

A STUDY ON
CAPITAL STRUCTURE AND CORPORATE GOVERNANCE

BY

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DISSERTATION

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in Finance
in the Graduate College of the
University of Illinois at Urbana-Champaign, 2011

Urbana, Illinois

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ABSTRACT

Capital structure and corporate governance are the important areas that represent salient part of corporate finance research. By studying various aspects of the two areas, this study attempts to deepen our understanding of the two. First, this study provides both a theoretical model and empirical evidence on the interaction between capital structure and managerial incentive compensation (one of key measures of corporate governance). Researchers acknowledge that the two interact to each other and the interaction should affect their optimal determination, but few studies formally consider the interaction. This study shows that due to the interaction through agency conflicts, key firm characteristics that represent agency costs affect leverage and managerial incentive compensation in opposite directions. After controlling for the opposite interactions, the two are shown to be positively related. Second, this study provides empirical evidence on the interaction between financial structure and product market performance by examining business group affiliated firms. The firms that are affiliated to a business group is not only affected by their own financial position, but also affected by the position of business groups which the firms belong to. The empirical investigation suggests that affiliated firms lose market shares to their rivals in their product market when their business group is financially weak due to high group leverage. Third, this study examines whether special governance structure of business groups is actually beneficial to the groups' member firms. The study exploit unique dataset of firms that were once stand alone, but later acquired by business groups. The empirical methodology we employ can account for the fact that the firms which are acquired by business groups can be very different from other firms which are not acquired. The findings from matching estimator suggest that performance increase of the

acquired firms is significantly greater than the performance of matched stand alone firms, implying that business groups are actually helping their affiliated firms to perform better than stand alone firms.

ACKNOWLEDGEMENTS

I would like to express profound gratitude to my advisor and a co-author of my third paper (chapter), Heitor Almeida for allowing me to work with him and all the guidance and support he has given me along the way. I am very much obliged to many illuminating conversations with him in developing my dissertation. He always encouraged me to go one step further by setting up high standards and assured me that I can reach further. I started working with him from the first year that he joined the school and I have very much enjoyed discussions with him. I am also grateful for valuable discussions with Timothy C. Johnson. My job market paper was first inspired by his class project. He continued to give me advices in developing a theoretical model for my job market paper. I also want to thank to Murillo Campello, Dirk Hackbarth and Ola Bengtsson for helping me to improve my research.

I would like to thank to the department of finance for great support during the course of this PhD program. I also appreciate the support from the staffs at the department of finance, especially Brunner Karen. I could not go without thanking friends at St. Mary church. They made my stay in the states where I don't have any family or relatives less lonely and happy.

Last but not least, I would like to give special thanks to my husband, Jae Myoung Shin for being incredibly supportive and patient during the course of this Ph.D. program. He have always kept me motivated and focused. Special thanks also go to my parents (Wonho Kim and Sunja Lee) who taught me the value of hard work, efficiency, and self-sufficiency and who always pray for me. I also appreciate the support from my parents in law, my sister and brother. Finally, my greatest gratitude goes to the Lord.

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CHAPTER 1

INTRODUCTION

Since Modiglian and Miller (1958), researchers devoted much effort in studying capital structure of a firm. Even though M&M's irrelevance theory provides a good insight in understanding capital structure, it is widely accepted that capital structure can greatly alter firm value in the presence of frictions. Hence, capital structure is now regarded as being determined by various factors such as taxes, bankruptcy costs and agency conflicts. Many studies have been developed on how capital structure is optimally determined. Despite the development of the literature, the literature focusing on the factors of agency conflicts have not suggested useful quantitative applications about the effects from the factors. On the other hand, capital structure has great influence over various firm policies including product market strategy, investment and corporate governance.

The reason that capital structure is affected by agency conflicts is that there arise conflicts of interest between stockholders and debt holders. However, these two groups are not only stakeholders of a firm. There are a manager, employees, suppliers, customers and others. Even in the group of stockholders, there are conflicts of interests between major and minor stockholders. Since a firm is represented by interests of various stakeholders, corporate governance has been a key topic of active discussions. Especially, conflicts of interests between stockholders and debt holders and between stockholders and a manager have received a lot of attentions from both academia and practices. Again, corporate governance also has great influence over various firm policies including capital structure.

In chapter 1, I set forth a dynamic model in which capital structure and managerial compensation are jointly determined and interact. In the presence of frictions, both manager–stockholder and stockholder–bondholder conflicts affect investment decisions and, hence, firm value. Rational stockholders set financial policies and managerial compensation simultaneously, to minimize the distortion caused by these conflicts. This joint optimization creates a tradeoff between leverage and managerial incentive compensation. I incorporate this idea into a real option framework where not only investment and leverage, but also managerial incentive compensation are endogenously determined. The resulting model predicts that due to the tradeoff between optimal leverage and managerial incentive compensation, key determinants which are firm characteristics representing agency costs, should move managerial compensation and leverage in opposite directions. Specifically, the model predicts that investment, profitability, market-to-book, and depreciation rate each have a negative effect on optimal leverage and a positive effect on optimal managerial incentive compensation. Firm size is predicted to have a positive effect on leverage, and a negative effect on managerial incentive compensation. I also report empirical evidence strongly supporting the model’s predictions by estimating simultaneous equations of market leverage and pay–performance sensitivity. When market leverage and pay–performance sensitivity are simultaneously estimated after controlling for the tradeoff by including the key determinants suggested by the model, the relation between market leverage and pay–performance sensitivity is positive.

In chapter 2, I investigate the effect of financial structure on product market performance by examining internal capital markets of Korean business groups. Leverage of a business group has exogenous variation which is not associated with product market performance of an affiliated firm of the group. I find that high leverage of a business group causes affiliated firms to lose market share to industry rivals. The result supports the hypothesis that debt induces a firm to

choose less aggressive strategy in its product market. Since core firms are likely to have greater impact on the determination of group leverage, I investigate the effect of group leverage on sub-samples of non-core firms. The sub-samples exclude core affiliated firms and the firms which are in the same industry as the core firms. I still find the negative effect of group leverage on affiliated firms' performance. The main result is robust to different definitions of group leverage. I attempt to uncover the actual channel through which change in financial strength of a business group affects product market performance of affiliated firms. Besides the direct channel from financial leverage to strategic decisions, the negative effect of group leverage can also be explained by resource reallocation in the internal capital market and dividends from cross shareholding. First, I show that group leverage decreases investment of affiliated firms. This result support the hypothesis that high debt burden of affiliated firms decreases internal resources available to the firms. Second, I show that cross-holdee leverage significantly hurts product market performance of cross-holders, suggesting that high leverage of cross-holdee significantly hurt performance of cross-holders by decreasing cash payable as dividends which is an important source of cash flows. By showing that leverage of cross-holders does not have impact on cross-holdees, I cast doubt on the hypothesis that the effect of cross-holdee leverage is driven by factors which determine cross-holding in the first place.

In chapter 3, I and my co-author attempt to study whether business groups are actually beneficial to their affiliated firms in helping them to perform well. Business group has actively studied by researchers in corporate governance due to its special ownership (governance) structure. This study exploits unique dataset which includes firms which were previously stand-alone, but later acquired by business groups. We examine whether the performance of those firms improves after being acquired by the groups. We find a strong evidence of performance improvement after acquisition from simple dummy regressions. However, the results from OLS

may be biased in the presence of endogeneity since those acquired firms could have been chosen for better performance or other reasons. If they were carefully selected, after-acquisition performance can be mere reflection of the selection, not of the business group effects. To resolve this problem, we match stand alone firms which are similar to acquired firms based on firm characteristics, industry and years before acquisition. The matching estimator still supports the hypothesis that business groups help their affiliated firms to perform better than stand alone firms.

CHAPTER 2

JOINT DETERMINATION OF LEVERAGE AND MANAGERIAL INCENTIVE COMPENSATION: THEORY AND EVIDENCE

2.1. Introduction

Theoretical studies on optimal capital structure presume that manager's interest is perfectly aligned with stockholders, but there exist manager-stockholder conflicts. Due to the conflicts, stockholders would retain incentive compensation as a part of executive compensation package. Also, theories on managerial incentive compensation are often abstract away from capital structure and stockholder-bondholder conflicts. On the other hand, some empirical studies attempt to recognize that capital structure and managerial incentive compensation should have impact on each other, but the recognition is limited to including one as simply one of many determinants of the other¹. However, without considering the two together, the picture of what determines optimal leverage and managerial incentive compensation is far from complete, since the two are interdependent. Surprisingly, no study has formally considered what factors should jointly determine the two in a unified framework. By connecting these two literatures, this paper attempts to uncover how leverage and managerial incentive compensation are optimally determined through mutual interaction. The model is parsimonious enough to generate empirically testable predictions which link key firm characteristics to optimal choices of leverage and managerial incentive compensation. The predictions strongly hold for the large sample of

¹ Lewellen et al. (1987), Matsunaga (1995), Mehran (1995), Yermack (1995), Bryan et al. (2000), Ittner et al. (2003), Ortiz-Molina (2007), Friend and Lang (1988), and Berger, Ofek and Yermack (1997).

U.S. firms. Moreover, the model generates, for optimal leverage and managerial incentive compensation, the numerical solution values that are not far from what we actually observe in the data.

This paper embeds a manager-stockholder conflict into a dynamic debt-overhang framework. The manager-stockholder conflict is shaped by managerial incentive compensation. By combining these two agency conflicts in one model, the resulting model has three parties who have separate objective functions which they want to maximize. Each objective function cannot be maximized independently from others since they are interlinked. The manager chooses optimal investment which maximizes her objective function, but the value of the function is determined by leverage and managerial incentive compensation which are set by equity holders. The equity holders choose optimal leverage and managerial incentive compensation to maximize the ex ante equity value, but the value is, in turn, affected by the manager's investment choices and the price of debt. The debt is priced by debt holders anticipating investment distortion whose size depends on manager's investment choice that is greatly influenced by leverage and managerial incentive compensation. The value of debt is also altered by default time which is chosen by equity holders. Key parameters which are investment, leverage and managerial incentive compensation are all endogenously determined in the model and investment decision is dynamic. Thus, I solve the model numerically and the numerical solutions illustrate what firm characteristics should simultaneously determine optimal leverage and managerial incentive compensation.

This paper develops the first model which investigates how leverage and managerial incentive compensation are jointly determined to minimize the costs of both manager-stockholder and stockholder-bondholder conflicts. Since leverage and managerial incentive compensation are determined simultaneously to minimize agency conflicts, the two are

determined by the same factors, i.e., firm characteristics that decide the degree of agency conflicts. Moreover, the model shows that there is a tradeoff between leverage and managerial incentive compensation. Because of this tradeoff, the key firm characteristics representing agency conflicts affect leverage and managerial incentive compensation in opposite directions. These predictions are uniquely generated from the model in this paper since most of existing theories study leverage and managerial incentive compensation separately. The predictions are confirmed by empirical evidence in this paper.

To understand a basic economic intuition behind the main predictions of the model, consider a levered firm where the incumbent manager derives private benefits from investment. Managerial incentive compensation greatly alleviates manager–stockholder conflicts by aligning the manager’s interests with those of stockholders. As shown in Grossman and Hart (1982) and Jensen (1986), leverage can also help to mitigate such conflict (i.e. overinvestment problem). However, the model suggests that the additional benefit from leverage is not significant when managerial incentive compensation is sufficiently high and leverage alone cannot entirely eliminate severe overinvestment. On the other hand, leverage causes underinvestment (debt-overhang) and high managerial incentive compensation aggravates stockholder-bondholder conflicts caused by leverage. As Jensen and Meckling (1976) argue, the extent to which a manager acts opportunistically in the interest of stockholders to maximize shareholder value depends on their equity-based incentives. Underinvestment becomes more severe when manager’s interests are better aligned with those of stockholders. When both leverage and managerial incentive compensation are high, the underinvestment cost overwhelms the benefit of alleviating manager-stockholder conflict. Due to this tradeoff, stockholders would not want both leverage and managerial incentive compensation to be high. Which one is chosen depends on relative costs of under-and overinvestment costs of a firm.

The firm characteristics that represent agency costs in the model are: investment, firm size, profitability, market-to-book, and depreciation rate. To investment-intensive firms, underinvestment is more costly and, hence, would want to keep low leverage. Since managers of these firms still have incentive to overinvest, the firms would want to employ high managerial incentive compensation in order to mitigate manager-stockholder conflict. The same explanation applies to depreciation rate. High depreciation rate means that a firm needs to make high investment every period to keep its optimal level of production capital. The model shows that small firms face more serious overinvestment problem than large firms due to decreasing return to scale of the production function since only non-negative NPV projects are considered. This is interpreted that small firms have more manager's discretion. Thus, small firms employ strong managerial incentive compensation, but choose low leverage to minimize underinvestment. On the other hand, large firms would be better off with high leverage since overinvestment is not severe and tax advantages dominates underinvestment costs if managerial incentive compensation is minimized. Highly profitable firms also confront severe overinvestment problem since these firms are likely to have a lot of free cash flow in the firm which can be exploited by their managers. Using the same argument for the firm size, highly profitable firms would want to have high managerial incentive compensation, but low leverage.

This paper contributes to the literature on what determines managerial incentive compensation by conferring a new and unified theory and by providing a reconciliation of empirical evidence on low pay performance sensitivity. There are many empirical studies on the determinants of managerial compensation, and many intuitive explanations are put forward to explain the determinants. However, theoretical considerations are limited.² Similar to this study, John and John (1993) employ a stockholder-bondholder conflicts framework which is often used

² Berle and Means (1932) and Jensen and Meckling (1976).

to analyze optimal capital structure, but their study is limited to one direction effect from leverage to managerial incentive compensation. Thus, I propose a new theory based on joint determination of managerial incentive and leverage which recognizes the mutual interaction between the two. This new theory generates the numerical solutions for optimal managerial incentive compensation whose values are very much far from 1 (perfect alignment of interests between principal and agent). The low pay performance sensitivity that we observe in the data can be explained, to some extent, by the joint optimization which takes into account both agency conflicts. Finally, the theory not only accounts for existing determinants but also suggests that depreciation can be an important determinant of managerial incentive compensation.

This paper also contributes to the literature on the determinants of leverage by providing a unified framework that directly accounts for most of key determinants of leverage, along with the interaction between capital structure and managerial compensation. While the main elements of the model are already analyzed in the literature, the interaction between capital structure and managerial incentive is a new contribution from this model. The empirical facts about leverage are well known, but the exact mechanism that drives the effects from key determinants is difficult to identify. This is attributable to the fact that many empirical studies are aimed at testing a particular theory—such as tradeoff, pecking order, and market timing. These theories typically explain only one or two determinants. In particular, no established theory can account for the firm size effect, even though many intuitive explanations are suggested. In my model, the joint determination of leverage and managerial incentive compensation and the tradeoff between them can generate the positive effect of firm size on leverage as described above. Additionally, the effect of profitability and depreciation on leverage can also be explained via joint optimization as well.

Finally, the empirical tests provided in this paper contribute to the literature by providing evidence on joint optimization of leverage and pay–performance sensitivity. No existing work examines the determinants of capital structure and managerial compensation while taking into account the simultaneity of these decisions. Consistent with the model’s predictions, empirical results show that the two are determined by same firm characteristics that represent the size of agency cost of a firm and the effects from the characteristics are opposite on the two because of the tradeoff between the two. Additionally, the relationship between leverage and pay–performance sensitivity is positive when they are estimated simultaneously after controlling for the tradeoff between them. This result comprises two opposing arguments on the relationship between leverage and managerial incentive compensation. The negative relation is captured by the opposite effects of key determinants. Leverage and managerial incentive compensation have positive impact on each other when they are estimated simultaneously and the opposite effects of key determinants are controlled.

I begin by developing a real option model of the firm where both leverage and managerial compensation affect not only taxes and costs of financial distress, but also firm investment policy and there is an empire building manager. In this environment, I analyze how the initial choice of capital structure and managerial incentive compensation, made ex ante by equity holders, are optimally determined simultaneously. This analysis generates several predictions on the effects of key determinants. It is noteworthy that the tradeoff between leverage and managerial incentive described above manifests in the effects of key determinants. Specifically, key determinants move optimal leverage and managerial incentive compensation in opposite directions. On the other hand, the private benefit enjoyed by a manager from an investment affects both leverage and managerial incentive compensation in the same direction. First, the model predicts negative effects from profitability, market-to-book, and depreciation on

leverage, and a positive effect from firm size on leverage. These are consistent with the existing empirical evidence.³ Second, the model generates a negative relationship between investment and leverage. This negative relationship is taken as evidence of debt overhang in some studies (Lang, Ofek, and Stulz (1997) and Hennessy (2004)). However, I show that this relationship is not derived from underinvestment (debt overhang), but rather from the joint optimization of leverage and managerial incentive. Additionally, the model generates predictions on the determinants of managerial incentive compensation. First, the model predicts a negative effect from firm size and a positive effect from investment, profitability and market-to-book on managerial incentive compensation, which is consistent with existing empirical evidence.⁴ Second, the model generates new prediction not tested in the literature, but that are supported by the empirical evidence presented here. Specifically, the model predicts positive effect of depreciation on managerial incentive compensation.

Additionally, this paper provides empirical tests of the model using a U.S.-firm sample. To be consistent with the model's predictions, I estimate simultaneous equations of market leverage and pay-performance sensitivity. Pay-performance sensitivity roughly measures dollar change in manager wealth per dollar change in stockholder wealth (Yermack (1995)); this closely follows the model's measure of representing managerial incentive compensation. The key determinants generated by the model are included as regressors in both equations; these are investment, firm size, profitability, depreciation, and market-to-book. Since two dependent variables, market leverage and pay performance sensitivity, are simultaneously and endogenously determined, I use three-stage least squares (3SLS) to estimate the system. The

³ Rajan and Zingales (1995), Fama and French (2002), and Frank and Goyal (2009).

