Tolerance	VIF	Tolerance	VIF
Firm size	.666	1.502	.663	1.507	.664	1.507
Leverage	.762	1.312	.766	1.305	.766	1.305
Firm age	.555	1.802	.554	1.803	.554	1.804
State ownership	.383	2.614	.370	2.702	.371	2.698
Domestic ownership	.322	3.103	.315	3.176	.315	3.175
Foreign ownership	.838	1.194	.836	1.196	.836	1.196
Managerial ownership	.746	1.341	.746	1.340	.746	1.340
Board size	.676	1.480	.680	1.471	.680	1.470
Independent director ratio	.819	1.221	.824	1.213	.825	1.213
Supervisory board size	.768	1.302	.771	1.296	.772	1.296
CEO duality	.895	1.117	.896	1.116	.896	1.116

Table 14: VIF Test for Model 2

	Model 2(a) ROA		Model 2(b) Tobin's Q	
	Tolerance	VIF	Tolerance	VIF
Firm size	.541	1.849	.540	1.852
Leverage	.733	1.364	.731	1.368
Firm age	.511	1.956	.513	1.949
State ownership	.376	2.659	.376	2.658
Domestic ownership	.320	3.124	.321	3.113
Foreign ownership	.833	1.201	.836	1.196
Managerial ownership	.743	1.347	.742	1.348
Board size	.676	1.480	.677	1.478
Independent director ratio	.816	1.226	.817	1.224
Supervisory board size	.766	1.305	.767	1.304
CEO duality	.892	1.121	.894	1.119
R&D intensity	.838	1.194	.838	1.194
Patent applications	.454	2.205	.453	2.206
Granted patents	.445	2.248	.444	2.250

With respect to the assumption of homoscedasticity, the widely used Breusch-Pagan test (null hypothesis: constant variance) and White tests (null hypothesis: homoscedasticity) was employed to detect the problem of heteroscedasticity. The findings of all three tests illustrated that the problem of heteroscedasticity existed (Prob > chi2 = 0.00) in Model 1(a), Model 1(b) and Model 1(c) (see Table 15), as well as in Model 2(a) and (b) (see Table 16). In addition, the Wooldridge Test (see Tables 17 and 18) was used in this thesis since it is the most common technique employed to detect

autocorrelation for panel data. The results of this test showed that the assumption of independence of the error terms was not met in all three sub models. The problem of autocorrelation cannot be handled using the fixed or random effects estimations. Arellano and Bond (1991) suggested that SGMM was a better estimation method to address the problem of autocorrelation and unobservable fixed effect problems for the dynamic panel data model. Therefore, SGMM becomes the main regression for all three models.

Table 15: Breusch-Pagan / Cook-Weisberg Test for Heteroscedasticity for Model 1

Ho: Constant variance		
Model 1 (a) R&D intensity	Model 1 (b) Patent applications	Model 1 (c) Granted patents
Variables: fitted values of R&D intensity	Variables: fitted values of patent application	Variables: fitted values of granted patent
Chi2(11) = 911.64	Chi2(11) = 375.24	Chi2(11) = 364.47
Prob > chi2 = 0.0000	Prob > chi2 = 0.0000	Prob > chi2 = 0.0000

Table 16: Breusch-Pagan / Cook-Weisberg Test for Heteroscedasticity for Model 2

Ho: Constant variance	
Model 2 (a) ROA	Model 2 (b) Tobin's Q
Variables: fitted values of ROA	Variables: fitted values of Tobin's Q
Chi2(14) = 1891.24	Chi2(14) = 2778.45
Prob > chi2 = 0.0000	Prob > chi2 = 0.0000

Table 17: Wooldridge Test for Autocorrelation in Panel Data for Model 1

Ho: No first-order autocorrelation		
Model 1 (a) R&D intensity	Model 1 (b) Patent applications	Model 1 (c) Granted patents
F(1, 667) = 40.181	F(1, 669) = 100.956	F(1, 669) = 60.211
Prob > F = 0.0000	Prob > F = 0.0000	Prob > F = 0.0000

Table 18: Wooldridge Test for Autocorrelation in Panel Data for Model 2

Ho: No first-order autocorrelation	
Model 2 (a) ROA	Model 2 (b) Tobin's Q
F(1, 667) = 2766.67	F(1, 628) = 2769.06
Prob > F = 0.0000	Prob > F = 0.0000

5.4.5 Multivariate Analysis

5.4.5.1 Multivariate Analysis: CE and CG

This section tests whether CE is related to CG in a multivariate setting, with industry controls. The industry was grouped into four based on CSRC classifications of industries.

In Table 19, Model 1 (a), (b), and (c) shows the main regression (SGMM) of CE on CG after controlling firm factors and industry.

The key exogeneity assumption in the relationship between CG and CE is that the firm's historical CG structures and firm-specific factors are exogenous with respect to CE. Arellano and Bond (1991) suggested two key tests of this assumption.

The first test is a test of second-order serial correlation. The main concern is whether or not the model estimation has included enough lags to control for the dynamic aspects of the empirical relationship. If it has, then any historical value of firm's CG structures beyond those lags is a potentially valid instrument since it will be exogenous to current CE data. Specifically, if the assumptions of the GMM IV (instrument variables) estimator were valid, then the residuals in the first differences (AR (1)) should be correlated but there should be no serial correlation in the second differences (AR (2)).

The second test is the Hansen Test of over-identification to detect the validity of the instruments in the models. The dynamic panel GMM estimator uses multiple lags as instruments, which means that the estimator is over-identified and provides an opportunity to carry out the test of over-identification (Hansen and Singleton, 1982). The Hansen Test yields a J-statistic which is distributed χ^2 under the null hypothesis of the validity of the instruments. This thesis performed the two specification tests (i.e. the tests of second-order serial correlation and over-identification) for the dynamic GMM estimates.

Table 19 reports the results when R&D intensity (see Column 2, Model 1 (a)), patent applications (see Column 3, Model 1 (b)) and granted patents (see Column 4, Model 1 (c)) as CE measures. One lag of CE has been included in the dynamic model. This makes historical CE, CG structures and historical firm characteristics, lagged two periods or more, available for use as instruments. The assumption in the SGMM

regression is that all the repressors except firm age and industry dummies are endogenous. The SGMM model enables the ability to estimate the linkage between CG and CE whilst including both historical data and fixed-effects to account for the dynamic aspects of the linkage between CG and CE and time-invariant unobservable heterogeneity, respectively.

In Table 19 with Model 1 (a), (b) and (c) report the results of the specification tests – the AR (2) second-order serial correlation tests and the Hansen J Test of over-identifying restrictions. The AR (2) Test yields a p-value of 0.64, 0.16, and 0.16 respectively, which means that the models cannot reject the null hypothesis of no second-order serial correlation. The results in Table 19 also reveal a J-statistic with a p-value of 0.56, 0.53, and 0.36, respectively, and as such, the models cannot reject the hypothesis of the validity of instruments for CE in Model 1 (a), (b) and (c) that are controlling the industry effects.

In addition, Table 19 also reports the results from a test of the exogeneity of a subset of the instruments. The SGMM estimator makes an additional exogeneity assumption: the assumption that any correlation between the endogenous variables and the unobserved (fixed) effect is constant over time. This is the assumption that enables the Models 1 (a), (b), and (c) to include the levels equations in the GMM estimates and use lagged differences as instruments for these levels. Eichenbaum, (1989) suggested that this assumption can be tested directly using a Difference-in-Hansen test of exogeneity. This test also yields a J-statistic which is distributed χ^2 under the null hypothesis that the subset of instruments that it is used in the levels equations are exogenous. The results in Table 19 show a p-value of 0.78, 0.19, and 0.19 respectively for the J-statistic produced by Difference-in-Hansen test. This implies that all three sub-models allow to a rejection of the hypothesis that the additional subset of instruments used in the system GMM estimates is indeed exogenous.

The results show that when the fixed-effects are included in a dynamic model and estimated via system GMM, the coefficient on firm size is significantly positive only in the two CE measures, patent applications and granted patents sub-models (0.188, corrected standard error = 0.0421 and 0.249, corrected standard error = 0.0400, respectively), both are significant at the 1% level. There was a significantly negative relationship between CE and leverage (-0.0608, corrected standard error = 0.0187), statistically significant at the 1% level only in R&D intensity sub-model. The coefficients of the CE and firm age were negative and statistically significant at the 1% level in the sub-models of patent applications and granted patents (-0.0413, corrected standard error = 0.007 and -0.0334, corrected standard error = 0.005, respectively). The state ownership is significantly and negatively related to the CE at the 10% level in the patent applications sub-model (-0.602, corrected standard error = 0.341), and at 1% level in the granted patents sub-model (-0.697, corrected standard error = 0.238). There is a significantly positive relationship between CE and foreign ownership, statistically significant at the 1% level in the patent applications sub-model (1.461, corrected standard error = 0.532). Executive ownership was negatively related to the R&D intensity sub-model at the 10% level (-0.073, corrected standard error = 0.043), but was positively related to the patent applications sub-model at the 1% level (1.494, corrected standard error = 0.469), and positively related to granted patents at the 5% level (0.763, corrected standard error = 0.307). The coefficients on board size were positively related to the R&D intensity sub-model (0.005, corrected standard error = 0.003) at the 10% level, but negatively related to the granted patents sub-model (-0.0698, corrected standard error = 0.0135) at the 1% level. A significantly negative relationship between independent director ratio can only be found in the granted patents sub-model (-1.177, corrected standard error = 0.660) at 10% level. The supervisory board size was positively related to the CE only in the patent applications sub-model (0.762, corrected standard error = 0.241) at the 1% level. The

coefficient of CEO duality was positively and significant at the 5% level in only the R&D intensity sub-model (0.014, corrected standard error = 0.087).

Table 19: The Relationship between CE and CG

CG structures & firm-specific factors	Model 1 (a)	Model 1 (b)	Model 1 (c)
	R&D intensity	Patent applications	Granted patents
Firm size	-0.00218 (0.00320)	0.188*** (0.0421)	0.249*** (0.0400)
Leverage	-0.0608*** (0.0187)	0.183 (0.208)	0.0987 (0.170)
Firm age	0.000219 (0.000560)	-0.0413*** (0.00681)	-0.0334*** (0.00543)
State ownership	0.00149 (0.0271)	-0.602* (0.341)	-0.697*** (0.238)
Domestic non-state ownership	-0.00808 (0.0245)	-0.0152 (0.307)	-0.219 (0.218)
Foreign ownership	-0.0315 (0.0335)	1.461*** (0.532)	0.513 (0.335)
Managerial ownership	-0.0734* (0.0433)	1.494*** (0.469)	0.763** (0.307)
Board size	0.00547* (0.00325)	-0.0260 (0.0353)	-0.0698** (0.0315)
Independent direct ratio	0.0138 (0.0871)	-0.115 (1.197)	0.307 (0.958)
Supervisory board size	0.00171 (0.0196)	0.762*** (0.241)	0.152 (0.181)
CEO duality	0.0153** (0.00758)	-0.125 (0.115)	-0.0265 (0.0826)
Industry included	Yes	Yes	Yes
Lagged dependent variables included	Yes	Yes	Yes
Constant	0.0209 (0.0485)	-0.642 (0.661)	-0.482 (0.561)
Observations	4,135	4,393	4,390
Number of code	668	687	687
AR (1) (p-value)	0.00	0.00	0.00
AR (2) (p-value)	0.64	0.16	0.16
Hansen Test of over-identification (p-value)	0.56	0.53	0.36
Diff-in-Hansen Tests of exogeneity (p-value)	0.78	0.19	0.19

Notes: The table reports regression coefficients and corrected standard errors (in parentheses). *, **, *** represent significance at the 1%, 5%, and 10% level, respectively. AR (1) and AR (2) are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen Test over-identifications under the null that all instruments are valid. The Diff-in-Hansen Test of exogeneity is under the null that instruments used for the equations in levels are exogenous.

5.4.5.2 Multivariate Analysis: CG, CE and Firm Performance

The main aim of Model 2 was to analyse the relationship between CG, CE, and firm performance in Chinese listed firms. The industry was grouped into four based on CSRC classifications of industries.

In Table 20, in columns labelled Model (1) to Model (6) showed the main regression (SGMM) of the relationship between CE, CG structures and firm performance after controlling firm-specific factors and industry dummy.

Table 20 Model (1) to (3) reports the results when Tobin's Q is used as the firm performance measurement, Models (4) to (6) report the results when ROA is used as the firm performance measurement. One lag of performance has been included in the dynamic model. This makes historical CE, CG structures and historical firm characteristics, lagged two periods or more, available for use as instruments. The assumption in the SGMM regression is that all the variables except firm age and industry dummies are endogenous. The SGMM Model enables the relationship between CG, CE and firm performance to be estimated whilst including both historical data and fixed-effects to account for the dynamic aspects and time-invariant unobservable heterogeneity, respectively.

In Table 20, Models (1) to (6) report the results of the specification tests – the AR (2) second-order serial correlation tests and the Hansen J Test of over-identifying restrictions. The lowest AR (2) test across all six columns yields a p-value of 0.211, which means that the model cannot reject the null hypothesis of no second-order serial correlation. The results in Table 20 also reveal a J-statistic with the lowest p-value of 0.111, and as such, the models cannot reject the hypothesis of the validity of instruments for CE in Table 20 that is controlling the industry effects.

In addition, Table 20 also reports the results from a test of the exogeneity of a subset of the instruments. The SGMM estimator makes an additional exogeneity assumption: the assumption that any correlation between the endogenous variables and the unobserved (fixed) effect is constant over time. This is the assumption that enables Models (1) to (6) to include the levels equations in the GMM estimates and use lagged differences as instruments for these levels (Eichenbaum, 1989). The results in Table 20 show the lowest p-value of 0.146 for the J-statistic produced by Difference-in-Hansen test. This implies that all models reject the hypothesis that the additional subset of instruments used in the system GMM estimates is indeed exogenous.

After the estimation method was decided, the multivariate analysis was developed to address the second and third objectives of this thesis, of whether there was a relationship between CG, CE and firm performance amongst Chinese listed firms after controlling firm-specific factors.

In the Models (1), (2) and (3) for Tobin's Q as a measurement of firm performance, the coefficient on firm size was insignificantly positive (0.330, 0.478, and 0.261, corrected standard error = 0.257, 0.315, and 0.337, respectively). The coefficients of the leverage and performance (Tobin's Q) were positive and statistically insignificant in Models (1) and (3) (1.524, and 0.243, corrected standard error = 1.469, and 1.296, respectively) and negative but insignificant in Model (2) (-0.723, corrected standard error = 1.468). The firm age was positive and statistically insignificant in Models (1) and (3) (0.00359, and 0.00803, corrected standard error = 0.0357, and 0.0314, respectively) and negative but insignificant in Model (2) (-0.0392, corrected standard error = 1.388). The coefficient on the state ownership was insignificant and positive in Model (1) (2.234, corrected standard error = 1.540), but significantly positive, statistically significant in Models (2) and (3) (3.202, and 4.653, corrected standard error = 1.606 and 1,646,

respectively). There was a positive but insignificant relationship between non-state domestic ownership and Tobin's Q (0.991, 1.496, and 2.109, corrected standard error = 1.533, 1.622, and 1.519, respectively). Foreign ownership was negatively related to the performance (-1.723, -0.611 and -0.658, corrected standard error = 2.363, 2.336 and 2.661, respectively) but statistically insignificant. Managerial ownership was statistically insignificant in Models (1) and (2) (-3.798 and 1.464, corrected standard error = 2.370, and 2.933, respectively) and negative and significant in Model (3) (-8.431, corrected standard error = 2.612).

