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Mediating Role of Innovation Capacity in the Relationship between Corporate governance and Firm Performance: evidence from Chinese listed firms

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Abstract:
This study examined the potential mediating role of innovation capacity of firm measured by innovation investment in between the relationships of corporate governance and firm performance. The study used panel data of 11,634 samples of Chinese listed firms covering from 2010-2018. We operationalized corporate governance into board independence, dual leadership, concentrated ownership, debt finance, and product market competition. The study found to support the mediation role of innovation investment in between most corporate governance mechanisms and firm performance measured by Tobin's Q. Specifically, we found that innovation investment has been fully mediated the relationship between concentrated ownership structure and firm performance, Similarly, corporate governance measured by debt financing, and product market competition were partially mediated by innovation investment in Chinese listed firms. The study makes an important contribution to corporate governance practice in emerging economies policymakers and managers by providing comprehensive empirical evidence on how corporate governance practices are related to firm performance through innovation activities. Firms in emerging countries should maintain high ownership concentration, improve the debt financing system and encourage product market competition to improve firm performance through innovation activities.

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1. Introduction

The direct relationship of corporate governance (CG) mechanisms and firm performance have been widely studied in previous (Chen, 2019; Nguyen et al., 2017; Aggarwal et al., 2011; Helen Wei Hu et al., 2009; Sheilfer and Vishny, 1997). These studies have raised a variety of issues; among them most of reported direct association of CG and firm value. These have shown that CG has positive or negative impact on firm value. The level of courses offered is inconsistent results due to various factors that affect or make it easier the governance – performance relationships. In other ways, some of studies reported the indirect relationships of CG and firm performance considering different variables as mediators or moderators. Some studies that have been conducted by considering some mediation variables between CG and performance of firm to alleviate the conflicting results of prior literature findings are; institutional environment, (Kong et al., 2019); Corporate social responsibility (Titisari, Ratnawati, & Indrawati, 2018); CEOs external advice networks (McDonald, Khanna, & Westphal, 2008); institutional environment (Kong, Gao, & Jiang, 2019); Firm reputation (Miller & Del Carmen Triana, 2009); Technological advancement (Zhang et al., 2014). However, little evidence was found that shows the role of innovation investment in between CG and firm performance, especially in emerging markets. The purpose of the current study is therefore to explore the mediating role of innovation capacity of firm that is measured by R&D investment in the between CG and the performance firm of Chinese listed firms.

Innovation investments are critical to the development of competitive market firms. As the literature argues that R&D investment demonstrates the potential of firms in a variety of ways, it influences the issuance of firms such as patents and citation numbers, which demonstrate the competitiveness of firms. Many previous studies (Chen, 2019; Yousaf et al., 2019; Bierwerth et al., 2015; Rauch et al., 2009; Kotabe, 2002; Zahra et al., 2000) have found a positive relationship between innovation investment and performance of firms. Kotabe (2002) confirms innovation processes such as product innovation process and product design can improve firm performance. According to this study, a firm with a better product design increases profits by separating its products from other competitors and can earn more profits. Lome, O., et al. (2016) also noted that firms that provide valuable resources for new jobs do much better than other firms have done during the financial crisis. Hsieh et al. (2003) also reported a positive relationship between innovation activities (R&D intensity) and firm performance. Similarly, another study (Ahu Karabulut, 2015) also conducted research using Turkish manufacturing firms concluded that firms had better innovation strategy that is pronounced in financial performance than the others. In other way, much of the evidence from previous studies confirmed the relationship between corporate governance and innovation activities. For example, Dong and Gou (2010); Kong et al. (2019); La Potterie, (2015); Hitt et al. (1997); Lee et al. (2003); Attanassov (2013), pointed out that the relationship between corporate governance and R&D investment. According to these studies result corporate governance mechanisms have had a significant impact (positive and negative impact) on innovation strategies of firms in various types of market development levels.

In general, the literature briefly highlights the roles of corporate governance not only in strong relationships with the performance of firms, but it also significantly influences the innovation activities of firm. Concurrently, Fitzgerald (2008) suggested that for firms to be successful and to promote financial efficiency, firms must design better corporate governance that facilitates innovations. From this evidence, one can understand that the company's innovation capacity can play a role in mediating between corporate governance and firm performance.

China as an emerging market economy and the second-largest economy in the world has recognized the importance of innovation and adopted policies to encourage innovation practices (Chen et al., 2011). Central and Chinese governments recognize the importance of new technological processes by encouraging companies to increase investment and development such as guidelines, funding, and the issuance of special tax policies. In China Zhang et al. (2014), investigate the role of mediation for technological advancement through the Information Technology (IT) industry only from 2007–2008, and demonstrate intermediate interactions between some CG and financial performance in the IT industry. Zhang et al. (2014) are reported as China's new technology is rising steadily from time to time, and is becoming one of China's emerging market strategies, with China's technology industry growing at a combined annual growth rate of 40 percent. This shows that the state in emerging markets is paying close attention and helping firms develop their novelty and competition between firms. Therefore, this shows that the innovation capability of Chinese firms can intervene between corporate governance and firm performance. Therefore, the purpose of this study is to investigate the role of mediation of innovation capacity in the relationship between corporate governance practices and performance of firms in Chinese listed firms.