⁴ Murphy (1985), Lewellen et al. (1987), Matsunaga (1995), Mehran (1995), Ittner et al. (2003), and Baker and Hall (2004).

estimation results strongly support the model and I find similar results when estimating the system using book leverage instead of market leverage.

My model resembles the Morellec (2004) framework in that Morellec considers both agency conflicts. This author argues that manager–stockholder conflicts can explain low debt levels observed in practice. In his model, the managerial incentive imposed by compensation is exogenously given and only leverage is optimally chosen. However, my model features the simultaneous and endogenous determination of optimal leverage and managerial incentive compensation while taking into account the consequences of both conflicts. Moreover, the focus of my model is to provide intuition behind the key determinants of both leverage and managerial compensation.

Cadenillas, Cvitanic and Zapatero (2004) also study joint determination of leverage and managerial incentive compensation. In their model, a firm faces only manager–stockholder conflict, and both optimal leverage and managerial compensation are determined to ensure that the manager exerts as much effort as stockholders wish. In contrast, my model examines more comprehensive interaction between leverage and managerial compensation by considering both manager–stockholder and stockholder–bondholder conflicts and provides empirically testable predictions on what determines the joint optimization. He (2009) models a manager–stockholder conflict that causes the manager not to exert as much effort as stockholders wish. This author shows that optimal contracting leads small firms to choose high managerial incentive and large firms to choose low managerial incentive, since managerial effort is more important in small firms. Because debt financing decreases managerial effort (what He calls “debt overhang”), small firms optimally choose to have low leverage. My model deals with investment debt overhang, not managerial effort overhang, and considers both agency conflicts. Moreover, this model encompasses all key determinants, whereas the He model is silent about other key factors

such as investment, profitability, market-to-book and depreciation. While Cadenillas, Cvitanic and Zapatero (2004) and He (2009) predict that leverage and managerial incentive compensation should move together and in opposite directions, respectively, this paper comprises these two.

The remainder of this paper is organized as follows. Section 2 describes the model. Section 3 sets forth the numerical results and generates predictions from the model. Section 4 presents empirical tests of the predictions. Finally, Section 5 describes the conclusions of this study.

2.2. The model

2.2.1 The unlevered firm with no manager–stockholder conflict

First, in order to make the model as clear as possible, let us begin with a benchmark case that has no agency conflict (case 1). The basic ingredients of the benchmark case are preserved in this and all other cases discussed in this paper.

The firm generates profit π at every period over an infinite time horizon. The profit function (π) is determined by capital (K), profitability (or demand) shock (ϵ), and constant marginal cost (mc). Presumably, this profit function results from the optimal choices for other inputs such as labor and raw materials. The production function has decreasing returns to scale with $0 < s < 1$. The concave profit function occurs when the firm faces a downward-sloping demand curve. Alternatively, as argued in Lucas (1978), the concavity can stem from limited managerial or organizational resources. As in Hennessy and Whited (2005), this profit function gives an upward bound of K , $K_{\max}$. $K > K_{\max}$ is not economically profitable. Thus, the decreasing return to scale may represent that investment opportunities decrease in K . The

produced outputs sell for price pe^ε , which fluctuates following moves of the profitability shock, ε . ε reflects shocks to demand, input price, or productivity. Thus, the profit function is given by

$$\pi = (pe^{\varepsilon_t} - mc)K_t^s. \quad (1)$$

The evolution of (K, ε) is given as follows:

$$dK_t = (I_t - \delta K_t)dt, \quad (2)$$

$$d\varepsilon_t = \mu dt + \sigma dW. \quad (3)$$

At every period, K is decreased by depreciation of δK and increased by investment, I . If no new investment is made at time t , then in the next period K will be smaller than current K . W is a standard Wiener process. When the firm makes a new investment, in other words $I > 0$, it must pay an investment adjustment cost, $g(I_t, K_t)$, and the relative price of capital goods is 1. I assume that investment is not reversible. Following Hennessy (2004), I assume that the adjustment cost is a convex function of I ; specifically, it is given by

$$g(I_t, K_t) = I_t + \frac{1}{2} \theta K_t \left(\frac{I_t}{K_t} \right)^2. \quad (4)$$

Let M and E denote the payoff to the manager and to the shareholders, respectively, after optimal investment is chosen. Since the manager is the only shareholder in this case, the manager takes an action that maximizes the manager's payoff and the maximized value is value of equity. In other words, M is equal to E . The firm lives forever. The default-free term structure is assumed to be flat with instantaneous risk free rate r ; investors can borrow and lend freely at this rate. The value of equity equals the expected present value of the discounted future cash flows,

less investment expenditure and corporate tax. I assume the corporate tax rate to be constant at τ . All expectations are taken under the pricing measure Q . Specifically, the equity value is given by

$$M^1(\varepsilon_0, K_0) = E^1(\varepsilon_0, K_0) = \max_I E^Q \left[\int_0^\infty \left\{ (1 - \tau)((pe^{\varepsilon_t} - mc)K_t^s - I_t - \frac{1}{2}\theta K_t \left(\frac{I_t}{K_t}\right)^2) \right\} e^{-rt} dt \right]. \quad (5)$$

In each time period, t , the manager chooses the optimal investment, which maximizes equation (5). I denote this optimal investment by $I_{t,FB}$, which is used as a benchmark throughout to determine whether the second-best investments are under- or overinvestment. Equity holders provide additional funds when internal funding from profits is not sufficient, so long as E^1 is greater than zero. I assume zero cost for new equity issuance, for simplicity.

2.2.2 The levered firm with no manager–stockholder conflict

In this section, stockholder-bondholder conflict is added to case (1), or the benchmark case explained above. In other words, this second case (case 2) investigates a levered firm in which the manager is the only shareholder. I consider a line-of-credit characterized by (i) an infinite stream of interest payments, and (ii) a commitment that the firm is liquidated at default. The infinite stream of interest payments is chosen to model agency cost of debt, since debt maturing before growth options are realized is irrelevant to the investment decision. For simplicity, I assume that there is no cost for adjusting capital structure.

Previous studies assume that the firm pays fixed coupon, c , forever or until it hits a refinancing threshold. However, I assume a fixed coupon rate, c , and coupon payment is determined by cK_t , where K_t is capital at time t . Once the coupon rate is set, the coupon payment increases as K_t grows. In other words, the contract is a line-of-credit at a bank in which the maximum amount of borrowing is pledged to be some fixed fraction of capital and the interest is

also fixed in advance. Then, the firm borrows the maximum and it will always pay the interest of cK_t , where c is the fixed fraction times the fixed interest rate. By assuming that the coupon payment at every period is cK_t , my model features dynamic adjustments of capital structure without assuming the scaling property (Goldstein et al. (2001) and Strabulaev (2007)).

When internal cash flow is not sufficient for the promised interest payment at time t , a liquidity crisis occurs. In Strabulaev (2007), a portion of assets in place is sold to fill the crisis deficiency and the sale results in a decrease in future cash flows. In my model, a firm does not sell assets, but instead it fills the gap via equity financing. When this happens, the firm incurs an additional cost. This cost may correspond to the decrease in future cash flows in Strabulaev (2007). This cost represents, in my model, costly equity financing in unfavorable situations. A liquidity shortage may be perceived as an adverse situation for the firm in the market and, hence, equity holders may be reluctant to inject additional funds into the firm. The cost of the liquidity crisis is proportional to the liquidity shortage, and it is calculated as LC times the shortage. Finally, I assume that the cost of the liquidity crisis is affected by a profitability shock. When the firm is in a poor state, the firm will have much greater difficulty raising money. In good times, on the other hand, financing will be easier, and thus less costly. LC reflects this property.

The levered firm operates until it reaches bankruptcy threshold. This threshold is chosen to maximize equity value. The equity holders choose T , time to default. As in case (1), the optimal investment is chosen by the manager. Note that I and T are not determined at date 0, but are chosen optimally based on information available at time t . Since the manager is a solitary shareholder, the manager chooses both I and T , which maximize equity value. The value of (ex post) equity after a credit line has already taken place in this case is given by

$$M^2(\varepsilon_0, K_0) = E_0^2(\varepsilon_0, K_0) = \max_{I, T} E^Q \left[\int_0^T \{ (1 - \tau) ((pe^{\varepsilon_t} - mc)K_t^s - I_t - \frac{1}{2} \theta K_t (\frac{I_t}{K_t})^2 - cK_t) \right]$$

$$-LC | (pe^{\varepsilon_t} - mc)K_t - cK_t | 1_{(pe^{\varepsilon_t} - mc)K_t^s < cK_t} \} e^{-rt} dt] \quad (6)$$

As shown in the above equation, optimal investment I^* and T are chosen to maximize equity value given c . Stockholder–bondholder conflicts occur because the manager chooses optimal investment to maximize only the equity value after debt has already taken place.

The optimal investment choice cannot be ex ante contracted and, hence, can be suboptimal relative to the first best. The model presumes rational expectation in that both shareholders and credit holders correctly anticipate the effect of debt financing on the investment decision and the effect of this decision on debt pricing. The market value at time 0 of the line-of-credit is given by

$$D^2(\varepsilon_0, K_0) = E^Q \left[\int_t^T cK_t e^{-rt} dt + e^{-rT} (1 - \gamma)K_T \right]. \quad (7)$$

The first component of the above equation represents coupon payments and the second component represents the payoff to credit holders at default. When default occurs, credit holders receive the liquidation value of assets in place at the time of default less bankruptcy cost, reflecting the absolute priority of debt claims. The bankruptcy cost is assumed to be a proportion γ of K_T , the assets in place at the time of default and, thus, the payoff to credit holders at liquidation is $(1-\gamma)K_T$. I assume that $(1-\gamma)$ also follows the moves of profitability shock, ε . At good times, credit holders can recover a high proportion of K and the opposite happens at bad times.⁵

⁵ Shleifer and Vishny (1992).

2.2.3 The unlevered firm with manager–stockholder conflict

Generally, there is a separation between a manager and stockholders and the manager sometimes pursues her own interests rather than those of equity holders. This is why equity holders design executive compensation in such a way so as to align the manager's interest with their own. Managerial compensation is composed of fixed salary and incentive compensation, which is intended for the interest alignment. Ignoring the fixed compensation portion of managerial compensation is not critical to obtaining my main results. Incentive compensation is represented by a proportion, α , of the equity value. The manager–stockholder conflict arises in my model from an empire building manager. This case, with its separation between the manager and equity holders is referred to as “case (3).” The firm in this case is unlevered. In addition to utility from her equity claim, the manager derives perquisites from investment. In particular, the manager gets η per unit of investment. The size of η will differ depending on firm or industry characteristics; large η means that the manager derives high perquisites per unit of investment. Due to this private benefit enjoyed only by the manager, the optimal investment chosen to maximize the utility of the manager can be higher than the first best. Both α and η take values from $[0, 1]$. I presume, for simplicity, that both compensation and private benefit are additively separable.

Variable α represents pay–performance sensitivity, which determines how much the manager's wealth changes when the equity holders' wealth changes by one dollar. As α grows, the payoff to the manager from equity becomes large and the private benefit from investment becomes small relative to the equity claim of the manager. In other words, the manager's objective function becomes close to that of the shareholders when α approaches 1. The

manager's objective function consists of two parts: (1) incentive compensation and (2) private benefit from investment; specifically, it is

$$M^3(\varepsilon_0, K_0) = \max_I E^Q \left[\int_0^\infty \left[\alpha(1-\tau)((pe^{\varepsilon_t} - mc)K_t^s - I_t - \frac{1}{2}\theta K_t \left(\frac{I_t}{K_t}\right)^2 + \eta I_t) \right] e^{-rt} dt \right]$$

$$\text{where } I_t^* > I_{t,FB} \text{ only if } (pe^{\varepsilon_t} - mc)K_t^s - I_t - \frac{1}{2}\theta K_t \left(\frac{I_t}{K_t}\right)^2 \geq 0$$

$$I_t^* = \arg \max [M_t]. \quad (8)$$

As in cases (1) and (2), the manager chooses the optimal investment I^* that maximizes her objective function. Due to the private benefit from investment, the last term in the first line of M^3 , the manager always wishes to invest more than the first best. How much more the manager chooses to invest, given K and ε , relative to the first best depends on α . When α is high, the optimal investment I^* is very close to the first best I_{FB} . Thus, I_t^* is a function of α . Note that the manager can overinvest only when there are enough internal funds to support the overinvestment in the firm, as shown in the second line above. I presume that cash flows and investment decisions are observable, but are not verifiable and thus not contractible. Based on the observed information, shareholders inject additional funds only for efficient investment projects. Thus, overinvestment is limited by the availability of free cash flow at that time.

The value of equity depends on the investment decision made by the manager. Thus, the equity value is equal to

$$E^3(\varepsilon_0, K_0) = E^Q \left[\int_0^\infty \left[(1-\tau) \{ (pe^{\varepsilon_t} - mc)K_t^s - I_t^* - \frac{1}{2}\theta K_t \left(\frac{I_t^*}{K_t}\right)^2 \} \right] e^{-rt} dt \right]. \quad (9)$$

2.2.4 The levered firm with manager–stockholder conflict

Most of firms in reality are levered and maintain a separation between the manager and equity holders. Thus, the manager maximizes a sum of the α proportion of the equity claim of a levered firm and the private benefit obtained from investment. Specifically, the sum is given by

$$M^4(\varepsilon_0, K_0) = \max_I E^Q \left[\int_0^T \left[\alpha(1-\tau)((pe^{\varepsilon_t} - mc)K_t^s - I_t - \frac{1}{2}\theta K_t \left(\frac{I_t}{K_t}\right)^2 - cK_t \right. \right. \right. \\ \left. \left. \left. - LC \mid (pe^{\varepsilon_t} - mc)K_t^s - cK_t \mid 1_{(pe^{\varepsilon_t} - mc)K_t^s < cK_t} + \eta I_t \right\} e^{-rt} dt \right] \right] \\ \text{where } I_t^* > I_{t,FB} \text{ only if } (pe^{\varepsilon_t} - mc)K_t^s - I_t - \frac{1}{2}\theta K_t \left(\frac{I_t}{K_t}\right)^2 - cK_t \geq 0$$

$$I_t^* = \arg \max [M_t]. \quad (10)$$

Note that now coupon payments also restrict free cash flow available to the manager. As before, the overinvestment is limited by the availability of free cash flows. Levered firms need to make interest payments before they make investments. Thus, debt financing becomes an additional device to alleviate the agency conflict between equity holders and the manager. Therefore, the optimal I is a function of c .

Also note the possible role of α in making the underinvestment problem severe. Since the manager wishes to invest more than the first best due to private benefit from investment but is limited by coupon payments, the resulting investment chosen to maximize the above objective function would be between the I^* in cases (2) and (3). In case (2), underinvestment reaches its maximum because the manager has no incentive to invest more than the level that stockholders want. On the other hand, in case (3), the overinvestment reaches its maximum because the manager always wishes to invest more and the free cash flows are not limited by coupon

payments. When α increases, the M^4 will converge to M^2 and, hence, the optimal investment will become smaller. In other words, when the manager's interest is better aligned with that of the equity holders, the underinvestment problem becomes more severe in levered firms. In this sense, high α can aggravate the underinvestment problem caused by debt financing. Therefore, the optimal I is determined by α as well.

Again, the value of equity depends on the investment decision made by the manager, and the equity holders choose when to liquidate the firm. As in case (2), the default time T is not chosen at time 0, but chosen optimally based on information available at time t . The equity value is

$$E^4(\varepsilon_0, K_0) = \max_T E^Q \left[\int_0^T [(1-\tau) \{ (pe^{\varepsilon_t} - mc)K_t^s - I_t^* - \frac{1}{2} \theta K_t \left(\frac{I_t^*}{K_t} \right)^2 - cK_t - LC \mid (pe^{\varepsilon_t} - mc)K_t^s - cK_t \mid 1_{(pe^{\varepsilon_t} - mc)K_t^s < cK_t} \} e^{-rt} dt] \right]. \quad (11)$$

The market value at time 0 of the credit line is the same as the market value (7) in Section 2 in that it depends on decisions on investments and default time, and is

$$D^4(\varepsilon_0, K_0) = E^Q \left[\int_t^T cK_t e^{-rt} dt + e^{-rT} (1-\gamma)K_T \right]. \quad (12)$$

By rational expectation, as mentioned above, the suboptimal investment choices are priced in the market value of credit. Additionally, the benefit of credit by limiting free cash flows available to the manager is also priced.

2.2.5 Optimal leverage and incentive compensation

Incentive compensation provides benefits in terms of mitigating agency conflicts between equity holders and a manager. Higher α reduces the overinvestment incentive of the manager by making the manager's objective function closely resemble that of the shareholders. Thus, higher α decreases the overinvestment-related agency cost. On the other hand, it aggravates the agency conflict between shareholders and debt holders. As α increases, the manager's interest is more aligned with that of the shareholders, thus the manager is more likely to underinvest at the expense of debt holders. Reflecting rational expectations, this is priced in the market value of debt. Therefore, shareholders of high α firms need to pay a high price for debt financing relative to shareholders of low α firms. This tradeoff is taken into consideration when optimal α is chosen.

Like incentive compensation, debt also yields both benefits and costs. Debt can be problematic in that it causes an underinvestment problem, debt overhang and, hence, increases debt financing cost and decreases firm value. Also, high debt significantly increases bankruptcy probability. On the other hand, debt can alleviate the agency problem between equity holders and the empire building manager. As mentioned above, overinvestment is limited by free cash flow available to the manager. If a firm is highly levered and thus has large coupon payment obligations, free cash flow will be very limited. For firms with high levels of free cash flows, debt financing may be beneficial. Additionally, such firms may enjoy large tax shield from interest payments. Therefore, these should also be considered when optimal leverage is chosen.