The coefficients of the board size and firm performance (Tobin's Q) were negative and statistically significant at the 1% level (-0.679, -0.619 and -0.698, corrected standard error = 0.224, 0.214, and 0.202, respectively). The independent director ratio was negatively related to firm performance (-11.12, -2.682, and -4.434, corrected standard error = 6.701, 7.044, and 5.889, respectively, but only Model (1) was significant at the 10% level. The coefficients of the supervisory board size and firm performance were negative and statistically significant at the 1% level (-4.874, -5.363, and -5.432, corrected standard error = 1.607, 1.424, and 1.746, respectively). CEO duality was negatively significant related to Tobin's Q (-2.118, -1.539 and -1.489, corrected standard error = 0.604, 0.658 and 0.603, respectively). The coefficients of R&D intensity and firm performance were positive and statistically significant at the 5% level (8.917, corrected standard error = 3.370). The number of patent applications was negatively related to the performance (Tobin's Q) (-0.738, corrected standard error = 0.150) at the 1% level. There is a negative but insignificant relationship between the number of granted patent and Tobin's Q (-0.213, corrected standard error = 0.153).

When firm performance was measured as ROA, the results in Models (4), (5) and (6) showed that when the fixed effects are included in a dynamic model and estimated

through SGMM, the coefficient on firm size is insignificantly positive (0.00289, 0.00387, and 0.00275, corrected standard error = 0.00279, 0.00337, and 0.00205, respectively) when the measurement for firm performance was ROA. The coefficients of the leverage and performance were negative and statistically significant at the 1% level (-0.0651, -0.0751, and -0.0518, corrected standard error = 0.0150, 0.0217, and 0.0120, respectively). The firm age was negatively related to performance (-0.000581, -0.000989, and -0.00172, corrected standard error = 0.000447, 0.000480, and 0.000279, respectively), only Models (5) and (6) were significant at the 5% and the 1% level. State ownership was positively related to the performance (0.0845, 0.0385, and 0.00866, corrected standard error = 0.0194, 0.0222, and 0.0171, respectively), only Model (6) is not significant. The coefficient on domestic non-state domestic ownership was positively related to ROA (0.0653, 0.0191, and 0.0134, corrected standard error = 0.0191, 0.0227, and 0.0135, respectively), Model (4) is significant at the 1% level. The coefficient on foreign ownership was insignificant related to firm performance (0.0108, -0.0285, and -0.0515, corrected standard error = 0.0292, 0.0375, and 0.0518, respectively). There was a significant positive relationship between managerial ownership and performance, and all statistically significant (0.119, 0.0727, and 0.0507, corrected standard error = 0.0249, 0.0297, and 0.0184, respectively). The board size was positively significant related to ROA (0.00399, 0.00586, and 0.00652, corrected standard error = 0.00224, 0.00257, and 0.00206, respectively). The coefficients of the independent director ratio were significantly negative (-0.160 and -0.146, corrected standard error = 0.0765 and 0.0519) and Model (4) was positive but not significant. Supervisory board size (-0.0082, 0.0211, and -0.0174, corrected standard error = 0.0144, 0.0182, and 0.0147, respectively) was negative and statistically insignificant. CEO duality (0.00342, -0.00194, and -0.0243, corrected standard error = 0.00628, 0.00918, and 0.00866, respectively) was only significant in Model (6). R&D intensity was significantly negative related to performance

(ROA) (-0.0699, corrected standard error = 0.0424). The number of patent applications was insignificantly positive related to ROA (0.00214, corrected standard error = 0.00194). The relationship between the number of granted patents and ROA was insignificantly negative related (-0.00149, corrected standard error = 0.00113).

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Table 20: The Relationship between CE and Firm Performance

Dependent variables	Tobin's Q			ROA		
	Model (1) R&D intensity	Model (2) Patent applications	Model (3) Granted patents	Model (4) R&D intensity	Model (5) Patent applications	Model (6) Granted patents
Corporate entrepreneurship variables						
R&D intensity	8.917*** (3.370)			-0.0699* (0.0424)		
Patent applications		-0.738*** (0.150)			0.00214 (0.00194)	
Granted patents			-0.213 (0.153)			-0.00149 (0.00113)
Corporate governance variables						
Board size	-0.679*** (0.224)	-0.619*** (0.214)	-0.698*** (0.202)	0.00399* (0.00224)	0.00586** (0.00257)	0.00652*** (0.00206)
Independent directors' ratio	-11.12* (6.701)	-2.682 (7.044)	-4.434 (5.889)	0.0587 (0.0619)	-0.160** (0.0765)	-0.146*** (0.0519)
No. of supervisors	-4.874*** (1.607)	-5.363*** (1.424)	-5.432*** (1.746)	-0.00820 (0.0144)	-0.0211 (0.0182)	-0.0174 (0.0147)
CEO duality	-2.118*** (0.604)	-1.539** (0.658)	-1.489** (0.603)	0.00342 (0.00628)	-0.00194 (0.00918)	-0.0243*** (0.00866)
State ownership	2.234 (1.540)	3.202** (1.606)	4.653*** (1.646)	0.0845*** (0.0194)	0.0385* (0.0222)	0.000861 (0.0171)
Foreign ownership	-1.723 (2.363)	-0.611 (2.336)	-0.658 (2.661)	0.0108 (0.0292)	-0.0285 (0.0375)	-0.0515 (0.0518)
Managerial ownership	-3.798 (2.370)	1.464 (2.933)	-8.431*** (2.612)	0.119*** (0.0249)	0.0727** (0.0297)	0.0507*** (0.0184)
Domestic non-state ownership	0.991 (1.533)	1.496 (1.622)	2.109 (1.519)	0.0653*** (0.0191)	0.0191 (0.0227)	0.0134 (0.0135)
Control variables						
Firm size	0.330 (0.257)	0.478 (0.315)	0.261 (0.337)	0.00289 (0.00279)	0.00387 (0.00337)	0.00275 (0.00205)
Leverage	1.524 (1.469)	-0.723 (1.468)	0.243 (1.296)	-0.0651*** (0.0150)	-0.0751*** (0.0217)	-0.0518*** (0.0120)
Firm age	0.00359 (0.0357)	-0.0392 (0.0388)	0.00803 (0.0314)	-0.000581 (0.000447)	-0.000989** (0.000480)	-0.00172*** (0.000279)
Industry dummies	Included	Included	Included	Included	Included	Included
Constant	13.86*** (3.847)	15.80*** (4.115)	11.91*** (3.455)	-0.0323 (0.0390)	0.0921** (0.0441)	0.0906*** (0.0280)
Observations	4,206	5,057	3,666	4,886	5,097	5,095
Number of firms	686	703	669	709	709	709
AR (1) test (p-value)	0.038	0.005	0.034	0.000	0.000	0.000
AR (2) test (p-value)	0.211	0.403	0.560	0.375	0.626	0.488
Hansen test of over-identification (p-value)	0.190	0.183	0.066	0.304	0.011	0.065
Diff-in-Hansen tests of exogeneity (p-value)	0.253	0.668	0.512	0.146	0.159	0.186

Notes: The table reports regression coefficients and corrected standard errors (in parentheses). *, **, *** represent significance at the 1%, 5%, and 10% level, respectively. AR (1) and AR (2) are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen Test over-identifications under the null hypothesis that all instruments are valid. The Diff-in-Hansen test of exogeneity is under the null that instruments used for the equations in levels are exogenous.

5.4.5.3 Multivariate Analysis: Moderating Effects

Table 21 to Table 26 show the results of the moderating effects of CG on the relationship between CE (R&D intensity, patent applications and granted patents) and firm performance (Tobin's Q and ROA) after controlling firm-specific factors and industry dummies.

There are three differing perspectives on the effect of CG structures on a firm's propensity to be entrepreneurial. The first perspective views CG structures as constraining CE because measures impede R&D intensity, the number of patent applications, and the number of granted patents. For example, in Table 21 Model (6) when firm performance is measured as Tobin's Q, firms performed better but R&D intensity was impeded when firms have a larger board; and the number of granted patents was impeded when firms have a higher proportion of independent directors on the board of directors (See Table 24, Model (6)). When firm performance is measured as ROA, a firm performs better but patent applications was impeded when firms have split the CEO and chairman roles (See Table 25, Model (6)).

The second perspective views CG structures as helping CE because measures trigger R&D investment, the number of patent applications, and the number of granted patents. For example, in Table 21 Model (6), when firm performance is measured as Tobin's Q, a firm performs better and R&D intensity was triggered when firms have a combined role of CEO and chairman; the number of patent applications was triggered when firms have a larger board and supervisory board size and a combined role of CEO and chairman (see Table 22, Model (6)); and the number of granted patents was triggered when firms have a larger supervisory board (see Table 23, Model (6)). When firm performance is measured as ROA, a firm performs better, and the number of patent

applications was triggered when firms have a separation role between CEO and chairman (see Table 25, Model (6)).

The third perspective views CG structures as having insignificant or little impact on CE because it is used primarily for signalling. When firm performance is measured as Tobin's Q, Independent directors' ratio and supervisory board size do not or have little impact on the relationship between R&D intensity and firm performance (see Table 21, Model (6)); the independent directors' ratio does not moderate the relationship between patent applications and firm performance (see Table 22, Model (6)); the size of the board of directors and supervisors, CEO duality does not moderate the relationship between granted patents and Tobin's Q. When firm performance is measured as ROA, board size, supervisory board size, independent directors' ratio, and CEO duality do not play a moderation role on the relationship between R&D intensity and firm performance (see Table 24, Model (6)); both the board of directors and supervisors, and independent directors' ratio do not moderate the linkage between CE and firm performance when CE is measured by patent applications (see Table 25, Model (6)); and board size, independent directors' ratio, and CEO duality do not moderate the relationship between granted patents and ROA (see Table 26, Model (6)).

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Table 21: The Relationship between CG, R&D Intensity and Tobin's Q

Dependent variables: Tobin's Q	Model (1)	Model (2) Board size	Model (3) Independent directors' ratio	Model (4) No. of supervisors	Model (5) CEO duality	Model (6) Whole
Corporate entrepreneurship variables (main effects)						
R&D intensity	8.917*** (3.370)	8.406** (3.890)	11.17*** (3.861)	13.64*** (3.596)	7.690** (3.048)	6.523** (2.869)
Corporate governance variables						
Board size	-0.583*** (0.217)	-0.326* (0.189)	-0.356 (0.238)	-0.489** (0.213)	-0.216* (0.129)	-0.0599 (0.100)
Independent directors' ratio	-10.05 (6.624)	0.649 (6.260)	-0.305 (6.139)	-4.571 (6.155)	8.896** (4.002)	8.677** (3.633)
No. of supervisors	-5.729*** (1.571)	-5.560*** (1.467)	-5.236*** (1.605)	-3.622** (1.440)	-2.386*** (0.688)	-1.385** (0.627)
CEO duality	-1.918*** (0.549)	-0.621 (0.670)	-1.636*** (0.611)	-1.442*** (0.530)	-0.969** (0.432)	-0.244 (0.460)
State ownership	2.234 (1.540)	4.598*** (1.500)	1.692 (1.502)	1.123 (1.521)	-0.222 (1.068)	2.391** (1.087)
Foreign ownership	-1.723 (2.363)	-0.353 (2.150)	-1.856 (2.361)	-1.322 (2.277)	-0.647 (1.852)	1.331 (1.655)
Managerial ownership	-3.798 (2.370)	-4.915* (2.939)	-4.307* (2.423)	-4.202 (2.747)	-2.123 (1.462)	-0.145 (1.243)
Domestic non-state ownership	0.991 (1.533)	2.322 (1.490)	0.842 (1.433)	0.459 (1.495)	0.445 (1.034)	2.208** (1.036)
Moderation effects						
R&D intensity * Board size	-	-3.555* (1.881)	-	-	-	-3.352** (1.391)
R&D intensity * Independent directors' ratio	-	-	-19.72 (66.92)	-	-	-41.12 (40.31)
R&D intensity * No. of supervisors	-	-	-	9.012 (22.75)	-	19.57* (11.00)
R&D intensity * CEO duality	-	-	-	-	10.93* (6.372)	11.30** (5.394)
Control variables						
Firm size	0.330 (0.257)	-0.202 (0.262)	0.124 (0.235)	0.300 (0.238)	-0.221 (0.160)	-0.766*** (0.167)
Leverage	1.524 (1.469)	0.658 (1.248)	1.842 (1.227)	2.015 (1.484)	1.120 (0.736)	-0.838 (0.971)
Firm age	0.00359 (0.0357)	0.0184 (0.0358)	0.00942 (0.0350)	-0.0132 (0.0346)	0.0325 (0.0215)	0.0613*** (0.0217)
Industry dummies	Included	Included	Included	Included	Included	Included
Constant	13.86*** (3.847)	9.220*** (3.568)	9.511*** (2.407)	4.531 (3.429)	4.252* (2.235)	7.243*** (1.065)
Observations	4,846	4,846	4,846	4,846	4,846	4,206
Number of firms	703	703	703	703	703	686
AR (1) test (p-value)	0.038	0.000	0.054	0.050	0.060	0.000
AR (2) test (p-value)	0.211	0.065	0.032	0.041	0.057	0.079
Hansen test of over-identification (p-value)	0.190	0.245	0.234	0.212	0.145	0.532
Diff-in-Hansen tests of exogeneity (p-value)	0.253	0.568	0.200	0.143	0.200	0.627

Notes: The table reports regression coefficients and corrected standard errors (in parentheses). *, **, *** represent significance at the 1%, 5%, and 10% level, respectively. AR (1) and AR (2) are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen Test over-identifications under the null hypothesis that all instruments are valid. The Diff-in-Hansen test of exogeneity is under the null that instruments used for the equations in levels are exogenous.