The findings of this study have several contributions to literature and as well as for emerging economy corporate governance shareholders and policymakers. We found the influence of several corporate governance mechanisms on firm performance through innovation investment. Thus, the results of our study contribute to our understanding of the mediation role of innovation investment in the relationship between corporate governance practices and firm performance in an emerging market economy. Farther more, our study result yields an important implication for shareholders/managers and policymakers in an emerging market. Corporate governance in emerging economies should enhance innovation through upholding relatively increasing state ownership and block shareholding control role, in other ways policymakers in the emerging market should design strategies that optimizing debt financing from external financial institutions and should adopt innovation policy the strength the relationship between corporate governance and firm performance.

2. Literature Review and Hypotheses Development

Based on the theory and literature the study considers a set of prospective from internal and external corporate governance variables that affect firm performance. Accordingly, independent board, dual leadership, ownership concentration from internal CGMs, and Debt financing and Product market competition were included from external corporate governance mechanisms.

2.1. Internal Corporate Governance, Innovation, and Firm Performance

A corporate board of directors is the key part of internal corporate governance mechanisms. In corporate governance literature board of directors and firm performance have studied extensively and reported mixed results in different market development levels. As well as there are a lot of studies on the relation of the board of directors and R&D investment. But no consensus was observed regarding the relationship between corporate board and innovation, with both positive and negative arguments being found, and with empirical evidence not always pointing in the same direction.

Firm innovation results depend on factors that affect by internal corporate governance, among the function of the board is the major. According to Agency theory, the board of directors provides a formal link between the owners and managers of firms. It plays a crucial

role in relation to firm corporate governance and firm strategy decisions, such as innovation investment strategy. Therefore, some evidence shows links between board functions and firm R&D investment. A study Baysinger et al. (1991) analyzed the link between board characteristics and R&D investment. Similarly, many researchers examine the relationships between board structure and R&D expenditures. For example board size (Brunninge et al., 2007, and Balsmeier et al., 2014); Board independence (Yoo and Sung, 2015); board education level (Dalziel et al., 2011, Escribá-Esteve et al., 2009); Board meeting(Chen and Hsu, 2009) and board leadership(Lhuillery, 2011, Hoskisson et al., 2002). Yoo and Sung (2015) shows as board composition play special roles in related to firm strategic management decision. They analyze outside directors can settle differences on the board, evaluate whether independent agendas fit in corporate routines, and reduce potential agency conflicts. The independent board plays important role in the firm strategic decision. Better position to supervise management and link with external environments and acquisition resources. Similarly, the resource dependency theory argued that outside board of directors is most appropriate to link a firm with the external environment and its resources. In line with this Westphal, (1999), the suggested independent board plays an essential role in the acquisition of specialist knowledge, as do their networks for speeding up knowledge transfer. Therefore, independent directors can be expected to boost firm strategies that will foster the owner's wealth through different investments, including R&D investment. Independent directors can be agents for the gain of resources and can improve the organizational reputation that helps them to facilitate external coordination innovation investment (Kim and Kim, 2015). In line to these arguments, many studies reported a positive relationship between independent directors and firm innovation capacity. (eg. Brunninge et al., 2007; Shapiro et al., 2015; and Balsmeir et al., 2014) reported the positive impact of the external board on innovation investment. In other way some studies report the negative relation of outside independent directors and form innovation expenses, because of the limitation of crucial information on the strategic decision (Yoo and Sung, 2015). Regarding China, most of the independent outside directors in China are from universities, research institutions, and law firms (Dong and Gou, 2010). According to the characteristics of this group of people, this study argues that outside directors prefer better R&D activities and enhance better firm performance. Therefore, independent directors can be expected to boost firm strategies that will foster the owner's wealth through R&D investments.

Hypothesis 1: *R&D investment mediate the relationship of independent directors and firm performance of Chinese listed firm*

The other roles of the board of directors are board dual leadership means directors have dual position chair of board and CEO. When one person holds more than one position the probability of agency problems arise will very high, because of information asymmetries between the CEO and the board. In line with this argument of extant studies, CEO duality leads to unfavorable results for shareholders (Petra and Dorata, 2008; Webb, 2004), and separation of these two positions used for reducing anxiety between board and management (De Villiers et al., 2011). These arguments conclude that the separation of dual leadership has a positive relationship with firm performance and innovation investment strategy (Zhang, 2012). In contrast, some studies oppose this argument by reporting a negative association between the separations of dual leadership with technological innovation investment, such studies is Lhuillery (2011) Driver and Guedes (2012) using France and UK firms data.