Optimal α and c are chosen simultaneously by the equity holders at time 0 by balancing benefits and costs, as discussed above. At this point, it is important to note that optimal decisions on α and c are made to maximize ex ante equity value. The value of equity ex post is given by the present value of cash flow accruing to shareholders after debt is already in place. The optimal

investment and default threshold are typically determined to maximize the ex post equity value. The value of equity ex ante is the sum of the ex post equity value and the market value of debt. Optimal leverage and incentive compensation are determined to maximize the ex ante equity value. Specifically,

$$c^*, \alpha^* = \arg \max [E^4 + D^4 | I^*]. \quad (13)$$

The above equation (14) states that equity holders maximize the sum of (i) the present value of the after-tax cash flows accruing to equity, and (ii) the present value of the income payments to all debt claims to be issued. Note that the total value takes into account the future capital structure adjustment that will occur subsequent to each refinancing point, when the firm makes new investments.

The model assumes that equity holders choose both optimal leverage and incentive compensation. Most of previous studies assume that leverage is determined to maximize ex ante equity value (firm value) since they assume no conflict between manager and stockholders. Even in the presence of manager-stockholder separation, the model assumes that equity holders still choose the optimal leverage since it considers only a conflict in investment decisions. Empirically, leverage of a firm has strong persistence over time.

2.3. Numerical results and testable predictions

2.3.1 Numerical methodology

This section investigates the cross-sectional determinants of optimal leverage ratios and incentive compensation in equilibrium. Ultimately, I am interested in determining whether the model can simulate the effects of key determinants of leverage and incentive compensation. I use

numerical analyses to generate the predictions and, in the Section 4, I use COMPUSTAT and Execucomp data to find empirical evidence.

I solve the model via iteration on Bellman equation until the value function converges. At every period, the manager chooses optimal investment that maximizes her objective function, M^4 , given a discretized space of (K, ε) . The Bellman equation that the manager solves to choose I^* at time t is

$$rM = \max_I [\alpha(\pi - I - g - cK) + \eta I + (I - \delta K)M_K + \mu M_\varepsilon + \frac{1}{2}\sigma^2 M_{\varepsilon\varepsilon}]. \quad (14)$$

After solving for optimal investments for all possible combinations of α and c , the equity holders will choose, at time 0, simultaneously optimal α and c that maximize the ex ante equity value (or firm value), which is $E^4 + D^4$.

I parameterize my model along the lines of the relevant literature. The risk free rate, r , is 6%, and the mean and volatility of the profitability shock are $\mu = 0$ and $\sigma = 0.5$, respectively. The corporate tax rate, τ , is 0.3. The depreciation rate, δ , is 0.15, and the production scale factor, s , is 0.689, all consistent with Hennessy and Whited (2005). The private benefit per unit of investment, η , is 0.05. When I solve for different parameter sets, the main predictions on the effect of key determinants described below do not change.

Knowledge of optimal policies and the value functions allows me to compute key variables generated by the model, as shown in Table 1. Specifically, I define my variables to mimic variables used in the empirical literature and the definitions closely follow those used by Hennessy and Whited (2005).

2.3.2 Testable predictions

Before proceeding to my main predictions, I solve the model for cases (1), (2), and (3) and a brief summary is depicted in Figure 1. The first line of Figure 1 reports figures for case (2) with the First Best or case (1) for comparison. In Panels A and B, we observe underinvestment, since case (2) addresses levered firms without separation. Panels A and B show investment at low and high profitability states of ϵ . High c value means high debt financing. Note that underinvestment caused by debt is observable in both states of profitability and underinvestment is severe at low K . If a firm comes into the current period with a high stock of outstanding debt, it will choose lower investment than the other firms with a low stock. And underinvestment is severe for small firms. Moreover, firms with poor profitability, as shown in Panel A, go bankrupt even with moderate levels of debt financing. However, debt also provides a tax shield since interest payments are tax deductible. Firms with relatively low leverage ratios are more valuable than those with zero leverage ratios, because of tax advantages (this graph is not reported, but available upon request). Thus, it is optimal to keep some debt on the firm's balance sheet even though debt causes investment distortion.

The second line of Figure 1 reports figures for case (3) with the benchmark (FB) of case (1). Since in case (3) we have unlevered firms with separation, we observe overinvestment relative to the first best. In contrast to underinvestment, overinvestment is observable only in firms at good states (high profitability states), as shown in Panel D, since overinvestment is limited by free cash flow availability. Also note that α holds a significant implication for overinvestment. When α is small, private benefit from overinvestment is larger than the α proportion of equity. However, as α grows, the private benefit is overwhelmed by payoffs from equity claims and, hence overinvestment decreases.

Panel D of Figure 1 shows that overinvestment decreases substantially when capital K is high and overinvestment is severe when capital K is low, due to decreasing returns to scale of production. This may contradict what we usually think of overinvestment. It is because the model only considers non-negative NPV investment opportunities. Small firms have a lot of investment opportunities with non-negative expected returns even though all investment options are not value maximizing. In order to enjoy private benefit, a manager would want to choose a level of investment which exceeds the value maximizing level. On the other hands, large firms do not have a large investment set with positive expected returns. Thus, even for highly profitable firms, there is little overinvestment when K is high. One can regard this as that managers at small firms have more discretion since they have more investment options and, hence, managerial incentive is more important to make them choose value maximizing options.

The optimal choices of α and c become different when the firm has both manager–stockholder and stockholder–bondholder conflicts. Figure 2 provides optimal investment choices at low and high profitability states of case (4). Panel A of Figure 2 shows investment at the low profit state and Panel B shows its counterpart at the high profit state. The first thing to note in both figures is that higher α leads to more underinvestment when the firm is levered. The more interests are aligned between equity holders and the manager, the lower the optimal chosen investment is when the firm is levered. In other words, when there is no discrepancy between equity holders and the manager, the underinvestment is most severe and when there is maximum discrepancy, the underinvestment is not a significant problem, due to the manager’s overinvestment incentive. Thus, underinvestment cost of leverage increases when α increases. However, it is noteworthy that overinvestment decreases when c (debt financing) increases. Debt financing provides the additional benefit in mitigating the free cash flow problem on top of the tax advantage. However, even with very high leverage, overinvestment is not completely

eliminated when α is very small, as shown in Panel B. Moreover, the benefit of leverage in reducing overinvestment may be minimal when α is sufficiently large.

After taking into account the tradeoff between leverage and managerial incentive compensation discussed above, the equity holders choose optimal α and c to maximize the ex ante equity value. To minimize the conflict between the equity holders and the manager, the equity holders can employ either high α or high c , or both. The equity holders may choose to use high incentive compensation. However, as explained above, this may end up decreasing the value of equity if the firm is levered since this leads to more severe underinvestment and, hence, increases ex ante debt financing costs. If the equity holders use both, overinvestment can decrease significantly, but underinvestment will increase substantially. Thus, we can expect that the equity holders will not use both at the same time unless the overinvestment cost is very large. Generally, incentive compensation is preferred to debt in alleviating manager–stockholder conflicts. This is because even high leverage cannot entirely eliminate overinvestment and high leverage causes a decrease in firm value through underinvestment. However, when the manager’s overinvestment incentive is not strong, the equity holders do not need to give strong incentive compensation to the manager. Since underinvestment cost can be reduced when the incentive given by the compensation package is weak, debt financing is preferred due to its tax advantages. The equity holders will decide on optimal α and c , balancing these benefits and costs as determined by firm characteristics.

Now I proceed to the main testable predictions of the model, how variables of interest affect managerial incentive compensation and the leverage ratio in equilibrium. The equity holders choose optimal c and α based on the variables for firm characteristics. The equilibrium relationships tell us why a firm with particular characteristics chooses any given optimal incentive compensation and leverage ratio. The Figures 3 to 7 plot the variables calculated in

Table 1; each point is obtained by averaging the variables over ϵ and points that correspond very small K s (bottom 10) are dropped. As one can see in the Figures, obtained values for optimal leverage and managerial incentive compensation are close to what we observe in practice; leverage ranges between 0.05 and 0.7 and managerial incentive compensation is between 0.04 and 0.08. Note that the optimal managerial incentive compensation is very small. Perfect alignment of interests between a manager and stockholders is not optimal. Moreover, without consideration of manager's risk aversion, the joint optimization can generate sufficiently low level of optimal pay performance sensitivity.

The first variable of interest is investment. Investment represents investment ratio to book assets. We can expect that incentive compensation rather than debt is more likely to be used for investment intensive firms. The equilibrium relationships are plotted in Figure 3. The model predicts that high investment needs lead the firm to choose a high α , as shown in Panel A of Figure 3. Both incentive compensation and debt financing can mitigate the overinvestment problem. However, since firms with high investment needs cannot be highly levered due to the underinvestment problem, only incentive compensation can be employed. Hence, the equilibrium relation between α 's and investments is positive. Panel B of Figure 3 illustrates the equilibrium relationship between investments and leverage ratios. As shown in Figure 1, underinvestment is more severe for firms with high investment needs. Since such firms choose strong managerial incentives, high debt financing will aggravate the underinvestment problem. Therefore, investment has a negative effect on optimal market leverage.

Panel A of Figure 4 again plots the relationship between investment and optimal market leverage. Note that we observe both overinvestment and underinvestment, as shown in Panel B of Figure 4. The y-axis values are differences between the first best investments and the second best investments, and a positive difference represents underinvestment. Importantly, high

leverage ratios do not necessarily mean underinvestment. Since firms with high investment needs, anticipating underinvestment, choose not to issue much debt and managers of the firms may have overinvestment incentives, investments chosen by such firms are not necessarily below the first best investments. Some previous studies examine the existence of debt overhang by regressing investments on leverage ratios or leverage-related measures. Figure 4 suggests that simply regressing investments on leverage ratios may not be the correct way to detect underinvestment. I acknowledge that it may be challenging to find actual underinvestment empirically since it is hard to identify the first best level of investment for a firm.

Figure 5 plots a negative effect of firm size on managerial incentive compensation and a positive effect of firm size on market leverage. As shown in Figure 1, small firms are more likely to have a severe overinvestment problem or more discretion of managers than large firms. To mitigate this problem, stockholders of small firms choose high-powered incentive compensation for their managers. As discussed above, severe overinvestment cannot be entirely eliminated even by high leverage. Thus, small firms choose strong managerial incentive compensation. Due to the tradeoff between managerial incentive and leverage, they avoid high leverage. On the other hand, overinvestment is not much of a concern to large firms, hence they do not need high levels of managerial incentive compensation. They choose high leverage which confers the tax advantage and mitigates the overinvestment problem somewhat. By choosing low managerial incentive compensation, underinvestment cost can be minimized. This generates a negative relation between optimal α 's and K , book assets, and a positive relation between optimal market leverage and K , as shown in Figure 5.

My model also generates a negative relation between profitability and leverage ratio as shown in Panel B in Figure 6. The model suggests that a dynamic tradeoff model without adjustment cost and with a multi-period debt can also generate this important relationship, which

is empirically robust. Also, the model predicts the positive effect of profitability on managerial incentive compensation, which is not tested in the literature. As shown above Figure 1, high profitability leads the manager to make overinvestment. Thus, strong incentive compensation needs to be employed when profit is high since, as discussed above, severe overinvestment is not eliminated even with high leverage. Due to the tradeoff between managerial incentive and leverage, the highly profitable firms choose low leverage. Additionally, since growth in profitability increases the value of the firm, which is a denominator of market leverage, this can lead to a decrease in leverage, as in a dynamic tradeoff model with adjustment cost.

The model also generates the effects of market-to-book. The first graph of Figure 7 shows the positive relation between market-to-book and optimal α . The second reports the negative relation between market-to-book and optimal leverage. In the absence of market timing, the model generates a negative relationship between market-to-book and leverage. Market-to-book can be decomposed into three parts in the model: profitability, investment opportunities, and book assets. M , the market value of the firm, is $E^4 + D^4$ and it comprises current and future production and investment. When current and future profitability is good, M increases. When everything else remains unchanged and investment opportunities increase, M increases as well. K in the denominator represents book assets, which is firm size. As discussed above, the optimal α increases and the optimal leverage decreases when profit and investment increase and size decreases. This mechanism generates the patterns shown in Figure 7.

Additionally, the model provides a new determinant of both incentive compensation and leverage, which is the depreciation rate of the firm. When assets of a firm are depreciated deeply, the firm needs to make more investment every period to maintain the level of optimal capital for production. Since depreciation rate is closely linked to investment needs, this argument is similar to the one that explains the effects of investment. A firm with a high depreciation rate, which

means high investment needs every period, employs low debt and strong incentive compensation. In other words, the depreciation rate has a positive effect on optimal managerial incentive compensation and a negative effect on optimal leverage. Since depreciation rate is one of the parameters for simulation, I report the averages of optimal α 's and leverages after solving the model at different depreciation rate. The averages of optimal α 's are 0.0151, 0.0531, and 0.3542, at depreciation rates of 0.05, 0.15, and 0.3, respectively. The corresponding averages of optimal leverages are 0.4185, 0.4121, and 0.6149, respectively. When the depreciation rate increases from 0.15 to 0.3, optimal c 's actually decreases (less debt financing), but the market leverage increases. These values are calculated by averaging the optimal α and leverage at all combinations of K and ε .

Finally, the model generates a prediction on the relationship of optimal leverage and optimal incentive compensation with private benefit that the manager enjoys per unit of investment. This is denoted as η in the model. High η means that the manager of the firm can enjoy large private benefit per unit of investment. Then, the manager has very strong incentive to overinvest. The equity holders would want to employ a compensation package that includes a high powered incentive scheme, meaning high α . For the benchmark case with $\eta = 0.05$, I obtain the average of optimal α 's to be 0.0531. When I change η to 0.01 and 0.2, the average becomes 0.0113 and 0.2191, respectively. These values are calculated by averaging the optimal α 's for all K and ε . The effect on optimal α is easily predictable. However, what would be the effect on leverage choices? According to the arguments presented above, when there is strong incentive compensation, low debt financing is desirable to minimize underinvestment. On the other hand, when the overinvestment problem is severe, the equity holders may want to use both debt and incentive compensation. The model suggests that leverage ratios do not necessarily decrease, even with very high α 's, when the overinvestment incentive of the manager is very strong. The

model predicts that the averages of the optimal leverage ratios are 0.4106, 0.4121, and 0.4120 when values of η are 0.01, 0.05, and 1, respectively. Thus, within the range of η examined here, both leverage and managerial compensation increase when η increases, but the effect of private benefit mainly manifest in managerial incentive compensation.

2.4. Empirical evidence

In this section, I empirically assess the main predictions of the model.

2.4.1 Data and variables

I obtain relevant accounting data from COMPUSTAT and data on executive compensation from Standard and Poor's Execucomp database. The data set includes executives who are identified by Execucomp as CEOs. Consistent with prior research, the data set excludes firms in the finance and utilities industries. Firms without information on pay-performance sensitivity and market leverage, the main variables of analysis, are also dropped from the sample. This results in an unbalanced panel of 1,920 firms over the period 1992–2008.

For α in the model, I employ *Pay performance sensitivity*, which roughly represents the change in the dollar value of the executive's wealth per dollar change in the wealth of stockholders. It is calculated as the sum of the fraction of managerial stock ownership and the sensitivity generated by new awards of stock options, following Yermack (1995). The sensitivity by stock options uses the Black-Scholes (1973) option valuation model, as modified by Merton (1973) to account for dividends. Specifically, it is calculated from the product of two terms: the Black-Scholes formula's partial derivative with respect to stock price times the fraction of equity represented by the option award. For awards about which detailed information is not available, I

assume that exercise price is equal to the fiscal year-end stock price at the time of award and that time to expiration is 10 years.

Market leverage ratio is used to match the leverage in the model. *Market leverage* is the most recently reported book value of debt, divided by debt book value plus year-end market capitalization. I also use book leverage, which is defined as debt book value, divided by book value of assets. The book leverage does not exactly match the leverage in the model, but many properties of market leverage are carried over to book leverage.

The variables of interest are investment, size, profitability, market-to-book and depreciation. These are defined to match the model and to coincide with the literature. *Investment* is measured by dividing CAPEX by book assets. *Size* is defined as the log of book value of total assets. *Profitability* is defined as operating income divided by book assets. *Depreciation* is defined as depreciation divided by book assets. I use the industry average of the depreciation rate since variation in individual firm depreciation rates may merely reflect different accounting methods that firms employ, not actual differences in the depreciation rates. *Market-to-book* is the sum of market capitalization and book value of debt, divided by book value of assets.

Since there are other important variables that affect pay-performance sensitivity and market leverage separately, I consider as control variables the variables used in related literatures. As determinants of the pay-performance sensitivity, CEO characteristics and other compensation components should be included in a regression. Among several variables of CEO characteristics, I employ CEO age and tenure. *Tenure* measures the number of years the CEO has held that position. I also include salary as one of the regressors for pay-performance sensitivity and its log value is used in the regressions. As an important determinant of leverage ratios, I use tangibility. *Tangibility* is defined as property, plant, and equipment divided by total assets.

Table 2 reports descriptive statistics for the sample. All variables are CPI deflated. All numbers are similar to values reported in related literature such as Coles, Daniel and Naveen (2006).

