

Does Corporate Governance Reduce the Overinvestment of Free Cash Flow? Empirical Evidence from China

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Abstract

This paper theoretically and empirically investigates the relationship between corporate governance mechanisms and firm level overinvestment of free cash flow based on a broad cross-sectional sample of 1411 firm-year observations of listed companies in Shanghai and Shenzhen stock exchanges in China over the period 2003 to 2010. By following the creative approach to measure overinvestment and free cash flow suggested by Richardson (2006), the results show that there is a significantly positive association between overinvestment and free cash flow. Further analysis reveals that this positive association is mainly driven by state-owned enterprises sub-group. Finally, this paper explores the governance role of firm's board of directors and debt financing in controlling overinvestment of free cash flow. The results indicate that state-owned enterprises with a large board of directors are more likely to engage in overinvestment of free cash flow. Contrary to the theoretical expectation, there is no evidence suggesting that the independence of the board of directors, as measured by either the proportion of non-executive directors on the board or the separation of roles of board chairman and CEO, is significantly negatively associated with overinvestment of free cash flow. However, I find that both short-term debt (debt maturity structure) and total leverage can significantly reduce the likelihood of state-owned enterprises' overinvestment. Furthermore, the governance role of short-term debt in constraining overinvestment is even stronger for private-owned enterprises with high free cash flow and low growth opportunities. However, bank loan has no impact on the reduction in the degree of overinvestment of free cash flow. These results above show that the board of directors is ineffective in alleviating the firm's level of overinvestment of free cash flow. According to relevant provisions of newly promulgated companies law in China, the board of directors should hold overall responsibility for ensuring that shareholders' interests are not expropriated by self-interested managers, however, it doesn't perform functions very well.

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1 Introduction

In a world with perfect capital markets where there are no asymmetric information and transaction costs, and debt financing is free risk, Modigliani and Miller (1958) have confirmed that a company's investment decisions are independent of its financing decisions, and the market value of a company will be determined only by the future profitability and capital cost of its investment projects, which will achieve the maximum market value at the optimal level of investment. However, there are no conditions that establish perfect capital markets in reality, Information asymmetries and transaction costs in the capital markets may give rise to agency conflicts and contract enforcement problems between shareholders and managers, which causes the actual investment expenditures of a company deviating from its optimal level of investment, and thus results in the company's investment inefficient. Though the manifestations of inefficient investment include both overinvestment, which shows that a company may undertake some projects with negative net present value, and underinvestment, which indicate that a company could forego or postpone some investment opportunities that would have positive net present value in the absence of adverse selection (Biddle, Hilary and Verdi, 2009), from a principal-agency perspective, if interest conflicts between the managers and shareholders are reflected in a firm's investment decisions, in order to obtain much more monetary and non-monetary private benefits associated with a larger company size, such as pursuit of power, as well as perquisites, self-interested managers would continue to invest in some low-return or even loss projects that are beneficial from view point of managers but costly from the perspective of shareholders (Jensen, 1986). Overinvestment makes a company's funds troppo sunk in idle fields of production capacity, which wastes scarce resource and results in a reduction in company value. Therefore, in nature, overinvestment is not only whether a company's investment is efficient, but also an agency problem. The free cash flow hypothesis suggested by Jensen (1986) states that when there exist rich internal cash flows in excess of that required to fund all projects that have positive net present values which are discounted at the relevant capital cost, managers' empire building incentives will create the potential to misuse those funds rather than pay them out to shareholders. In a model in which managers have an interest in growth, and can't credibly communicate their company's investment opportunities to the market, Stulz (1990) demonstrates that managers will tend to choose to invest too much when cash flow is high, and are forced to invest too little when cash flow is low. By influencing the resources under managers' discretion, financing policies can reduce the costs of under- and overinvestment. Empirically, Richardson (2006) uses an accounting-based framework to measure overinvestment and free cash flow and finds that overinvestment is likely to occur in companies with the highest levels of free cash flow, which provides the direct empirical support for Jensen's (1986) free cash flow hypothesis. At the same time, his evidence indicates that certain governance mechanisms, such as the presence of activist shareholders, appear to mitigate overinvestment. In the context of China, some scholars have also found that there exists overinvestment behavior abusing cash flows for Chinese listed companies. Fu (2011) examines the effect of overinvestment on the operating performance of SEO companies and finds that it is managers'

overinvestment incentives behavior that results in companies' operating performance deterioration following seasoned equity offerings (SEOs). Based on the Jensen's free cash flow hypothesis, Liu (2006) and Li (2007) have studied the relationship between overinvestment and free cash flow, respectively, and found that a company's overinvestment is significantly positively associated with its free cash flow.

The financial objective of a company is to maximize its shareholders' wealth or return on investment. Though overinvestment could increase the managers' utility, as a behavior of abusing funds and destroying company value, overinvestment damages shareholders' interests. Thus, when a company's free cash flow is high, how to force managers to return these surplus funds to shareholders rather than invest them in unprofitable projects or waste them on organizational inefficiencies becomes an important problem that corporate governance mechanisms need to resolve. On the one hand, being a core institution arrangement of modern company governance structures, the board of directors performs two main functions of ratification and monitoring for important decisions of a company including the investment activities (Fama and Jensen, 1983). While a large body of corporate governance literature has investigated the effect of the board of directors on corporate agency problems and demonstrated an efficient board of directors can play a major role in reducing agency conflicts between shareholders and managers (Yermack, 1996; Peasnell, Pope and Young, 2005; Cai, 2007), relatively few papers have directly explored the relationship between overinvestment of free cash flow and the board of directors. A potentially more important question is whether the board of directors can control the overinvestment of free cash flow and improve the efficiency of resource allocation of a company, and protect the outside shareholders' interests against expropriation imposed by self-interested managers. On the other hand, Jensen (1986) and Stulz (1990), among others, argue that a potential way to resolve the overinvestment problem of free cash flow is debt creation. Due to its hard constraint attribute of payment of principals and interests, debt reduces the cash flows available for value-destroying empire-building projects at the discretion of managers, and thus effectively lower the agency costs of free cash flow. The effects of the supervision of managers and improvement of organizational efficiency of debt are called as the "control hypothesis" for debt creation (Jensen, 1986). Utilizing the basic principle of control hypothesis for debt creation, Gul and Tsui (1998), Jaggi and Gul (1999), Wang (2004) test the role of debt in reducing the agency costs of free cash flow, respectively. Gul and Tsui, Jaggi and Gul both find that debt can significantly reduce the free cash flow at the discretion of managers and thus provide the direct support for Jensen's control hypothesis for debt creation. On the contrary, using Chinese listed companies' firm-level observations as research sample, Wang does not find debt has the governance role of reducing the agency costs of free cash flow. While Lang, Ofek and Stulz (1996), and Aivazian, Ge and Qiu (2005a) directly explore the influence of debt on firm investment and document that debt is significantly negatively associated with investment. In another paper, Aivazian, Ge and Qiu (2005b) directly test the correlation between maturity structure of a firm's debt and its investment decisions, and find that, after controlling for the effect of the overall level of leverage, a higher percentage of long-term debt in total debt significantly reduces investment for firms with high growth opportunities. In contrast, the relationship between debt maturity structure and investment is not significant for firms with low growth opportunities.

Through systematical analysis of these literature, I find that, most studies mainly focus on how debt reduce the agency costs of free cash flow. By contrast, few papers have directly

studied the governance role of debt in controlling the overinvestment of free cash flow. Furthermore, when a majority of the scholars study the control hypothesis for debt creation, they usually consider classes of debt as homogeneous, and few have paid attention to the differences in the governance effect of classes of debt with different seniorities. In fact, Since there is a huge differences for corporate debt in terms of maturity, sources and priorities, different debt financing contract arrangements inevitably lead to the differences in governance efficiency of classes of debt. Therefore, when exploring control hypothesis for debt creation, it may arrive at a confused or wrong research conclusions without considering the difference in governance efficiency of classes of debt. In sum, based on the analysis above, I think the evidence on the possible effect of governance mechanisms on overinvestment of free cash flow is scarce. The purposes of this paper seek to address the following questions: (1) Under the special institutional background of a transitional economy, such as China, whether there is overinvestment of free cash flow in Chinese listed companies. (2) If Chinese listed companies tend to engage in overinvestment when free cash flow at managers' discretion is high, whether both the board of directors and debt can reduce the overinvestment of free cash flow and relieve the agency conflicts between shareholders and managers in terms of the use of surplus funds. The answer to the first question constitutes the base for further studying the second question.

The principal tests of this paper suggest that state-controlled companies with high free cash flow are more likely to engage in overinvestment, but the positive relationship between overinvestment and free cash flow does not exist in private-controlled companies. I also find that state-controlled companies with a large board of directors tend to use their free cash flow in overinvestment, Contrary to the theoretical expectation, the results of this paper do not provide evidence that the independence of the board, as measured by either the the proportion of non-executive directors on the board or the separation of roles of board chairman and CEO can significantly constrain the overinvestment of free cash flow. Both short-term debt and total debt are significantly negatively associated with overinvestment. Furthermore, short-term debt can play an even more important roles in reducing the overinvestment of private-controlled companies with high free cash and low growth opportunities. However, the governance role of private debt, such as bank loan, in controlling a firm's overinvestment of free cash flow is weakened, and there is no evidence suggesting that bank loan can significantly reduce the overinvestment of free cash flow relative to other debt sources. These research results above have important policy implications due to the heightened interest in corporate governance matters from governments and regulators (Davidson, Goodwin-Stewart and Kent, 2005).

The remainder of this paper is organized as follows. Section 2 presents the theoretical analysis and related hypotheses. In section 3, I provide a brief description of the sample selection, the variable definitions and methodology specification. It also discusses the measurements of overinvestment and free cash flow by following the investment expectation model creatively suggested by Richardson (2006). The main results are reported in section 4. The final section summarizes findings of this paper and discusses some policy implications.