Thus:

Hypothesis 2: *R&D investment mediates the relationship of CEO duality and firm performance in Chinese publicly listed firm*

Concentrated ownership is one of the corporate ownership structures types through which ownership rights are distributed within the corporate. As the Agency's view suggests block ownership plays a vital role in the monitoring of management strategic activities and, also, reduces the high cost of agency-related innovations. According to Haggard (1994), owners of large blocks shares play an important role in paying for innovation activities, because they provide the resources to create new technologies, which have a positive impact on shareholder economic performance.

There are two conflicting arguments regarding block ownership and innovation investment relationship; the first argument is a negative relation. The basis of this argument is an agency view developed by Jensen and Meckling (1976), and Fama and Janesen (1983), which noted that shareholders more risk-averse as their shares in the company capital growth. This means that shareholders restrict risk as their shares in the company's financial growth. This shows that as their capital becomes the growth in the company they become more savings and make fewer long-term investments including R&D investment, and as a result, less interested in getting involved in strategic change activities as a innovative strategy. Studies such as Chang et al. (2010); Zeng and Lin (2011); Brunning et al., (2007), Ortega Argiles et al. (2005) confirmed the negative correlation between new investment and the high degree of ownership.

The second view of argument is the positive relationship between concentrated ownership and innovation investment. This view has arisen because block shareholders have been very keen to invest in long-term projects such as new investments. Concentrated shareholders are small numbers, and they know more about company market values than scattered ownership. Therefore, they easily select strategic long-term strategic decisions (Ortega Argiles et al., 2006).

Similarly, Baysinger et al. (1991) evaluated R&D investment and found a positive effect of patent analysis on corporate investment in R&D. Lacetera (2001) also shows that the focus of stock ownership reduces agency disputes. Besides, these studies conducted an empirical analysis and found that concentrated ownership positively affects R&D investment. Cho (1998) confirms that block shareholder contributes to R&D investment and corporate value; Specifically, studies in emerging market like Chen et al. (2014); Zeng and Lin (2011) in a Chinese listed company shows concentrated ownership controlled corporation is better in innovation activities, that direct firms to better performance.

The research of Shleifer and Vishny (1997) has suggested, agency problems are reduced because concentrated shareholders have the interest of profit-making through providing better control on the internal management. In order, such as concentrated ownership structure can identify innovation strategy, whether it is better or not for firms future successes. Therefore, concentrated ownership allows for the provision of an additional contribution to improving company performance by adopting an effective innovation policy. So, the following hypothesis can be deduced:

Hypothesis 3: *R&D investment mediates the relationship of concentrated ownership and firm performance of Chinese listed firms*

2.2. External Corporate Governance Mechanisms, innovation Capacity, and Firm Performance

External corporate governance is a broad term that encompasses all aspects of external corporate governance such as market competition, external financers, institutional ownership, and the legal system. Among these external CG mechanisms that can contribute to

firm performance through innovation, we only considered product market competition and debt financing due to the availability of data. In the competitive environment, technological advancement is an important factor in maintaining a leading position (Inauen and Schenker, 2011). Firms operating in competitive industries are under greater pressure than those operating in concentrated industries. Therefore, product market competition was considered the key to the company in building new technologies.

There are several studies, which confirm the direct relationship between strong competition and the investment of R&D for the best stock gain. Studies, Chauvin and Hirschey (1993); Vo and Le (2017) reveals high R&D cost firms receiving positive response from the market in competing industries. They conclude that companies in the competitive industry are under pressure. Therefore, competing firms spend more on new projects to gain competitive advantage than les competing firms. Therefore, companies in the competitive industry have performed better than those operating in a less competitive industry. Andras and Srinivasan (2003) finding also affirms R&D investment is positively associated with the profit margin of the firm when the strong operate in the competitive industries. Lifeng Gu (2015), noted his study firms in competing industries have used high R&D investment to get a better market share and firm value. Chen et al. (2014) evaluate and report that R&D investment firms can improve their stock returns when outside corporate governance is strong. Better R&D costs are driven by better future performance in competitive industries (Bens et al., 2004). Similarly, Lefeng Gu (2015) states that, when many listed firms compete to develop new technologies or products, firms with successful innovation projects gain profits and ultimately increase their market share.