2.4.2 Empirical approach

The model suggests that pay performance sensitivity and market leverage are jointly determined. This is consistent with what is observed in practice, since managerial incentive and leverage are not exogenously given but are endogenously determined. Thus, estimating the equations of pay performance sensitivity and market leverage separately is not a proper way to test predictions generated by the model, because the parameter estimates will be biased, since regressors are endogenously determined along with the dependent variable. Thus, I adopt simultaneous equations approach. My econometric model has two equations. The first has market leverage as the dependent variable and the second has pay performance sensitivity as the dependent variable. To conform to the underlying reasoning for simultaneous equations and for the model, I use contemporaneous rather than lag values of variables. The systems I estimate are as follows:

(A)

Market Leverage

$$= \alpha_0 + \alpha_1 Investment + \alpha_2 Size + \alpha_3 Profitability + \alpha_4 Depreciation \\ + \alpha_5 Market - to - book + \alpha_6 Pay\ performance\ sensitivity$$

Pay performance sensitivity

$$\begin{aligned} &= \beta_0 + \beta_1 \text{Investment} + \beta_2 \text{Size} + \beta_3 \text{Profitability} \\ &+ \beta_4 \text{Depreciation} + \beta_5 \text{Market} - \text{to} - \text{book} + \beta_6 \text{Market Leverage} \end{aligned}$$

(B)

Market Leverage

$$\begin{aligned} &= \alpha_0 + \alpha_1 \text{Investment} + \alpha_2 \text{Size} + \alpha_3 \text{Profitability} + \alpha_4 \text{Depreciation} \\ &+ \alpha_5 \text{Market} - \text{to} - \text{book} + \alpha_6 \text{Pay performance sensitivity} \\ &+ \alpha_7 \text{Tangibility} \end{aligned}$$

Pay performance sensitivity

$$\begin{aligned} &= \beta_0 + \beta_1 \text{Investment} + \beta_2 \text{Size} + \beta_3 \text{Profitability} + \beta_4 \text{Depreciation} \\ &+ \beta_5 \text{Market} - \text{to} - \text{book} + \beta_6 \text{Book Leverage} + \beta_7 \text{Salary} + \beta_8 \text{Tenure} \\ &+ \beta_9 \text{Age} \end{aligned}$$

As shown in the above equations, market leverage and pay performance sensitivity are endogenously determined in the system. Thus, I use 3SLS to estimate the system. System A shown above has only the variables predicted by the model. The system A is not identified since in both equations, there is no excluded exogenous variable. To estimate the system, I employ additional variables to be used as instruments. These are CEO salary, tenure, age, and tangibility. CEO salary, tenure, and age have important effects on managerial incentive, but do not necessarily affect leverage decisions. They often used as instruments of CEO incentive in relevant studies. Also, tangibility does not affect managerial incentive, but it has a positive effect on leverage. Campello (2006) also use tangibility as an instrument of leverage. On the other hand,

system B is identified. The pay performance sensitivity equation is identified due to tangibility and the market leverage equation is identified due to excluded exogenous variables, such as salary, tenure, and age. All exogenous variables in the system are used as instruments in the 3SLS estimation.

2.4.3 Empirical results

As shown in Tables 3, I find results consistent with the predictions generated by the model. Table 3 reports the estimation results for simultaneous equations of pay performance sensitivity and market leverage. Model A includes only those key determinants generated by the model, and Model B adds all control variables on top of the key variables, as shown in the above regression equations.

The signs of the coefficients of the key variables are as expected from the model. Investment has a significant and negative effect on market leverage and a positive effect on pay performance sensitivity. In other words, firms that need to make large investments issue less debt and choose to have strong managerial incentives. The positive coefficient of size in the regression of market leverage reconfirms the well-known size effect. Additionally, as expected, the coefficient of size in the regression of pay performance sensitivity is significantly negative. This suggests that small firms worrying about both under- and overinvestment choose to give managers strong incentive compensation, and large firms in which overinvestment cost is minimal choose to issue more debt to utilize the tax benefits, because they need not keep managers highly incentivized. Again, the negative coefficient of profitability in the regression of market leverage is consistent with the literature. The positive coefficient of profitability in the regression of pay performance sensitivity supports my model. Highly profitable firms in which

the manager has high levels of free cash flow to overinvest wish to keep strong managerial incentive alignment with the equity holders and, hence, choose to issue less debt. The opposite is true for unprofitable firms.

Depreciation has significant effects on both market leverage and pay–performance sensitivity, as shown in Table 3. Firms with high depreciation rates choose to issue less debt, due to concern about high investment needs, hence they maintain strong managerial incentives. Fama and French (2002) also employ depreciation as a regressor of leverage ratios and show negative coefficients. However, these authors use depreciation to measure non-debt tax shield. According to the results from simultaneous estimation presented in this paper, the effect of depreciation can be better explained by investment concerns. Market-to-book is shown to have a positive effect on pay-performance sensitivity and a negative effect on market leverage. Consistent with the model’s prediction, high expected profitability and investment opportunities lead the firm to choose high-powered incentive compensation and low leverage.

Finally, market leverage increases pay performance sensitivity and pay performance sensitivity increases market leverage; this result comprises the opposing arguments in existing literature about the relation between them. In the literature, the relationship between them is often hypothesized to be negative due to debt agency costs. He (2009) also predicts a negative relation and actual correlation between them from the data is negative. On the other hand, Cadenillas, Cvitanic and Zapatero (2004) predict a positive relation since leverage decreases managerial compensation from equity and, hence, increase manager’s sensitivity to firm performance. As argued above, the tradeoff between leverage and managerial incentive compensation manifests in the effects of key determinants and leverage. The negative relation is captured by the opposite effects of key determinants. They have positive effect on each other

when they are estimated simultaneously and the opposite effects from key determinants are controlled.

The estimates for other control variables such as tangibility, age, tenure, and salary are consistent with previous findings. Tangibility has a positive effect on leverage. Age and salary have negative effects and tenure has a positive effect on pay performance sensitivity. In addition to estimation results of simultaneous equations, the Hausman specification test also suggests joint determination of market leverage and pay performance sensitivity.

Table 4 reports the estimation results for book leverage. As shown in the tables, most of the results for market leverage are preserved for book leverage. Table 5 presents robustness checks. Panel A reports 3SLS estimation results when stock return volatility is included as a regressor in both equations since the volatility can also be an important determinant of pay performance sensitivity and market leverage, even though the model does not consider the risk factor. The coefficients of volatility in both equations are along the line with existing literature. Panel B reports 2SLS estimation results with robust standard errors since 3SLS is sensitive to specification errors. Panel C reports 2SLS results with standard errors which are clustered by firm identifier. The estimation results shown in Table 5 again confirm the predictions generated by the model.

Taken together, these results provide strong evidence in favor of the model. They suggest that leverage and managerial incentive are jointly determined and, hence, same factors affect both leverage and managerial incentive compensation. Due to a tradeoff in the joint optimization, the directions of effects from the key factors on market leverage and pay performance sensitivity are opposite. These dual effects of key determinants bolster the arguments based on the joint optimization. There are other explanations behind the determinants, but no previous theory can explain the dual effects. Finally, I show that the relationship between leverage and pay–

performance sensitivity is significantly positive when the two are simultaneously estimated and the tradeoff between them is controlled.

2.5. Conclusion

This paper is the first to provide both theory and empirical evidence on the joint determination of leverage and managerial incentive compensation. Leverage and managerial incentive compensation interact with each other through manager–stockholder conflicts and stockholder–bondholder conflicts. To minimize manager–stockholder conflict, the stockholders can employ either high leverage or strong managerial incentive, or both. Low pay–performance sensitivity can alleviate the overinvestment problem substantially. In contrast, to achieve the same goal, the firm must issue a large quantity of debt with no help from managerial incentive compensation. Moreover, debt financing always leads the firm to under invest. The degree of underinvestment in the levered firm reaches its maximum when the manager’s interests are perfectly aligned with those of stockholders. When managerial incentive compensation increases, the marginal benefit of leverage in alleviating manager–stockholder conflicts increases and the marginal cost of leverage in aggravating stockholder-bondholder conflicts grows. In other words, there exists a tradeoff between leverage and managerial incentive compensation. Thus, the stockholders will not use both high leverage and strong managerial incentive at the same time, unless the overinvestment cost is very high. Which one is chosen by the stockholders will depend on firm characteristics that represent relative underinvestment and overinvestment costs. For high growth firms, underinvestment is more of a concern, so such firms may not wish to use high levels of debt financing, but strong managerial incentives instead. However, when the manager’s desire to overinvestment is not strong due to the limited investment opportunities available to the

firm, the stockholders need not grant high incentive compensation to the manager. Since underinvestment cost is relatively small when the incentive created by the compensation package is weak, debt financing is preferred for its tax advantages.

The empirical evidence presented in this paper supports the model of joint determination. I estimate simultaneous equations of market leverage and pay–performance sensitivity. As predicted by the model, the tradeoff manifests in the effects of key determinants. The standard determinants of leverage move the optimal pay–performance sensitivity in opposite direction. Investment, profitability, market-to-book, and depreciation rate have negative effects on leverage, but positive effects on pay–performance sensitivity. Firm size has a positive effect on leverage, but a negative effect on pay–performance sensitivity. After controlling for the tradeoff effect, optimal leverage and pay–performance sensitivity have a positive effect on each other.

The empirical analysis presented in this paper is limited to testing a subset of testable hypotheses generated by the model, leaving several issues open for future research. The hypothesis on private benefit per investment should be tested. As discussed above section 3, the private benefit can affect both leverage and managerial incentive compensation in the same direction. Very large private benefit leads stockholders to choose high leverage and high managerial incentive compensation. However, the effect of private benefit appears mainly in managerial incentive compensation. An increase in the private benefit results in a dramatic increase in the managerial incentive compensation and a small increase in leverage. Identifying the appropriate way to measure the private benefit enjoyed by the manager is a challenge. The size of the private benefit can vary by firm and industry characteristics.

2.6. Figures and Tables

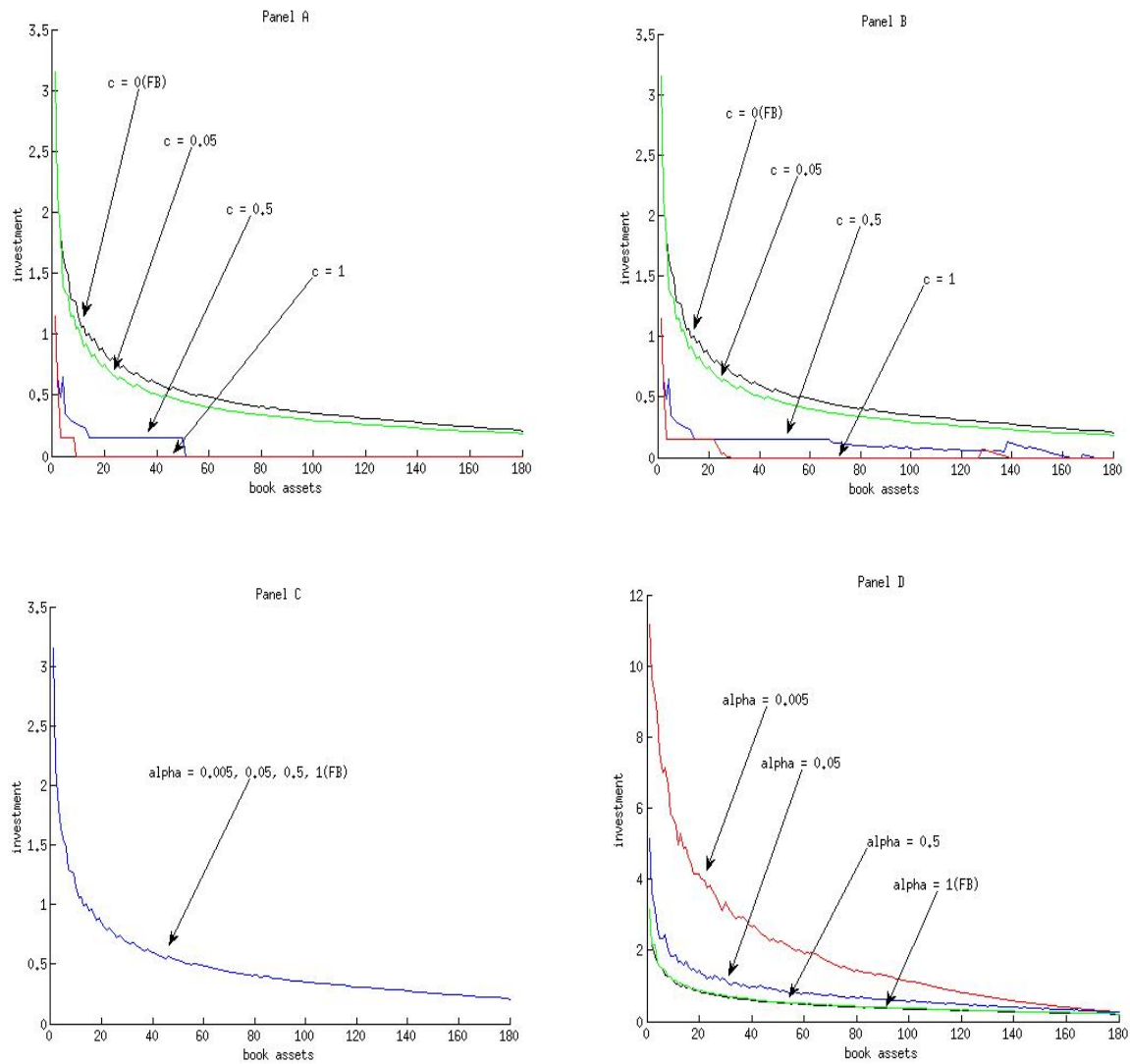


Figure 2.1. Cases (2) and (3). This figure plots optimal investments in case (2) (Panels A and B) and in case (3) (Panels C and D). Panels A and C correspond low profitability state and Panels B and D correspond high profitability state.

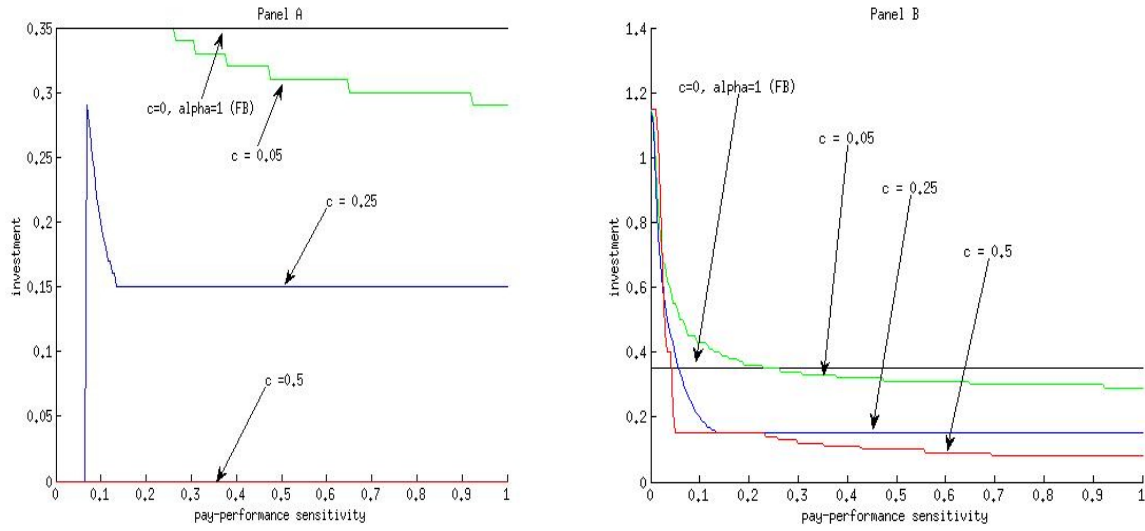


Figure 2.2. Case (4), before joint optimization: Panel A plots optimal investments at a low profit state and Panel B plots optimal investments at a high profit state for a range of α .

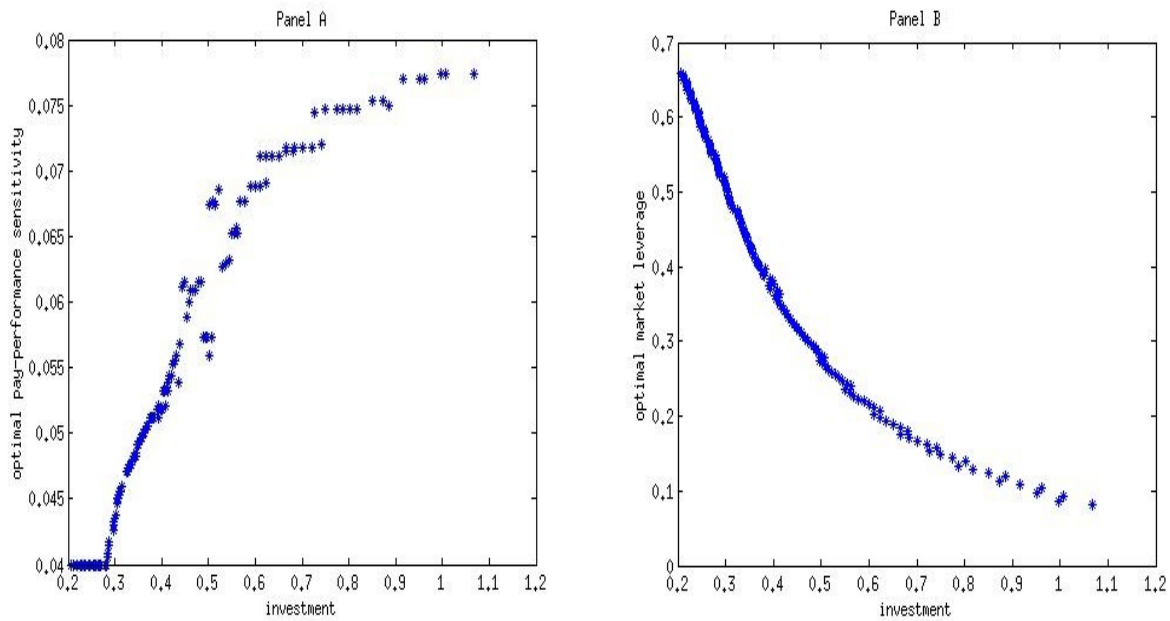


Figure 2.3. The effect of investment on managerial incentive compensation (Panel A) and leverage (Panel B) after joint optimization.