2 Institutional Background, Theoretical Analysis and Research Hypotheses

Since free cash flow hypothesis advanced by Jensen (1986), free cash flow has become one of the most important factors to be considered in the overinvestment research. According to Jensen's (1986) definition, free cash flow is cash flow in excess of that required to fund all projects that have positive net present values when discounted at the relevant cost of capital (Jensen, 1986). Due to agency problems, there are interest conflicts in terms of the use of free cash flow between managers and shareholders. Theoretically, if the firm had excess cash beyond that needed to fund available positive NPV projects (including options on future investment), from the perspective of increasing shareholders' wealth, it would distribute free cash flow to shareholders in the form of extra dividends. However, returning free cash flow to shareholders will reduce resources under control of managers which could be used to build empires to increase their personal utility. Thus, managers have incentives to hoard and abuse free cash flow, and invest the excess funds in some projects with negative NPV which are beneficial from managers' perspective but costly from shareholders' perspective. Through continuously investing in negative NPV projects, managers can not only control more resources and acquire more perquisit consumption, but also upgrade their powers in the firm. Especially for those firms whose free cash flow is high (i.e., free cash flow is positive), but growth prospects are poor, the incentives for managers to undertake overinvestment are usually even more severe. therefore, free cash flow hypothesis holds that firms with large free cash flow are more likely to engag in overinvestment. These overinvestments, though enhancing managers' private benefits, destroy company value, and thus reduce shareholders' wealth. Richardson (2006) finds that overinvestment is mainly concentrated in firms with highest levels of free cash flow. On the contrary, overinvestment is less likely to occur in firms with low free cash flow. Based on the analysis above, I can put forward the first hypothesis:

H1: Overinvestment is significantly positively associated with free cash flow.

During the process of economic transition in China, in order to satisfy the fund demand of state-owned enterprises to realize the sustainable growth of inner-system economies, Chinese government adopts ultrastrong financial control policy characterized by financial repression and ownership discrimination. Financial repression and ownership discrimination under ultrastrong financial control policy have resulted in the ability of private-controlled enterprises to raise external funds generally weaker than that of state-controlled enterprises, which lead to private-controlled enterprises facing much more severely financing constraints in the capital markets. In order to obtain the funds required for investment externally, private-controlled enterprises are usually forced to pay very high cost premium for external financing. Therefore, private-controlled enterprises' managers have even stronger incentives to use company's funds effectively than those of state-owned enterprises. In other words, though the investment expenditures of private-controlled enterprises may be also distorted and inefficient due to information asymmetry in the capital markets and agency conflicts, the inefficient degree of investment of private-controlled enterprises is significantly lower than that of state-owned enterprises, and the forms of inefficient investment of private-controlled enterprises are more likely to arise from underinvestment rather than overinvestment. On the contrary, because of the policy loans of the state-owned banks and the expectation of soft budget constraint bailing out from the governments at all levels when falling into financial distress, as well as

institutional arrangements of the stock markets sevicng for the difficulties of the state-owned enterprises in China, state-owned enterprises generally have a much higher ability to obtain external financing and thus face lower financing constraint than that of private-controlled enterprises. As a result, managers of state-owned enterprises are more prone to generate self-interested behaviors, and less likely to use the company's funds effectively, and thus giving rise to even higher agency problems between shareholders and managers. In order to obtain much more monetary and non-monetary benefits associated with a large company size, managers of state-owned enterprises have more strong incentives to engage in overinvestment, which inevitably reduces the company's investment efficiency (Cai, 2012). Thus, according to the theoretical analysis above, my second hypothesis could be ststed as follows:

H2: The overinvestment problem of free cash flow is even more severe in state-owned enterprises than in private-controllrd enterprises in China, other things being equal.

Though the theoretical analysis above shows that, due to agency problems between managers and outside shareholders, firm tends to engage in overinvestment when its free cash flow is high. However, both free cash flow and overinvestment are associated with the optimal level of investment. According to neoclassical investment theory (Jorgenson, 1971), since the investment demand of a company is an increasing function of its investment opportunities, a company's optimal level of investment will systematically vary with its quality of growth prospects. To be exact, the optimal investment level will be higher for those firms that have abundant valuable growth opportunities in the future than that of other firms with poor growth opportunities. Thus, through influencing the optimal level of investment, growth opportunities will impose an important effect on the level of free cash flow and overinvestment, which results in the relation between free cash flow and overinvestment potentially changing with growth opportunities of a company. The probability of overinvestment is much higher for companies with serious agency costs of free cash flow, which are lack of good investment opportunities and simultaneously hold large excess cash flows. By developing a measure of free cash flow using Tobin's q to distinguish between companies that have good good investment opportunities and those that don't, and using a sample of successful tender offers, Lang, Stutz and Walking (1991) find that companies with high cash flow and low growth opportunities are more likely to engage in acquisition activities that result in a reduction in company value. On the contrary, the probability of overinvestment is least for companies with low cash flow and high growth opportunities. accordingly, I can put forward the third hypothesis below:

H3: If free cash flow hypothesis is ture, the overinvestment problem is much stronger for companies with low growth opportunities and high free cash flow compared with other types of companies.

Diffuse shareholders constrained by collective action problems must rely on the board of directors to monitor and deter managers from implementing policies that diverge from shareholders' interests (Hanson and Song, 2006). In modern company, the board of directors is widely believed to play an important role in corporate governance, particularly in constraining and ensuring that managers act in the interests of outside shareholders (Fama and Jensen, 1983) and regard the board of directors as one of the most important control mechanisma available since it constitutes the apex of a company's internal governance structures. Because the board of directors links shareholders who provide capital and managers who use these capital to create value together, it is regarded as the core of modern corporate governance mechanisms in some corporate governance literature. From an agency perspective, the ability of the board of directors to act as an effective

control mechanism is often dependent upon its size and independence from the managers (Beasley, 1996; Davidson, Goodwin-Stewart and Kent, 2005). The role of board size in corporate governance has not yet reached agreement among scholars. Some scholars agree that if board size is too large, it will result in the directors acting slowly and divergent views, and thus lead to the directors' powers and responsibilities unclear and weaken their monitoring functions, which causes a company operation inefficient. Jensen (1993) argues that, due to the inherent coordination problems inside the board of directors together with managerial discretion, the operating efficiency is much higher for a company with small size board of directors than that with large size board of directors. When the number of directors on the board is beyond (or exceeds) seven or nine persons, the likelihood of the board of directors effectively monitoring managers is smaller and more likely to be controlled by managers. Yermack (1996) argues that companies with smaller board tend to be more effective in monitoring managers' behavior. As evidence, Newell and Willson (2002) have documented that the most efficient board of directors should be comprised of 5-9 members. However, other scholars believe that a large board of directors is much more beneficial to corporate governance than a small board of directors. More (2002) argues that the board of directors is too small to meet the demand for range of management, and that a board of directors with nine to fifteen members is the most suitable.

Given the board size, the governance effectiveness of the board of directors is usually determined by its independence from management. Independence of the board of directors refers to the extent to which a board of directors is comprised of non-executive directors who have no relationship with the firm beyond the roles of directors and whether there is a separation of the roles of board chairman and the chief executive officer (Davidson, Goodwin-Stewart and Kent, 2005). Directors' independence as well as their power and willingness to constrain managers' malevolent behavior plays a crucial role in the success of governance structure of a company (Hanson and Song, 2006). The governance literature stresses the the role of non- executive directors in resolving agency problems between managers and shareholders through the creation of appropriate employment contracts and the subsequent monitoring of managerial behavior (Peasnell, Pope and Young, 2005). Fama and Jensen (1983) argue that the incentives to maintain the value of their reputation capital in the external labor markets enable non-executive directors to be less likely to collude with managers to expropriate shareholders' wealth, which thus ameliorates the interest conflicts between managers and shareholders. Therefore, a non-executive director who is entirely independent from management is expected to provide the greatest protection in monitoring managers' actions and ensuring that managers are pursuing policies consistent with shareholders' interests (Baysinger and Butler, 1985). It is generally accepted that a higher proportion of non-executive directors on the board is more effective in constraining managers' discretion. Consistent with view above, Rosenstein and Wyatt (1990), Byrd and Hickman (1992) find that the proportion of non-executive directors on the board is positively associated with a company performance. Lin, Pope and Young (2003) show that stock prices of a company respond positively to the announcement of appointment of non-executive directors, namely, the appointment of non-executive directors increases the company value. McWilliams and Sen (1997) documents that board effectiveness in protecting shareholders' wealth is an increasing function of the proportion of non-executive directors on the board.

Another independence of the board of directors relates to duality, which occurs when the same person undertakes the combined roles of chief executive officer and board chairman

(Hanson and Song, 2006). According to principal-agency theory, in the modern company where ownership separates from management, agency problems are mainly reflected in the interest conflicts between managers and shareholders. Using the board of directors to monitor managers is an important governance mechanism that shareholders safeguard their own interests from expropriation by managers. The ability of the board of the directors to fulfil monitoring function will be weakened when chief executive officer also serves as board chairman. The appointment of the chief executive officer to the position of board chairman can lead to a concentration of power (Beasley, 1996) and possible conflicts of interest, thus resulting in a reduction in the level of monitoring (Davidson, Goodwin-Stewart and Kent, 2005). As a specific form of agency problem in the modern company, the occurrence and level of overinvestment of free cash flow is obviously influenced by the governance effectiveness of the board of directors. Based on the analysis above, I can put forward these three hypotheses as follows:

H4a: Overinvestment of free cash flow is positively associated with the board size.

H4b: Overinvestment of free cash flow is negatively associated with the board size.

H5: Overinvestment of free cash flow is negatively associated with the proportion of non-executive directors on the board.