Hypothesis 4: *R&D investment mediates the effect of product market competition on firm performance in Chinese listed firms.*

Another external CG mechanism considered in the study is debt financing, which is an important source of investment for a company's investment, such as innovation investments. The agency's view provides a clear argument that debt financing may result in agency problems, which contribute to investment performance. The agency's disagreement between the agent and the owners will escalate as the free cash flow of the managers increases due to the debt financing. Contrary to the argument of Jensen (1986) that as the debt increases, the financial risk of the company will also increase, and therefore managers need to work harder to increase interest rates. Gugler's (2003) study noted in detail the debt and R&D investment relationships and found many possibilities as to why debt was poorly associated investments. For example, when R&D assets lower retail prices could lead to collapse if the project fails; if the asymmetry of information about innovation developments between debt holders firms and creditors institution, and when firms invest in high-risk project activities. These arguments are confirmed by many researchers such as Btsinger et al. (1989); Carpenter and Peteren (2002) using US firms; Ortega-Argiles et al. (2005) using Spanish-listed firms has shown a negative relationship between innovation investment and firm's debt levels.

In emerging markets such as China, the economy is very high in the development phase and Chinese government firms are privately held from time to time (Zhang et al., 2014). This means that the capitalization process of the market is highly competitive; through those changes, they may face financial challenges from the business environment. In such a case, innovation is the key to maintaining growth and gaining competitive advantage; in which case, there is no doubt that firms need more credit from external funds such as banks or other financial institutions. Also, the Chinese government established an innovative development

program to encourage firm performance. Therefore, the study concluded that innovation investment ones could be better involved between debt financing and firm performance in Chinese listed firms.

Hypothesis 5*: R&D investments mediates the association of debt financing and firm performance of Chinese listed firms*

3. Research Methods

3.1. Data sources and Sampling Selection Methods

Corporate governance and financial performance data collected from China Stock Market and Accounting Research (CSMAR) database. R&D expenditure data collected from China Stock Market and Accounting Research (CSMAR), and Chinese Research Data Services Platform (CNRDS). Firm annual reports are also used to collect the data manually to supplement the missing values. CNRDS provides an open platform for high standard Chinese business research data. The development of the CNRDS was supported by grants from the National High Technology Program, the National Program on Key Basic Research Project from the Ministry of Science and Technology. The CSMAR database covers all corporations listed on the Shanghai Stock Exchange and Shenzhen Stock Exchange. 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 capitalized R&D investment during the fiscal year (Wang and Fan, 2014). To determine the sample size of this study, the researcher adopted a purposive sampling technique. Because of difficult to access reliable financial performance and R&D expenditures data from unlisted firms in China, this study deals with Chinese listed firms that only issue A shares in domestic stock exchanges (Shanghai and Shenzhen). We used the non-financial Chinese firms listed on the Shanghai and Shenzhen Stock Exchanges to construct the sample data because financial firms have special regulations. The period of the data was from 2010- 2018. The panel is unbalanced as the number of firms grows considerably over time. To match firms with industries, we require firms with non-missing CSRC top-level industry codes in the Chinese Stock Market Accounting Research (CSMAR) database. Final observations in the period from 2010 to 2018 are 11,634 firm-year observations.

3.2. Measurement of Variables

3.2.1. Dependent variable

Firm performance is the dependent variable of the study**.** It is **measured by using market-base firm performance, which is Tobin's Q.** Past studies especially corporate governance studies (Chen, 2019; Shao, 2019; Nguyen et al., 2017; Gompers et al. 2003) used Tobin's Q firm performance measurement. It is measured by the sum of the market value of equity and book value of debt, divided by the book value of assets

3.2.2. Independent Variables

Board independence: many previous studies used a proportion of independent directors to measure board independence (Shao, 2019; Chen and Al Najjar, 2012; Liu et al., 2015). Thus, this study was calculated as the ratio of the number of independent directors divided by the total number of directors on boards.

CEO Duality: CEO duality refers to a position where the same person serves the role of chief executive officer of the form and as the chairperson of the board. CEO duality is a dummy variable, which equals 1 if the CEO is also the chairman of the board of directors, and 0 otherwise. A previous study used CEO duality (Zahra, 1996).

Ownership Concentration: Ownership concentration has different measurements. It is measured in terms of the percentage of shareholdings held by shareholders, which is the most common way to measure ownership concentration in a company. Thus, following previous studies (Shao, 2019; Dong and Gou, 2010), ownership concentration is measured through the total percentage of the block holders' ownership (owners of more than 10% shares of the firm) in this study.

Product Market Competition: Following previous works in developed and emerging markets (Chen et al., 2013, Liu et al, 2018, Giroud and Mueller, 2011; Chang, 2015) were measured using proxies of market concentration or Herfindahl-Hirschman Index (HHI). HHI is calculated for CSRC top-level industries by summing the square of the individual firm market shares based on total sales of all available listed firms in the industry from the CSMAR database. This index measures the degree of concentration by industry. The bigger this index is, the more the concentration and the less the competition in that industry will be, vice versa.

Debt Financing: The debt financing proxy in this study is measured by the percentage of a total asset over the total debt of the firm following past studies (Zhang et al., 2014, Pant et al., 2010).