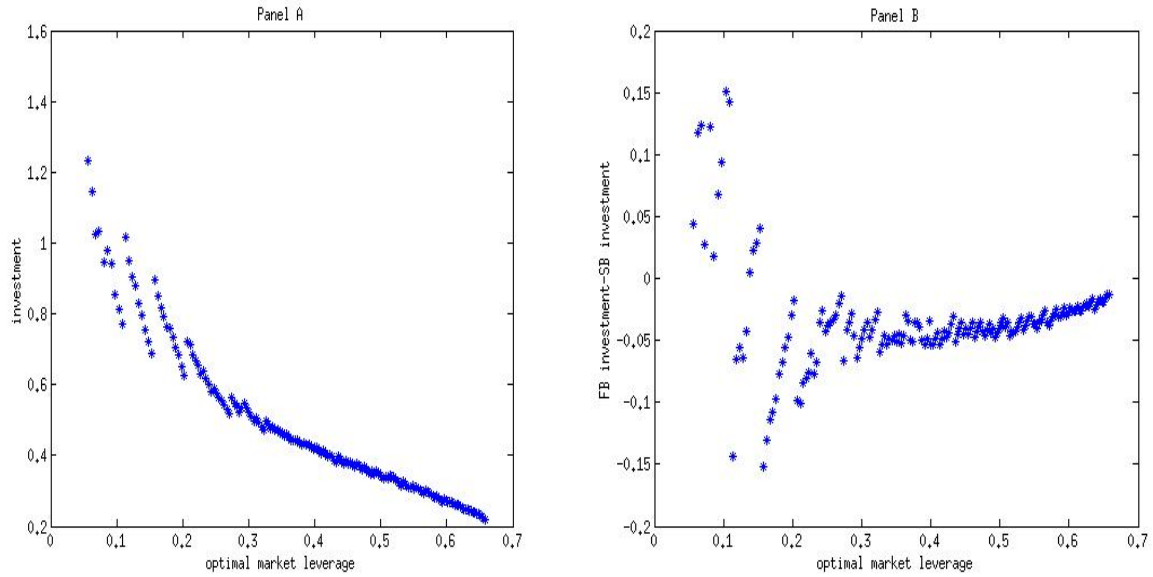


Figure 2.4. Debt overhang: Panel A plots the relationship between optimal market leverage and investment and Panel B plots whether optimal second best investments exceed first best investment.

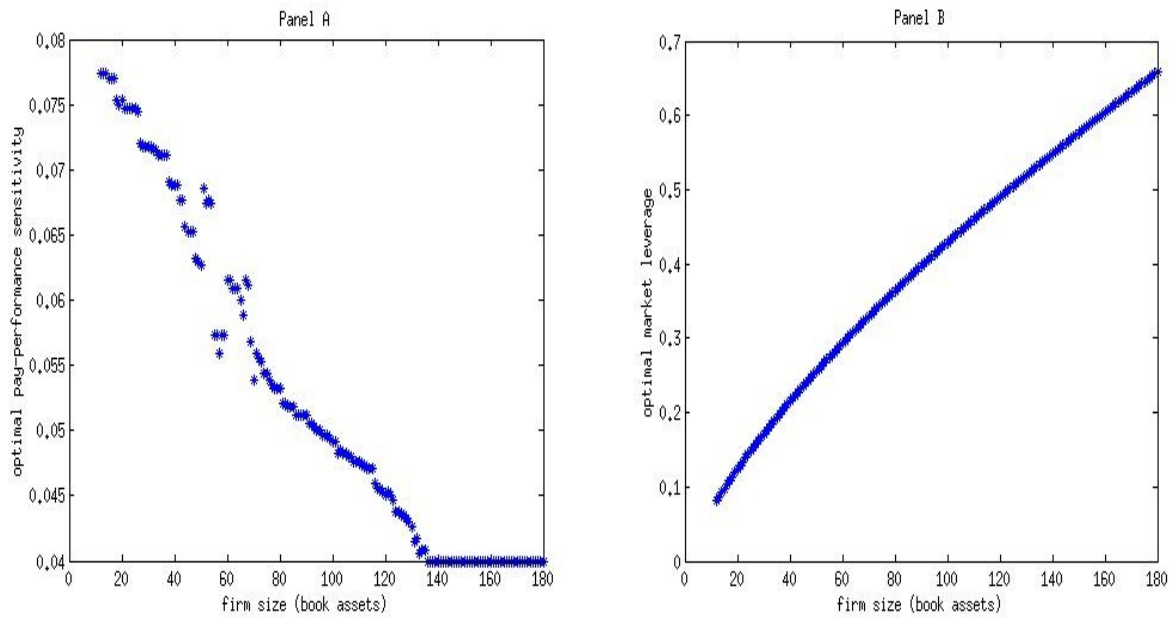


Figure 2.5. The effect of firm size on managerial incentive compensation (Panel A) and leverage (Panel B) after joint optimization.

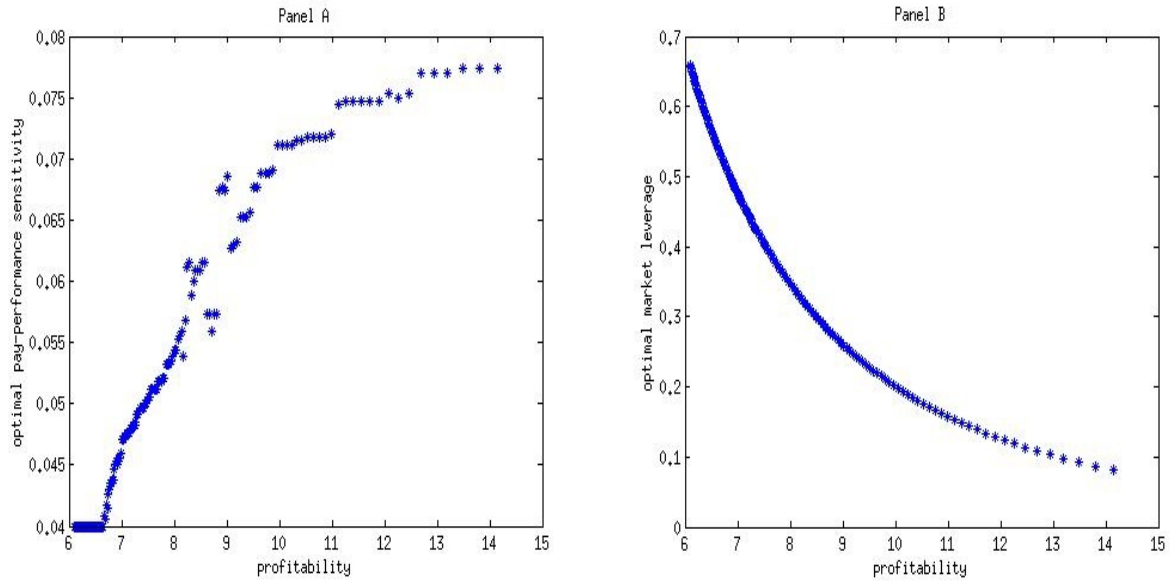


Figure 2.6. The effect of profitability on managerial incentive compensation (Panel A) and leverage (Panel B) after joint optimization.

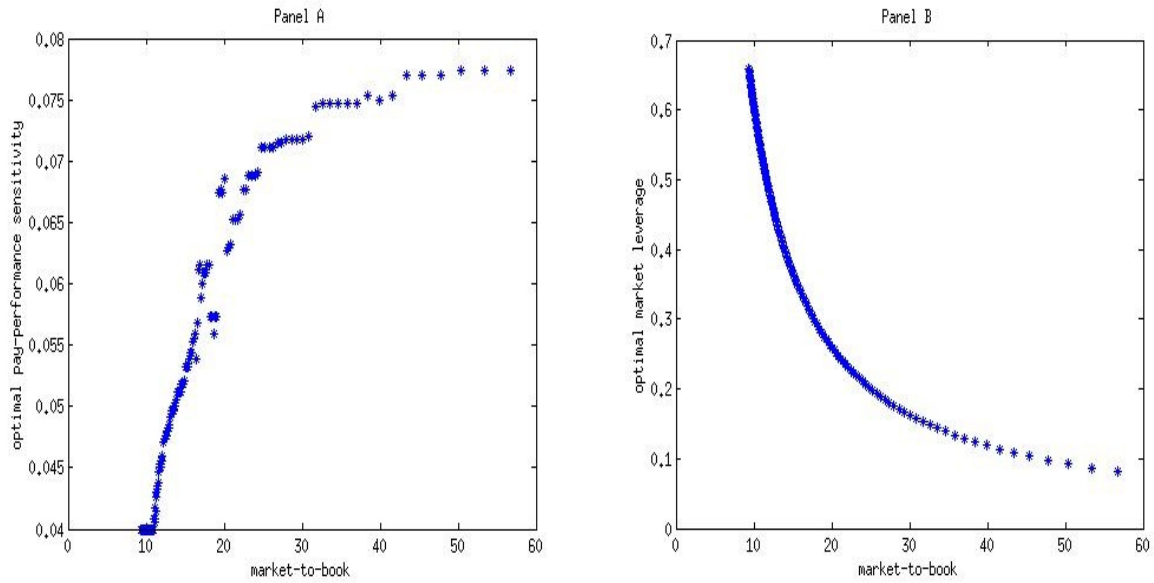


Figure 2.7. The effect of market-to-book on managerial incentive compensation (Panel A) and leverage (Panel B) after joint optimization.

Table 2.1. Key variables generated by the model

All variables are calculated at time 0. D_0^4 considers debt issued at time 0 and does not include new debt yet to be issued.

Firm size (Book assets)	K
Ratio of investment to book assets	I^*/K
Market leverage	$D_0^4/(E^4+D^4)$
Market-to-book	$(E^4+D^4)/K$
Profitability	$(Pe^e-mc)K^s/K$

Table 2.2. Summary statistics

	Mean	Standard deviation	25 th percentile	50 th percentile	75 th percentile
<i>CEO characteristics</i>					
Pay-performance sensitivity	.0272223	.0610521	.0028049	.0065949	.0237264
(log)Salary	6.253477	.8287946	5.968114	6.309918	6.684612
Tenure	7.100707	7.215219	2	5	10
Age	55.49138	7.340227	50	56	61
<i>Firm characteristics</i>					
Market leverage	.2029	.1918406	.0536549	.1545528	.3053405
Book leverage	.2200379	.2195065	.0996196	.2002632	.3054089
Investment	.3347083	1.559892	.1303667	.2285438	.3945061
Market-to-book	2.183796	2.291915	1.155838	1.653101	2.424053
Size	7.403017	1.793365	6.176452	7.210101	8.565923
Profitability	.1063695	.2007889	.0636941	.1350885	.1859304
Depreciation rate	.0468936	.0726691	.0253078	.0336075	.0447449
Tangibility	.2752211	.2038485	.1251604	.2135921	.3802689

Table 2.3. Simultaneous equations of Pay performance sensitivity and Market leverage

	Model A		Model B	
	Pay performance sensitivity	Market leverage	Pay performance sensitivity	Market leverage
Investment	.00144*** (.00028)	-.00325*** (.00069)	.00107*** (.00023)	-.00203*** (.00068)
Size	-.02388*** (.00048)	.05625*** (.00075)	-.00993*** (.00062)	.04606*** (.00081)
Profitability	.10836*** (.00307)	-.25742*** (.00596)	.05118*** (.00360)	-.25002*** (.00617)
Market-to-book	.00851*** (.00028)	-.02097*** (.00050)	.00232*** (.00033)	-.01903*** (.00049)
Depreciation	.01622*** (.00625)	-.02709* (.01527)	.04036*** (.00520)	-.04886*** (.01538)
Pay-performance sensitivity		2.05534*** (.04244)		.70118*** (.06050)
Market leverage	.40106*** (.00974)		.08651*** (.01536)	
Salary			-.00571*** (.00048)	
Tenure			.00237*** (.00006)	
Age			-.00009 (.00007)	
Tangibility				.11728*** (.00586)
R ²	0.055	0.2619	0.1627	0.2784
No. of observations	20423	20423	20423	20423

Significant at 1% (***), 5% (**) and 10% (*).

Table 2.4. Simultaneous equations of Pay performance sensitivity and Book leverage

	Model A		Model B	
	Pay performance sensitivity	Book leverage	Pay performance sensitivity	Book leverage
Investment	.00108*** (.00024)	-.00446*** (.00093)	.00113*** (.00023)	-.00342*** (.00092)
Size	-.00879*** (.00028)	.02156*** (.00109)	-.00682*** (.00028)	.01442*** (.00109)
Profitability	.04584*** (.00276)	-.21705*** (.00819)	.04504*** (.00274)	-.24235*** (.00831)
Market-to-book	.00071*** (.00017)	-.00206*** (.00067)	.00064*** (.00017)	.00042 (.00066)
Depreciation	-.02584*** (.00825)	.60958*** (.02063)	.01073 (.00822)	.53441*** (.02070)
Pay-performance sensitivity		.95267*** (.08076)		.00409 (.08144)
Book leverage	.08817*** (.00993)		.05475*** (.01008)	
Salary			-.00672*** (.00051)	
Tenure			.00255*** (.00006)	
Age			-.00026*** (.00006)	
Tangibility				.19363*** (.00788)
R ²	0.0550	0.0979	0.1627	0.1239
No. of observations	20423	20423	20423	20423

Significant at 1% (***), 5% (**), and 10% (*).

Table 2.5. Robustness checks

	Panel A (Volatility)		Panel B (2SLS, robust)		Panel C (Clustered s.e.)	
	Pay performance sensitivity	Market leverage	Pay performanc e sensitivity	Market leverage	Pay Performance sensitivity	Market leverage
Investment	.00107*** (.00023)	-.00202*** (.00068)	.00094** (.00038)	-.00143* (.00085)	.00094** (.00043)	-.00143 (.00100)
Size	-.00997*** (.00063)	.04620*** (.00080)	-.00599*** (.00030)	.04214*** (.00100)	-.00599*** (.00084)	.0421*** (.01229)
Profitability	.05112*** (.00359)	-.24709*** (.00614)	.03175*** (.00185)	-.22805*** (.00743)	.03175*** (.00905)	-.2281*** (.06318)
Market-to- book	.00233*** (.00033)	-.01903*** (.00049)	.00066** (.00027)	-.01865*** (.00286)	.00066 (.00041)	-.0187*** (.00332)
Depreciation	.04135*** (.00521)	-.05583*** (.01530)	.03996*** (.00340)	-.02563** (.01203)	.03996*** (.01200)	-.02563 (.12981)
Pay- performance sensitivity		.65482*** (.06036)		.46086*** (.06227)		.46086 (.37522)
Market leverage	.08680*** (.01539)		.10788*** (.02126)		.10788 (.06815)	
Volatility	-.07872*** (.02648)	.78918*** (.06954)				
Salary	-.00576*** (.00048)		-.00679*** (.00106)		-.00679*** (.00217)	
Tenure	.00238*** (.00006)		.00256*** (.00009)		.00256*** (.00035)	
Age	-.00010 (.00007)		-.00028*** (.00008)		-.00028 (.00024)	
Tangibility		.11759*** (.00583)		.12343*** (.00738)		.1234*** (.04458)
R ²	0.1624	0.2830	0.1627	0.2784	0.1627	0.2784
No. of observations	20398	20398	20467	20424	20467	20424

Significant at 1% (***), 5% (**) and 10% (*).

CHAPTER 3

FINANCIAL WEAKNESS AND PRODUCT MARKET COMPETITION: INTERNAL CAPITAL MARKET EVIDENCE

3.1. Introduction

Established theoretical literature suggests a possible link between a firm's financial structure and its product market competition. This literature has generated hypotheses which predict that a firm's financial leverage boosts or hurts its product market competition. Recent empirical studies attempt to test the predictions, but these studies focus only on standalone firms. However, affiliated firms of business groups have one more dimension which represents their financial position compared to standalone firms. An affiliated firm is affected by not only own financial structure but also financial strength of the business group which the firm belongs to. This paper documents the first empirical evidence that financial strength of a business group comprises significant product market dimension of affiliated firms in the group. Further, this article also suggests the actual channels through which change in financial strength of a group affects product market performance of affiliated firms.

Although the theories on the interaction between financial strength and product market competition have received a lot of attention, there are only few empirical works which directly test implications of the theories and they often rely on identifying assumptions that may not hold. It is mostly due to the fact that financial position and product market performance are endogenously determined. As in many cases in corporate finance, it is a challenging task to obtain a truly exogenous variation of financial structure that is not associated product market

outcomes. It is also difficult to establish whether certain financial structure decision causes the manager to choose certain product market strategy, or the relation is reversed.

This paper proposes that the problem mentioned above is mitigated by using Business group data. Business group is defined as a collection of legally independent firms under common ownership. Business group is very similar in many perspectives to a diversified conglomerate, but different from it in that each constituent firm (division in a diversified conglomerate) is legally independent and has equity shares of other constituent firms. I use approach pioneered by Lamont (1997) and applied by Lang, Ofek and Stulz (1996). The latter investigates the effect of conglomerate leverage on investment of divisions to find evidence of debt overhang since investment opportunities of a division should not have much impact on the capital structure of the firm. I examine the effect of group leverage on product market performance of an individual affiliated firm. Since the group leverage is determined based on the information of all affiliated firms in the group, product market strategies of an affiliated firm should not have much influence on the financial position of the group as a whole. Thus, group leverage may have exogenous variations which are not associated with product market performance of an individual affiliated firm. The exogenous variations may also be achieved by studying diversified conglomerates, but business groups confer extra benefit in studying the effect of capital structure on product market performance. Unlike divisions of a conglomerate, affiliated firms of a business group are legally independent. The legally independency makes it possible for an affiliated firm to raise external financing on its own and the separate financing generates exogenous changes in group leverage which is not necessarily related to other affiliated firms. Moreover, the affiliated firms have separate industry codes which are not well assigned to divisions of a conglomerate. This allows me to control for industry effects and investigate the product market performance relative to

industry rivals. Leverage is largely affected by the industry factor as shown in Frank and Goyal (2009).

The central result of this study is summarized as that affiliated firms lose market share when their group is financially weak due to high debt. Specifically, I find economically significant negative effect of group leverage on industry adjusted sales growth of affiliated firms. The finding is robust to a variety of different ways to calculate group leverage. The findings are supportive of the theories that predict that debt leads a firm to choose less aggressive strategies in its product market. The group leverage may not provide exogenous variation to core firms if core firms mainly determine the debt burden of the internal capital market. Thus, I test the effect of group leverage on subsamples of non-core firms in order to avoid possible bias from endogeneity. The subsamples exclude core firms and other affiliated firms which are in the same industry as the cores.