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Table 22: The Relationship between CG, Patent Applications and Tobin's Q

Dependent variables: Tobin's Q	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
		Board size	Independent directors' ratio	No. of supervisors	CEO duality	Whole
Corporate Entrepreneurship variables (main effects)						
Patent applications	-0.738*** (0.150)	-0.609*** (0.172)	-0.629*** (0.183)	-0.585*** (0.194)	-0.705*** (0.221)	-0.838*** (0.209)
Corporate Governance variables (moderators)						
Board size	-0.616*** (0.201)	-0.725*** (0.237)	-0.860*** (0.248)	-0.715*** (0.249)	-0.847*** (0.254)	-0.526*** (0.196)
Independent directors' ratio	-5.857 (7.134)	-0.0981 (7.439)	0.916 (6.102)	5.879 (6.689)	-4.571 (7.841)	6.154 (6.167)
No. of supervisors	-6.039*** (1.481)	-4.205** (1.926)	-4.054** (1.879)	-4.016** (1.826)	-4.498** (1.947)	-3.391** (1.575)
CEO duality	-1.465** (0.611)	-2.481** (1.022)	-2.719*** (1.013)	-2.687*** (1.012)	-2.012** (0.799)	-1.595** (0.758)
State ownership	3.202** (1.606)	3.948* (2.217)	3.460 (2.156)	4.020** (2.042)	4.497** (2.256)	2.478 (2.153)
Foreign ownership	-0.611 (2.336)	-3.955 (8.380)	1.623 (7.385)	-2.976 (5.353)	-2.661 (7.191)	1.344 (6.083)
Managerial ownership	1.464 (2.933)	-3.783 (3.158)	-3.393 (3.141)	-4.539 (3.009)	-4.178 (3.438)	-4.385 (2.990)
Domestic non-state ownership	1.496 (1.622)	2.535 (2.068)	2.281 (2.069)	2.375 (1.909)	2.957 (1.948)	2.092 (1.901)
Moderation effects						
Patent applications * Board size	-	0.238** (0.0946)	-	-	-	0.204*** (0.0713)
Patent applications * Independent directors' ratio	-	-	0.377 (2.007)	-	-	-0.466 (1.721)
Patent applications * No. of supervisors	-	-	-	1.347*** (0.515)	-	1.135** (0.511)
Patent applications * CEO duality	-	-	-	-	0.647* (0.359)	0.862** (0.353)
Control variables						
Firm size	0.478 (0.315)	0.383 (0.307)	0.496 (0.309)	0.249 (0.303)	0.458 (0.322)	0.319 (0.287)
Leverage	-0.723 (1.468)	-3.792** (1.606)	-3.682** (1.684)	-2.723 (1.787)	-3.146* (1.733)	-3.145* (1.634)
Firm age	-0.0392 (0.0388)	-0.0185 (0.0405)	-0.0246 (0.0417)	-0.0257 (0.0413)	-0.0126 (0.0423)	-0.0219 (0.0390)
Industry dummies	Included	Included	Included	Included	Included	Included
Constant	15.80*** (4.115)	5.812 (4.724)	12.50*** (2.815)	5.434 (4.039)	14.17*** (4.637)	0.677 (2.189)
Observations	5,057	5,057	5,057	5,057	5,057	5,057
Number of firms	703	703	703	703	703	703
AR (1) test (p-value)	0.005	0.000	0.001	0.001	0.001	0.000
AR (2) test (p-value)	0.403	0.073	0.360	0.300	0.043	0.065
Hansen test of over-identification (p-value)	0.183	0.129	0.131	0.122	0.121	0.135
Diff-in-Hansen tests of exogeneity (p-value)	0.668	0.160	0.036	0.165	0.090	0.120

Notes: The table reports regression coefficients and corrected standard errors (in parentheses). *, **, *** represent significance at the 1%, 5%, and 10% level, respectively. AR (1) and AR (2) are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen Test over-identifications under the null hypothesis that all instruments are valid. The Diff-in-Hansen test of exogeneity is under the null that instruments used for the equations in levels are exogenous.

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Table 23: The Relationship between CG, Granted Patents and Tobin's Q

Dependent variables: Tobin's Q	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
		Board size	Independent directors' ratio	No. of supervisors	CEO duality	Whole
CE variables (main effects)						
Granted patents	-0.213 (0.153)	-0.151 (0.197)	0.0662 (0.161)	-0.236 (0.176)	-0.0434 (0.206)	-0.248 (0.215)
CG variables						
Board size	-0.601*** (0.189)	-0.311 (0.224)	-0.408* (0.226)	-0.542*** (0.195)	-0.469** (0.236)	-0.370* (0.217)
Independent directors' ratio	-2.510 (5.519)	2.425 (5.770)	7.861 (5.725)	9.068 (5.772)	-1.881 (6.918)	10.70* (6.007)
No. of supervisors	-5.403*** (1.493)	-6.683*** (1.850)	-5.758*** (1.673)	-4.661*** (1.215)	-6.728*** (1.800)	-5.152*** (1.225)
CEO duality	-1.294** (0.533)	-1.099* (0.642)	-1.657*** (0.604)	-1.013* (0.609)	-1.656*** (0.518)	-0.723 (0.565)
State ownership	4.653*** (1.646)	3.832** (1.715)	1.493 (1.526)	3.236** (1.498)	2.298 (1.752)	3.426** (1.572)
Foreign ownership	-0.658 (2.661)	-3.253 (2.837)	-5.073 (3.174)	-0.916 (2.490)	-4.208 (3.338)	-0.932 (2.639)
Managerial ownership	-8.431*** (2.612)	-4.527* (2.477)	-4.640** (2.166)	-5.153** (2.310)	-4.271* (2.303)	-2.275 (2.329)
Domestic non-state ownership	2.109 (1.519)	1.796 (1.714)	0.776 (1.528)	1.818 (1.470)	1.329 (1.739)	1.821 (1.578)
Moderation effects						
Granted patents * Board size	-	0.0495 (0.0822)	-	-	-	0.0214 (0.0743)
Granted patents * Independent directors' ratio	-	-	-2.390 (1.944)	-	-	-4.399** (1.895)
Granted patents * No. of supervisors	-	-	-	0.986*** (0.297)	-	0.925** (0.383)
Granted patents * CEO duality	-	-	-	-	0.351 (0.329)	0.326 (0.378)
Control variables						
Firm size	0.261 (0.337)	0.0971 (0.432)	-0.0221 (0.376)	0.275 (0.413)	0.0937 (0.402)	0.176 (0.430)
Leverage	0.243 (1.296)	-1.516 (1.406)	-0.278 (1.354)	-1.393 (1.247)	0.00683 (1.385)	-1.653 (1.441)
Firm age	0.00803 (0.0314)	0.00761 (0.0413)	0.0429 (0.0364)	-0.0199 (0.0387)	0.0443 (0.0399)	-0.00135 (0.0391)
Industry dummies	Included	Included	Included	Included	Included	Included
Constant	11.91*** (3.455)	9.043** (4.269)	12.49*** (2.915)	1.727 (4.374)	13.55*** (4.423)	0.850 (3.171)
Observations	5,055	5,055	5,055	5,055	5,055	5,055
Number of firms	703	703	703	703	703	703
AR (1) test (p-value)	0.005	0.000	0.001	0.001	0.001	0.000
AR (2) test (p-value)	0.403	0.073	0.360	0.300	0.043	0.065
Hansen test of over-identification (p-value)	0.183	0.129	0.131	0.122	0.121	0.135
Diff-in-Hansen tests of exogeneity (p-value)	0.668	0.160	0.036	0.165	0.090	0.120

Notes: The table reports regression coefficients and corrected standard errors (in parentheses). *, **, *** represent significance at the 1%, 5%, and 10% level, respectively. AR (1) and AR (2) are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen Test over-identifications under the null hypothesis that all instruments are valid. The Diff-in-Hansen test of exogeneity is under the null that instruments used for the equations in levels are exogenous.

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Table 24: The Relationship between CG, R&D Intensity and ROA

Dependent variables: ROA	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
		Board size	Independent directors' ratio	No. of supervisors	CEO duality	Whole
Corporate Entrepreneurship variables (main effects)						
R&D intensity	-0.0699* (0.0424)	-0.00631 (0.0668)	0.0391 (0.0627)	0.0540 (0.0685)	-0.0382 (0.0385)	-0.0456 (0.0381)
Corporate Governance variables						
Board size	0.00399* (0.00224)	0.00258 (0.00329)	0.00182 (0.00392)	0.00143 (0.00423)	0.00220 (0.00211)	0.00451** (0.00195)
Independent directors' ratio	0.0587 (0.0619)	-0.0497 (0.123)	-0.0393 (0.109)	-0.0381 (0.126)	0.0648 (0.0599)	0.0383 (0.0541)
No. of supervisors	-0.00820 (0.0144)	-0.0213 (0.0251)	-0.0160 (0.0240)	-0.0128 (0.0227)	-0.00159 (0.0130)	-0.0113 (0.0125)
CEO duality	0.00342 (0.00628)	-0.00890 (0.0104)	-0.00760 (0.0109)	-0.00840 (0.0110)	-0.00483 (0.00658)	-0.000279 (0.00633)
State ownership	0.0845*** (0.0194)	0.0969*** (0.0231)	0.0901*** (0.0225)	0.0920*** (0.0231)	0.0657*** (0.0156)	0.0730*** (0.0177)
Foreign ownership	0.0108 (0.0292)	0.0373 (0.0360)	0.0224 (0.0372)	0.0194 (0.0353)	0.00984 (0.0224)	0.00709 (0.0262)
Managerial ownership	0.119*** (0.0249)	0.176*** (0.0404)	0.168*** (0.0403)	0.179*** (0.0413)	0.0999*** (0.0238)	0.124*** (0.0247)
Domestic non-state ownership	0.0653*** (0.0191)	0.0996*** (0.0228)	0.0892*** (0.0227)	0.0898*** (0.0228)	0.0513*** (0.0160)	0.0570*** (0.0181)
Moderation effects						
R&D intensity * Board size	-	-0.00882 (0.0256)	-	-	-	-0.00321 (0.0174)
R&D intensity * Independent directors' ratio	-	-	1.090 (1.223)	-	-	0.120 (0.574)
R&D intensity * No. of supervisors	-	-	-	0.0955 (0.310)	-	0.0593 (0.167)
R&D intensity * CEO duality	-	-	-	-	0.0955 (0.0741)	0.0354 (0.0746)
Control variables						
Firm size	0.00289 (0.00279)	-5.10e-06 (0.00359)	-0.00193 (0.00393)	-0.00192 (0.00397)	0.00241 (0.00255)	0.00189 (0.00268)
Leverage	-0.0651*** (0.0150)	-0.0191 (0.0232)	0.0326 (0.0306)	0.0265 (0.0325)	-0.0417** (0.0164)	-0.0658*** (0.0143)
Firm age	-0.000581 (0.000447)	-0.000493 (0.000523)	-0.000581 (0.000486)	-0.000506 (0.000453)	-0.000481 (0.000356)	-0.000523 (0.000409)
Industry dummies	Included	Included	Included	Included	Included	Included
Constant	-0.0323 (0.0390)	0.0473 (0.0593)	-0.00389 (0.0337)	-0.00478 (0.0708)	-0.0367 (0.0373)	0.0248 (0.0215)
Observations	4,886	4,886	4,886	4,886	4,886	4,886
Number of C	709	709	709	709	709	709
AR (1) test (p-value)	0.005	0.000	0.001	0.001	0.001	0.000
AR (2) test (p-value)	0.403	0.073	0.360	0.300	0.043	0.065
Hansen test of over-identification (p-value)	0.183	0.129	0.131	0.122	0.121	0.135
Diff-in-Hansen tests of exogeneity (p-value)	0.668	0.160	0.036	0.165	0.090	0.120

Notes: The table reports regression coefficients and corrected standard errors (in parentheses). *, **, *** represent significance at the 1%, 5%, and 10% level, respectively. AR (1) and AR (2) are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null hypothesis of no serial correlation. The Hansen Test over-identifications under the null that all instruments are valid. The Diff-in-Hansen test of exogeneity is under the null that instruments used for the equations in levels are exogenous.

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Table 25: The Relationship between CG, Patent Applications and ROA

Dependent variables: ROA	Model (1)	Model (2) Board size	Model (3) Independent directors' ratio	Model (4) No. of supervisors	Model (5) CEO duality	Model (6) Whole
Corporate Entrepreneurship variables (main effects)						
Patent applications	0.00214 (0.00194)	0.00590** (0.00266)	0.00321 (0.00270)	0.00434 (0.00270)	0.00788*** (0.00304)	0.00782** (0.00332)
Corporate Governance variables						
Board size	0.00397 (0.00252)	0.00529 (0.00382)	0.00614 (0.00412)	0.00611 (0.00388)	0.00584 (0.00418)	0.00626 (0.00388)
Independent directors' ratio	-0.187*** (0.0672)	-0.0990 (0.115)	-0.0191 (0.114)	-0.142 (0.122)	-0.140 (0.122)	-0.0929 (0.118)
No. of supervisors	-0.0195 (0.0176)	-0.000216 (0.0285)	0.0165 (0.0276)	-0.00125 (0.00915)	-0.00320 (0.0270)	0.00112 (0.0125)
CEO duality	-0.00420 (0.00758)	0.00869 (0.0107)	0.0114 (0.0111)	0.00689 (0.0113)	0.00781 (0.0103)	0.0114 (0.00986)
State ownership	0.0385* (0.0222)	0.0303 (0.0245)	0.0240 (0.0254)	0.0246 (0.0254)	0.0330 (0.0253)	0.0353 (0.0247)
Foreign ownership	-0.0285 (0.0375)	-0.0314 (0.0504)	-0.0342 (0.0499)	-0.0438 (0.0508)	-0.0368 (0.0496)	-0.0187 (0.0487)
Managerial ownership	0.0727** (0.0297)	0.0145 (0.0558)	0.0410 (0.0580)	0.0406 (0.0618)	0.0711 (0.0648)	0.0214 (0.0554)
Domestic non-state ownership	0.0191 (0.0227)	0.0189 (0.0245)	0.0148 (0.0257)	0.0147 (0.0248)	0.0185 (0.0247)	0.0213 (0.0240)
Moderation effects						
Patent applications * Board size	-	-0.000186 (0.00132)	-	-	-	-0.00189 (0.00185)
Patent applications * Independent directors' ratio	-	-	-0.0533 (0.0494)	-	-	-0.0128 (0.0498)
Patent applications * No. of supervisors	-	-	-	-0.00850 (0.0319)	-	-0.00835 (0.0293)
Patent applications * CEO duality	-	-	-	-	-0.0135*** (0.00485)	-0.0113** (0.00515)
Control variables						
Firm size	0.00387 (0.00337)	-0.00536 (0.00396)	-0.00373 (0.00442)	-0.00486 (0.00427)	-0.00486 (0.00398)	-0.00462 (0.00453)
Leverage	-0.0751*** (0.0217)	-0.0389 (0.0307)	-0.0497 (0.0326)	-0.0374 (0.0300)	-0.0387 (0.0294)	-0.0459 (0.0286)
Firm age	-0.000989** (0.000480)	-0.000992* (0.000523)	-0.00115** (0.000526)	-0.00108** (0.000536)	-0.00103* (0.000540)	-0.000876* (0.000522)
Industry dummies	Included	Included	Included	Included	Included	Included
Constant	0.0921** (0.0441)	0.132** (0.0655)	0.0145 (0.0462)	0.0931 (0.0623)	0.0952 (0.0705)	0.0889*** (0.0332)
Observations	5,097	5,097	5,097	5,097	5,097	5,097
Number of C	709	709	709	709	709	709
AR (1) test (p-value)	0.005	0.000	0.001	0.001	0.001	0.000
AR (2) test (p-value)	0.403	0.073	0.360	0.300	0.043	0.065
Hansen test of over- identification (p-value)	0.183	0.129	0.131	0.122	0.121	0.135
Diff-in-Hansen tests of exogeneity (p-value)	0.668	0.160	0.036	0.165	0.090	0.120

Notes: The table reports regression coefficients and corrected standard errors (in parentheses). *, **, *** represent significance at the 1%, 5%, and 10% level, respectively. AR (1) and AR (2) are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null hypothesis of no serial correlation. The Hansen Test over-identifications under the null that all instruments are valid. The Diff-in-Hansen test of exogeneity is under the null that instruments used for the equations in levels are exogenous.