3.2.3. Mediating variable

Innovation Capacity: This study used the inputs oriented methods of innovation measures, R&D intensity; past studies measure research and development intensity through different ways; Measured as the total annual expenditure on R&D divided either by the total asset (Zhang et al., 2014; Dong and Gou, 2010), by the employees' number (Vincent, L., et al 2002; Baysinger et al., 1991) or by the total sales of the firm (Yousaf et al., 2019; La Potterie et al, 2015). We used R&D intensity which is measured by the ratio of a firm's annual R&D investments to its total asset, it is has been widely used in previous emerging market studies (Zhang et al., 2014; Dong and Gou, 2010). This measure shows the firm's willingness to invest in innovation activities by using its assets.

3.2.4. Control Variables

Firm Size: Firm size can be measured in many ways; common measures are market capitalization, revenue volume, number of employments, and size of total assets. In this study, firm size is measured by the logarithm of total assets following a previous study (Zhang et al., 2014; Shao, 2019). **Firm Age:** Firm age is the number of years that a firm has operated, it was calculated from the time that the company first appeared on the Chinese exchange. Thus, firm age is measure as a natural logarithm of the number of years listed from the time that company first listed on the Chinese exchange market. **Growth opportunity:** Growth opportunity is measured as the ratio of current year sales minus prior year sales divided by prior year sales. Sales growth enhances the capacity utilization rate, which spreads fixed costs over revenue resulting in higher profitability (Kumar et al., 2018).

4. Data Analysis Methods

The study examined the existence of a mediating effect of R&D intensity employing the hierarchical regressions method to compare the overall effect of the variables following the past studies (Zhang et al., 2014*).* The verification of this effect is achieved by constructing models in which each variable constituting corporate governance mechanism is treated through a specifically pertinent model. To test the complete mediating effect Baron and Kenny (1986) propose three conditions; Accordingly, to test a complete mediating effect of moderating variable in the context of an independent variable – dependent variable relationship described as follows: first, the independent variable should have a significant impact on dependent variable, second, the independent variable should have a significant impact on mediator variable, third, the mediator variable must significant influence on dependent variable when influence of independent variable on dependent variables is

controlled, the significant influence of independent variable on dependent variable must vanish when the effect of mediator on dependent variable statistically controlled.
Therefore, the following models; three for each of the five independent variables are used to investigate the mediating role of R&D intensity.

$R\&D_i = \beta_0 + \beta_1 (CTR) + \beta_2 (CG) + \in i$ ..... (1)

$PERF_i = \beta_0 + \beta_1 (CTR) + \beta_2 (CG) + \in i$ ..... (2)

$PERF_i = \beta_0 + \beta_1 (CTR) + \beta_2 (CG) + \beta_3 (R\&D) + \in i$ ..... (3)

Where

$PERF_i$: represent the firm i performance measured by Tobin's Q and ROA; $\beta 0_{:-}$ represent constant; CRT: represents control variables: Firm size, firm age, and growth opportunities; B_{1-3}: represent parameters to be estimated; CG: represents corporate governance variables represented by independent boards, CEO duality, Ownership concentration, Debt financing, and product market competition; R&D: represents the firm's R&D investment intensity and $\in i$: represent the random error.
Therefore, to test the predicted hypotheses step-by-step hierarchical regression analysis method was employed. To deal with the endogeneity problem in the model, one-year lagged independent and control variables were used, following previous studies (Zhang et al., 2014 and Aggarwal et al., 2011).

5. Results and Discussion

Table 1 indicates the summary of descriptive variables included in the models of the study. Table 2 provides the correlation matrix among all variables in the regression analysis. As a basic check for multicollinearity, a correlation of 0.7 or higher in absolute value may indicate a multicollinearity issue (Hair et al., 2006). According to Table 2 results, there is no multicollinearity problem among variables of this study. Additionally, to assess the existence of multicollinearity among the variables, the variance inflation factor has been tested. The result shows all explanatory variables were also below the threshold of 10, (Hair et al., 2006) which indicates that no multicollinearity issue exists. According to Baron and Kenny's (1986) to test the mediation effect, the independent variable in the first two models is expected to show significance, while the third model is expected to statically insignificance on dependent variable and significance of mediator variable.

Table 1: Summary of descriptive statistics of variables

Variable	Mean	Std. Dev.	Min	Max
Tobin's Q	2.739432	1.772316	.884476	10.06002
Board independence	.3739679	.0535505	.3333333	.5714286
Dual leadership	.2897542	.4536677	0	1
Ownership concentration	58.54636	14.9478	22.5897	90.2627
Product market competition	.0580452	.092206	.0084798	.4052926
Debt financing	.3986051	.2017631	.0488051	.8691791
R&D intensity	.0417156	.0424993	.0001813	.2498554
Firm size	22.04965	1.217836	19.92883	25.97107
Firm age	8.864106	5.7934684	2.079442	27.526361
Sale growth opportunity	.098404	.2327094	-.8339386	.7059863