While I motivate this study and interpret my empirical findings by appealing to established theories on the direct impact of financial strength on product market competition, I attempt to detect actual channel through which a change in financial strength of a business group may alter product market performance of affiliated firms. First, literature on internal capital markets often examines the sensitivity of investment to cash flows of other affiliated firms to investigate whether internal capital markets are functioning. Following this approach, I show that group leverage has a negative effect on the level of investment of affiliated firms. The result still hold for subsamples of non-core affiliated firms discussed above. High group leverage decreases internal cash available to affiliated firms and, hence, hurts performance of affiliated firms. Second, dividend payments from cross shareholding among affiliated firms can explain the negative effect of group leverage. If dividend payments from cross-holdee firms to cross-holder firms are important source of cash flow besides from the firms' own operation, high leverage of

cross-holdee firms is bad since debt reduces cash payable as dividends.⁶ I employ leverage of cross-holders and cross-holdees. I show that the only cross-holdee leverage hurts product market performance of cross-holders and cross-holders leverage does not have significant effect on cross-holdees. Thus, the negative effect is driven by not some other factors which determine cross-holding, but dividends.

This paper makes two main contributions to the literature. First, this study augments to empirical literature documenting that debt hurts product market competition, but differentiate from the literature by identifying an exogenous change in financial strength from business groups. Most of previous studies test industry- or event-specific effect of financial leverage in order to avoid endogeneity problem. This paper is similar to Campello (2006) in the sense that it investigates the general effect of leverage on product market performance using a broader sample. While he provides an instrument for leverage, there still exists a limitation in interpreting his results since own leverage is not free from the endogeneity issue.

Second, by providing the first evidence that financial strength of internal capital markets significantly affects product market performance of affiliated firms, this study deepens our understanding about the implications of internal capital markets within business groups. Scant attention is given to investigating internal capital markets from researchers on Business groups and existing studies on internal capital markets mainly focus on the sensitivity of investment to cash in internal capital markets. Samphanthara (2006) also studies this sensitivity and further shows that group structure and corporate governance have important impacts on efficiency of internal capital markets in Thailand. By showing that group leverage has impact on individual firm's performance, this study not only provides evidence on existence of internal capital

⁶ Gopalan, Nanda and Seru (2008) also argue that dividend payments are used as a channel through which internal funds are redistributed within a business group.

markets, but also suggests that the internal capital markets have tangible impact on actual performance of business groups.

The remainder of this paper is organized as follows. The section 2 provides reviews on the related literature and develops the empirical strategy. Section 3 describes my empirical methodology and discusses the sample used in this study. Section 4 presents empirical findings showing that internal capital markets have impact on product market performance of affiliated firms. Section 5 concludes.

3.2. Related literature and empirical strategy

3.2.1 Theoretical considerations

While there are many theoretical papers on the interaction between financial structure and product market competition, such theories are developed at an individual firm level. However, as mentioned in the previous section, a business group is a collection of firms under common ownership and the group of firms is controlled by a family. The theories can be applied to business groups as if a business group is a diversified conglomerate.

Some theories demonstrate that debt can lead firms to take less aggressive action and such theories predict a negative effect of financial leverage on product market competition. This idea starts from early study by Telser (1966) and his long purse story. He argues that entrant usually comes into the market with vulnerable financial structure and, hence, is easily exposed to predation by an incumbent. Similarly, Bolton and Scharfstein (1990) argue that financially unconstrained firms may take deliberate actions to increase the likelihood that a financially constrained competitor is exposed to financial distress. This predation is possible as firms with external financing are likely to be under financial constraint to make promised payments.

Chevalier and Scharfstein (1996) also argue that firms with external financing are likely to have liquidity problem especially in bad times. Thus, they suggest that firms with more external financing are likely to have more counter cyclic markup.

Like divisions of a diversified conglomerate, affiliated firms of a business group are not financial independent from each other. The internal capital market plays a major role in allocating resources in a business group.⁷ A group is financially constrained when the internal capital market is heavily levered. Since each affiliated firm relies on the internal capital market more or less, competitors may attempt to predate affiliated firms of business groups and the affiliated firms behave less aggressively in product markets when the groups' internal capital markets are financially constrained.

On the other hand, there are other theories which predict positive effect of leverage. Jensen and Meckling (1976) argue that equity holders of a firm with debt financing have an incentive to shift risk to debt holders since equity holders have limited liability. Brander and Lewis (1986) show that the risk shifting incentive of equity holders leads a levered firm to behave aggressively in product market via choosing large out quantity. They further argue that increasing leverage can have impact on competitor's decision since increasing leverage can be a strategic commitment to be aggressive in product market. Maksimovic (1988) also addresses the limited liability effect and argues that high debt can reduce industry profits because it harms firms' ability to collude in a repeated oligopoly setting.

The limited liability effect can be extended to a business group. As mentioned in previous section, a business group refers a collection of firms under common ownership and such business group usually controlled by a family. As equity holder of affiliated firms also has limited liability

⁷ Lee, Park, and Shin (2009)

on the firms. Then, the controlling family may want affiliated firms to take aggressive actions in their product markets when the group has large debt burden.

3.2.2. Empirical evidence

Most of empirical studies demonstrate that debt leads firms to behave less aggressively in product markets. Opler and Titman (1994) provide an evidence of financial distress cost by examining the effect of leverage on performance in depressed industries. They show that in industry downturns, firms with high leverage significantly underperform competitors with low leverage. Chevalier (1995) suggests LBO makes the product market competition soft in super market industry. She shows that LBO announcement induces increase in stock prices of competitors of the LBO firm and super market chain is likely to enter or expand in the market with high share of LBO super markets. Similarly, Chevalier and Scharfstein (1996) show that super market chains which undertake LBO exhibit more counter cyclic markup as an evidence of their theory. Phillips (1995) also finds that LBOs are associated with lower output levels and higher output prices in three of the four industries he studies. On the other hand, Hadlock and Sonti (2009) provide an evidence supporting that debt leads firms to behave more aggressively. They identify Asbestos liabilities as an exogenous increase in leverage.

While the aforementioned studies mainly focus on specific industry or event, the negative effect of leverage is also found in broader samples. Campello (2003) extends the result of Chevalier and Scharfstein (1996) to different industries and show that industries with high average leverage have more counter cyclic markups. He further shows that firm with high leverage underperform competitors in the same industry but this is true only for industries with high concentration. Campello (2006) shows that debt can both boost and hurt performance. He

shows that leverage has positive effect on relative to industry performance at moderate level of debt, but it has negative effect at high level. Kovenock and Phillips (1997) report a similar finding for the expansion activities of highly levered firms using plant-level data.

As mentioned above, as an effort to identify exogenous variation of leverage, most of what has found is event specific. Few studies examine the general effect of leverage, but they rely on identifying assumptions that may not hold. Thus, I attempt to understand general effect of leverage using business group leverage.

3.2.3. Business groups and their Internal capital markets

Studies on business group mainly focus on the effect of ownership structure of a group on performance or firm value of affiliated firms. Such studies often presume existence of internal capital markets. On the other hand, few directly investigate internal capital markets of business groups. They usually examine whether and how much investment of affiliated firms move in response to cash flow of all affiliated firms in a group. Samphanthara (2006) sets up a structural model of investment with costly external financing and tests empirical prediction from it. He shows that investment is less sensitive to own cash flow for business group firms. He further shows that this sensitivity to own cash flow decreases as size of central control grows or when intermediary exists in a group. In other words, he argues that the sensitivity decreases as the efficiency of internal capital market increases. Lee, Park and Shin (2009) report empirical evidence on internal capital market of Korean business groups. Specifically, they study how the financial crisis in 1997 affects functions of the internal capital market.

A business group can be financially constrained in terms of internal capital market. If a business group is highly levered, it means less resource which can be reallocated to affiliated

firms. As suggested in Samphanthara (2006), the more efficient the internal capital market is, the more affected an individual affiliated firm is by group cash flow. Even if an affiliated firm can raise external financing on its own, external financing is more costly than internal resources. Then decrease in internal resources means increased cost to all affiliated firms. Thus, group leverage may lead deterioration of product market performance.

The controlling family achieves control of the constituent firms by a chain of ownership relations: the family directly controls a firm, which in turn controls another firm.⁸ In order to keep control of the group in the family, affiliated firms hold shares of each other. For this reason, an affiliated firm have significant share of other affiliated firms. Thus, the size of dividends from equity ownership is large and the dividends may be one of important sources of cash flows to share holding firms.

While debt burden of a group can directly affect product market performance through strategic operating decisions of affiliated firms, internal resource reallocation and cross-shareholding dividends may be actual channel explaining why financial position of a group should affect product market performance of affiliated firms.

3.2.4. Empirical strategy

As in many cases in corporate finance, when examining the interaction between capital structure and product market competition or performance, one encounters problems of endogeneity and reverse causality. Since a manager makes a decision on one or the other simultaneously after considering many factors including capital structure and performance, it is difficult to obtain exogenous variation of leverage which is not associated with performance.

⁸ Almeida et al. (2009)

Moreover, it is hard to determine which causes which to change. Therefore, there have been attempts to identify a change in financial strength which is not associated with product market performance.

These problems can be somewhat mitigated by using business group data. Group level leverage roughly represents the sum of leverage of all affiliated firms (exact definition is discussed in Section 3). The group leverage is determined based on information about product markets of all affiliated firms in the group. Also, affiliated firms are legally independent from each other and they can raise external financing on their own. Thus, the group leverage can have exogenous variation which is not associated with an individual affiliated firm. Moreover, reverse causality is easily avoidable since it is less likely that performance of an individual firm, especially a non-core firm determines the entire group leverage.

The approach I use in this study is similar to one pioneered by Lamont (1993) and applied by Lang, Ofek and Stulz (1996). Lang, Ofek and Stulz (1996) examine whether the effect of leverage on investment is same for core and non-core divisions of a conglomerate in order to abandon the alternative explanation that the relation between investment and leverage is due to investment opportunity not due to debt overhang. They use leverage of a conglomerate to measure ‘exogenous’ leverage which is not associated with individual division’s investment opportunities. Like in their paper, I also need to resolve endogeneity and reverse causality in order to examine the effect of leverage on performance. To measure ‘exogenous variation’ of leverage which is not associated with individual firm performance, I use group leverage instead of individual firm’s own leverage. I examine the effect of group leverage on individual affiliated firm’s performance. As in Lang, Ofek and Stulz (1996), I could also use diversified conglomerate in U.S. to study the interaction between leverage and performance. However, business group data provide better experiment than conglomerate as explained as follows.

The advantages of business group over conglomerate can be summarized in three ways. First, it is hard to obtain detailed accounting and financial information on each division since they are not legally separate companies. On the other hand, the data is available for business group affiliated firms. Thus, I can include own control variables including own leverage. This will provide better understanding of the effect of group leverage on performance. Second, I can control industry effect of each firm. Controlling for industry effect is important as shown in previous literature (Phillips (1995), Kovenock and Phillips (1997), Campello (2003, 2006)) in examining the interplay between capital structure and competitive outcomes. As shown in Frank and Goyal (2009), industry mean leverage is one of significant determinants of individual leverage and industry average leverage varies in industries. In case of conglomerate data, information on each division's industry is limited, thus it is hard to control for industry effect. However, industry effect can be controlled by including own leverage which is adjusted with industry mean in the regression. Finally, since in a business group all affiliated firms are legally independent to each other, they can raise external financing independently to each other. This further assures that group leverage has exogenous variation which is not associated with most of affiliated firms.

3.3. Data and Variables

3.3.1. Data and sample selection

I use data of Korean business group which is called "Chaebol" for the period of 1998 to 2006. The Chaebols are regulated by "Monopoly Regulation and Fair Trade Act (hereafter Fair Trade Act or FTA)" and the government agency, "Korean Fair Trade Commission (KFTC)," oversees the FTA. A legal expression for Chaebol is "Large business group." A Chaebol in the

FTA is defined as a business group where “an identical person de facto controls affiliated firms’ businesses.” There are two criteria for a company under a de facto control called “affiliated company”: de facto ownership of more than 30 percent excluding preferred shares of a company and de facto exercise of controlling influence on a company.

The ownership data of this study is obtained from Korean Fair Trade Commission (KFTC). This data contains stock ownership information for 30 largest business groups from 1998 to 2001, and the large business groups subject to regulations on cross-shareholding and debt guarantees of affiliates of the same group from 2002 to 2006, which are designated by the KFTC. The firms in the designated 30 chaebols had been prohibited from cross-shareholdings and limited at investing in equity of the domestic firms. Since 1998, just after IMF financial crisis, these firms have also been prohibited from cross debt guarantees among affiliated companies. These business groups are required to report the status of affiliate shareholders and persons with special interest and the financial status of group companies on April 30 of each year, following the Fair Trade Act and its enforcement ordinance. Since I focus on Business groups which are entirely or partially controlled by a controlling family or a person, my sample excludes business groups such as government-controlled business groups. The final sample starts in 1999 since I use lag variables for regressions. The sample includes 30 groups in 1999, 25 groups in 2000, 25 groups in 2001, 31 groups in 2002, 35 groups in 2003, 36 groups in 2004, 40 groups in 2005, and 41 groups in 2006.

In order to obtain additional financial and accounting information, I also use databases developed by Korea Listed Companies Association (KLCA) and Korea Investors Service (KIS). These databases contain information on not only listed companies but also private companies. I use these databases to obtain information of non-business group firms so that I can adjust all variables with industry means.

There are several reasons that the business group data from Korea is a good sample for this study. First, Korea is an emerging economy in which capital market is not fully developed and, hence external financing is costly. Thus, it is a good place to test story on the value of internal capital market. Second, business group affiliated firms are very important in Korean economy and have businesses in almost every industry. For example, as of 2004, the business groups accounted for 14% of the value added of the entire manufacturing sector, 2.95% of the nation's employment, and more than half (52.3%) of the total market value of all listed companies (Almeida et al. (2009)). Third, the data is available for both listed and non-listed firms. Thus, I can avoid a possible problem arising from sample selection.

3.3.2 Methodology and variable definition

I study the interaction between leverage and firm performance by examining cross sectional data over 8 years. In the sense that this study is not limited to event/industry specific tests and focuses on general effect of leverage, it is similar to Campello (2006). The regression model I use here resembles Opler and Titman (1994) and Campello (2006), but it differs in that it includes not only own leverage but also group leverage which captures exogenous change in financial strength of affiliated firms. The following regression equation (1) is a base regression equation and I also further include other group variables to control for alternative explanation of the group leverage effect.

$$(1) \quad salesgrowth_{i,t} = \alpha + \beta size_{i,t} + \gamma own_leverage_{i,t-1} + \phi profitability_{i,t-1} + \lambda investment_{i,t-1} + \mu group_leverage_{i,t-1} + \varepsilon_{i,t}$$

In the estimations performed, all regressors except size are lagged. I correct the regression error structure for within-firm residual clustering and heteroskedasticity using Huber-White's covariance estimator. I also estimate the model with firm fixed effect model to check robustness of the result. In addition to the equation above, I also examine the effect of leverage on investment by just replacing sales growth with investment. All financial data are CPI deflated based on 2005.

As shown in the previous literature (i.e., Kovenock and Phillips (1996) and Campello (2003)), industry effect plays an important role in investigating the effect of capital structure on performance. Thus, I adjust all own variables with corresponding industry means. Adjusting sales growth with industry mean provide additional advantage in interpreting result. By employing industry adjusted sales growth, I can see how a firm does relative to its industry competitors.

As a gauge of a firm's product market competition, I choose industry adjusted sales growth following Campello (2006). Price setting behavior which has been examined in other previous literature does not fully reflect firm's competitive strategies in product market. Sales growth is a nice practical measure of performance which captures the combined effect from both pricing and other competitive strategies and it can consistently estimated across industries and periods (Campello (2006)). The sales growth is calculated as sales of current year divided by sales of previous year.

As an exogenous proxy for capital structure, I use leverage of a group. Some previous literature use long term debt as an attempt to reduce bias from endogeneity. However, I use total debt to capture comprehensive financial strength of a group. As mentioned in previous section, group leverage mitigates the endogeneity problem coming from using own leverage. Group leverage is defined as the ratio of sum of total debt of all affiliated firms to the sum of total assets

of them: Group leverage = $\sum \text{total debti} / \sum \text{total assets}_i$ for all $i, i=1, \dots, N$, where there are N firms in a group. Total debt and assets are all measured in book value. Even though group affiliated firms are under central control, an affiliated firm can raise external financing for need which is not related to other affiliated firms'. Thus, group leverage can have exogenous variation which is not associated with most of affiliated firms. Group leverage can also easily avoid reverse causality which is an unresolved issue of previous literature on the interplay between capital structure and performance in product market. It is less likely that an individual firm determines group leverage, but it is more likely that group leverage affects an individual firm's decisions.

I use group control variables such as group profit, group investment, group cash, group size and number of firms in a group. Group profit is likely to increase resource in the internal capital market of a group, hence affect affiliated firm's performance. Also, group profit is likely to be correlated with group leverage. Group profit is defined as the ratio of sum of total operating income of all affiliated firms to the sum of total assets of them: Group profit = $\sum \text{operating income}_i / \sum \text{total assets}_i$ for all i . Group investment is defined as the ratio of sum of capital expenditure to the sum of total assets. Group cash is defined in the same way, but capital expenditure is replaced with cash holding. When I calculate the group variables including group leverage, I exclude affiliated firms which are in financial sector.

As an important control, I include own leverage which is the ratio of own total debt to own total assets, both measured in book value. By including own leverage, I can capture the effect possibly from reverse causality and also industry effect by using industry adjusted own leverage. As in Campello (2006), I use other own control variables such as profitability, size and investment. Profitability is defined as operating income divided by total assets and investment is capital expenditure normalized by total assets. Size is log of total assets.