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Table 26: The Relationship between CG, Granted Patents and ROA

Dependent variables: ROA	Model (1)	Model (2) Board size	Model (3) Independent directors' ratio	Model (4) No. of supervisors	Model (5) CEO duality	Model (6) Whole
CE variables (main effects)						
Granted patents	-0.00149 (0.00113)	-0.00515 (0.00322)	0.00296 (0.00304)	-0.00462 (0.00335)	-0.00525 (0.00484)	-0.00837 (0.00590)
CG variables						
Board size	0.00337* (0.00177)	-0.00328 (0.00498)	0.00396 (0.00458)	0.00910* (0.00549)	0.00720 (0.00441)	-0.000194 (0.00536)
Independent directors' ratio	-0.138*** (0.0433)	0.0370 (0.140)	0.0978 (0.118)	-0.0629 (0.130)	-0.139 (0.165)	-0.0411 (0.150)
No. of supervisors	-0.00774 (0.0126)	0.107** (0.0440)	0.0594 (0.0387)	0.0142 (0.0308)	-0.0116 (0.0408)	0.0830*** (0.0317)
CEO duality	-0.0220*** (0.00701)	-0.0139 (0.0184)	-0.00197 (0.0184)	-0.0266 (0.0192)	-0.0215 (0.0202)	-0.00641 (0.0159)
State ownership	0.000861 (0.0171)	-0.0144 (0.0506)	0.00893 (0.0451)	-0.0161 (0.0452)	0.0180 (0.0463)	0.00493 (0.0538)
Foreign ownership	-0.0515 (0.0518)	-0.244 (0.251)	-0.148 (0.193)	-0.176 (0.215)	-0.0479 (0.214)	-0.270 (0.260)
Managerial ownership	0.0507*** (0.0184)	-0.0182 (0.0533)	-0.0190 (0.0574)	0.00176 (0.0530)	0.0535 (0.0686)	0.0350 (0.0548)
Domestic non-state ownership	0.0134 (0.0135)	0.0403 (0.0377)	0.00630 (0.0332)	0.0334 (0.0342)	0.0508 (0.0380)	0.0402 (0.0402)
Moderation effects						
Granted patents * Board size	-	0.00148 (0.00195)	-	-	-	0.00297 (0.00261)
Granted patents * Independent directors' ratio	-	-	-0.0619 (0.0506)	-	-	-0.0466 (0.0754)
Granted patents * No. of supervisors	-	-	-	-0.0135 (0.00950)	-	-0.0305** (0.0151)
Innovation * CEO duality	-	-	-	-	0.0248* (0.0138)	0.0176 (0.0146)
Control variables						
Firm size	0.00275 (0.00205)	0.00594 (0.00598)	-0.00895 (0.00553)	0.00345 (0.00598)	-0.00391 (0.00599)	0.00807 (0.00656)
Leverage	-0.0518*** (0.0120)	-0.0609 (0.0395)	-0.0225 (0.0412)	-0.0223 (0.0412)	-0.0210 (0.0467)	-0.0965*** (0.0361)
Firm age	-0.00172*** (0.000279)	-0.00292*** (0.000713)	-0.000425 (0.000860)	-0.00287*** (0.000685)	0.000194 (0.000875)	-0.00233*** (0.000801)
Industry dummies	Included	Included	Included	Included	Included	Included
Constant	0.0906*** (0.0280)	-0.113 (0.0934)	-0.0132 (0.0512)	-0.0107 (0.0731)	0.0328 (0.0883)	0.0266 (0.0456)
Observations	5,095	5,095	5,095	5,095	5,095	5,095
Number of C	709	709	709	709	709	709
AR (1) test (p-value)	0.005	0.000	0.001	0.001	0.001	0.000
AR (2) test (p-value)	0.403	0.073	0.360	0.300	0.043	0.065
Hansen test of over- identification (p-value)	0.183	0.129	0.131	0.122	0.121	0.135
Diff-in-Hansen tests of exogeneity (p-value)	0.668	0.160	0.036	0.165	0.090	0.120

Notes: The table reports regression coefficients and corrected standard errors (in parentheses). *, **, *** represent significance at the 1%, 5%, and 10% level, respectively. AR (1) and AR (2) are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null hypothesis of no serial correlation. The Hansen Test over-identifications under the null that all instruments are valid. The Diff-in-Hansen test of exogeneity is under the null that instruments used for the equations in levels are exogenous.

5.5 Summary

This chapter has demonstrated the data analysis, including the descriptive analysis, univariate analysis, and multivariate analysis. The descriptive analysis of the data sample for the development and independent variables provided a preliminary understanding of the data and its distribution. The univariate analysis examined the correlations between the dependent and independent variables for each model separately with the Spearman's rho correlations. Multivariate regression was employed to test the hypotheses and allowed for isolating the contribution of each independent variable to explain variation in the dependent variable by holding the effect of the other variables constant. Four assumptions are to be tested before regression analysis to ensure the validity of the results and the inferences drawn from the analysis. The four assumptions are normality, linearity, homoscedasticity, and independence of error terms. After consideration of the estimation methods (OLS, fixed or random effects, and system GMM) for panel data and the statistical justification for the selection, this thesis has chosen the system GMM.

In addition, this chapter has presented the empirical results of testing the hypotheses relating to the relationship between CG, CE and firm performance, as well as the moderating effects of CG structures on the relationship between CE and firm performance. Before presenting the empirical results, the data description was shown to provide an overall picture of the data. The data set was then used to examine the distributions and undertake any transformation as necessary to meet the assumptions of the regression approach applied in the regression analysis.

Chapter 6 Discussion of Results

6.1 Introduction

Four research objectives were specified in Chapter 1, which are: 1) To study and analyse the relationship between firm-level CG structures and CE in Chinese listed firms; 2) To study and analyse the relationship between firm-level CG structures and firm performance in Chinese listed firms; 3) To study and analyse the relationship between CE and firm performance in Chinese listed firms; 4) To explore whether firm-level CG structures and CE interact to influence firm performance in Chinese listed firms. The hypotheses relating to the relationship between CG, CE and firm performance were developed in Chapter 4. The approach to test these hypotheses was discussed in Chapter 5 (Research Methodology) and empirical results are presented in Chapter 6 (Data Analysis).

This chapter is structured as follows: in Section 6.2, the discussion of results on the effects of CG on CE is presented. The effects of CG and CE on firm performance are discussed in Section 6.3. Findings and discussion of the moderating effects of CG structure between CE and firm performance are presented in Section 6.4. Robustness checks are presented in Section 6.5. Finally, Section 6.6 summarises the chapter and provides concluding remarks.

6.2 Discussion of Results of the Impact of CG on CE

6.2.1 Board Size

Hypothesis 1b predicts that there is a positive relationship between board size and CE. The results show that when CE is measured by R&D intensity, Hypothesis 1b is supported.

However, when CE is measured by patent applications and granted patents, Hypothesis 1b is not supported.

Results from Table 19 suggest that large boards affect R&D intensity positively. It could be explained by the fact that a large number of directors allow the firms to potentially access a larger pool of external resources, including financial and technological resources that are critical for CE projects. This finding is consistent with Zhara et al. (2000) who found that when the size of the board increased by up to 11 members, the relationship between board size and CE was positive. This result supports the resource dependence view, which posits that large boards gain more advantage from collective experiences and diverse skills, therefore, leading to their greater engagement in R&D activities. Given that firms (e.g. state-owned enterprises, foreign-owned enterprises, and private firms) in China in general lack the same access to various CE-related resources, the resource-providing function of the board will be important for a firm's R&D intensity.

However, the current evidence does not show a connection between board size and patent applications. Probably because new patent creation includes risky investment, it might require higher commitment and cohesion amongst board members. Having too many members may prevent the board from reaching a consensus. Furthermore, because patenting decisions require a rapid reaction from the board to new opportunities, having more board members may lead to delayed decision-making. Consequently, although a larger board is beneficial for R&D intensity through increased aggregated competences, skills and resources, it is disadvantageous for highly risky patenting projects. Also, this could be because the directors on the board do not focus on investing in CE projects as a form of patenting, they might focus on other CE projects, for example, strategic renewals. This thesis also finds a statistically significant and negative relationship between board

size and the granted patents. It suggests that larger boards might harm the quality of patent applications.

6.2.2 Independent Directors' Ratio

Hypothesis 2b predicts that there is a positive relationship between independent director ratio and CE. However, this thesis does not find any significant results between CG and CE as measured by all three measurements (R&D intensity, patent applications and granted patents). Therefore, Hypothesis 2b is not supported. The results are inconsistent with the arguments that a higher proportion of independent directors on the board should better supervise managers, alleviate the information asymmetry between managers and shareholders, and should improve the corporate value by their expertise to facilitate CE projects (e.g. R&D investment, patenting). Empirically, Zahra (1996) found a negative relationship, but Chen et al. (2016) and De Cleyn and Braet (2012) found a positive relationship between the proportion of independent board members on the board and CE.

This could be explained by the fact that independent directors have difficulty in obtaining inside information. What they could receive usually is some financial information rather than complete information about the firm. This difficulty may cause some independent directors to encourage managers to pursue a different form of entrepreneurial activity, one that centres on new market entry through venturing rather than on patient new product innovation, or other familiar financial activities (Hill and Snell, 1988; Hoskisson et al., 2002). It could also be that firms may try to conform to social norms (e.g. compliance with the China CG Code) by increasing the number of independent directors on the board, although such conformity does not necessarily enhance the board's effectiveness. The results indicate that outside independent directors do not contribute to a firm's innovation investment and patenting amongst Chinese listed firms. Meanwhile, the implementation of these activities requires a thorough

understanding of the current business and industry, of which the outside directors often lack knowledge and information. This may be a reason why an outside presence is not associated with R&D intensity and patenting.

6.2.3 CEO Duality

The results support Hypothesis 3b which predicts that there is a positive relationship between CEO duality and CE. This thesis finds a positive relationship lending support to the argument that the CEO also working as chairman can increase the ability of the firm to evaluate CE, especially in terms of R&D intensity. Results are inconsistent with the studies of developed economies by Azeez (2015) and Zahra et al. (2000), which found that the CEO and board chairperson separation in medium-sized firms promoted CE. However, the results indicate that CEO duality has no impact on patenting, lending support to the notion that organisational changes occur as a result of processes that make organisations more similar without necessarily making them more efficient (Dimaggio and Powell, 1983, p. 147). In other words, because of the need for legitimacy, listed firms maintain a separate leadership structure in order to respond to the regulation demands. It might be possible that the arguments of agency and stewardship theory complement each other, resulting in no significant associations between CEO duality and patenting.

6.2.4 Supervisory Board Size

Hypothesis 4b predicts that there is a positive relationship between supervisory board size and CE. The coefficients for R&D intensity, patent applications and granted patents are all positive but only patent applications measurement is significant at the 1% level. In other words, Hypothesis 4b is supported only when CE is measured by patent applications. The results suggest that for this research sample, the size of supervisory board affects CE more strongly and positively when CE is measured as patent applications, rather than R&D intensity or granted patents. This indicates that as well as providing protection for

employee rights and channels for employee participation in CG, having a larger board of supervisors might facilitate more patent applications in a firm.

6.2.5 State Ownership

The results in this thesis are not supported by Hypothesis 5a which predicts that state ownership has a positive impact on CE. The results show that there is a positive but insignificant relationship between state ownership and R&D intensity. This could be explained by the fact that government support may not be sufficient to stimulate CE investments in industrial sectors. Dong and Gou (2010) also argue that the incentive structure for technology-based CE is shaped by firms in the private sector responding to market forces, not government policies and funding. This result is inconsistent with Zeng and Lin (2011), who found a negative and significant relationship between state ownership and R&D intensity.

State ownership has a negative and significant relationship with patent applications (10% significant level) and granted patents (1% significant level). The results are consistent with the argument that firms with high a proportion of state-held shares usually have a more monopolistic position in the related industry. Because of the weak competition in the market and the passive nature of the state shareholders, firms with large state shares usually have less motivation to improve their operations and are not very enthusiastic about CE related projects, especially about patenting. The results are inconsistent with Zeng and Lin (2011) and Dong and Gou (2010), who found a positive and significant relationship.

6.2.6 Domestic Non-State ownership

There is a negative but insignificant relationship found across all three measurements of CE with regard to non-state domestic ownership, which does not lend support to the

argument that domestic non-state investors typically have larger social networks in the home market, blended within their family and other interpersonal relationships (Filatotchev et al., 2011). These social relationships enable local non-state investors to be quickly informed about local trends and more capable of finding timely and accurate information relevant to technology localisation and local CE opportunities (Chen et al., 2014a).

The findings indicate that non-state domestic investors exert no measurable influence on a firm's CE activities (R&D intensity, patent applications, and granted patents). This result reveals that non-state domestic investors are myopic and passive and thus make no contribution to firms in this regard. The coefficient on domestic institutional ownership is negative and significant in the study conducted by Bena et al. (2014).

There are some possible explanations for this. Firstly, given the fact non-state domestic investors in the context of China often lack information about the internal operations of the firms, their dependence on the CEO and the board of directors for the formulation of long-term strategy is crucial. Whereas CE activities require technological knowledge and expertise, patenting decisions rely on an understanding of the market, industry and regulations. Non-state domestic investors therefore, may lack the information enabling them to gain involvement in these activities. Secondly, non-state domestic investors in China are likely to invest in those firms with which they have business relationships or are affiliated (Dong and Gou, 2010). Thirdly, short-term non-state domestic investors tend to encourage managers to engage in opportunistic behaviours (Zahra, 1996). Because entrepreneurial projects are usually based on a long-term strategy, often taking up to five or more years before returns are realised, short-term investors are unlikely to encourage such investments. Fourthly, scholars posit that different types of non-state domestic investors may have different outcomes in terms of

the relationship between CE and investors. With regard to innovation, Zahra (1996) found positive effects for long-term institutional investors and negative effects for short-term investors. Clearly, given the fact that different types of investors invest in Chinese listed firms, a lack of control over these types may be the reason for the insignificant results found.