Table 3.1 shows the results of the mediation effect of R&D investment on the relationships between independent board of directors and firm performance. The results indicate that in the first step (model 1) independent board has a negative significant relationship with innovation investment (β=-0.0105, $p<0.1$), and in the second model it had a positive insignificant relationship with firm performance (β = 0.351, model 1b). In the third model, there is the relationship of independent board with performance remains insignificant while R&D intensity and firm performance, highly related (β=2.397, $p<.01$ see model 1c). This

shows that the relationship between CG that is measured by the independent board and the firm performance measured by TQ is not mediated by innovation investment in Chinese listed firms. Therefore, hypothesis 1a is not supported, which predicts R&D investment has a mediating effect on the relationships of independent board and firm performance. The study findings contradict the argument that the independent board plays a key role in the acquisition of technical information, external communication that accelerates the transfer of information that promotes firm performance (Westphal, 1999).

Table 2 Correlation matrix and Variance inflation factors

Variables	1	2	3	4	5	6	7	8	9	VIF
Firm size	1									1.64
Firm age	0.182***	1								1.13
Growth opportunity	0.033***	-0.049***	1							1.03
R&D investment	-0.274***	-0.114***	-0.019**	1						1.24
Product market competition	-0.008	-0.089***	0.013	0.161***	1					1.01
Debt financing	0.543***	0.165***	-0.024***	0.341***	-.033***	1				1.51
Dual leadership	-0.178***	-0.089***	0.049***	0.142***	-0.004	-0.145**	1			1.09
Independent board	0.006	-0.056***	-0.012	0.067***	0.039***	-0.014*	0.121***	1		1.02
Ownership concentration	0.081***	-0.232***	0.109***	-0.031**	0.032***	-0.126**	0.053***	0.052**	1	1.18

As we have seen in the sections above (Chapters 3 and 4) the independent board plays an insignificant role in Chinese listed companies. Furthermore, Chen (2019) has confirmed that the independent board has no impact on R&D and strong performance in Chinese listed firms. Current research confirms that the independent board has a negative relationship with R&D investment and a non-significant contribution to firm performance, while R&D has a positive relationship with firm performance.

Table 3.2 shows the regression results of the effect of CEO leadership on firm performance through R&D investment. The result indicates the effect of CEO duality on firm R&D was positively significant (β=0.00115, $p < 0.1$), model 2(a), and the effect of CEO duality on firm performance was also negative and insignificant (β =-0.0235), see model 2b). When R&D intensity was inserted in the dual leadership and firm performance regression, its relationship had to remain a negative insignificant relationship, while R&D has a positive (β = 2.398, $p<0.01$) significant association with firm performance. These results lead to reject hypothesis 1b, which shows that R&D investment can mediate between the dual leadership and performance of firm in the listed Chinese companies. This also highlights the unimportant role of the dual CEOs in enhancing market performance through investment in research and development.

Table 3.1: Regression results of Mediation effect of R&D investment on the relationship between independent board and Firm performance

	R&D investment	Firm performance(TQ)	
VARIABLES	(1a)	(1b)	(1c)
Firm size	0.00309***(0.000556)	-0.913***(0.0386)	-0.911***(0.0386)
Firm age	0.00353*(0.00197)	1.202***(0.137)	1.147***(0.137)
Growth opportunity	-0.0085***(0.000812)	0.0379(0.0563)	0.0783(0.0576)
Board independence	-0.0105*(0.00569)	0.351(0.394)	0.353(0.394)
R&D intensity			2.397***(0.719)
Constant	-0.0299***(0.00954)	19.13***(0.661)	19.13***(0.661)
Industry&year dummies	yes	yes	yes
Observations	11,634	11,634	11,634
R-squared	0.020	0.070	0.071
Number of firms	2,492	2,492	2,492

Note: *, **, *** represent 10%, 5%, 1% statistical significance levels respectively

Table 3.2: Regression results of Mediation effect of R&D investment on the relationship between dual leadership and Firm performance

	R&D investment	Firm performance (TQ)	
VARIABLES	2(a)	2(b)	2(c)
Firm size	0.00311***(0.000556)	-0.914***(0.039)	-0.912***(0.0386)
Firm age	0.00340*(0.00197)	1.207***(0.136)	1.153***(0.137)
Growth opportunity	-0.00853***(0.000812)	0.0371(0.0563)	0.0775(0.0576)
Dual leadership	0.00115*(0.000653)	-0.0235(0.0453)	-0.0245(0.0453)
R&D intensity			2.398***(0.719)
Constant	-0.0342***(0.00932)	19.27***(0.646)	19.27***(0.646)
Industry&year dummies	yes	yes	yes
Observations	11,634	11,634	11,634
R-squared	0.019	0.070	0.071
Number of firms	2,492	2,492	2,492