H6: Overinvestment of free cash flow is negatively associated with the separation of the roles of board chairman and CEO.

a company's overinvestment problem is generally associated with its free cash flow, as well as the information asymmetry in the capital markets. Previous studies have showed, as a control mechanism, debt has the functions of mitigating managers' moral hazard and lowering agency costs of free cash flow by forcing managers to disgorge surplus funds, and therefore reducing the amount of cash under their discretion. Debt is thus hypothesized to be able to alleviate the incentives for managers to overinvest in negative net present value projects which reduce shareholders' wealth. However, when scholars analyze the governance role of debt, they always consider classes of debt of a company raising from different sources as homogeneous. In fact, each debt is different in terms of maturity, source and priority. Different debt financing contract arrangements will lead to the differences in governance efficiency of debt. First, as for debt maturity structure, Although, due to its role of hard claims in constraining managers, both short-term debt and long-term debt would play an important role in the modern corporate governance, the characteristic or emphasis of restricting managers' behavior is different between short-term debt and long-term debt (Yang and Zheng, 2004). Several prior studies have showed that the governance role of short-term debt is mainly reflected in the liquidation of a company and restriction on managerial discretion over free cash flow (Hart and Moore, 1995)¹², and delivering high quality signal to the outside investors (Flannery, 1986). On the contrary, the governance role of long-term debt is mainly focused on preventing the company from raising new capital for unprofitable investment against future earnings from assets in place (Hart and Moore, 1995). Therefore, relative to the long-term debt, short-term debt has an advantage in reducing the agency costs associated with free cash flow and information asymmetry in the capital markets. Second, as far as debt sources are

¹² Hart and Moore (1995) have theoretically showed that nonpostponable, short-term debt could force managers disgorge cash flows that might otherwise be used to make unprofitable but empire-building investment, and trigger liquidation in states of the world where the firm's assets are more valuable elsewhere.

concerned (with respect to debt sources), private debt, such as bank loans, will be more efficient in curbing and monitoring the managerial behavior than public debt, whose typical form is a company's publicly issued bond, due to the following reasons: The first is that, as a professional lending institutions, banks can timely grasp internal information that a company has yielded yet not disclosed externally through using the companies' loan applications and their bank accounts. Thus, banks have advantages in collecting and processing information about companies. The second is that, because of their larger loan amount and longer loan term, in most cases, banks are the main representative of creditors participating in corporate governance and have the ability to intervene with the companies' activities when it is necessary. The third is that loan renegotiation between bank and company can transfer signals on the company's quality to capital markets, which thus reduces information asymmetry between company and outside investors. Therefore, as a creditor, bank has a comparative advantage in participating in corporate governance and monitoring managers of companies.

Taken together, the maturity structure and sources of debt constitute two important corporate governance mechanisms. In this paper, I employ the ratio of current liabilities to total debt and the ratio of bank loan (the sum of short-term loan and long-term loan) to total debt (hereforth referred to as the proportion of short-term debt and bank loan ratio, respectively) to proxy for two corporate governance mode of debt, which are used to reflect differences in governance role of maturity structure and sources of debt in controlling agency problems arising from overinvestment. In addition, I also use the total debt-to-asset ratio (leverage) to proxy for creditors' incentives to monitor managers. Generally speaking, as debt increases, the default risk of a company also increases. Creditor, therefore, have even higher incentives to monitor managers. Based on the analysis above, this can lead to the following hypotheses:

H7: Overinvestment of free cash flow is negatively associated with the ratio of short-term debt.

H8: Overinvestment of free cash flow is negatively associated with the ratio of bank loan.

H9: Overinvestment of free cash flow is negatively associated with total debt-to-asset ratio.

A series of research results have confirmed that agency problems associated with underinvestment and overinvestment systematically vary with a company's growth opportunities and exhibit significant variation (Myers, 1977; Jensen, 1986). The companies with high growth opportunities will face much more underinvestment problem (Myers, 1977), however, companies with low growth opportunities are often suffered from an overinvestment problem (Jensen, 1986). Since the agency problems faced by the companies with high growth opportunities are fundamentally different from those encountered by the companies with low growth opportunities, the control effect of debt varies with the company's growth opportunities. In particular, because companies with low growth opportunities and high free cash flow are more likely to give rise to agency problems of overinvestment, the control hypothesis implies that the governance function of debt is more important in companies that generate large cash flows yet have poor growth prospects, and even more important in companies which are falling into recession. In these companies, the potential pressure to squander cash flows by investing them in unprofitable projects is the most serious (Jensen, 1986). On the contrary, with respect to rapidly growing companies with large and highly profitable investment projects but low free cash flow, since such companies will be forced to resort to capital markets to raise funds regularly, the markets have an opportunity to evaluate these companies, their

managers, and their proposed projects. In this case, other governance mechanisms, such as bankers and analyst followings, will play a crucial role in monitoring managers' behaviors, which means that the governance function of debt will not be important for this kind of companies (Jensen, 1986). Some studies have empirically confirmed that there is an interaction between the corporate debt and growth opportunities. McConell and Servaes (1995) find that the relationship between corporate value and debt is negatively correlated for the rapidly growing companies, however, positively related for companies with low growth prospects. According to the theoretical analysis above, the following hypothesis can be proposed:

H10: The governance function of debt controlling overinvestment of free cash flow is significantly affected by the company's growth opportunities.

It is very important to note that its hard constraint attribute and the existence of the efficient bankruptcy institutions constitute an essential prerequisite of the achievement of control effect of debt. As for China, there are many deficiencies in these aspects, which are focused on that soft budget constraint problems of debt resulting from governments at all levels administrative intervention in bank loan decision and irrationality of debt financing of state-owned enterprises have not been fundamentally changed so far. Consequently, whether debt can really play a role in reducing and controlling the overinvestment of free cash flow of Chinese listed companies is still an important problem which should be tested by using normative empirical research approaches.

3 Sample Selection and Research Design

3.1 A Framework to Measure the Overinvestment and Free Cash Flow

In order to construct measures of underinvestment and overinvestment, I follow the approach suggested by Richardson (2006) and first estimate a model that predicts expected investment of a company and then use residuals from this model as a proxy for inefficient investment. The model that has been modified is as follows:

$$I_{it} = \alpha_0 + \alpha_1 Gr_{it-1} + \alpha_2 Cash_{it-1} + \alpha_3 LnTA_{it-1} + \alpha_4 Roa_{it-1} + \alpha_5 Lev_{it-1} + \alpha_6 I_{it-1} + \alpha_7 LnAge_{it} + \Sigma Ind + \Sigma Year + \varepsilon_{it} \quad (1)$$

Where i is the sample company and t indicates the year in the sample period, respectively; I is the firm's capital expenditures and measured as cash paid to acquire fixed assets, intangible assets and other long term assets minus net cash received from the sale of fixed assets, intangible assets and other long term assets in period t scaled by the average book value of total assets as of the end of year $t-1$ and t . The prior period's firm-level (lagged) investment is included in model to capture non-modeled firm characteristics that affect investing decisions (Richardson, 2006) and the acceleration effect of investment. Gr is the firm's investment opportunities as of year $t-1$. In empirical studies, the variables commonly used to measure the company's investment opportunities are Tobin's q and sales growth, respectively. Tobin's q is defined as the ratio of the market value of the company's assets to their replacement cost at the start of the fiscal year. The market value of the company is the sum of the market value of the equity, the value of short term debt and the value of long term debt. The replacement cost of assets is proxied by the book value of

total assets. Tobin's q is an imperfect measure of investment opportunities because it is an average value rather than marginal value (Hayashi, 1982; Lang, Stulz and Walking, 1991). Further, marginal q itself is difficult to measure and Tobin's q calculation will use stock prices. Due to the inefficiency and functional fixation problems of stock markets in China, employing Tobin's q to proxy the company's investment opportunities will bring measurement errors. In addition, Alti (2003) has also showed that, since Tobin's q mainly reflects option value relating to firm long term growth potential but doesn't provide information about investment opportunities in the near-term, Tobin's q performs as a noisy measure of short-term investment expectations. Thus, to control possible measurement error in Tobin's q as a proxy for investment opportunities, I use sales growth as a proxy for a company's investment opportunities to estimate the regression. $Cash$ is the firm's cash and cash equivalent divided by the book value of total assets as of year $t-1$. $LnTA$ is the natural logarithm of book value of total assets as of year $t-1$, used to control the effect of company size on the investment. Roa is return on assets as of year $t-1$, equal to the ratio of the profit before interest and tax to the book value of total assets. Prior period's returns are included as an additional variable to capture growth opportunities not reflected in Gr . Lev is debt-to-asset ratio and measured as the book value of total debt (the sum of short-term debt and long-term debt) divided by the book value of total assets as of year $t-1$. $LnAge$ is the natural logarithm of the number of years the firm has been listed on the stock exchanges in China since IPO. Firm level investment is lessed when it is more difficult to raise additional cash to finance the new investment as captured by leverage, firm size, firm maturity and level of cash (Richardson, 2006). Finally, I include industry indicators, Ind , and year indicators, $Year$, since firm level investment patterns may systematically vary with differences in industry and are affected by fluctuation in macro economic conditions. For the purpose of industry classification, the Standard Industry Classification Code of China Securities Regulatory Commission (CSRC) is adopted. According to Standard Industry Classification Code of China Securities Regulatory Commission (CSRC), I constructed 20 industry dummy variables, consistent with prior research, such as Xia and Fang (2005). ε is error term.