Observations of firms in financial sectors are excluded. Firms which have industry adjusted sales growth, main dependent variable, of over 15 or below -15 are also excluded in order to avoid possible bias from outliers. The final sample covers 244 firms in 1999, 240 firms in 2000, 281 firms in 2001, 331 firms in 2002, 385 firms in 2003, 353 firms in 2004, 488 firms in 2005, and 512 firms in 2006. Table 1 reports descriptive statistics of variable used in the study (both before and after adjusted by industry means), including group variables and Table 2 reports correlation matrix.

3.4. Empirical results

3.4.1 Revisiting previous findings

Before proceeding to my main tests, I replicate previous empirical studies. I do this replication in order to avoid concerns that whatever I show here may be driven by characteristics of business groups or Korean market. The replication results suggest that firms in my sample are not different from U.S. firms that are studied in the existing literature. I mainly follow Campello (2006). My sample includes more industries than Campello's (2006). The result is also reminiscent of Opler and Titman (1994). Leverage is defined in two ways: total debt and long term debt. I use total debt in my study, but I also employ long term debt following Campello (2006). Campello (2006) not only adjusts for industry mean but also standardizes by standard error in order to make "z-leverage." However, I adjust only for industry mean.

Replication results are presented in Table 3. Monotonic effect of leverage both in long term and total debt is positive. Since I did not standardize leverage, the results do not exactly match the one presented by Campello (2006). However, I also find non monotonic relationship between leverage and sales performance. I also run similar regressions with total debt and find

results reminiscent of Opler and Titman (1994). I find that total debt which is greater than 75 percentile of the sample has negative effect of industry adjusted sales growth. Since I find similar results to findings of some previous literature, the main findings presented below are not attributed to some special features of my sample.

3.4.2 Main results

3.4.2.1 Sales growth

Now I investigate the interaction between leverage and performance by examining the effect of group leverage on sales growth of affiliated firms.

Table 4 reports a significant negative effect of group leverage on performance of affiliated firms. I also run regressions with firm fixed effect and standard errors of regression without firm fixed effect are clustered within firm level. Moreover, I control for other group factors in order to drop alternative explanation for the relation between group leverage and performance. Group controls I use are group profit, group size, group investment and the number of constituent firms in a group. After including group profit in the regression model, group leverage is still significant. At the same time, group profit is significantly positive. The positive coefficient of lagged group profit may provide additional support for internal capital market in a business group. Group affiliated firms share profits with other affiliated firms and this shared profit increases performance of all affiliated firms. This is consistent with arguments of profit sharing in Khanna and Yafeh (2005). I further include other control variables, but they are not statistically significant, but group leverage is still significant after controlling for them. Thus, I cast doubt on that the effect of group leverage captures the effect from other group variables.

Own leverage is most significantly positive, but not significant in models with firm fixed effect. The positive coefficient of own leverage may capture reverse causality. It may suggest that firms with good performance are able to issue more debt, suggesting larger debt capacity. By showing that group leverage and own leverage have opposite signs, one can see that it is difficult to interpret the coefficient of own leverage when he/she examines the interaction between financial strength and product market competition.

In all models, the coefficient of group leverage is significantly negative. As group leverage increases, sales performance of individual affiliated firm decreases, supporting the debt-makes-you-weak hypothesis. The coefficients range from about -0.62 to -1.19. When a group increases its leverage by 0.1, industry adjusted sales growth of a affiliated firm on average drops by 0.062 at least. Again, the sales growth is calculated as sales of current year divided by sales of previous year. Thus, drop by 0.062 is economically noticeable.

Next I run the same regressions on subsamples of noncore firms. Before, I assume that group leverage is exogenous enough for all affiliated firms. However, it may not be for a core firm in a group. Almeida et al. (2009) suggest that larger, older and public firm is likely to be a core/key firm in a group. It means that a controlling family uses the firm to control over other affiliated firms. It may mean that the core firm is likely to contribute most to a change in financial structure of a group. If it is true, the assumption that group leverage is exogenous to the core firm is no longer acceptable. In order to achieve further exogeneity, I exclude core firms out of my sample and re-run same regressions on the resulting subsample.

The results are reported in Table 5. Since as shown in the previous table group controls other than group profit do not significantly explain performance of affiliated firms, I only include group profit as a control. The core firm is defined as a firm which has biggest value in terms of following three variables: size, own leverage and sales. As shown in the table, the group leverage

is still significantly negative in all definitions of core and in all model specifications. Moreover, the magnitude of the effect is similar to one with the entire sample. Thus, once again I can confirm that high group leverage decreases performance of affiliated firms.

Business groups are much diversified, but it is still true that some affiliated firms are in same industries as others. In that case, excluding only core firms is not enough. If some non-core firms are in same or related industries with the core firm, their performance may closely move with performance of the core firm. Thus, I further refine my sample by excluding firms which are in same industries with core firms. The results are reported in Table 6. The result is somewhat weakened. The group leverage is no longer significant for models using definition of core as a firm with biggest leverage. However, group leverage is still negative for all models, suggesting that group leverage has negative effect on performance of affiliated firms.

In sum, my tests with group leverage show that firms in a business group which is highly leveraged underperform those in a group which is lowly leveraged. I obtain significant negative effect of group leverage on performance of individual affiliated firms by testing on the subsamples of non-core firms as well as on the entire sample. The negative effect of leverage is consistent with the prediction generated in the literature such as Bolton and Scharfstein (1990) and Chevalier and Scharfstein (1996). I argue that weak financial position of a group leads its affiliated firms to take less aggressive strategies and to be exposed to more aggressive competition in their product markets.

3.4.2.2. Robustness

In order to make sure that the results shown in previous sections are not driven by the way I calculate the group leverage, I repeat the same tests using different definitions of group

leverage. The original group leverage was calculated as the sum of total debt of all affiliated firms divided by the sum of their total assets. However, one might argue that total debt should be weighted with size. It might be true that leverage of a firm with larger size should have bigger impact than leverage of a firm with smaller size. Thus, I calculate the size-weighted group leverage. Second, I adopt a different method of summation. Instead of summing total debt then dividing by total assets, I first obtain leverage which is individual total debt to total assets ratio and then sum them up to calculate the group leverage. In other words, this second group leverage is the sum of own leverage of all affiliated firms. The third one is similar to the second one, but only it is weighted by size when summing up own leverages.

The results are reported in Table 7. As shown in the table, the negative effect of group leverage is robust to different definitions of group leverage.

3.4.3. Extensions

So far we find that financial strength of a group directly affects strategic decisions of its affiliated firms. In this section, I will discuss actual channel through which changes in financial strength of a group may affect performance of affiliated firms.

3.4.3.1. Investment regression

In this section, I investigate the relation between group leverage and investment of affiliated firms in order to examine whether group leverage reduces internal resources which can be reallocated to affiliated firms. The regression estimates from the entire sample are reported in

Table 8. By including own leverage I obtain cleaner effect from internal capital markets and also control for industry effect.

Group leverage significantly reduces investment of affiliated firms. Increase in group leverage by 0.1 reduces investment on average by about 0.004. The notable thing is that own leverage is mostly insignificant and the magnitude of the own leverage effect is smaller than the one of group leverage. This further emphasizes the importance of internal capital markets to group affiliated firms. The group leverage, as in regressions of sales growth, is still significant after controlling for other group control variables such as group profit, group investment and group cash. The significant coefficients of group profit and group investment are also suggestive of existence of internal capital market in a business group.

As done in previous section, I also conduct same tests on the subsample of noncore firms which are in different industries from core firms'. Core firm is defined in the same way as in the previous section on sales performance. Table 9 and 10 provide regression estimates for level investment and industry adjusted investment respectively. They report that significantly negative effect of group leverage still holds for the subsample.

Significant coefficient of group leverage on investment provides strong support for the internal capital market story. If one finds the negative relation between sales performance and group leverage, it may be due to factors other than internal capital market. As mentioned in Opler and Titman (1994), the industry adjusted sales performance can also be customer driven or competitor driven. On the other hand, investment is a direct decision variable of a manager. Therefore, by showing that group leverage actually reduces investment of affiliated firms, I argue that group leverage reduces internal resources of all affiliated firms. Thus, I conclude that group leverage hurts product market performance of affiliated firms by reducing resource of internal capital market.

3.4.3.2. The effect of cross holding dividends

In order to uncover another channel of the negative effect of group leverage on performance, I test whether leverage of cross-holdees has impact on performance of cross-holders. As mentioned in Section 2, affiliated firms hold shares of other firms in their group and they pay dividends. If dividends are actually important source of cash flows to cross-holders, leverage of cross-holdees should have negative effect on performance of cross-holders since debt decreases cash payable as dividends. One may argue that the effect of cross holding leverage stems from some factors which determine cross-shareholding in the first place, not from dividend payments. In order to exclude the alternative explanation, I examine both the effect of cross-holder leverage on cross-holdee and the effect of cross-holdee leverage on cross-holder. If the effect is actually due to the factors which determine cross-shareholding, I should see similar effect on both tests.

The result on the effect of cross-holdee leverage on performance of cross-holders is reported in Table 11. The cross-holdee leverage is calculated in two ways: the sum of cross-holdee total debt divided by the sum of cross-holdee total assets (Crossholdee_leverage) and the leverage of maximum cross-holdee (MaxShare_crossholdee_leverage). Consistent with the results on the effect of group leverage, leverage of cross-holdee has negative effect on the performance of cross-holders. The effect is significant for both definitions of cross-holdee leverage and for different model specifications. The magnitude of the effect is on average about -0.4. When cross-holdees increase leverage by 0.1, sales growth of cross-holders decreases on average by 0.04.

As shown in Table 12, I find somewhat different result on the effect of cross-holder leverage on performance of cross-holdees. The cross-holder leverage is also calculated in the same ways as the cross-holdee leverage. Most of estimates are insignificant. The only significant one is the coefficient of MaxShare_crossholder_leverage, but it is no longer significant once MaxShare_crossholder_profit is included in the regression. I could not find any significant estimate of the effect of cross-holder leverage on performance of cross-holdees. Moreover, in contrast to the coefficient of cross-holdee leverage, some coefficients of cross-holder leverage are positive. From this table, I exclude alternative explanation for the negative effect of cross-holdee leverage. If it were due to some factors which determine cross-shareholding, then I should have been able to find significant effects of both cross-holder leverage and cross-holdee leverage. However, I do not. Thus, I argue the negative effect of cross-holdee leverage on performance of cross-holders is not driven by determinants of crossholding, but by resource transfer via dividend payments of cross shareholding. This result complements arguments by Gopalan, Nanda and Seru (2008) who show that dividend policy within a group is closely linked to investment policies in the group.

3.5. Conclusion

This study provides the first empirical evidence that internal capital markets of business groups significantly affect product market competition of affiliated firms. Previous empirical studies on the interaction between financial strength and product market performance have long been limited since it is difficult to identify exogenous variation in a firm's financial structure which is not associated with product market performance. This study proposes to use business group data in order to mitigate the problem. I test on a sample of affiliated firms of Korean

business groups in various industries and document evidence supporting the hypothesis that high leverage hurts product market performance. I calculate group leverage to measure the exogenous change in financial strength of a group which is not associated with product market opportunities of an affiliated firm and examine how group leverage alters sales performance of individual affiliated firm. At the same time, by including own leverage as one of regressors, I control for industry effect and reverse causality. In order to achieve further exogeneity of the group leverage, I conduct subsample tests. The subsample excludes core firms and the affiliated firms which are in the same industry as the core firms'. The subsample tests also show that group leverage reduces performance of non-core affiliated firms.

This paper further uncovers what actually drives the effect of financial position of a group on performance of affiliated firms. First, I argue that group leverage decreases internal resources available for reallocation among affiliated firm by showing that the group leverage decreases investment of affiliated firms. The effect on investment is still found on subsamples of non-core firms which are in different industries from cores'. Second, I argue that dividend payments from cross shareholding among affiliated firms provide another channel. I examine the effect of cross-holding leverage. The effect is shown to be from cross-holdee firms to cross-holder firms, not the other way around.

This paper suggests that internal capital markets have impact on product market performance. This finding points to possible avenues for future research. Previous studies on internal capital markets mainly focus on efficient resource allocation in internal capital markets. However, we know very little about other dimensions of internal capital markets. One may investigate how the internal capital markets affect other important policies of affiliated firms.

3.6. Figures and Tables

Table 3.1. Descriptive statistics of main variables

	Mean	Pct. 25	Median	Pct. 75	Std. Dev.
Sales growth	1.262625	1.002982	1.10661	1.26799	.8158025
Own leverage	.5381033	.400548	.5346506	.6484476	.2618339
Size	19.18755	17.77365	19.12787	20.57525	1.932374
Profitability	.0627173	.0248248	.0601601	.1029929	.1197134
Investment	.0470543	.0083639	.0275997	.0660516	.0831218
Cash	.065404	.0072921	.0306621	.0816282	.0927153
Group leverage	.4909021	.3863648	.4979585	.5644584	.1541595
Group profit	.0650137	.0426225	.0629543	.0865424	.0400046
Group investment	.038645	.0210817	.0348471	.0500132	.0361303
Group cash	.0345719	.0197591	.0301296	.0457315	.021503
Num_per_group	21.07728	10	16	33	13.10459
Group size	23.25135	22.0685	22.88521	24.63711	1.371688
<i>Adjusted by industry mean</i>					
Sales growth	-.5486038	-.4820738	-.1222481	.0290844	2.102606
Own leverage	-.0542158	-.1421443	-.0046099	.1343229	.4613264
Size	.8127923	-.4947758	.7235899	2.135729	1.832762
Profitability	.0241259	-.0213876	.0172161	.072614	.1212175
Investment	-.0023613	-.0354142	-.0107583	.0172935	.0869527
Cash	-.0106825	-.0581475	-.0311789	.0086747	.0857283

Table 3.2. Correlation Table

	Sales growth _t	Own Leverage _{t-1}	Profitability _{t-1}	Size _t	Investment _{t-1}	Group Leverage _{t-1}	Group Profit _{t-1}	Group investment _{t-1}
Sales growth _t	1.0000							
Own leverage _{t-1}	0.0507	1.0000						
Profitability _{t-1}	-0.0641	-0.1016	1.0000					
Size _{t-1}	-0.1830	-0.0052	0.0425	1.0000				
Investment _{t-1}	0.0399	-0.0049	0.0743	-0.0271	1.0000			
Group leverage _{t-1}	-0.0779	0.1099	-0.0849	-0.0197	-0.0762	1.0000		
Group profit _{t-1}	0.0847	-0.1000	0.1746	-0.0035	0.0667	-0.3131	1.0000	
Group investment _{t-1}	-0.0267	-0.0003	0.0575	0.0086	0.1885	-0.1544	0.1478	1.0000

Table 3.3. Revisiting previous findings

	(1)	(2)	(3)	(4)	(5)
Dependent variable: Industry adjusted sales growth _t					
Profitability _{t-1}	-1.65878*** (.5274912)	-1.62033*** (.4114015)	-1.49711*** (.4029053)	-1.53727*** (.4105043)	-1.559765*** (.4130471)
Size _t	-.143791*** (.0285648)	-.121969*** (.0260813)	-.137280*** (.0264528)	-.130880*** (.0258574)	-.1338036*** (.026362)
Investment _{t-1}	1.211482** (.5498337)	1.477974*** (.4995583)	1.371284*** (.5074734)	1.336625*** (.5126543)	1.302765** (.5139866)
Cash _{t-1}	1.845275*** (.6815988)	1.742616*** (.5968495)			
Own_leverage _{t-1} (total debt)	.1852912* (.1095381)				
Own_ltleverage _{t-1}		.2722738** (.1080805)			
Own_ltleverage _{t-1} (≤25%)			.3257843*** (.1234647)		
Own_ltleverage _{t-1} (≥25% & ≤75%)			-1.123618* (.6151346)		
Own_ltleverage _{t-1} (≥75%)			.0039271 (.2552198)		
Own_ltleverage _{t-1} (≤10%)				.3852565*** (.1225383)	
Own_ltleverage _{t-1} (≥10% & ≤90%)				-.5990961* (.3379379)	
Own_ltleverage _{t-1} (≥90%)				-.0392453 (.2409197)	
Own_ltleverage _{t-1} (≤5%)					.4210685*** (.1246846)
Own_ltleverage _{t-1} (≥5% & ≤95%)					-.533137** (.2141853)
Own_ltleverage _{t-1} (≥95%)					.0345343 (.2574236)
GDP	Yes	Yes	Yes	Yes	Yes
No. of Observations	2237	2541	2542	2542	2542
R-sq	0.0604	0.0552	0.0526	0.0535	0.0549

Significant at 1% (***), 5% (**) and 10% (*).

Table 3.4. The effect of group leverage on sales growth of all affiliated firms (group leverage includes all affiliated firms including core)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: Industry Adjusted Salesgrowth _t							
Profitability _{t-1}	-1.3197** (.528299)	-2.5874*** (.7090625)	-1.4206*** (.5357772)	-2.767*** (.7128266)	-1.3259** (.5275417)	-1.3015** (.5329285)	-1.31356** (.5299407)
Size _t	-.1753*** (.027668)	-.326955** (.1541743)	-.17643*** (.0280024)	-.32335** (.1539836)	-.17978*** (.0286293)	-.17572*** (.0277794)	-.17068*** (.0272735)
Investment _{t-1}	.8151932 (.598638)	2.02301*** (.6758297)	.776365 (.5954868)	2.0286*** (.6749605)	.794997 (.5966312)	.9000141*** (.5889409)	.8498855 (.6016125)
Own leverage _{t-1}	.3037913** (.1211042)	.1496036 (.1324972)	.3097203** (.12139)	.1777042 (.1329392)	.3032863** (.1213598)	.3040634** (.1211226)	.2973931** (.1192622)
Group leverage _{t-1}	-.783149** (.358078)	-1.300187* (.6808568)	-.615938* (.3649837)	-1.18889* (.6818503)	-.74220** (.3459793)	-.845237** (.38068)	-.937447** (.3664075)
Group profit _{t-1}			2.466853** (1.046376)	4.13671** (1.877703)			
Group Size _t					.0249499 (.0356333)		
Group investment _{t-1}						-1.314707 (1.457065)	
No. of firms in a group _{t-1}							-.0052506 (.0035226)
GDP	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	No	Yes	No	Yes	No	No	No
No. of Observations	1990	1990	1990	1990	1990	1990	1990
R-sq	0.0689	.	0.0706	.	0.0691	0.0693	0.0699

Significant at 1% (***), 5% (**) and 10% (*).