Note: *, ** and *** indicate 10%, 5%, 1% statistical significance levels respectively

Regarding the mediating role of R&D investment in the relationship between ownership concentration and firm performance, the first two regression of ownership concentration on R&D investment and firm performance shows a significant positive relationship (β=0.0150, p<0.01 and β= β = 0.328, p< 0.1 see model 1 & 3 of Table 3.3 respectively. When R&D investment is inserted into the model the relationship of ownership concentration and firm performance becoming insignificant (β=0.300, p>0.10), due to the presence of R&D investment, while R&D strongly relationships with firm performance (β=2.219, p<0.01). This result shows that the ownership concentration has direct and indirect relation with firm performance (TQ) in Chinese listed firms. This result reveals the concentrated ownership can exert more control and prevent managers from conducting actions against shareholders interests (Zhang et al., 2014). As a result, managers will become invested in the ownership benefits, and it improves firm performance. A study in emerging markets like Chen et al. (2014); Zeng and Lin (2011) in China shows block ownership controlled firm has a positive relation with innovation investment which guide firms to better performance. Block ownership able to identify the characteristics of innovation, whether it is more risk or not. Thus, concentrated ownership allows the provision of more contribution for improving the firm's performance by adopting an effective innovation policy.

Table 3.3: Regression results of mediation effect of R&D investment on the relationship between ownership concentration and Firm performance

	R&D intensity	Firm performance (TQ)	
VARIABLES	3(a)	3(b)	3(c)
Firm size	0.00295***	-0.946***	-0.943***
	(0.000563)	(0.0390)	(0.0390)
Firm age	0.00484**	1.512***	1.454***
	(0.00213)	(0.147)	(0.148)
Growth opportunity	-0.00870***	0.00538	0.0436
	(0.000816)	(0.0565)	(0.0578)
Ownership concentration	0.0150***(0.003)	0.328*(0.184)	0.300(0.184)
	(2.71e-05)	(0.00188)	(0.00188)
R&D intensity			2.219***(0.718)
Constant	-0.0374***	18.52***	18.53***
	(0.00952)	(0.659)	(0.659)
Industry&year dummies	yes	yes	yes
Observations	11,634	11,634	11,634
R-squared	0.020	0.073	0.074
Number of firms	2,492	2,492	2,492

Note: *, **, * represent 10%, 5%, 1% statistical significance levels respectively**

Concerning the mediation role of R&D investment in the relationship of external corporate governance and firm performance, Table 3.3 provided the statistical results of R&D investment in between the product market competition and firm performance. It indicates product market competition has a positive and significant impact on firm R&D investment level (model 1). Regarding the relation of product market competition and firm performance, it had a positive (β=3.188) and significant relationship at the 1% level (see model 2 Table 3.3). On the third step (model), when product market competition and R&D intensity entered into the model at the same time the relationship significance level of product market competition and firm performance remains existing, while the impact of R&D strongly significant (β=2.446, p<0.01). However, the coefficient of its relation reduced to 3.179, which provides the partial mediating role of R&D intensity between product market comp and firm performance.

This result also partially supported our hypothesis. In this study, product market concentration is measured by market concentration. This means high concentration shows less competition in the market. So our finding indicates that firms in high market concentration invest more in R&D activities and as well as had better performance. This shows concentrated product market competition was contributed to firm performance through promoting innovation investment in Chinese listed. This is against the argument that better R&D expense is driven by better future firm performance in competitive industries (Lefeng Gu, 2015; Bens et al., 2004; Andras and Srinivasan, 2003), due to the underdeveloped nature of Chinese external corporate governance system. Debt finance has negative significant (β=-0.0250, p<0.01) impact on R&D intensity, and has positive significant on firm performance (β = 0.889, p< 0.01). When the R&D intensity added to the direct relationships of debt finance and firm performance became remain positive significant. Whereas, the effect of R&D on firm performance is positive and significant (β=2.780, p<0.001). But the coefficient of debt finance and the firm performance had reduced to (model 5c) β = 0.841, due to the presence of R&D intensity. This shows partial mediation of R&D intensity in the relation of firm performance and external debt. These results guide us to accept the proposed hypothesis, which predicts the innovation capacity of a firm can mediate the relationship between firm performance and debt financing in Chinese listed firms. These findings can be

explained in various ways: Creditors of Chinese firms are not willing to firms' invest on risks investment activities (R&D investment), rather than they initiating firms' to invest on non risky investments. In other ways, creditors such banks only receive interest from loans and do not share returns from R&D investments with firms. This is consistent with argument; creditors prevent companies from investing in promising projects because debt contracts make it difficult for firms to raise more money (shleifer and vishny, 1997). Therefore, this indicates a high rate of debt- asset ratio obtains a low investment rate of R&D which contributes for positive impact on firm performance in Chinese listed firms.