The fitted values from the regression model (1) is the estimate of the expected level of investment, EI . The unexplained portion (or the error term) is the estimate of the unexpected investment, UI , which reflects the degree of a company's investment distortion. I measure investment efficiency using the residual from the model (1). If the residual is greater than 0, it indicates that firm is overinvesting. On the contrary, if the residual is less than 0, it means that firm is underinvesting. Both overinvestment and underinvestment are decreasing in investment efficiency (Biddle, Hilary and Verdi, 2009). Free cash flow can be defined as cash flow beyond what is necessary to maintain assets in place and to finance expected new investment (Richardson, 2006). According to the definition above, after calculating firm's expected investment for a particular firm, free cash flow can be computed as the difference between the firm's net cash flows from operation and its expected level of investment (EI), as estimated with regression model (1), and thus obtained as follows:

$$FCF_{it} = OCF_{it} - EI_{it} \quad (2)$$

Where FCF , OCF and EI is the firm's free cash flow, net cash flows from operating activities and the expected level of investment in period t of a company and normalized by the average book value of total assets as of the end of year $t-1$ and t , respectively.

3.2 Sample Selection and Data Sources

For the study of this paper, the initial sample are selected from all non-financial companies listed on Shanghai or Shenzhen stock exchanges in China during the period 2003 to 2010. To ensure the validity of the data collected and simultaneously minimize the effect of other factors on the research results, I exclude from our initial sample those companies whose main operational business has ever experienced substantial change. Also excluded are firms which have extreme outliers and those whose financial information is seriously inadequate or obviously misrecorded. At the same time, the privatized companies whose controlling private ownership came into being through the block transfer of state shares after IPO are also excluded. After these exclusion are made, I then obtain a pooled sample with 7215 firm-year observations in total over 8 years. On this basis, I use the model (1) to regress these 7215 firm-year observations. According to the study purpose of this paper, I confine the analysis to the subgroups of companies whose unexpected investment and free cash flow are both greater than zero (positive). Finally, the sample is left 1411 firm-year observations. Either financial data or non-financial data used in this paper, such as investment expenditures, growth opportunities, return on assets, the book value of asset and equity, short term debt, bank loan, debt-to-asset ratio (total leverage), the composition or characteristic of the board of directors, age (the number of years listed on stock exchanges since IPO), and company's ownership identity et al., are all obtained from disclosure made in annual report of listed companies published by Shanghai Wind Information Co., Ltd. of China, a leading Bloomberg-style data provider in China, and the China Securities Markets and Accounting Research (CSMAR) database prepared by Shenzhen GTA Information Technology Limited Company, another major data provider in China.

Table 1 presents the characteristics of full sample and subsamples of state-controlled companies and private-controlled companies by year and industry. It is evident from the year distribution outlined Panel A that, among 1411 firm-year observations, state-controlled companies and private-controlled companies account for 1135 and 276 observations in my sample, respectively. Moreover, in each year, the observations of state-controlled companies are all more than those of private-controlled companies, indicating that the probability of engaging in overinvestment is more likely to occur in state-controlled companies rather than private-controlled companies. Nevertheless, the number of overinvestment of private-controlled companies increase steadily from 14 in 2003 to 69 in 2010, suggesting that, with the increasing number of listed companies controlled by private entities, the likelihood of private-controlled companies to engage in overinvestment is also gradually increase. Panel B reports the industry distribution of full sample and subsamples of state-controlled companies and private-controlled companies. As with Panel A, in each industry, state-controlled companies all exhibit a higher possibility of undertaking overinvestment squandering funds. However, private-controlled companies operating in the machinery and equipment, medical and biological product sectors tend to have a higher number of overinvestment at 53 and 38, respectively.

Table 1: Distribution of Sample

Panel A: By year

This panel outlines the distribution of full sample and subsamples of state-controlled companies and private-controlled companies by year.

Year	Full sample	State-controlled companies	Private-controlled companies
2003	120	106	14
2004	135	117	18
2005	184	157	27
2006	193	165	28
2007	140	117	23
2008	186	150	36
2009	254	193	61
2010	199	130	69
Total	1411	1135	276

Panel B: By industry

This panel outlines the distribution of full sample and subsamples of state-controlled companies and private-controlled companies by industry.

Industry	Full sample	State-controlled companies	Private-controlled companies
Agriculture	26	23	3
Communication	102	68	34
Conglomerate	45	29	16
Construction	18	15	3
Culture, Sport and Entertainment	17	17	0
Electric, Gas, and Water	42	42	0
Electron	51	27	24
Textile and Clothing	88	59	29
Machinery and Equipment	248	195	53
Metal and Nonmetal	108	95	13
Lumber and Furniture	3	0	3
Other Manufacturing	12	5	7
Petroleum and Chemical	130	114	16
Food and Beverage	123	115	8
Medical and Biological Products	123	85	38
Papermaking and Printing	14	9	5
Mining	44	44	0
Public Utility	38	37	1
Real Estate	47	37	10
Transportation	67	64	3
Wholes and Retail trade	125	115	10
Total	1411	1135	276

3.3 Model Specification and Variable Definitions

The basic regression specifications used to test the hypotheses developed in this paper take the following two forms.

$$OverI_{it} = \beta_0 + \beta_1 FCF_{it} + \beta_2 Gr_{it} + \beta_3 Roa_{it-1} + \beta_4 LnAge_{it} + \Sigma Ind + \Sigma Year + \varepsilon_{it} \quad (3)$$

$$\begin{aligned} OverI_{it} = & \gamma_0 + \gamma_1 FCF_{it} + \gamma_2 Gr_{it} + \gamma_3 FCF_{it} * Gr_{it} + \gamma_4 Board_{it} + \gamma_5 Dir_{it} + \gamma_6 Dul_{it} + \gamma_7 Board_{it} * FCF_{it} \\ & + \gamma_8 Dir_{it} * FCF_{it} + \gamma_9 Dul_{it} * FCF_{it} + \gamma_{10} ShortDebt_{it} + \gamma_{11} Bank_{it} + \gamma_{12} Lev_{it} + \gamma_{13} ShortDebt_{it} \\ & * Gr_{it} + \gamma_{14} Bank_{it} * Gr_{it} + \gamma_{15} Lev_{it} * Gr_{it} + \gamma_{16} ShortDebt_{it} * Gr_{it} * FCF_{it} + \gamma_{17} Bank_{it} * Gr_{it} \\ & * FCF_{it} + \gamma_{18} Lev_{it} * Gr_{it} * FCF_{it} + \gamma_{19} Roa_{it-1} + \gamma_{20} LnAge_{it} + \Sigma Ind + \Sigma Year + \varepsilon_{it} \end{aligned} \quad (4)$$

In the model (3) and (4), *i* and *t* are firm and year indicators, respectively; *OverI* is the positive residuals estimated from regression model (1), which is used as a proxy for the firm's level of overinvestment. *FCF* is free cash flow that a company holds and measured as the difference between net cash flows from operating activities and the expected level of investment estimated from regression model (1) scaled by average book value of total assets as of the end of year *t*-1 and *t*. *Gr* is the firm's sales growth as of the end of year *t*, equal to the change in sale revenues between current year and previous year divided by total sale revenues of previous year, indicating a firm's investment opportunities. In model (4), The interaction term *FCF* × *Gr* is used to examine the effect of investment opportunities on the relation between free cash flow and overinvestment. Based on hypothesis 2, I expect the coefficient of *FCF* × *Gr* should be significantly negative. *Board* is the board size, as measured by the total number of directors on the board. Based on earlier studies, I conjecture that a smaller board will play a stronger monitoring role. *Dir* is the proportion of non-executive directors on the board. *Dul* is a dummy variable taking the value of 1 if the roles of chief executive officer and board chairman are overlapped, and 0 otherwise. The interaction terms, *Board* * *FCF*, *Dir* * *FCF* and *Dul* * *FCF*, are used to explore the effect of the size and the independence of the board on the relation between free cash flow and overinvestment, respectively, namely, whether an effective board of directors can significantly reduce a firm's overinvestment of free cash flow. *ShortDebt* is year-end total current liabilities divided by year-end total debt, reflecting a firm's debt maturity structure. *Bank* is bank loans acquired from banks scaled by total debt, which is used to measure debt sources. *Lev* is the sum of the year-end book value of short-term debt and long term-debt deflated by the year-end book value of total assets. Jensen (1986) argues that debt can serve as a device limiting managers' discretion and reduce the company's free cash flow, and thus forcing managers to reduce overinvestment (debt control hypothesis). Jaggl and Gul (1999) find that there is a significantly positive association between free cash flow and debt for firms with low investment opportunity set, which provide direct support to Jensen's (1986) "debt control hypothesis". The interaction terms, *ShortDebt* * *FCF*, *Bank* * *FCF* and *Lev* * *FCF*, are employed to test Jensen's "control hypothesis" for debt creation as well as the differences in governance effect among debt with different maturity and sources. If debt financing can effectively reduce overinvestment of free cash flow, the coefficients of *ShortDebt* * *FCF*, *Bank* * *FCF* and *Lev* * *FCF* are expected

to be all significantly negative. The tripple interaction terms, $ShortDebt * FCF * Gr$, $Bank * FCF * Gr$ and $Lev * FCF * Gr$ are used to examine the hypothesis 10 whether the governance function of debt financing controlling overinvestment of free cash flow is affected by growth opportunities. If the coefficients of $ShortDebt * FCF * Gr$, $Bank * FCF * Gr$ and $Lev * FCF * Gr$ are all significantly positive, then the hypothesis 10 is supported empirically. Remaining variables, such as Roa and $LnAge$, are all as previously defined.

In addition, in order to deeply investigate the difference in overinvestment of free cash flow between state-controlled companies and private-controlled companies, and explore how ownership identity of a company influences the role of governance mechanisms in controlling the overinvestment of free cash flow, at the same time avoid the multicollinearity between variables used in this paper, I further separate listed companies into state- and private-controlled subsamples based on the identity of the company's ultimate controlling shareholder and explore the effect of corporate governance on the two subsamples separately. When the company's ultimate controlling shareholder is the governments at all levels, such as the bureaus of state assets management, finance bureaus and bureaus in charge of different industries or other government agencies et al., I regard it as a state-controlled company. On the contrary, if the company's ultimate controlling shareholder is non-government units, such as entrepreneurs, townships and villages, and foreign companies, it is correspondingly treated as a private-controlled company, and re-estimate the regression model (3) and (4), respectively. Ultimate controlling shareholder of a company is identified through reviewing its published annual report.