6.2.7 Foreign Ownership

This thesis finds that foreign ownership fosters firm-level CE as measured by the patent applications but has no impact when measured as R&D intensity and granted patents. Therefore, Hypothesis 7a is supported when CE is measured by patent applications. The results support the argument that foreign firms often have critical resources for CE activities, including technological assets, for example, patents, inventions, and progress logs of product development (Chen et al., 2014a). Such technological assets from foreign owners is difficult to replicate from domestic owners because such knowledge accumulation is closely tied to prior experiences and established international networks. Take codified knowledge as an example, although the structure of a patent can be explicitly articulated, it is difficult for a domestic user to understand all the contingent factors that may affect its application without experiments (Chen et al., 2014a). The result is consistent with Choi et al. (2012), who found foreign ownership is positively associated with patent counts in 301 Korean listed firms. However, it is inconsistent with Bena et al. (2014) and Chen et al. (2016).

6.2.8 Managerial Ownership

If the shares held by executive directors increased, the director is not only a director but also a shareholder. This thesis finds that the managerial ownership is significantly and positively related to both patent applications and granted patents, but significantly and

negatively related to R&D intensity. The results failed to support Hypothesis 8b which predicts that there is no significant relationship between managerial ownership and CE.

The positive and significant impact of managerial ownership on both patent applications and granted patents may reflect a closer alignment between the goals of executives and shareholders. Increasing share value and tying rewards to long-term corporate value can stimulate executives' interest in CE activities. In this thesis, it is argued that managers tend to support applying for more patents and tend to ensure the quality of the patent applications, which is good for the firm's long-term development and return on investment. In other words, firms with a high level of executive ownership tend to apply for more patents and ensure the successful rate of patent applications.

However, managerial ownership is significantly and negatively related with R&D intensity that is as the percentage of shares held by executive directors increases, corporate R&D intensity will decrease. This is consistent with Zeng and Lin (2011). However, Francis and Smith (1995) and Beyer et al. (2014) found a U-shape relationship between managerial ownership and R&D intensity. It is worth briefly discussing the findings despite their small magnitude and low degree of significance. A possible explanation could be that when the manager holds a relative minority of shares, the share returns and the share value only account for a small proportion of their incomes. They have little motivation to stimulate the share price and forgo long-term spending (e.g. R&D investment) to strengthen the firm's long-term competitiveness. The negative relationship shows that the results here support stewardship theory, where equity ownership does not contribute to a higher degree of R&D intensity, however, managers are likely to spend less but produce high quality new products.

6.2.9 Firm-Specific Factors

6.2.9.1 Firm Size

Hypothesis 11b predicts that there is a positive impact of firm size on corporate entrepreneurship. The coefficient of firm size is positive and significant, which lends support to the economies of scale for CE activities, especially when CE is measured as patent applications and granted patents, thus supporting Hypothesis 11b. Results are consistent with Zeng and Lin (2011) and Chen et al. (2014), who found a positive and significant relationship, suggesting that larger firms have economies of scale, market power, and capacity to explore new patents.

However, no relationship was found between R&D intensity and firm size. This is consistent with Choi et al. (2012). This contradicts the view that smaller firms may be more entrepreneurial (Dong and Gou, 2010), as they are more flexible, and can quickly adapt to changes in the environment to take advantage of new opportunities (Rauch et al., 2009). According to Rauch et al. (2009), the effect of firm size is significantly higher in micro firms (less than 50 employees) than small firms (50-499 employees), but no significant difference exists between small and large firms (more than 500 employees). The mixed results in the literature with regard to firm size effect can be explained by the different operational definitions of firm size in different studies and different contexts, for example, using the number of employees as a measurement of firm size.

6.2.9.2 Firm Age

Hypothesis 12b predicts that there is a negative impact of firm age on CE. Results from this thesis indicate that there is a negative and statistically significant relationship between firm age and CE when measured as patent applications and granted patents, supporting Hypothesis 12b. The results indicate that firms listed for fewer years on stock markets

have more entrepreneurial flexibility, which in turn affects a firm's ability and willingness to take risks, such as producing more new products to increase a firm's competitive advantage (Choi et al., 2011). This is inconsistent with Choi et al. (2012), who found no relationship between patent counts and firm age. In addition, this thesis indicates a positive but insignificant relationship between firm age and R&D intensity, which is consistent with De Cleyn and Braet (2012).

6.2.9.3 Leverage

Hypothesis 13b predicts that there is a relationship between leverage and CE. In the results, only when CE is measured by R&D intensity does it have a significant and negative relationship with leverage, supporting Hypothesis 13b. This negative relationship is inconsistent with De Cleyn and Braet (2012), Chen et al. (2014) and Choi (2012) but consistent with Zeng and Lin (2011). Surprisingly, firms with more R&D investment seem thus to have fewer debts with financial institutions than their less entrepreneurial counterparts. This result can be interpreted in two ways. Firms might need fewer debts to have their innovation trajectory financed. Alternatively, they might - because of their innovativeness - have more easy access to additional financial support for R&D investment instead of applying for loans, for example, national funding. On the other hand, there is no relationship found between leverage and CE as measured by patent applications and granted patents, suggesting that compared to R&D investment, leverage in Chinese listed firms has less impact on the number of patents the firm applies for and the quality of granted patents.

6.3 Discussion of Results of the Effects of CG and CE on Firm Performance

6.3.1 Board Size

Hypothesis 1a predicts that board size affects firm performance positively. Hypothesis 1a is not supported when firm performance is measured by Tobin's Q, but is supported by ROA. The results show that board size is found to be statistically significant and negatively related to Tobin's Q, suggesting that a smaller board in China is perceived by the market as more effective than a larger one as reflected in the findings of this thesis. In particular, the statistically significant and negative coefficient lends empirical support to Guest (2009), Lipton and Lorsch (1992), and Yermack (1996) studies. However, this finding is contrary to past researchers who reported a positive and statistically significant association between board size and Tobin's Q (De Cleyn and Braet, 2012; Jackling and Johl, 2009; Coles et al., 2008). One common interpretation of a negative relationship between board size and firm performance is that many boards are inefficient and persistently too large.

On the other hand, this thesis presents evidence that a positive correlation between board size and profitability extends to listed firms in China. An alternative explanation is that board size reflects the composition of the board. Larger boards can consist of more outsiders, who foster more careful decision-making policy in a firm. The reputation cost will be high if the firm fails, on the other hand, they could gain private benefit if a project (e.g. CE projects) turns out to be profitable (Wang et al., 2008). If there is an ideal board size, the board size effect in this thesis suggests that the ideal board size varies with the firm performance measurement.

6.3.2 Independent Directors' Ratio

Hypothesis 2a predicts that the higher the independent director ratio the better the firm performance. The results are not supported by Hypothesis 2a when firm performance is measured by both ROA and Tobin's Q. In the ROA Model (see Table 20), the proportion of independent directors in Chinese listed firms has a significant and negative association with firm performance (see Table 20 Model (5) and (6)). Similar to the accounting-based performance measure (ROA), the independent director ratio is found to be statistically significant and negatively related to Tobin's Q at the 10% significance level. This further lends empirical support to the notion that the higher the independent director ratio, the lower the firm performance. Empirically, this finding is consistent with past evidence (Mangena et al., 2012; Guest, 2009; Bozec, 2005), which suggests that incorporating an increasing number of independent directors would not contribute to adding value to the firm. However, the results of the current thesis relating to independent director ratio and firm performance are contrary to several studies into corporate governance (e.g. Gupta and Fields, 2009; Coles et al., 2008; Daily and Dalton, 1992). Wintoki et al. (2012), Sanda et al. (2010) and Haniffa and Hudaib (2006) found no impact of the independent director ratio on firm performance. Arguably, it appears that Chinese listed firms have (36.85%) independent directors on the board which strictly follow the Chinese CG Code of provisions for firms to have at least one third of independent directors on the board. This is to oversee executive director's actions and to protect the shareholder interests.

Though many scholars have argued that independent directors improve a firm performance, it is questionable whether this is taking place in the Chinese context where the current findings hold the view that the independent director has a significant negative association with firm performance. A question could be raised as to whether the independent directors are really in a position to make proper informed decisions and also

whether they truly fulfil their duties which the best code of practice recommends. In addition, the differences in findings between this thesis and prior studies may be because of the differences in the sample each study used where the independent director ratios of 78% in U.S. listed firms (Coles et al., 2008) and listed firms in China may be different.

Studies that attempt to study board independence in China face several challenges. First, it is difficult to assess the efficacy of board independence in China given the low variation of the independence ratio (see Table 20). Second, any study that contends to have identified firm-specific determinants of board structure may be viewed with scepticism, given that most controlling shareholders simply maintain the minimum requirement of the ratio of independent directors to the board. In stark contrast to China, firms in most developed economies have more independent directors than is required. Third, Chinese firms' propensity to maintain the minimum one-third independence ratio implies that the firm's independence ratio is simply driven by board size and not by anything else. Therefore, differences in independence ratio between firms may be economically meaningless. For example, the higher independence ratio of a firm with 11 directors and 4 independent directors compared to a firm with 9 directors and 3 independent directors may be meaningless. Finally, given that the majority of directors are not independent, researchers may have a difficult time proving empirically and convincingly that independent directors enhance firm performance in a Chinese context.

6.3.3 CEO Duality

Hypothesis 3a predicts that CEO duality has a negative impact on firm performance. A negative but insignificant relationship is found between CEO duality and firm performance as measured by ROA in this thesis (see Table 20). Contrary to ROA, the results of the thesis suggest that the combined leadership board structure is negatively associated with the market-based measure of Tobin's Q (in a 5% significance level),

suggesting that Hypothesis 3a is supported when firm performance is measured by Tobin's Q. Thus, when a CEO doubles as the board chairman, Tobin's Q decreases. The result is consistent with studies which have also found that the combined leadership structure results in the leadership facing conflict of interest and agency problem (Ujunwa, 2012; Bozec, 2005; Bai et al., 2004; Pi and Timme, 1993;), therefore, giving preference to the separation of roles between CEO and chairman. Other research, for example, Daily and Dalton (1992) found no relationship between CEO duality and firm performance in entrepreneurial firms, Azeez (2015), Peng et al. (2007), Peng, (2004) found CEO duality positively affects firm performance. Those who found a positive relationship argued that CEO duality establishes strong, unambiguous leadership embodied in a unity of command and that firms with CEO duality may make better and faster decisions and, consequently, may outperform those which split the two positions.

The mixed results from different studies may be attributed to the different governance data sources and estimation methods used by both studies. Whereas this thesis collected governance data from the CSMAR database and from firm annual reports with SGMM estimation methods, Peng et al. (2007) gathered governance data from the fiscal year 1996 using generalised least squares (GLS) as the estimation method. This is particularly important because the one-year governance data may not reflect governance practices during the past periods' firm performance. In addition, the GLS and SGMM regressions may provide differences in coefficients and significant levels given the differences in the two methods of estimation.

6.3.4 Supervisory Board Size

Hypothesis 4a predicts that there is no significant relationship between supervisory board size and firm performance. It is interesting to note that the supervisory board is inversely related to performance (Tobin's Q) at the 1% significance level, suggesting the market

sees firms with a small number of supervisors on the supervisory board as being more effective for monitoring. On the other hand, there is a negative but insignificant relationship between the size of supervisory board and accounting-based measure – ROA, suggesting that the size of the supervisory board has no effect on operational performance. A possible explanation can be found in Tam (2000, p. 56) who noticed that ‘about one-quarter of supervisors did not regularly inspect firm activities and financial affairs, and 78% of supervisors were not prepared to investigate firm affairs’. Another possible reason could be the expertise of the supervisory board is not a significant direct determinant of corporate financial performance in Chinese listed firms (Shan and McIver, 2011). These findings are consistent with Shapiro et al. (2015), who found that firms with a supervisory board encounter negative effects on firm performance. Hu et al. (2010) found supervisory boards have been hindered by ownership concentration, rendering them unable to improve firm performance at present. Shan and McIver (2011) found no relationship between supervisory board size and firm financial performance.

6.3.5 State Ownership

Table 20 shows SGMM results for each ROA and Tobin’s Q on the independent variables. The results derived from the regression analysis reveal that state ownership has a significant and positive relationship with firm performance as measured by both ROA and Tobin’s Q, supporting Hypothesis 5a. Based on the results, it suggests that a firm with a higher proportion of state ownership would lead to better performance of listed firms in China, suggesting that firms with a higher level of state ownership have higher current profitability, as well as a high potential for future growth in profitability. The hypothesis is accepted at the 1% significance level in the ROA Model and 5% significance level in Tobin’s Q. These results are consistent with Dong and Gou (2011), Shan and McIver (2011), and Zeng and Lin (2011) but in contrast to Peng (2004). One

explanation could be that the Chinese government may signal its interest to help certain firms by holding substantial equity stakes. In addition, having sufficient shares held by the state can provide an incentive for state shareholders to closely monitor management and, therefore, ensure that managers pursue profitable and sustainable goals.

6.3.6 Domestic Non-State Ownership

Hypothesis 6a predicts that domestic non-state ownership is positively related to firm performance. Non-state domestic ownership impacts firm performance as measured by ROA positively and significantly only in Table 20 Model (4), but no relationship is found with Tobin's Q and the other models for ROA. Therefore, Hypothesis 6a is supported when firm performance is measured by ROA. The hypothesis is accepted at the 1% significance level in the ROA model. The results for ROA, but not for Tobin's Q are partially consistent with Douma et al. (2006), who found domestic corporate ownership positively affects both ROA and Tobin's Q. One explanation could be that non-state domestic investors use their social networks to understand local trends, thus are more responsive to local environments which would enhance their firm's competitive advantage.

In many emerging countries, domestic corporations are amongst the largest group of block-holders (Douma et al., 2006; Claessens et al., 2000). In China, listed firms also constitute the largest category of shareholders. These block-holders usually have a longer investment time horizon. Their monitoring incentives and abilities should be greater than those of foreign investors. Furthermore, after privatisation, large non-state domestic shareholders in Chinese listed firms seem to want to enhance and sustain the domain of their firm's core competence. This type of shareholders is likely to have both the incentives and the skills to act as good monitors.

6.3.7 Foreign Ownership

The evidence is different from prior Chinese (Ning et al., 2014; Zeng and Lin, 2011) and international (Mishara and Ratti, 2011; Douma et al., 2006) studies which reported an insignificant relationship between foreign ownership and firm performance when measuring using ROA and Tobin's Q. The results failed to support Hypothesis 7b, which predicts that foreign ownership has a positive impact on firm performance.