Table 3.4: Regression results of mediating effect of R&D in the relationship between PMC and firm performance

	R&D intensity	Firm performance (TQ)	
VARIABLES	4(a)	4(b)	4(c)
Firm size	0.00312***(0.00056)	-0.862***(0.0389)	-0.859***(0.0388)
Firm age	0.00336*(0.00199)	1.384***(0.137)	1.329***(0.138)
Growth opportunity	-0.00854***(0.000813)	0.0229(0.0561)	0.0640(0.0573)
Product market competition	0.000723*(0.00518)	3.188***(0.357)	3.179***(0.358)
R&D intensity			2.446***(0.716)
Constant	-0.0341***(0.00978)	17.43***(0.675)	17.42***(0.675)
Industry&year dummies	yes	yes	yes
Observations	11,634	11,634	11,634
R-squared	0.019	0.078	0.079
Number of firms	2,492	2,492	2,492

Note: *, **, *** represent 10%, 5%, 1% statistical significance levels respectively

Table 3.5: Regression results of mediating effect of R&D in the relationships between debt financing and firm performance

	R&D intensity	Firm performance	
VARIABLES	5(a)	5(b)	5(c)
Firm size	0.00474***(0.000568)	-0.969***(0.0396)	-0.969***(0.0396)
Firm age	0.00281(0.00195)	1.226***(0.136)	1.164***(0.137)
Growth opportunity	-0.00819***(0.000806)	0.0256(0.0562)	0.0717(0.0575)
Debt financing	-0.0250***(0.00207)	0.889***(0.145)	0.841***(0.144)
R&D intensity			2.780***(0.720)
Constant	-0.0582***(0.00946)	20.08***(0.660)	20.13***(0.659)
Industry&year dummies	yes	yes	yes
Observations	11,634	11,634	11,634
R-squared	0.035	0.074	0.075
Number of firms	2,492	2,492	2,492

Note: *, **, *** represent 10%, 5%, 1% statistical significance levels respectively

5.1. Conclusion

This study examined the potential mediating role of innovation capacity of firms measured by R&D investment in between the relationships of CG and firm performance. Results were found to support the mediation role of innovation investment in between most corporate governance mechanisms and firm performance in Chinese listed firms. Specifically; we found

a full mediation role of the R&D investment in between CG and firm performance, while CG measured by concentrated ownership. Concentrated ownership can contribute to the performance of a firm by promoting growth opportunities through innovation activities in Chinese firms. This shows that concentrated ownership is very important in Chinese firms by enhancing innovations. Similarly, we found the partial mediation role of firm innovation capacity in the relationship between CG and firm performance, when CG measured by dept financing, and product market competition. Our finding doesn't show any mediation role of R&D investment in between the relation of independent board and COE duality, and firm performance in Chinese listed firms.

Our finding also shows external corporate governance mechanisms are also important controlling mechanisms of corporate governance, the empirical results show as debt financing and market competition have a direct and indirect effect on firm performance in Chinese listed firms. Generally, in emerging markets like China, the economy is highly at the developmental stage and Chinese state-owned firms are privatized from time to time (Zhang et al., 2014). This means the market capitalization process becoming more competitive, through such changes firms may face the challenges arising from the business environment in with they operate. In such a case, innovation is a key to sustaining long term growth and gaining competitive advantage, therefore, firms need more strong and effective internal and external corporate governance that fostering firm value through innovation. Finally, our findings concluded that firms can benefits from corporate governance through innovation investments to foster firm performance. This provides support to the agency theory because firms' corporate governance promotes the internal innovation that contributes to firm performance.

5.2. Contributions

The study makes several important contributions to the literature. While several kinds of research have been conducted on the direct relation of CG and firm performance, this study contributed to the emerging market by providing comprehensive empirical evidence to the corporate governance literature using unique characteristics of Chinese listed firms covering nine years. Therefore, the current study provides empirical evidence that a firm's innovation investment (R&D intensity) mediates the relationship between some corporate governance mechanisms and firm performance. Thus, the results of our study contribute to our understanding of the mediation role of innovation investment in the relationship between corporate governance practices and firm performance in an emerging market economy. Farther more, our study result yields important implications for managers/owners and policymakers in emerging market. Firms in emerging economies should enhance innovation through strengthening internal CG role, and policymakers should designing strategies that optimizing debt financing from external financial institutions and should adopt innovation policy the strengthen the relationship between corporate governance and firm performance.

5.3. Limitation and Future Research Suggestions

This study has several limitations, among these: The study investigated the mediating role of innovation capacity of the firm in the between corporate governance and firm performance. We measured innovation capacity by using input-oriented methods, which is R&D investment; this might not show the exact capacity of firm innovation capacity. Thus, the future study can include output-oriented innovation measurements such as patent application and citation in this research framework. Second, this study included all firms in listed firms except financial firms; the next study can use innovation-intensive industries that could show the role of innovation investment more clearly.

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