4 Results

4.1 Analysis of Investment Model

Table 2 provides the descriptive statistics for the variables used to estimate the investment model (1). The mean (median) company in the sample engages in investment activities equal to 0.069 (0.049) of average total assets as of the end of year t-1 and t and has an average (median) Gr equal to 0.159 (0.147) during the sample period. The mean (median) cash across all firm-years equals to 0.172 (0.138). The mean (median) value for the firm operating performance is 0.054 (0.052), indicating that firms performed poorly during sample period on the whole and some firms have suffered from an even more serious loss (the minimum value of the firm operating performance is -0.968). The average (median) company has reported debt-to-asset ratio of 0.472 (0.482), the maximum debt-to-asset ratio is 0.996, indicating that some companies have fallen into serious financial distress during the period of study. On average, company has been listing 7.60 years on the stock exchanges in China after IPO.

The sample period for investment expectation model (1) is 2003-2010. For each variable, I report the number of firm-year observations, mean, median, minimum (Min), maximum (Max) and standard error (Std), where I is the firm's investment expenditures and measured as cash paid to acquire fixed assets, intangible assets and other long term assets minus net cash received from the sale of fixed assets, intangible assets and other long term assets in period t scaled by average book value of total assets as of the end of year t-1 and t. Gr is the firm's investment opportunities and as measured by sales growth.

Cash is the firm's cash and cash equivalent divided by the book value of total assets as of year t-1. *LnTA* is the natural logarithm of the book value of total assets as of year t-1, used to control the effect of the size of a company on its investment. *Roa* is return on assets as of year t-1, equal to the ratio of the profit before interest and tax to the book value of total assets. Prior period's profitability is included as an additional variable to capture growth opportunities not reflected in *Gr*. *Lev* is debt-to-asset ratio and equal to the book value of total debt (the sum of short-term debt and long-term debt) divided by the book value of total assets as of year t-1. *Age* is the number of years a company has been listed on the stock exchanges in China since IPO.

Table 2: Descriptive Statistics for the investment expectation model (1)

Variable	No. of obs	Mean	Median	Min	Max	Std
<i>I</i>	7215	0.069	0.049	-0.387	0.857	0.075
<i>Gr</i>	7215	0.159	0.147	-0.973	0.996	0.256
<i>Cash</i>	7215	0.172	0.138	0	0.954	0.129
<i>LnTA</i>	7215	21.522	21.375	18.601	28.003	1.116
<i>Roa</i>	7215	0.054	0.052	-0.968	0.493	0.068
<i>Lev</i>	7215	0.472	0.482	0.018	0.996	0.183
<i>Age</i>	7215	7.60	7.00	1	20	4.211

Table 3 presents the regression results for the investment expectation model (1) based on the data of 7215 firm-year observations during the period 2003-2010, in which the dependent variable is the firm's capital expenditures. This model is used to determine the expected investment level and overinvestment of a company. The expected level of investment is the fitted values (*EI*) and overinvestment (*OverI*) is the positive residuals estimated from the model (1). The model of investment expenditures in the column (1) of Table 3 only includes investment opportunities which are proxied by sales growth in period t-1 and industry and annual fixed effects as independent variables. The coefficient on *Gr* is 0.045 and significantly positive at 1 percent level, indicating that investment demand is an increasing function of growth opportunities, and this model explains 12.9% of the variation in investment expenditure. The model of investment expenditures in the column (2) of Table 3 that includes all control variables, such as cash balance, company size, debt ratio, the natural logarithm of the number of years listed on the stock exchanges in China, operating performance and prior investment expenditures, explains 36.7% of the variation in investment expenditures. However, when I include growth opportunities and all other control variables together to regress the model of investment expenditures in the column (3) of Table 3 (model (3)), it doesn't significantly increase explanatory power (the adjusted R-square of model (3) is 36.8%) and the coefficient on *Gr* has become much smaller, though the signs of all variables are the same as predicted. Nevertheless, in subsequent analysis I still rely on the model (3) in Table 3 as the baseline to decompose investment expenditures of a company into expected investment and unexpected investment.

This table provides the regression results for model (1):

$$I_{it} = \alpha_0 + \alpha_1 Gr_{it-1} + \alpha_2 Cash_{it-1} + \alpha_3 LnTA_{it-1} + \alpha_4 Roa_{it-1} + \alpha_5 Lev_{it-1} + \alpha_6 I_{it-1} + \alpha_7 LnAge_{it} + \Sigma Ind + \Sigma Year + \varepsilon_{it}$$

where I is the firm's investment expenditures and measured as cash paid to acquire fixed assets, intangible assets and other long term assets minus net cash received from the sale of fixed assets, intangible assets and other long term assets in period t scaled by average book value of total assets as of the end of year $t-1$ and t . Gr is the firm's investment opportunities and as measured by sales growth. $Cash$ is the firm's cash and cash equivalent divided by the book value of total assets as of year $t-1$. $LnTA$ is the natural logarithm of book value of total assets as of year $t-1$, used to control the effect of the size of company on the investment. Roa is return on assets as of year $t-1$, equal to the ratio of the profit before interest and tax to the book value of total assets. Prior period's profitability is included as an additional variable to capture growth opportunities not reflected in Gr . Lev is debt-to-asset ratio and equals total debt (the sum of short-term debt and long-term debt) divided by the total assets as of year $t-1$. $LnAge$ is the natural logarithm of the number of years the company has been listed on the stock exchanges in China since IPO. Ind and $Year$ are a vector of industry and year indicator variables, respectively, which are used to capture year and industry fixed effect. According to Standard Industry Classification Code of China Securities Regulatory Commission (CSRC), there are 20 industry dummy variables in the regression. ε is error term. Industry and year fixed effect are controlled for but not reported for the sake of space. T-statistics are presented below the estimated coefficients; ***, **, * indicate two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

Table 3: The multivariate regression results of the investment model (1):

Variable	Predicted sign	Model		
		(1)	(2)	(3)
Intercept	?	0.045*** 8.950	-0.013 -0.803	-0.011 -0.689
Gr	+	0.045*** 13.568		0.008*** 2.648
$Cash$	+		0.038*** 5.556	0.037*** 5.439
$LnTA$	+		0.002*** 3.215	0.002*** 3.125
Roa	+		0.118*** 10.025	0.109*** 8.845
$Debt$	-		-0.011** -2.345	-0.014*** -2.768
I_{t-1}	+		0.439*** 43.690	0.437*** 43.193
$LnAge$	-		-0.006*** -5.477	-0.006 -5.293***
Ind		Included	Included	Included
$Year$		Included	Included	Included
$AdjR^2$		0.129	0.367	0.368
F		39.300***	127.897***	124.445***
No. of obs		7215	7215	7215

4.2 Analysis of Corporate Governance and Overinvestment of Free Cash Flow

4.2.1 Descriptive statistics and univariate test

Table 4 provides descriptive statistic information on the main variables used to estimate model (3) and (4). By construction, there are 1411 companies with positive free cash flow classified as overinvesting companies. The mean (median) overinvestment across all firm-years equals to 0.048 (0.028) of average book value total assets as of the end of year t-1 and t, and the standard deviation of the overinvestment is 0.061, indicating that there is a variation in overinvestment among companies during sample period. The mean (median) company in the sample has a FCF of 0.062 (0.046), suggesting that majority of companies hold surplus funds. The mean (median) value for the investment opportunities is 0.199 (0.181). The average (median) company has about 9.55 (9) directors on the board and the mean (median) value for the proportion of non-executive directors on the board is 0.352 (0.333). Some 86 percent of companies maintain a separation of the roles of the chief executive officer and board chairman. The mean (median) values for short-term debt, bank loans and total leverage are respectively 0.840 (0.903), 0.387 (0.407) and 0.487 (0.494), with standard deviation of 0.174, 0.237, and 0.181, indicating that, on average, companies hold more short-term debt than long-term debt.

This table presents descriptive statistics for the regression variables used in the hypothesis tests to examine the relationship between free cash free and overinvestment as well as the effect of corporate governance on the relationship between free cash flow and overinvestment for a sample of 1411 firm-year observations over the period 2003-2010. For each variable, I report the number of firm-year observations, mean, median, minimum (Min), maximum (Max) and standard error (Std), where *OverI* is the positive residuals estimated from regression model (1), which is used as a proxy for the firm's level of overinvestment. *FCF* is the level of free cash flow that a company holds and measured as the difference between net cash flows from operating activities and the expected level of investment estimated from regression model (1) scaled by average book value of total assets as of the end of year t-1 and t. *Gr* is the firm's sales growth as of the end of year t, equal to the change in sale revenues between current year and previous year divided by total sale revenues of previous year, indicating a firm's investment opportunities. *Board* is the board size, as measured by the total number of directors on the board. *Dir* is the proportion of non-executive directors on the board. *Dul* is a dummy variable taking the value of 1 if the roles of the chief executive officer and board chairman are overlapped, and 0 otherwise. *ShortDebt* is year-end total current liabilities divided by year-end total debt, reflecting a company's debt maturity structure. *Bank* is bank loans acquired from banks scaled by total debt, which is used to measure debt sources. *Lev* is the sum of the year-end book value of short-term debt and long-term debt deflated by the year-end book value of total assets. *Roa* is return on assets as of year t-1, equal to the ratio of the profit before interest and tax to the book value of total assets. *Age* is the number of years the company has been listed on the stock exchanges in China since IPO.