Possible explanations for the results is, it is noted in this thesis that foreign ownership has a substantially lower level of shareholdings on average (1.94%) compared to state ownership (9.43%) and domestic non-state ownership (43.46%) (See Table 8). This indicates that they have relatively lower incentives to devote energy and time to monitor managers and firms. As a consequence, no relationship is found between foreign ownership and firm performance. It may also be argued that the differences in findings between this thesis and those of other studies (e.g. Ning et al., 2014; Zeng and Lin, 2011) in China are due to the different samples used by each study. Particularly, and whereas this thesis focuses on Chinese listed firms from high-technology industries, Zeng and Lin (2011) used data from 2000 to 2005 and Ning et al. (2014) used data from 2000 to 2011 to establish the relationship between the two where the level of CE at the firm level may be different.

6.3.8 Managerial Ownership

In this thesis, for the ROA regression, the coefficient for managerial ownership is positive and significant. Managerial ownership has been argued as a possible remedy to align the interests of managers and shareholders (Peng, 2004). For example, in China, Peng (2004) finds increased organisational performance when directors hold more company shares. On the other hand, other scholars argue that a high level of managerial ownership may result in entrenchment, as documented in countries, for example, Russia (Buck et al.,

1999) because of the difficulty in predicting a priori the performance impact of inside director ownership. However, in this thesis, it is suggested that issuing more shares to executive directors improves firm performance.

In Tobin's Q Model (see Table 20 Models (1), (2), and (3)), the managerial ownership variable loses significance or positive correlation in the model where Tobin's Q is used as a performance measure. The lack of statistical significance of managerial ownership with regard to Tobin's Q seems to indicate that the capital market in China perceives executive directors to be of minor importance. This is inconsistent with Cui and Mak (2002), who found that Tobin's Q initially declines with managerial ownership, then increases, then declines again and, finally, increases again – a W-shaped relationship. The different results could also be due to using different samples in the studies. Generally, Hypothesis 8a is supported when firm performance is measured by ROA but not Tobin's Q.

6.3.9 R&D Intensity

Hypothesis 9 predicts that CE is positively associated with firm performance. Results show that when CE is measured by R&D intensity, Hypothesis 9 is supported when firm performance is measured by Tobin's Q, but not by ROA.

There is a positive relationship between R&D intensity and Tobin's Q (in a 1% significance level), which is not surprising because the expenses of R&D investment will increase the probability of growth in the firm. The result suggests that R&D investment is mostly an instantaneous expense, which reduces current profits. Nevertheless, it is important to understand that R&D investment might lead to higher future profits. It conveys a positive signal to market investors and has an incrementally explanatory ability of market expectation. This is consistent with Bierwerth et al. (2015), Ehie and Olibe (2010), and Zhang et al. (2014), but inconsistent with Wang and Fan (2014).

On the other hand, there is no relationship found in ROA regression, consistent with Zeng and Lin (2011). This demonstrates that the valuation of R&D intensity can be linked to a firm's market capitalisation as investors assess the value relevance of a firm. The results also suggest that R&D intensity enhances firm performance by developing a strong reputation and positive image, helping firms differentiate themselves from competitors (Bierwerth et al., 2015). On the other hand, Cui and Mak (2002) found R&D intensity is significantly and negatively associated with firm performance and pointed out that industry type seems to have an impact on the relationship between CE and firm performance.

The differences between previous studies and the current thesis may be because of industry differences across the studies. For example, Cui and Mack (2002) used the New York Stock Exchange, 310 firms in 1996 and 1998 across seven high R&D intensity industries, meaning the results are likely to be less representative. Moreover, to avoid the argument of using broad-based samples which may disguise different patterns in this relationship across industries and firms of different sizes, Ehie and Olibe (2010) examined the impact of R&D investment on firm value pre-and-post-9/11 terrorist attack in the manufacturing and service industries for a broadly representative sample of 26,500 firms covering the period 1990-2007. They found that R&D investment in the manufacturing industry appears to be highly correlated with Tobin's Q, especially in pre-9/11, a stable business environment. However, the attitude of investors changed in the post-9/11 period in that investors seemed to favour R&D investment in service industries more than in the manufacturing industry because of the lower intensity of R&D spending in service.

Whereas this thesis collected governance data from the CSMAR database and firm annual reports with SGMM estimation methods, Zahra (1996) gathered the

governance data through interviews and questionnaire techniques using generalised least squares (GLS) as the estimation method. This is particularly important because collecting the governance data through interviews and questionnaire techniques may not reflect the governance practices during the past periods' firm performance. In addition, the GLS and SGMM regressions may provide differences in coefficients and significant levels given the differences in the two methods of estimation.

6.3.10 Patent Applications

When CE is measured by patent applications, the coefficient in the ROA Model (see Table 20, Model (5)) is insignificant and positive, however, the coefficient in Tobin's Q Model (see Table 20 Model (2)) is significant and negative. Results indicate that Hypothesis 9 is not supported. When firm performance is measured by ROA, results are not consistent with the view that CE is a key element of organisational success (Lumpkin and Dess, 1996) and a prerequisite for yielding a high profitability from new product developments (Zahra, 1996). This argument has been criticised for being normative (Lumpkin and Dess, 1996). However, the negative coefficient of patent applications to Tobin's Q (in a 1% significance level) is associated with bad news. Its impact on Tobin's Q transfers a negative message to investors as other costs in the firm. Investors perceive expenses for patent applications as the amount of unsuccessful CE projects. In addition, as Leuz et al. (2003) and Wang and Fan (2014) indicated, the strength of law enforcement affects the value correlation. Law enforcement in China is weak, hence, although the new Chinese Accounting Standard stipulates that the amount of R&D investments which are included in the current profits and losses and recognised as intangible asset should be disclosed, firms do not appropriately disclose them and do not appropriately disclose the value of patents, and the difficulty of verifying patent applications reduces the correlation of this information.

6.3.11 Granted Patents

Contrary to expectations, the number of granted patents is insignificant and negatively related to both ROA and Tobin's Q. Hypothesis 9 is not supported when CE is measured by granted patents. The results indicate that a firm's CE activities measured by the transformation of the number of granted patents may not be perceived as efficient by the firm. This result is inconsistent with Ning et al. (2014), who found a significant and negative relationship between patent counts and Tobin's Q.

A possible explanation for such phenomena is that even if patents increase the net income of the firm, the R&D investment spent, and their capitalised value is relatively higher, therefore bringing the ROA ratio down. In addition to that, it might take some time until a firm can actually recognise the benefits of a verified patent, therefore, net income might lag behind, leading to an increase in the denominator (total assets which include intangible assets), while the numerator remains the same.

6.3.12 Firm-Specific Factors

6.3.12.1 Firm Size

Hypothesis 11a predicts that larger firms perform better than the smaller ones. The results document an insignificant effect between firm size and firm performance (ROA and Tobin's Q), that is firm size in Chinese listed firms has no impact on both market- and accounting-based performance measures, which failed to support Hypothesis 11a. The findings are inconsistent with Ning et al. (2014), Choi et al. (2011), De Cleyn and Braet, (2012), and Zahra, (1996), who reported a positive and significant coefficient on firm size indicating that firm size has a positive impact on performance. Wang and Fan (2014) found a significant and negative relationship between firm size and CE.

6.3.12.2 Firm Age

The results in this thesis failed to support Hypothesis 12a, which predicts that firm age has a positive influence on firm performance. Results show that firm age is statistically insignificant and negatively associated with ROA, evidence indicating that firms with fewer years listed on stock exchanges are more likely to report higher profitability. Results contradict earlier literature, for example, Azeez (2015) found no association between firm age and performance. On the other hand, firm age has no impact on Tobin's Q. This suggests that firm age is less effective in explaining the market-based performance measure (Tobin's Q) than the accounting-based performance measure (ROA).

6.3.12.3 Leverage

Hypothesis 13a predicts that there is a relationship between leverage and firm performance. With regard to the relationship between the control variables and firm performance (ROA and Tobin's Q), leverage is found to be statistically significant and positively related with ROA but positively insignificant with Tobin's Q, suggesting that Hypothesis 13a is supported in the ROA model. The results also suggest that higher levels of leverage increase profitability in Chinese firms with the accounting-based performance measure. The positive coefficients do not lend empirical support to prior studies, for example, Azeez (2015) found no significant relationship between leverage and performance.

6.4 Discussion of Results of the Moderating Effects

The fourth research objective was to explore the moderation effect of CG on the relationship between CE and firm performance. Tables 21 to 26 provide a test for this objective when the firm performance is measured as ROA and Tobin's Q, respectively,

after controlling for firm-specific factors represented by firm size, leverage, firm age, and industry.

Table 21 Model (6) showed that R&D intensity * board size is negative and statistically significant at the 5% level, indicating that the effect of R&D intensity on firm performance is negatively moderated by board size. However, a positive and significant moderating relationship is found when CE is measured as patent applications (see and 22 Model (6)). Therefore, Hypothesis 10a is supported when CE is measured as R&D intensity and patent applications, and when firm performance is measured as Tobin's Q. Although the statistical significance of interaction terms in the moderated regression models lend support to the hypotheses, the examination of interaction plots presents further insights into the specific moderating effects. The interaction effects in the graph shown in Figures 4 and 5 are plotted by using one standard deviation above and below the mean to capture different conditions of board structure and innovation variables (Aiken et al., 1991). As illustrated in Figure 4, at higher levels of R&D intensity, board size has a negative impact on firm performance. However, Tobin's Q is weaker when firms have a larger board. The result does not support the argument that firms with larger boards are often considered to be more capable of monitoring the actions of management as it is more difficult for the CEO to dominate a large board or to obtain consensus for making decisions that harm shareholders' value. Moreover, the results do not support the idea that as the board size grows, the board's collective experience and skills would also grow. However, larger boards are likely to increase cognitive diversity, which leads to increased creativity in decision-making and favours investment in patent applications for firm development (see Figure 5) (Shapiro et al., 2015).

Figure 4: The Moderating Effect of Board Size on the Relationship between R&D Intensity and Tobin's Q

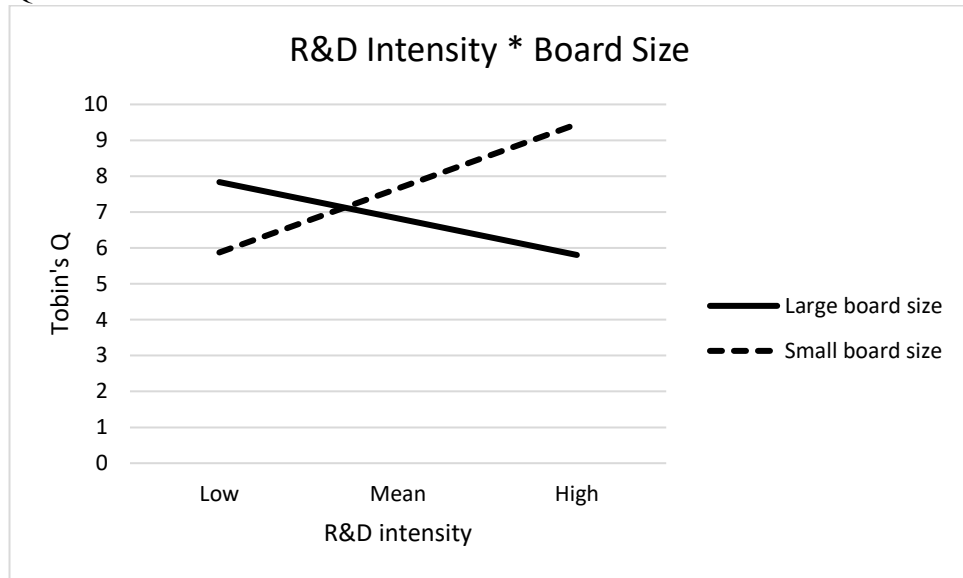
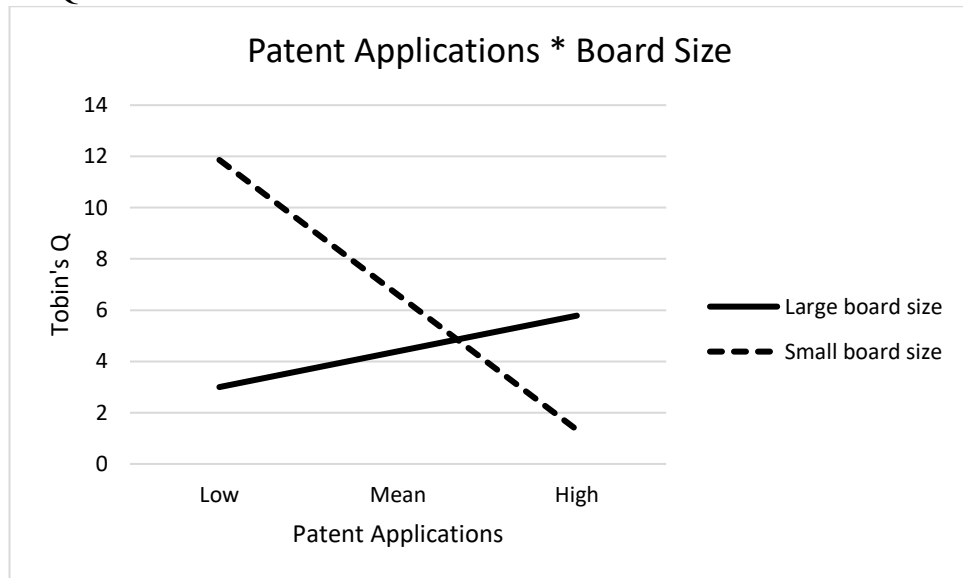


Figure 5: The Moderating Effect of Board Size on the Relationship between Patent Applications and Tobin's Q



In contrast, R&D intensity * independent directors' ratio is non-significant, indicating that the effect of R&D intensity, patent applications and granted patents on firm performance (both Tobin's Q and ROA) is not relevant to or has no direct relationship to independent director ratio. Overall, Hypothesis 10b is not supported, results in this thesis suggest that a more fine-grained analysis of the relationship between independent directors, innovation and firm performance is necessary.

Hypothesis 10c stipulates that supervisory board size moderates the effect of CE and firm performance. Hypothesis 10c is supported when CE is measured as patent applications and granted patents, and firm performance is measured as Tobin's Q. When firms apply for more patents, a positive relationship is shown between supervisory board and Tobin's Q (see Figure 6). The results indicate that supervisors transfer specific knowledge, skills and experience to the board. They also improve monitoring and advice competencies in terms of qualified and sustainable R&D investment strategies that in turn lead to a higher innovation output (e.g. granted patents) (see Figure 7).

Figure 6: The Moderating Effect of Supervisory Board Size on the Relationship between Patent Applications and Tobin's Q

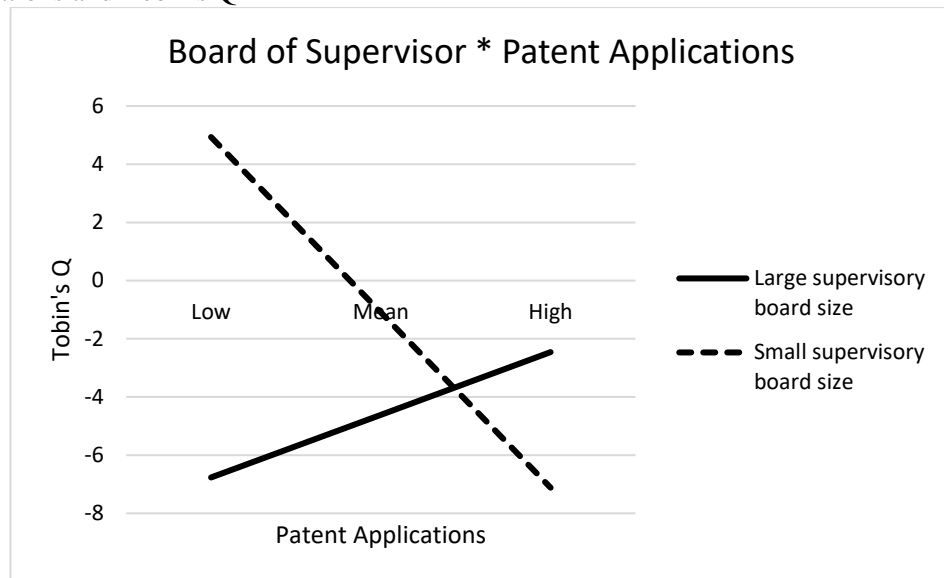
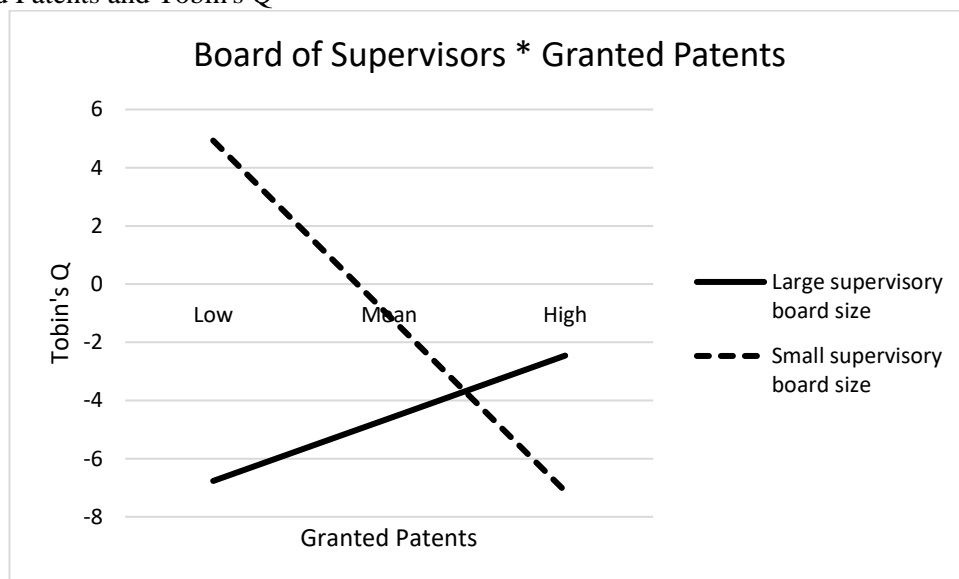


Figure 7: The Moderating Effect of Supervisory Board Size on the Relationship between Granted Patents and Tobin's Q



Hypothesis 10d stipulates that CEO duality moderates the effect of CE and firm performance. As shown in both Table 21 Model (6) and Table 22 Model (6), R&D intensity * CEO duality and patent applications * CEO duality are positive and significant at the 5% level. Thus, Hypothesis 10d is supported. The interaction plots (see Figure 8 and Figure 9) show that a high level of R&D intensity or a greater number of patent applications will lead to better firm performance when both roles of CEO and chairman are held by the same person. The results echo stewardship theory, which stresses the beneficial consequences on shareholder returns with unifying command by combining CEO-chairman roles (Azeez, 2015; Donaldson and Davis, 1991). The market responds favourably to the combination of two roles and the results in both Figure 8 and Figure 9 suggest that when combining the CEO and chairman positions, firms will perform better as information flow among senior leaders improved. On the other hand, when firm performance is measured as ROA, a greater number of granted patents will lead to better profitability when both roles of CEO and chairman are held by different people. The results indicate that separating the roles of CEO and chairman helps firms to achieve a higher number of patents granted and leads to higher profitability.

Figure 8: The Moderating Effect of CEO Duality on the Relationship between R&D Intensity and Tobin's Q



Figure 9: The Moderating Effect of CEO Duality on the Relationship between Patent Applications and Tobin's Q

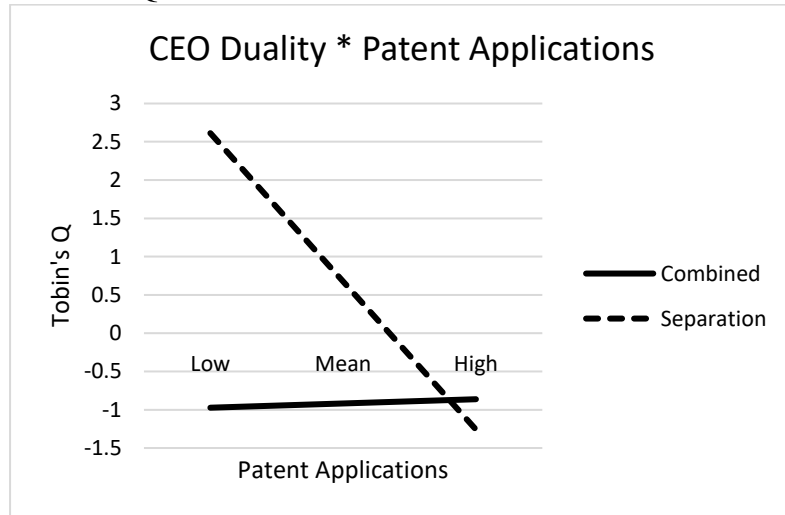
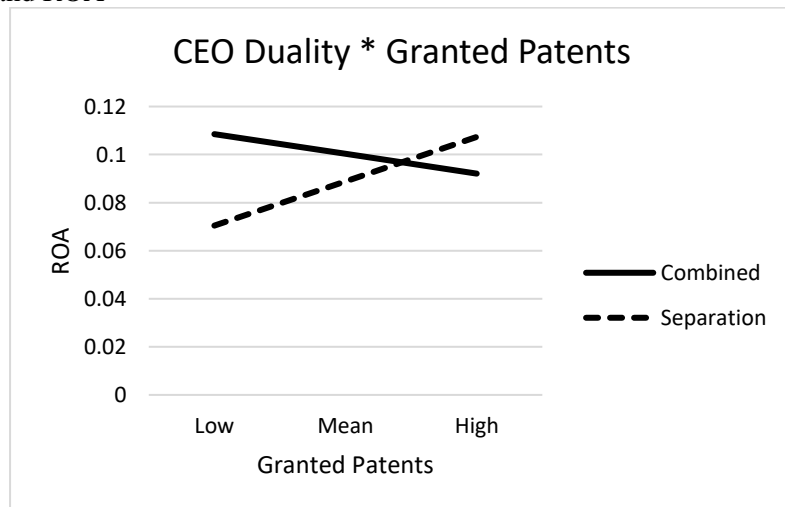


Figure 10: The Moderating Effect of CEO Duality on the Relationship between Patent Applications and ROA



6.5 Robustness Checks

Following Becker-Blease (2011), the robustness of the results is tested in several alternative specifications. Firstly, an alternate set of control variables was considered. For example, if state ownership or foreign ownership are removed from the analysis, or if firm age is measured by the number of years since the firm was established, the analysis also yields results similar to the results in Table 5.

Second, the variance inflation factor (VIF) is calculated to test the multicollinearity and provide additional support for the robustness of the results. The highest value of VIF across all five models was 1.662, which is far below the recommended cut-off threshold value of 10 (Hair et al., 2006). Therefore, multicollinearity is not an issue in this thesis.

Third, following Wintoki et al. (2012), the Arellano-Bond second-order autocorrelation test (AR2), the Hansen test of over-identification, and the Difference-in-Hansen test of exogeneity are conducted to assess the reliability of the estimates, as well as to ensure that the results do not derive from methodological problems. It is found from Tables 19 to 26 (see the bottom of the tables for the tests results), the Arellano-Bond (AR1) tests are all statistically significant, suggesting that the levels used to test the first-differenced equation provide weak instruments. It failed to reject the AR2 tests, thus providing evidence that the error terms in the system of equations are not serially correlated, and orthogonality has been achieved (Wintoki., et al., 2012). The Hansen tests of over-identification are not significant, indicating that the instruments are valid and are not correlated with the error term. In addition, the Difference-in-Hansen tests of exogeneity are not significant, implying that the additional subset of instruments used in the SGMM estimates is not exogenous.

6.6 Summary

This chapter discussed the results of the hypotheses testing as suggested in Chapter 4. The first group of hypotheses (see Section 7.2) considered the effects of CG structures (board structure and ownership structure) on CE while the second group (see Section 7.3) considered the effects of CG structures and CE on firm performance. The discussion included an explanation of the results from the theory and prior literature. In addition, the chapter discussed the results of the moderating effects of CG structures on the relationship between CE and firm performance.

Chapter 7: Conclusion

7.1 Introduction

This thesis has investigated the relationship between corporate governance (CG) structures and corporate entrepreneurship (CE), the relationship between CG, CE and firm performance, and the moderating effect of CG structures on the relationship between CE on firm performance in Chinese listed firms over the period 2007-2015. This chapter begins by restating the summary of research aim and objectives. This is followed by a summary of research methodology, research findings, implications, contribution and limitations of the thesis, and finally, suggestions for future research.

7.2 Research Aim and Objectives

The aim of this thesis is to examine the relationship between CG, CE and firm performance in Chinese listed firms by adopting a multiple theoretical approach, applying theories including agency theory (e.g. Jensen and Meckling, 1976), stewardship theory (Donaldson and Davis, 1991), and resource dependence theory (Pfeffer and Salancik, 1978a).

China presents a unique context in which to examine this issue. It has strikingly different characteristics from those in Anglo-Saxon countries upon which many studies are based. For example, its CG structures are different in that share ownership is highly concentrated, the government is a significant shareholder and often appoints the key management and board members (Tong et al., 2013; Yang et al., 2011). Also, its economy is in transition from planned to market economy, along with the fact that central government controls resources, financing investment size, industry structure, materials distribution, business formation and bank loans (Choi et al., 2011; Tang et al., 2008). For most entrepreneurial firms without government connections, availability of capital is one

of their major challenges. Commercial banks in China have much higher levels of regulations in terms of lending loans to entrepreneurial firms, in particular, the small-to-medium size entrepreneurial firms, than do banks in other countries (Tang et al., 2008). However, the pursuit of CE strategies requires resources because CE is resource-consuming (Zhang et al., 2014). The innovativeness and risk taking of firms all involve making large resource commitments to risky activities, new products or services, untried technologies in the market. With access to limited financial resources, the implementation of CE will most likely go awry and will not help entrepreneurial firms build competitive advantages and compete with their high-quality innovative products and services (Shapiro et al., 2015). Therefore, firms with state ownership or board members with political connections could enable a firm to obtain more resources for CE (more R&D investment). These characteristics imply that findings from developed countries might not apply in the unique institutional environment of China, thus providing an opportunity to make a significant contribution to the literature.

Although studies on the impact of CG on organisational outcomes have started to develop in China (e.g. Chen et al., 2014a; 2014b; Choi et al., 2012), these are still limited and similar to literature across the world and have yet to consider how CG and CE interact to influence performance. For example, controlling owners in Chinese listed firms are often present on the board of directors. The members of management usually have political incentives to take an active role to fulfil government requirements or private welfare for the benefit of their future political or business career (Tong et al., 2013, Choi et al., 2011). The Chinese government views CE as one of the top national priorities and encourages firms to promote CE through provisions of funding and favourable policies (Zhou et al., 2017; Chen et al., 2014a; 2014b; Choi et al., 2011), and therefore, managers are likely to pursue government agenda, which might influence firm decisions for

implementing China's ambitious CE plan. To this extent, it seems reasonable to suspect that CG and CE have interactional effects on performance.

Specifically, the thesis addresses the following research objectives:

- (1) To study and analyse the relationship between firm-level CG structures and CE in Chinese listed firms;
- (2) To study and analyse the relationship between firm-level CG structures and firm performance in Chinese listed firms;
- (3) To study and analyse the relationship between CE and firm performance in Chinese listed firms;
- (4) To explore whether firm-level CG structures and CE interact to influence firm performance in the Chinese listed firms.

7.3 Summary of Research Methodology

This thesis is based on panel and cross-sectional analysis of a data sample of 5,118 firm-year observations from 2007-2015. The timespan from 2007-2015 was chosen to capture direct R&D investment of firms since 2007 when the new Chinese Accounting Standards (CAS) commenced in 2006, given that R&D investment can either be expensed as incurred as a whole or partly capitalised and partly expensed from 2007 in the annual report. The required data was accessible mainly from two databases in China: The China Stock Market and Accounting Research (CSMAR) and the State Intellectual Property Office (SIPO) databases. Where data was unavailable from the CSMAR and the SIPO, annual reports of the selected firms were used. The CSMAR database mainly provided data at firm level in relation to CG structures (board and ownership structures) and CE (R&D investment), firm performance indicators (ROA and Tobin's Q), and firm profile (industry, firm age, firm size, and leverage), whilst the SIPO database provided the data at the firm level of patent data (the number of patent applications and granted patents in

a year basis). The annual report mainly provided the missing or incomplete data from the two databases.

To answer the research's aim and objectives, three empirical research models have been developed. The first model was used to examine the effects of CG structures on CE and address the first research objective. The second model was used to test the effects of CG and CE on firm performance and address the research objective (2) and (3). The third model was used to examine the interaction between CG and CE on firm performance and address the last research objective.

The measurements of CG structures (e.g. state ownership, non-state domestic ownership, foreign ownership, executive ownership, board size, independent director ratio, supervisory board size, and CEO duality) were developed from prior studies (e.g. Yu and Ashton, 2015; Dong and Gou, 2010; Munari et al., 2010). The R&D intensity, the number of patent applications, and the number of granted patents were used to measure CE (Shapiro et al., 2015; Zhang et al., 2014; Choi et al., 2011). Firm performance was measured by ROA and Tobin's Q (Yu and Ashton, 2015; Tong et al., 2013). Firm-specific factors were measured by firm size, firm age, leverage and industry (Chen et al., 2014a; Munari et al., 2010; Zahra, 1996).