Table 4: Descriptive statistics for variables used to estimate model (3) and (4)

Variable	No. of obs	Mean	Median	Min	Max	Std
<i>OverI</i>	1411	0.048	0.028	0.00002	0.758	0.061
<i>FCF</i>	1411	0.062	0.046	0.00013	0.415	0.056
<i>Gr</i>	1411	0.199	0.181	-0.755	0.979	0.251
<i>Roa_{it-1}</i>	1411	0.046	0.055	-0.968	0.343	0.097
<i>Board</i>	1411	9.55	9	5	19	2.120
<i>Dir</i>	1411	0.352	0.333	0	0.571	0.047
<i>Dul</i>	1411	0.140	0	0	1	0.345
<i>ShortDebt</i>	1411	0.840	0.903	0.116	1	0.174
<i>Bank</i>	1411	0.387	0.407	0	0.962	0.237
<i>Lev</i>	1411	0.487	0.494	0.012	0.993	0.181

Table 5 reports univariate differences in means for all regression variables used in model (3) and (4) between state-controlled companies and private-controlled companies. The sample consists of more state-controlled companies than private-controlled companies, since, as previously mentioned, among the 1411 firm-year observations during the period 2003-2010, only 276 of them are private-controlled companies. The distribution of sample above suggests that state-controlled companies are more likely than private-controlled companies to engage in overinvestment when their free cash flow is high. Consistent with theoretical expectation, on average, state-controlled companies tend to have a higher overinvestment and free cash flow. The mean values of overinvestment and free cash flow for state-controlled companies are respectively 0.057 and 0.063, while the corresponding statistics for private-controlled companies are 0.045 and 0.055, respectively. The differences in overinvestment and free cash flow between state-controlled companies and private-controlled companies are both statistically significant at conventional levels (with state-controlled companies exhibiting higher mean values than private-controlled companies). Not surprisingly, state-controlled companies have a larger size of the board, more debt-to-asset ratio, lower profitability, and longer time listed on stock exchanges. However, private-controlled companies have a less separation of the roles of board chairman and CEO, higher proportion of non-executive directors on the board, and higher percentage of short-term debt in total debt. The differences in means of variables above between state-controlled companies and private-controlled companies are all statistically significant. However, there are no significant differences in bank loans and growth opportunities between state-controlled companies and private-controlled companies. In a nutshell, though the univariate analyses above provide strong preliminary supports to the hypotheses developed in this paper, they only show binary correlations without controlling for other potential determinants. In the next section, I attempt to extend my analysis by more rigorously examining whether the evidence on these hypotheses holds in a multivariate regression framework.

This table reports the results for univariate tests for all regression variables between state-controlled and private-controlled subsample. Among 1411 firm-year observations, state-controlled companies and private-controlled companies represent 1135 and 276 of observations, respectively. For each variable, I separately report the variable means for state-controlled and private-controlled companies, differences in means, t-statistics, and p-values. A company is treated as state-controlled one if its ultimate controlling shareholder is the governments at all levels, such as the bureaus of state assets

management, finance bureaus and bureaus in charge of different industries or other government agencies et al., and private-controlled companies otherwise. For the definitions of *OverI*, *FCF*, *Board*, *Dir*, *Dul*, *ShortDebt*, *Bank*, *Lev*, *Gr*, *Roa_{it-1}*, and *Age* see the note to Table 4.

Table 5: Univariate tests by the identity of controlling shareholder

Variable	Stated-controlled companies (1135)	Private- controlled companies (276)	Differences in means	t-statistics	p-values
<i>OverI</i>	0.057	0.045	0.011	-2.673	0.008
<i>FCF</i>	0.063	0.055	0.008	2.428	0.016
<i>Board</i>	9.68	9	0.675	5.054	0.000
<i>Dir</i>	0.350	0.359	-0.008	-2.762	0.006
<i>Dul</i>	0.12	0.22	-0.103	-3.842	0.000
<i>ShortDebt</i>	0.829	0.884	-0.054	-5.439	0.000
<i>Bank</i>	0.392	0.372	0.019	1.196	0.232
<i>Lev</i>	0.501	0.433	0.068	5.718	0.000
<i>Gr</i>	0.197	0.204	-0.007	-0.399	0.690
<i>Roa_{it-1}</i>	0.043	0.057	-0.014	-2.101	0.036
<i>Age</i>	8.88	6.12	2.761	9.924	0.000

4.2.2 Analysis of correlation coefficients

Table 6 reports both Spearman and Pearson correlation coefficients between the regression variables used in regression model (3) and (4) which allow for industry and firm level clustering. Spearman (Pearson) correlation coefficients are presented above (below) the main diagonal. In terms of Spearman correlation matrix, It is noted that the overinvestment variable (*OverI*) is significantly positively correlated with free cash flow (*FCF*), growth opportunities (*Gr*), the board size (*Board*), bank loan (*Bank*), prior period's profitability (*Roa_{it-1}*), and significantly negatively associated with the proportion of the non-executive directors on the board (*Dir*), short-term debt (*ShortDebt*), total leverage (*Lev*), and the natural logarithm of the number of years listed on stock exchanges in China since IPO (*LnAge*), highlighting the importance of explicitly controlling for these company's attributes in the multivariate regressions. Finally, I find that the correlation coefficients between independent variables are generally small, with the highest (lowest) being 0.248 (-0.353) between *Lev* and *LnAge* (*Roa_{it-1}*), which thus reduces my concerns that multicollinearity is possible spuriously responsible for the evidence on the hypotheses developed in this paper. The Pearson correlation coefficients between regression variables also show similar characteristics to Spearman correlation coefficients.

Table 6: Correlation Matrix between the Regression Variables (*p*-value, two tailed)

Variables	<i>OverI</i>	<i>FCF</i>	<i>Gr</i>	<i>Board</i>	<i>Dir</i>	<i>Dul</i>	<i>ShortDebt</i>	<i>Bank</i>	<i>Lev</i>	<i>Roa_{<i>t</i>-1}</i>	<i>LnAge</i>
<i>OverI</i>	1 (-)	0.046* (0.084)	0.107*** (0.000)	0.061** (0.023)	-0.060** (0.023)	0.028 (0.293)	-0.186*** (0.000)	0.109*** (0.000)	-0.088*** (0.001)	0.263*** (0.000)	-0.195*** (0.000)
<i>FCF</i>	0.042 (0.112)	1 (-)	0.062** (0.020)	-0.050* (0.060)	0.031 (0.240)	-0.021 (0.437)	0.030 (0.262)	-0.221*** (0.000)	0.009 (0.735)	0.061** (0.021)	0.126*** (0.000)
<i>Gr</i>	0.042 (0.116)	0.071*** (0.008)	1 (-)	0.055** (0.038)	-0.045* (0.088)	0.009 (0.743)	-0.046* (0.084)	-0.097*** (0.000)	0.022 (0.418)	0.186*** (0.000)	-0.143*** (0.000)
<i>Board</i>	0.068** (0.010)	-0.019 (0.487)	0.052* (0.052)	1 (-)	-0.183*** (0.000)	-0.099*** (0.000)	-0.148*** (0.000)	0.056** (0.035)	0.059** (0.027)	0.118** (0.000)	-0.036 (0.171)
<i>Dir</i>	-0.065** (0.015)	0.028 (0.288)	-0.028 (0.301)	-0.206*** (0.000)	1 (-)	0.021 (0.422)	0.005 (0.854)	-0.067** (0.012)	0.027 (0.308)	-0.043 (0.106)	0.070*** (0.009)
<i>Dul</i>	-0.007 (0.784)	-0.020 (0.458)	-0.010 (0.718)	-0.096*** (0.000)	0.012 (0.656)	1 (-)	0.028 (0.289)	0.017 (0.519)	-0.038 (0.152)	-0.011 (0.686)	-0.014 (0.607)
<i>ShortDebt</i>	-0.250*** (0.000)	0.065** (0.015)	-0.035 (0.191)	-0.130*** (0.000)	0.014 (0.612)	0.048* (0.069)	1 (-)	-0.323*** (0.000)	-0.135*** (0.000)	-0.120*** (0.000)	-0.029 (0.274)
<i>Bank</i>	0.136*** (0.000)	-0.208*** (0.000)	-0.094*** (0.000)	0.042 (0.114)	-0.071*** (0.008)	0.016 (0.544)	-0.348*** (0.000)	1 (-)	0.234*** (0.000)	-0.104*** (0.000)	0.001 (0.981)
<i>Lev</i>	-0.045* (0.089)	0.037 (0.166)	0.018 (0.496)	0.077*** (0.004)	0.007 (0.797)	-0.039 (0.141)	-0.126*** (0.000)	0.262*** (0.000)	1 (-)	-0.353*** (0.000)	0.248*** (0.000)
<i>Roa_{<i>t</i>-1}</i>	0.118*** (0.000)	0.004 (0.884)	0.163*** (0.000)	0.106** (0.000)	-0.018 (0.500)	-0.021 (0.433)	-0.086*** (0.001)	-0.054** (0.044)	-0.257** (0.000)	1 (-)	-0.244*** (0.000)
<i>LnAge</i>	-0.153*** (0.000)	0.092*** (0.001)	-0.160*** (0.000)	-0.026 (0.333)	0.051* (0.058)	-0.026 (0.320)	-0.051 (0.056)	0.048* (0.073)	0.277** (0.000)	-0.177*** (0.000)	1 (-)

This table reports both Spearman and Pearson correlation coefficients for the regression variables while allowing for industry and firm level clustering for a sample of 1411 year-level observations during the period 2003-2010. Spearman (Pearson) correlation coefficients are presented above (below) the main diagonal. *p*-values are outlined in the parenthesis below the correlation coefficients between the regression variables. ***, **, and * denote two-tailed statistical significance at the 1%, 5%, and 10% level, respectively. All variables are defined in Table 4.

4.2.3 Multivariate analysis

(1) Free cash flow and overinvestment

Table 7 gives the multivariate regression results of the association between free cash flow and overinvestment estimated from model (3), with overinvestment as dependent variable. As seen from F-statistics, all models are significant at the 5% or 1% level, with the adjusted R-square ranging from 5.4% to 7.1%.