The data analyses included the descriptive analysis, univariate, and multivariate analysis. The descriptive analysis of the sample for the dependent and independent variables provided a preliminary understanding of the data and its distribution. The data transformation was carried out when data of variables were not normally distributed. The univariate analysis examined the correlations between the dependent and independent variables for each model, separately using Spearman's rho correlations and to find the potential multicollinearity problem. Multivariate regression was used to test the hypotheses and to allow the isolation of the contribution of each independent variable to

explain variation in the dependent variable by holding the effect of the other variables constant. Regression analysis was based on a set of assumptions which had to be tested before the analysis, in order to ensure the validity of the results and the inferences drawn from the analysis. The assumptions refer to the normality, linearity, homoscedasticity, and independence of error terms. Various checks were discussed to examine the data of this thesis against the assumptions of the ordinary least squares (OLS). This section ended with a consideration of the selected estimation methods and the statistical justifications for the selection, which was the two-step system generalised methods of moments (SGMM) method.

7.4 Research Findings

According to the findings, all four objectives have been met in this thesis. Objective (1) was to study and analyse the relationship between firm-level CG structures and CE in Chinese listed firms. The results of the empirical analysis (see Table 19) showed that R&D intensity in Chinese listed firms was related to managerial ownership, board size, and leadership when controlling factors as in the Anglo-Saxon countries (firm size, leverage, firm age, and industry). The number of patent applications in Chinese listed firms was related to state ownership, foreign ownership, executive ownership, and the size of the supervisory board when controlling firm-specific factors (firm size, leverage, firm age, and industry). Also, the number of granted patents in Chinese listed firms was related to state ownership, managerial ownership, and board size when controlling firm-specific factors (firm size, leverage, firm age, and industry).

Objectives (2) and (3) were examined in Table 20 to analyse the relationship between CG, CE and firm performance in Chinese listed firms. The results of the empirical analysis showed that ROA in Chinese listed firms was mainly related to board size, independent director's ratio, state ownership, managerial ownership, and R&D

intensity when controlling firm-specific factors (firm size, leverage, firm age, and industry). Tobin's Q in Chinese listed was related to board size, independent directors' ratio, supervisory board size, CEO duality, state ownership, R&D intensity, and the number of patent applications when controlling firm-specific factors (firm size, leverage, firm age, and industry).

Objective (4) was examined in Tables 20 to 26 to explore the moderating effects of CG structures on the relationship between CE and firm performance in Chinese listed firms. The results of the empirical analysis showed that after entering the interaction terms (CG structures * CE), Tobin's Q in Chinese listed firms was related to board size, supervisory board size, CEO duality, R&D intensity, and the number of patent applications. It was also found that when the moderators were state ownership, managerial ownership, board size, independent director ratio, and supervisory board size, they directly influence the relationship between CE and firm performance when controlling firm-specific factors (firm size, leverage, firm age, and industry). Furthermore, ROA in Chinese listed firms was related to board size, independent directors' ratio, and R&D intensity. It was also found that when the moderator was CEO duality, it directly influences the relationship between CE and firm performance when controlling firm-specific factors (firm size, leverage, firm age, and industry).

In summary, this thesis shows that, although corporate governance structures do not always have a moderating impact on the relationship between corporate entrepreneurship and firm performance, these relationships are contingent on a firm's entrepreneurship strategy, to a certain extent. These findings open a new venue for future research that addresses how to better understand the moderating effect of CG structures on the examined relationships in the context of transition economies.

7.5 Contribution of this Thesis

The study makes several important contributions to the literature. First, this thesis extends the literature on the impact of corporate governance and corporate entrepreneurship on firm performance in listed firms to a transition economy, based on panel data. Most studies (e.g. Barker and Chiu, 2018; Honoré et al., 2015; Aghion et al., 2013; Brossard et al., 2013; Munari et al., 2010; Guest, 2009; Wright et al., 1996; Zahra, 1996) have examined these issues in developed countries. This thesis contributes to these studies by demonstrating that similar to findings found in developed countries, CG variables and CE are important for firm performance also in developing countries, such as China.

Second, this thesis extends a developing stream of literature on China (Shapiro et al., 2015; Chen et al., 2014; Choi et al., 2011; Dong and Gou 2010), which focuses mainly on the effects of ownership structures and hardly consider board structures. China presents a unique context in which to examine this issue. It has strikingly different characteristics from those in Anglo-Saxon countries upon which many studies are based. This thesis provides evidence that some findings from developed countries might not apply in China. For example, the separation of the two roles, chairman and CEO, does not necessarily contribute to entrepreneurship decisions. Firms invest heavily in R&D would be beneficial from a combined leadership structures in Chinese listed firms.

Third, this thesis provides the first evidence suggesting that CG and CE are complementary in how they impact on firm performance in a Chinese setting. Previous studies have tended to examine the effects of CG and CE on firm performance independently, with little or no consideration of how the two might interact with each other to impact on firm performance. As argued by Fitzgerald et al., (2008), for firms to succeed, they need to design CG structures that facilitate CE capabilities, and in turn,

enhancing firm performance. To this extent, examining the effects of CG and CE on performance separately might lead to incorrect conclusions.

Fourth, at the methodological level, unlike previous studies (e.g. Zhang et al., 2014; Zeng and Lin, 2011), this thesis uses panel data covering a 9-year period (from 2007 to 2015), a system generalised method of moment (SGMM) - a statistical technique is adopted for data analysis. System GMM is considered more appropriate to estimate panel data because it removes the contamination through an identified finite-sample corrected set of equations which are robust to panel-specific autocorrelation and heteroscedasticity (Capezio et al., 2011). It is also a useful estimation tool to tackle the endogeneity and fixed effect problems (Arellano and Bond, 1991).

7.6 Policy and Practical Implications of the Thesis

In addition to theoretical and empirical contributions, this thesis also has several policy and practical managerial implications, which could facilitate decision-making by different market entities.

First, as for policy makers, this thesis demonstrates that several institutional and historical factors, rather than agency problems, shape the corporate governance arrangements for listed firms in China. It does not support the viewpoint that the standard Anglo-American corporate governance (CG) model can be applied in the context outside the U.S. and UK. The findings provide important implications for the Chinese government, which could be used to employ a modern CG model when issuing policies for public-held firms. For instance, the findings do not support the current policies, which encourage firms to separate the top two positions (CEO and chairman) and require them to recruit more independent directors onto the boards. Therefore, this thesis calls for special attention to the current trend of non-CEO duality and independent directors (Ye and Li, 2017; Wang, 2008; Peng et al., 2007). Although CEO duality could improve CE

significantly, it exerts a negative impact upon firm performance. The findings of this thesis implicitly indicate that the government may reconsider several policies relating to CG as applied to high-tech listed firms due to the fact that existing policies have not been applicable for Chinese firms. However, the findings do not indicate that agency problems are entirely absent in the context of transition economies. Agency costs do exist, but they are not as high as they are in developed economies. Instead, stewardship culture may help reduce these costs and the board members mainly include inside directors and supervisors may play their role as resource providers to a certain extent (Miller et al., 2008; Davis et al., 1997). This thesis reasserts that a CG structure is a dynamic concept that is heavily dependent on the specific context, particularly, in high-tech industries. These findings imply that the government should develop and revise policies with scrutiny and caution especially during institutional transition, as well as giving more attention to the role played by non-state owned and foreign capital, which could increase economic vitality (Mattlin, 2007).

Second, this thesis could also provide empirical evidence and decision support for corporate managers, CE policy makers and investors in a non-mandatory disclosure market of R&D investment. Because different R&D accounting choices have different market reactions, managers can choose a favourable method of reporting R&D investments to raise their firm's market prospects. Of course, firms may also just cater to investors and other information seekers by disclosing more R&D information. This requires policy makers to do more work on R&D policy to prevent this greenwashing behaviour and earnings management (Chen et al., 2006). Policy makers should standardise accounting treatment of R&D investment, strengthen the disclosure of R&D information and develop a detailed, workable R&D capitalisation accounting policies and procedures. At the same time, investors can make the right judgment and decisions on

business CE capability and future development by obtaining more R&D investment information (Chen and Hsu, 2009).

There are no objectively comparable conditions between different enterprises for the patent applications and R&D spending in China. In accounting practices, professional judgment is required to ascertain the accounting treatment of R&D as well as to ensure whether the economic benefits created by the intangible assets are likely to flow into the enterprise, which produces artificially manipulative space for R&D investment and patent data (James and McGuire, 2016; Song et al. 2015). Due to the fact that the provisions of new CAS (Chinese Accounting Standards) for the accounting treatment of R&D investment is only principle-oriented and not mandatory, coupled with the uneven level of practice of the accounting personnel and improper use of the criteria, R&D investment and patent information to investors delivered by financial reports is very limited (Bracker and Ramaya, 2011). Therefore, it is suggested that a mandatory disclosure policy of R&D investment needs to be developed, which can help regulate and constrain managers' earning management behaviour in R&D accounting treatment and provide investors with more accurate R&D information.

Third, the findings of this thesis could also encourage managers to think more broadly about their CG structures so as to improve firm performance. CEO and board of directors as well as shareholders should take into account all aspects in corporate governance. The findings of this thesis indicate that a firm should properly select the board size and the number of supervisors on the board under different circumstances (Kajola, 2008; Neely and Al Najjar, 2006; Conyon and Peck, 1998). In addition, the findings of this thesis also indicate that there is a significantly negative correlation between state ownership and patent application, but significantly positive impacts of managerial ownership, foreign ownership on patent applications and granted patents.

Hence, managers should attach great importance to the role of independent directors and the proportion of non-state-owned stocks and foreign stocks, because a reasonable and proper participation by those entities could restrict behaviours by the managers and thus benefit the interests of shareholders and firm value maximisation.

Given that firms are making significant investments in their CG structures and that they appear to pay less attention to the way they use the data generated from these structures, the findings of this thesis encourage managers to invest in data analysis skills, processes, and infrastructure in their firms (Neely and Al Najjar, 2006). The findings of this thesis also suggest that using CG structures is conducive to CE. Managers should possess the skills for managing CG structures.

Finally, the government should make substantial improvements in external corporate governance mechanisms, as suggested by Jiang and Kim (2015) because internal governance is only part of the package of governance practices (Yoshikawa et al., 2014). As such, instead of forcing firms to adopt common rules, the government should strive to strengthen external corporate governance, for example, developing a strong capital market, building an effective market for corporate control and active take-over market, and issuing strong regulations to protect the interests of minority investors.

7.7 Limitations of the Thesis

Research designs entails a trade-off between research objectives of generalisability, accuracy, and simplicity (Weick, 1979). Therefore, all research designs are subject to limitations. This thesis is no exception. There have been several limitations to this thesis which should be considered, however, these limitations do not diminish the value of the research.

7.7.1 Data and Sample Limitations

The sample in this thesis cannot randomly include all firms as many Chinese firms do not disclose or have no information on R&D investments, the number of patent applications and granted patents. For example, many Chinese firms are not R&D-orientated or they are not interested in disclosing their R&D investments information publicly, which considerably reduces the sample size. Therefore, the non-randomly selected sample size might result in a bias of sampling and lead to a sample composition that is not perfectly accurate.

The financial industry is excluded from the sample of this thesis since such an industry has different accounting practices and regulations. In addition, industries that have no or low R&D investments were also excluded from the sample. The exclusion of the industries might result in a problem in generalising the result to all industry sectors in China. Furthermore, the data in this thesis is specific only to China, which might lead to a problem in generalising findings in other countries, as other countries have different institutional environments, levels of R&D support and expenditure, economies of scale, cultures, and laws. Future studies that replicate these research models using multiple countries may enhance external validity. Hence, above limitations in data and sample are difficult to be avoided due to objectives reasons. Nonetheless, impacts of them on findings and conclusions of this thesis are relatively smaller.

7.7.2 Constructs and Variables Limitations

The results of this study are limited to Chinese listed firms to capture the specific effects of CE, and to the firms for which adequate information existed for the measurement of both R&D investment and patent data. A possible future avenue of research is to replicate the thesis with non-Chinese listed firms and to explore alternative measures of CE as measured by R&D intensity, patent applications, and granted patents. Other possible

measures include the value chain DEA (data envelopment analysis) model, which is an evaluating system to measure CE efficiency. Others include R&D investment to total assets, trademark applications, granted trademarks, the ratio of R&D personnel in total employees of the firm, and the ratio of capitalised investment in CE. In comparison to R&D intensity measurement by R&D investments to operating income. The ratio of R&D expenditure to total assets can be considered as a measure of R&D intensity in the future study when the most R&D expenditures satisfy conditions of forming intangible assets.

In addition, using ROA and Tobin's Q as measures of firm performance might not be able to provide a more comprehensive assessment of the relationship between CG, CE and firm performance, particularly as different components of firm performance have different influences on CE strategic decision-making. Besides dependent variables, control variable, such as using market capitalization to measure a firm size could also be added into the model. Both debt and R&D intensity are sensitive to size that measured as the logarithm form, since both variables capture firm's growth opportunities. Introducing more diversified variables could further testify findings and conclusions of this thesis.

7.7.3 Statistical Methods

Moderating (interaction) effects were created as a product of CG structures (moderator) and CE (main effect variable) which is a widely used form in social research. However, as Jaccard and Turrisi (2003) note, this simple product term is only one of many possible functional forms of the interaction effect and it is called bilinear interaction. This form of interaction indicates that the slope between dependent and independent variable changes as a linear function of scores on moderator variable. Therefore, a failure to obtain a statistically significant interaction may reflect the presence of an alternative form of interaction rather than the absence of a moderated relationship.

7.8 Suggestions for Future Research

Although this thesis has examined the impact of many CG structures and CE on firm performance, some other characteristics relevant to the determination of CE could be considered. For example, the effects of director and top management team characteristics (e.g. educational background, skill sets) might influence CE and firm performance. The business risk could be considered since CE is very expensive, time-consuming and risky. Hence, CE plays an important role in the business risk.

Furthermore, due to the resource and time constraints at the data collection and polishing stage, the time span of this thesis only covers 9 years from 2007-2015 and excluded the following years. As the R&D reporting became more standardised and the number of firms investing in R&D increased quickly after 2015 for Chinese listed firms, it would be interesting to undertake another study using a different data set including the following years (i.e. 2015-2017) to see whether the findings are consistent with this thesis.

In addition, this thesis excluded listed firms in the financial industry and other low R&D investment industries. It could provide further research to examine the industries with no or low R&D investment and to compare if the firm performance would be different for a firm with and without R&D investment.

This thesis focused on the relationship between CG structures, CE and firm performance for listed firms in China. In future research, it would be interesting to undertake a comparative study between China and developed Anglo-Saxon countries on the relationship between CG structures, CE and firm performance. Moreover, it would be interesting to conduct a comparative study between the one-tier and two-tier board systems of the impact on CE.

This thesis examined the moderating effects of CG structures (board structures and ownership structures) on the relationship between CE and individual firm performance individually. Future studies could examine the moderating effect of the interplay between CG structures on the relationship between CE and performance.

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