In column (1) of Table 6, which presents the regression results of full sample. After controlling for other variables that may be possible affect overinvestment, such as growth opportunities, prior period's profitability, as well as industries and years effect, I find that the coefficient on FCF is 0.075 and positively associated with overinvestment at 1% level. The estimated coefficient suggests that increasing free cash flow by one percent on average is related to an increase in overinvestment of 0.075%. Given that the mean value for overinvestment ($OverI$) in Table 4 is 4.8%, this change means that the economic implication of the effect is moderate. The result above confirms the conjecture of this paper that Chinese listed companies tend to engage in overinvestment when their free cash flow is higher, and thus provides direct evidence in support of Hypothesis 1 empirically. Surprisingly, I find that the coefficient on Gr is negatively but insignificantly at the conventional level associated with overinvestment, indicating that there is no correlation between overinvestment and growth opportunities. This result completely contrasts with the prediction in hypothesis 3 that the improved growth opportunities would reduce a company's overinvestment. The statistically significant coefficient on Roa_{it-1} indicates that firms with a higher prior period's operating performance prefer to engage in overinvestment in the subsequent year. Furthermore, I find that $LnAge$ is significantly negatively related to overinvestment, suggesting that as the number of years (time) listed on stock exchanges increases, a firm's investment behavior gradually becomes much more rational.

In order to test hypothesis 2, I further divide the sample into state-controlled and private-controlled categories (subsample) according to the identity of ultimate controlling shareholder of a company and respectively report regression results for each subsample in column (2) and (3) of Table 7. If the company's ultimate controlling shareholder is the government entities at all levels in any given year, it is correspondingly classified as state-controlled subsample, and as private-controlled subsample otherwise. In column (2), namely state-controlled subsample, the coefficient on FCF is still significantly positive at 1% level. However, I don't find that there is a significantly positive relationship between free cash flow and overinvestment in column (3) private-controlled subsample. This result shows that overinvestment is more likely to be present in state-controlled companies with high free cash flow rather than private-controlled companies. Based on the analysis above, I can conclude that hypothesis 2 that the overinvestment problem of free cash flow is much more serious (prevalent) in state-controlled companies is supported empirically. The coefficient on Roa_{it-1} still remains significantly positive in state-controlled subsample, but has become insignificantly positive in private-controlled subsample, indicating that private-controlled companies with high profitability in prior period do not exhibit the tendency to engage in overinvestment in the subsequent period. This table provides the main empirical results of the link between free cash flow and overinvestment of companies controlled by state and private. The corresponding specification is as follows:

$$OverI_{it} = \beta_0 + \beta_1 FCF_{it} + \beta_2 Gr_{it} + \beta_3 Roa_{it-1} + \beta_4 LnAge_{it} + \Sigma Ind + \Sigma Year + \varepsilon_{it}$$

where *OverI* is the positive residuals estimated from regression model (1), which is used as a proxy for the company's level of overinvestment. *FCF* is free cash flow that a company holds and measured as the difference between net cash flows from operating activities and the expected level of investment estimated from regression model (1) scaled by average book value of total assets as of the end of year t-1 and t. *Gr* is the company's sales growth as of the end of year t, equal to the change in sale revenues between current year and previous year divided by total sale revenues of previous year, indicating a company's investment opportunities. *Roa* is return on assets as of year t-1, equal to the ratio of the profit before interest and tax to the book value of total assets. *LnAge* is the natural logarithm of the number of years the company has been listed on the stock exchanges in China since IPO. *Ind* and *Year*, are respectively industry and year indicators. ε is error term. Industry and year fixed effect are controlled for but not reported for the sake of space. A company is treated as state-controlled one if its ultimate controlling shareholder is the governments at all levels, such as the bureaus of state assets management, finance bureaus and bureaus in charge of different industries or other government agencies et al., and private-controlled companies otherwise. T-statistics are presented below the estimated coefficients; ***, **, and * indicate two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

Table 7: Free Cash flow and Overinvestment

Variable	Predicted sign	Full sample (1)	State-controlled subsample (2)	private-controlled subsample (3)
Intercept	?	0.090*** 7.789	0.075*** 5.459	0.118*** 4.676
<i>FCF</i>	+	0.075*** 2.610	0.082*** 2.667	0.075 0.908
<i>Gr</i>	-	-0.004 -0.607	-0.011 -1.461	0.027 0.685
<i>Roa_{it-1}</i>	+	0.043** 2.511	0.050*** 2.603	0.009 0.220
<i>LnAge</i>	?	-0.012*** -4.607	-0.007** -2.064	-0.014** -2.478
<i>Ind</i>		Included	Included	Included
<i>Year</i>		Included	Included	Included
<i>AdjR²</i>		0.069	0.071	0.054
<i>F</i>		4.381***	3.870***	1.556**
No. of obs		1411	1135	276

(2) Does Firm-Level Governance Influence the Relationship between Free Cash Flow and Overinvestment

In Table 8, I present the multivariate regression results corresponding to model (4), which are used to test the effect of corporate governance on the relationship between free cash flow and overinvestment. Namely whether some of corporate governance mechanisms, such as the board of directors and debt financing, can effectively reduce a company's overinvestment of free cash flow. Column (1) in Table 8 reports full sample results. Contrary to analysis above, the coefficient on *Gr* has become significantly negative,

suggesting that better growth opportunities exert a correcting force on the overinvestment, and thus constrain the degree of a company's overinvestment. The coefficient on the interaction term between free cash flow (FCF) and growth opportunities (Gr) is statistically insignificant at conventional level, which indicates that improved growth opportunities have no effect on the relationship between free cash flow and overinvestment. The interaction term, $Board * FCF$, has a significant positive coefficient, indicating that a small rather than (instead of) large board is more likely to prevent managers' from misusing free cash flow in overinvestment. Therefore, the hypothesis 4b that there is a negative relationship between the size of board and overinvestment of free cash flow is supported empirically. However, though the estimated coefficient of the interaction term $Dir * FCF$ and $Dul * FCF$ are both negative as expected, they are statistically insignificant, which means that the independence of the board, as measured by either the proportion of non-executive directors on the board or the separation of roles of board chairman and CEO, can't impose any effect on the company's overinvestment of free cash flow. Furthermore, both $ShortDebt$ and Lev have a significantly negative coefficient, suggesting that short-term debt (debt maturity structure) and total leverage can constrain a firm's overinvestment. A insignificantly positive coefficient on the interaction term $ShortDebt * FCF$, and a significantly positive coefficient on the interaction term $Lev * FCF$, imply that the governance functions of short-term debt and total leverage controlling overinvestment don't realize through reducing managers' discretion over free cash flow. The findings above provide partially support to the Jensen's (1986) "control hypothesis" for debt creation. However, the coefficient on interaction term $ShortDebt * Gr$ is positive and significant at the 5% level, indicating the governance role of short-term debt constraining overinvestment is much stronger for companies with low growth opportunities. The coefficients of variables associated with bank loan, such as $Bank$, $Bank * Gr$, $Bank * FCF$ and $Bank * Gr * FCF$ are all insignificant at conventional level, showing that the governance advantages of bank loans relative to other debt sources don't fully take on in terms of controlling overinvestment of free cash flow. As seen previously, the results for other variables, such as Roa_{it-1} and $LnAge$, are highly similar to those reported in column (1) in Table 7.

In order to further tease out the effect of the ownership status of a company on the control functions of corporate governance mechanisms reducing overinvestment of free cash flow, I classify the full sample in column (1) of Table 8 into state-controlled subsample and private-controlled subsample based on the nature of ultimate controlling shareholder of a company. The corresponding regression results for each subsample are presented in column (2) and (3) of Table 8, respectively.

By comparison, I do find that (1) In column (2) of Table 8, namely, the state-controlled subsample, the coefficient on Gr remains significantly negative at the 1% level, but it has become insignificantly negative in column (3) of Table 8, suggesting that earlier finding on the the role of improved growth opportunities in reducing overinvestment only occurs in state-controlled subsample. However, a significantly negative coefficient of interaction term $FCF * Gr$ in column (3) private-controlled subsample shows that a higher growth opportunities can reduce private-controlled companies' overinvestment of free cash flow. Thus hypothesis 3 that overinvestment problem of free cash flow is much more serious in companies with low growth opportunities is partially supported

empirically in private-controlled companies. (2) The coefficient on interaction term $FCF * Board$ continues to load positively at the 1% level, however, in private-controlled subsample, it has become no longer statistically significant and negative, indicating that the role of a small board constraining overinvestment of free cash flow is only present in state-controlled companies instead of private-controlled companies. As suggested by summary statistics in Table 4, state-controlled companies on average have a larger board than private-controlled companies. Based on this finding, conclusion can be reached that reducing the size of the board of state-controlled companies can effectively reduce overinvestment of free cash flow. (3) In column (2) of Table 8, the estimated coefficient on $ShortDebt$ remains significantly negative in state-controlled subsample at the 1% level, while it has become insignificant in private-controlled subsample. This indicates that the governance function of short-term debt (debt maturity structure) only occurs in state-controlled companies. however, a significantly positive coefficient on the tripple interaction term $ShortDebt * FCF * Gr$ in private-controlled subsample suggests that short-term debt can play an even more important governance role in controlling overinvestment in private-controlled companies with high free cash and low growth opportunities. To summarize, the multivariate regression results in Table 7 and 8 provide some empirical evidence in support of hypotheses developed by this paper.

This table presents my main empirical evidence on the effect of corporate governance mechanisms on the link between free cash flow and overinvestment of companies controlled by state and private. The corresponding specification is constructed as follows:

$$\begin{aligned} OverI_{it} = & \gamma_0 + \gamma_1 FCF_{it} + \gamma_2 Gr_{it} + \gamma_3 FCF_{it} * Gr_{it} + \gamma_4 Board_{it} + \gamma_5 Dir_{it} + \gamma_6 Dul_{it} + \gamma_7 Board_{it} * FCF_{it} \\ & + \gamma_8 Dir_{it} * FCF_{it} + \gamma_9 Dul_{it} * FCF_{it} + \gamma_{10} ShortDebt_{it} + \gamma_{11} Bank_{it} + \gamma_{12} Lev_{it} + \gamma_{13} ShortDebt_{it} \\ & * Gr_{it} + \gamma_{14} Bank_{it} * Gr_{it} + \gamma_{15} Lev_{it} * Gr_{it} + \gamma_{16} ShortDebt_{it} * Gr_{it} * FCF_{it} + \gamma_{17} Bank_{it} * Gr_{it} \\ & * FCF_{it} + \gamma_{18} Lev_{it} * Gr_{it} * FCF_{it} + \gamma_{19} Roa_{it-1} + \gamma_{20} LnAge_{it} + \Sigma Ind + \Sigma Year + \varepsilon_{it} \end{aligned}$$

where $OverI$ is the positive residuals estimated from regression model (1), which is used as a proxy for the company's level of overinvestment. FCF is the level of free cash flow that a company holds and measured as the difference between net cash flows from operating activities and the expected level of investment estimated from regression model (1) scaled by average book value of total assets as of the end of year t-1 and t. Gr is the company's sales growth as of the end of year t, equal to the change in sale revenues between current year and previous year divided by total sale revenues of previous year, indicating a firm's investment opportunities. $Board$ is the board size, as measured by the total number of directors on the board. Dir is the proportion of non-executive directors on the board. Dul is a dummy variable taking the value of 1 if the roles of chief executive officer and board chairman are overlapped, and 0 otherwise. $ShortDebt$ is year-end total current liabilities divided by year-end total debt, reflecting a firm's debt maturity structure. $Bank$ is bank loans acquired from banks scaled by total debt, which is used to measure debt sources. Lev is the sum of the year-end book value of short-term debt and long-term debt deflated by the year-end book value of total assets. Roa is return on assets as of year t-1, equal to the ratio of the profit before interest and tax to the book value of total assets. $LnAge$ is the natural logarithm of the number of years the company has been listed on the stock exchanges in China since IPO. Ind and $Year$, are

repectively industry and year indicators. ε is error term. Industry and year fixed effect are controlled for but not reported for the sake of space. A company is treated as state-controlled one if its ultimate controlling shareholder is the governments at all levels, such as the bureaus of state assets management, finance bureaus and bureaus in charge of different industries or other government agencies et al., and private-controlled companies otherwise. T-statistics are presented below the estimated coefficients; ***, **, and * indicate two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

Table 8: Corporate Governance and Overinvestment and Free Cash flow

Variable	Predicted sign	Full sample (1)	State-controlled subsample (2)	private-controlled subsample (3)
Intercept	?	0.213*** 6.523	0.211 5.932***	0.116 1.211
<i>FCF</i>	+	-0.451 -1.108	-0.285 -0.659	-1.019 -0.702
<i>Gr</i>	-	-0.168** -2.566	-0.122* -1.722	-0.053 -0.233
<i>FCF * Gr</i>	-	-1.138 -1.353	0.026 0.029	-6.054* -1.948
<i>Roa_{it-1}</i>	+	0.034* 1.915	0.039* 1.926	0.020 0.450
<i>LnAge</i>	?	-0.013*** -5.026	-0.007** -2.261	-0.015** -2.541
<i>Board</i>	?	0.000 -0.881	-0.002 -1.349	0.004 1.163
<i>Board * FCF</i>	?	0.026** 1.978	0.037*** 2.674	-0.044 -0.925
<i>Dir</i>	-	-0.019 -0.361	-0.016 -0.280	-0.006 -0.042
<i>Dir * FCF</i>	-	-0.491 -0.755	-0.838 -1.220	0.517 0.200
<i>Dul</i>	-	0.004 0.659	0.004 0.510	-0.007 -0.468
<i>Dul * FCF</i>	-	-0.057 -0.677	-0.069 -0.760	0.130 0.558
<i>ShortDebt</i>	-	-0.114*** -6.116	-0.119*** -6.076	-0.039 -0.618
<i>ShortDebt * Gr</i>	+	0.138** 2.352	0.082 1.302	0.078 0.357
<i>ShortDebt * FCF</i>	-	0.315 1.166	0.200 0.706	1.180 1.175
<i>ShortDebt * FCF * Gr</i>	+	0.790 0.972	0.348 0.407	6.456 2.063**
<i>Bank</i>	-	0.015 1.047	0.015 0.974	0.063 1.533
<i>Bank * Gr</i>	+	0.066 1.570	0.002 0.033	0.131 1.197
<i>Bank * FCF</i>	-	0.067 0.365	0.007 0.037	-0.200 -0.311
<i>Bank * FCF * Gr</i>	+	-0.690 -1.510	-0.227 -0.429	-1.848 -1.302

<i>Lev</i>	-	-0.045** -2.596	-0.043** -2.234	-0.084* -1.915
<i>Lev*Gr</i>	+	0.050 0.951	0.087 1.462	-0.039 -0.298
<i>Lev*FCF</i>	-	0.372* 1.875	0.307 1.401	0.801 1.485
<i>Lev*FCF*Gr</i>	+	-0.484 -0.852	-0.493 -0.754	0.089 0.066
<i>Ind</i>		Included	Included	Included
<i>Year</i>		Included	Included	Included
<i>AdjR²</i>		0.120	0.135	0.099
<i>F</i>		4.846***	4.600***	1.643***
No. of obs		1411	1135	276

4.2.4 Robutness checks

In order to ensure the reliability of research conclusions of this paper, I perform the following robustness tests. First, The assumption for Richardson's (2006) model is that, on the whole, a company's capital expenditure behavior is normal, and there is no systematic phenomenon of overinvestment or underinvestment. If the above assumption is not met, using residuals estimated from Richardson's (2006) investment model to measure overinvestment and underinvestment is likely to classify some companies with good growth opportunities as companies with poor growth opportunities, and such errors will potentially bias the regression results against the hypotheses developed in this paper (Lang, Stulz and Walking, 1991). In order to address this concern, I follow Xin et al. (2007), and equally divide the residuals estimated from model (1) into three subgroups based on size, namely, from the largest to the smallest, and select the subgroup with the largest residuals as overinvestment sample, and re-estimate model (3) and (4). Second, I use an alternative definition of free cash flow, that is, the difference between net cash flows from operational activities and the sum of capital expenditures and working capital expenditures scaled by the average book value of total assets to measure the free cash flow and re-estimate model (3) and (4). Third, In practice, in addition to the return on total assets used in this paper, other indicators that can be used to measure a company's profitability also include sales profit margin and return on equity. In order to further investigate the effect of different profitability indicators on the research results of this paper, I replace return on total assets with sales profit margin and return on equity, respectively, and re-estimate model (1), (3) and (4). The regression results above are qualitatively unchanged and show that research conclusions of this paper are statistically robust. For space reason, these robustness results are not tabulated.

5 Conclusions

By following the approach suggested by Richardson (2006) to measure overinvestment and free cash flow, this paper presents empirical evidence on corporate governance and firm level overinvestment of free cash flow on a sample of 1411 firm-year observations of listed companies in Shanghai and Shenzhen stock exchanges in China over the period 2003 to 2010. My results show that, consistent with managers' empire building incentives, there is positive association between free cash flow and overinvestment. Further analysis

reveals that it is state-owned companies sub-group that drive this positive association, indicating that overinvestment is more likely to occur in state-owned companies that have more free cash flow. Moreover, for state-owned companies sub-group, growth opportunities is negatively related to overinvestment, suggesting that state-owned companies with high growth opportunities are less likely to undertake overinvestment. Finally, this paper explores the governance role of the board of directors (board size, the proportion of the non-executive directors and duality) and debt in controlling overinvestment of free cash flow. I find that a large board aggravates overinvestment of free cash flow of state-owned companies. Contrary to the theoretical expectation, there is no evidence that the independence of the board of directors, as measured by either the proportion of non-executive directors on the board or the separation of roles of board chairman and CEO, is significantly negatively associated with overinvestment of free cash flow. However, I find that both short-term debt (debt maturity structure) and total leverage can significantly reduce the likelihood of state-owned enterprises' overinvestment. Furthermore, the governance role of short-term debt in constraining overinvestment is even stronger for private-owned enterprises with high free cash flow and low growth opportunities. However, bank loan has no impact on the reduction in the degree of overinvestment of free cash flow. These results above show that the board of directors is ineffective in alleviating the firm's level of overinvestment of free cash flow. According to relevant provisions of newly promulgated companies law in China, the board of directors should hold overall responsibility for ensuring that shareholders' interests are not expropriated by self-interested managers, however, it doesn't perform functions very well.

It is the the managers' discretion over free cash flow and their empire-building incentives that make a company tend to engage in overinvestment abusing scarce resources. To a certain degree this phenomenon is related to a firm's ineffective corporate governance mechanisms during Chinese economy transition, which can't be used to constrain the managers' disfunctional behavior. Overinvestment reduces the efficiency of a company using funds and causes the distortion of resource allocation in the capital markets. Therefore, in order to solve the overinvestment problem of free cash flow in Chinese listed companies and radically preclude managers from engaging in activities dissipating company value, in addition to seeking reasons for overinvestment of free cash flow from the interior of a company and redesigning pertinent corporate governance structures to oppress managerial discretion over free cash flow, I suggest that China Securities Regulatory Commission should fundamentally reform inappropriate institution arrangements of non-executive directors of listed companies during China's economy transition, at the same time accelerate the reduction of state ownership of Chinese listed companies to minimize managers' incentives to engage in overinvestment and improve the efficiency of resource allocation inside listed companies.

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