Table 3.5. The effect of group leverage on sales growth of all noncore affiliated firms

	Core firm is defined as the firm with biggest size		Core firm is defined as the firm with biggest sales	
	(1)	(2)	(1)	(2)
Profitability _{t-1}	-1.30526** (.5353257)	-1.38374** (.5391764)	-1.342045** (.5449746)	-1.412591** (.5499043)
Size _t	-.19705*** (.0307989)	-.19981*** (.0312759)	-.196909*** (.031074)	-.199420*** (.0314823)
Investment _{t-1}	.7929554 (.6156651)	.7607234 (.612053)	1.078628** (.4873956)	1.046818** (.4834509)
Own_leverage _{t-1}	.2760726** (.1199874)	.2814832** (.1203844)	.3154243*** (.1218744)	.3192376*** (.1220669)
Group leverage _{t-1}	-.938815** (.3835933)	-.769768** (.3894647)	-.8794142** (.3820175)	-.7287682* (.3900522)
Group profit _{t-1}		2.437499** (1.110729)		2.128762** (1.064672)
GDP	Yes	Yes	Yes	Yes
No. of Observations	1794	1794	1797	1797
R-sq	0.0740	0.0756	0.0773	0.0785

Significant at 1% (***), 5% (**) and 10% (*).

Table 3.6. The effect of group leverage on sales growth of noncore firms which are in different industries from the industry of core firm

	Core firm is defined as the firm with biggest size		Core firm is defined as the firm with biggest sales	
	(1)	(2)	(1)	(2)
Profitability _{t-1}	-1.6593*** (.5937747)	-1.7102*** (.5951995)	-1.31820** (.5282174)	-1.4192*** (.5357759)
Size _t	-.19843*** (.0335027)	-.20018*** (.0336577)	-.17563*** (.0276965)	-.17670*** (.0280298)
Investment _{t-1}	.2531075 (.6808965)	.2365137 (.6781955)	.8156095 (.5986516)	.7770568 (.5954751)
Own_leverage _{t-1}	.3265424*** (.121609)	.3311917*** (.1217131)	.3037163** (.1211038)	.3097274** (.1213915)
Group leverage _{t-1}	-.6266484* (.361189)	-.5009752 (.3647534)	-.785901** (.3585438)	-.6171587* (.3657745)
Group profit _{t-1}		1.849641 (1.145664)		2.467877** (1.048829)
GDP	Yes	Yes	Yes	Yes
No. of Observations	1556	1556	1988	1988
R-sq	0.0721	0.0731	0.0689	0.0706

Significant at 1% (***), 5% (**) and 10% (*).

Table 3.7. Robustness checks for different definitions of group leverage.

Dependent Variable: Industry Adjusted Salesgrowth _t						
	(1)	(2)	(3)	(4)	(5)	(6)
Profitability _{t-1}	-1.236166** (.5373096)	-1.319662** (.5282989)	-1.272807** (.5301584)	-2.59478*** (.7094564)	-2.587353*** (.7090625)	-2.55158*** (.7094659)
Size _t	-.175851*** (.0272641)	-.175343*** (.0276682)	-.169265*** (.0267004)	-.3322997** (.1541958)	-.3269551** (.1541743)	-.3130306** (.1548194)
Investment _{t-1}	.9288194 (.6016878)	.8151932 (.5986377)	.9340069** (.6036262)	2.03337*** (.6761379)	2.023005*** (.6758297)	2.073879*** (.6761433)
Own_leverage _{t-1}	.2933528** (.1207685)	.3037913** (.1211042)	.2792947** (.1184695)	.1623722 (.1323009)	.1496036 (.1324972)	.1420063 (.1329534)
Sw_group leverage _{t-1}	-.0899212** (.0446252)			-.1366604 (.09454)		
Swa_group leverage _{t-1}		-.7831488** (.358078)			-1.300188* (.6808568)	
Group leverage' _{t-1}			-.0103688 (.0073568)			-.0252042* (.0142925)
Firm Fixed Effect	No	No	No	Yes	Yes	Yes
GDP	Yes	Yes	Yes	Yes	Yes	Yes
No. of Observations	1990	1958	1990	1990	1990	1990
R-sq	0.0689	0.0689	0.0677	.	.	.

Significant at 1% (***), 5% (**) and 10% (*).

Table 3.8. The effect of group leverage on investment of all affiliated firms

	Investment			Industry Adjusted Investment		
	(1)	(2)	(3)	(1)	(2)	(3)
Profitability _{t-1}	.0696484*** (.0245928)	.0485263 (.0518623)	.0504054 (.051864)	.0370345 (.0278516)	.0709304** (.0353072)	.0661857* (.0346806)
Size _t	.0085447 (.0052387)	-.003120** (.0014489)	-.0030982** (.0014198)	.0131484** (.0063674)	-.0020004 (.0013763)	-.0017203 (.0013382)
Sales _{t-1}	-8.22e-13 (1.18e-12)	5.12e-13 (7.71e-13)	5.41e-13 (8.03e-13)	-.0000606 (.0000536)	3.05e-06 (3.62e-06)	-1.28e-06 (3.73e-06)
Own leverage _{t-1}	-.039654** (.0163621)	-.0235347 (.0159084)	-.0208095 (.0156126)	-.0004422 (.0045614)	-.0012796 (.0032964)	-.0017492 (.0032157)
Cash _{t-1}	.0436982* (.0243176)	-.0289447 (.0205422)	-.0310552 (.0206147)	.1354258*** (.0308082)	.0005367 (.031117)	-.0026961 (.0301071)
Group leverage _{t-1}	-.047278** (.0220877)	-.042642** (.0169421)	-.0365283** (.0164359)	-.0261305 (.0247786)	-.058861** (.0235121)	-.0444533** (.0222942)
Group profit _{t-1}	-.0497276 (.0601897)	.1594833** (.0638807)		-.0801554 (.0692788)	.0722531 (.0787761)	
Group investment _{t-1}			.3590622*** (.0680111)			.3622233*** (.0766744)
Group cash _{t-1}			.0065972 (.0833762)			-.0550928 (.1099844)
GDP	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	No	No	Yes	No	No
No. of Observations	2003	2003	2003	1753	1753	1753
R-sq	.	0.0343	0.0518	.	0.0260	0.0450

Significant at 1% (***), 5% (**) and 10% (*).

Table 3.9. Investment regression excluding core firm and firms in the same industry as the core

	Core firm is defined as the firm with biggest size		Core firm is defined as the firm with biggest sales	
	(1)	(2)	(1)	(2)
Profitability _{t-1}	.0682022** (.0279646)	.0544763 (.054487)	.0674082*** (.0244451)	.0553833 (.0519444)
Size _t	.0089517 (.0061624)	-.00371** (.001538)	.0084841 (.0052398)	-.00315** (.0014706)
Own_leverage _{t-1}	-.045573** (.0192079)	-.0144493 (.017904)	-.0401122** (.0163578)	-.0225663 (.0159831)
Cash _{t-1}	.0413822 (.0279299)	-.0309893 (.0217303)	.0428774* (.0243031)	-.0254412 (.0208079)
Sales _{t-1}	-8.75e-13 (1.69e-12)	-9.39e-13* (5.44e-13)	-8.51e-13 (1.18e-12)	6.26e-13 (8.24e-13)
Group leverage _{t-1}	-.0468418* (.0269082)	-.0531*** (.0184057)	-.0458029** (.0220174)	-.0549*** (.0164604)
GDP	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	No	Yes	No
No. of Observations	1564	1564	2002	2002
R-sq	.	.07623	.	0.0293

Significant at 1% (***), 5% (**) and 10% (*).

Table 3.10. Industry Adjusted Investment excluding core and same-industry-firms

	Core firm is defined as the firm with biggest size		Core firm is defined as the firm with biggest sales	
	(1)	(2)	(1)	(2)
Profitability _{t-1}	.0409781 (.031073)	.0625635* (.0378032)	.0334716 (.027692)	.0741772** (.0355148)
Size _t	.0115694 (.0071235)	-.00372** (.0017845)	.0129884** (.006369)	-.0019672 (.0013934)
Salesgrowth _{t-1}	-.0000615 (.000057)	2.94e-06 (4.08e-06)	-.0000586 (.0000536)	2.82e-06 (3.71e-06)
Own_leverage _{t-1}	.0003705 (.0049497)	-.0010695 (.0034149)	.0000135 (.0045469)	-.0014753 (.0032487)
Cash _{t-1}	.1376989*** (.0344974)	.0034076 (.0326642)	.13405*** (.030804)	.0018384 (.0311231)
Group leverage _{t-1}	-.0367933 (.030145)	-.0715*** (.0266059)	-.025784 (.0247922)	-.06403*** (.0220157)
GDP	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	No	Yes	No
No. of Observations	1365	1365	1752	1752
R-sq	.	0.0239	.	0.0250

Significant at 1% (***), 5% (**) and 10% (*).

Table 3.11. The effect of crossholdee leverage on crossholder's sales growth

Dependent Variable: Sales growth _t of Cross-holder firms						
	(1)	(2)	(3)	(4)	(5)	(6)
Profitability _{t-1}	-1.322739** (.6020574)	-1.330051** (.6031176)	-2.6868*** (.8073424)	-1.32577** (.6026421)	-1.332719** (.6037191)	-2.6629*** (.8081278)
Size _t	-.174363*** (.0284787)	-.172700*** (.0286381)	-.43754*** (.1676459)	-.17322*** (.0284271)	-.171785*** (.0285967)	-.43411*** (.1678483)
Investment _{t-1}	.5945695 (.739311)	.6028348 (.7362205)	1.929248** (.7872449)	.5983005 (.739115)	.6037071 (.7365557)	1.888279** (.78876)
Own_leverage _{t-1}	.3048284** (.1280203)	.3046198** (.1283529)	.16963 (.1466393)	.3040368** (.1282381)	.3049859** (.1283901)	.1717582 (.1467704)
Crossholdee leverage _{t-1}	-.3561693** (.1352109)	-.3218951** (.1302748)	-.465325** (.1969261)			
Crossholdee profit _{t-1}		.4134074 (.3391726)	.4866333 (.4270326)			
MaxShare_crossholdee_leverage _{t-1}				-.34911*** (.1336273)	-.3193289** (.1274022)	-.479853** (.193889)
MaxShare_crossholdee_profit _{t-1}					.3816487 (.3447408)	.3536173 (.4213901)
Firm Fixed Effect	No	No	Yes	No	No	Yes
GDP	Yes	Yes	Yes	Yes	Yes	Yes
No. of Observations	1769	1769	1769	1765	1765	1765
R-sq	0.0694	0.0700	.	0.0689	0.0695	.

Significant at 1% (***), 5% (**) and 10% (*).

Table 3.12. The effect of Crossholder leverage on crossholdee's salesgrowth

Dependent Variable: Sales growth _t of Cross-holdee firms						
	(1)	(2)	(3)	(4)	(5)	(6)
Profitability _{t-1}	-1.3174** (.5389263)	-1.3175** (.53851)	-2.73*** (.72006)	-1.324** (.54053)	-1.322** (.54033)	-2.76*** (.72031)
Size _t	-.1704*** (.02674)	-.170*** (.02674)	-.3657** (.15899)	-.172*** (.02658)	-.172*** (.02661)	-.3668** (.15867)
Investment _{t-1}	.916063 (.60794)	.917191 (.60909)	2.013*** (.68398)	.9217255 (.60893)	.9210535 (.60919)	1.996*** (.68417)
Own_leverage _{t-1}	.30443** (.12130)	.304239** (.1220)	.1859442 (.13406)	.303582** (.12146)	.30399** (.12207)	.1881444 (.13408)
Crossholder leverage _{t-1}	.1120488 (.10754)	.117511 (.13389)	.010866 (.21343)			
Crossholder profit _{t-1}		.0407919 (.54254)	-.069564 (.59472)			
MaxShare_crossholder_ leverage _{t-1}				-.0025*** (.00052)	-.000880 (.00870)	.00681 (.03212)
MaxShare_crossholder_profit _{t-1}					-.014226 (.07907)	-.088647 (.28642)
Firm Fixed Effect	No	No	Yes	No	No	Yes
GDP	Yes	Yes	Yes	Yes	Yes	Yes
No. of Observations	1958	1958	1958	1957	1957	1957
R-sq	0.0664	0.0664	.	0.0671	0.0671	.

Significant at 1% (***), 5% (**) and 10% (*).

CHAPTER 4

DO BUSINESS GROUPS HELP THEIR AFFILIATED FIRMS TO PERFORM BETTER THAN STAND ALONE FIRMS?

4.1. Introduction and Related literature

A Group of firms under common ownership, so-called Business group is a prevalent form of organization around the world, especially in emerging markets. Many empirical studies attempt to uncover whether this form of organization provide advantages to firms that are affiliated to the business group. A natural approach of these studies is comparing performance of the affiliated firms to stand alone firms that are not affiliated to any business group. However, most of these studies focus on cross-sectional regressions without consideration of the fact that affiliated firms may be different from stand alone firms. In other words, the selection into a business groups is often ignored when investigating differences in performance between the two groups. Almeida and Wolfenzon (2006) argue that certain type of firms are selected to be set up in business groups. Thus, the estimates from the previous studies may be ambiguously capturing both the true effect which the studies attempt to find and the selection effect. This study attempt to provide more clean evidence about whether and how a business group confer relative advantages in performance to its affiliated firms by accounting the difference between the two groups.

This study exploits a unique dataset which contains comprehensive accounting information on firms that are acquired by business groups. It is important that we have access to accounting data before being acquired by business groups. One can try to account for differences between affiliated and stand alone firms without the data and eliminate the differences. However, if the affiliated firms might have become different after being affiliated to business groups, estimates may be misleading by taking out what shouldn't have eliminated. That is why we try to use the firm that are once stand alone, but later acquired by business groups. Since the acquired firms were once stand alone before being acquired by business groups, by taking out the differences during the time when the groups are both stand alone, we can obtain clean measure

of the business group effect, without any bias coming from distinctive characteristics of group affiliated firm.

The main empirical approach that we employ is matching estimator, which became popular recently (See also Villlalonga (2004) and Almeida et al. (2011)). The goal of our empirical methodology is to create an experiment-like setting in which being acquired by business groups can be seen as a treatment. We try to assure that we are comparing otherwise similar firms, with the only salient difference between the affiliated and stand alone firms is that the former firms are acquired by business groups. We match these two groups of firms on the basis of their profitability, firm size, investment ratio, leverage ratio, industry classification, and year. These variables are key determinant for a firm to be a target of business group acquisition. In order to eliminate potential bias from unobservable firm specific effects, we compare within firm changes in performance from the period that precedes the acquisitions to the period that follows the acquisitions.

This study is first in that it controls for the selection into business groups by examining before-and-after difference.. Masulis (2009) also attempt to control the selection by estimating simultaneous equations of being affiliated to business groups and performance. However, we compare firms that are otherwise stand alone firms to actual stand alone firms. Since we try to match the two groups of firms as close as possible, the difference in performance that we estimate can only be capturing the impact of being in business groups. Thus, we can provide cleaner estimate of business group effect.

Second, this study complements the literature documenting bright sides of business groups. There are many studies on business groups, but most of them support negative sides of business groups (see Claessens et al. (2002) and Joh (2003)). Many studies showing bright sides of business groups often highlight benefits of business groups in overcoming imperfection of capital markets, especially in emerging markets. Khanna and Palepu (2000) suggest that group reputation substitutes for underdeveloped legal and regulatory mechanisms that leave minority investors vulnerable to expropriation risks and information asymmetries. Others such as Hoshi, Kashyap, and Scharfstein (1991), Khanna and Yafeh (2005), and Gopalan, Nanda, and Seru (2007) focus on risk-sharing and intra-group financial support via internal capital markets that enable group affiliated firms to overcome external capital constraints and the associated risk of financial distress.

4.2. Data and Variables

4.2.1. Sample selection

We use data on Korean large business groups, especially family controlled groups. Such family controlled business group is called as Chaebol in Korean. We use the same dataset that is used by Almeida et al. (2011). The data are from the Korean Fair Trade Commission (KFTC). According to Almeida et al. (2011), the KFTC's defines a chaebol in two steps. In the first step, the KFTC defines the set of firms that belong to a business group. There are two criteria for this. The first is based on stock ownership. According to this criterion, a firm belongs to a business group if ownership by the controlling shareholder and related persons (relatives and other affiliated companies of the same business group) amounts to more than 30 per cent, excluding preferred shares. The second criterion is qualitative. Firms are also classified as belonging to a business group when the controlling shareholder exercises "controlling influence" over it. The latter criterion is further detailed to include cases of exchange of directors and managers, and also substantial business transactions between a firm that belongs to the business group and the company in question. Because this criterion of controlling influence is interpreted broadly, some companies legally belong to a group even though neither the families, nor other affiliated companies in the group own shares in those companies.

In the second step, some business groups are designated as chaebols based on size, which is defined as the value of the combined total assets of affiliated companies in the group. From 1987 to 2001, the KFTC annually designated the 30 largest business groups as chaebols. From 2002 onwards, the KFTC started using a new category by including any group with total combined assets greater than a certain cutoff in their definition of chaebol. Currently, these are business groups with combined assets greater than two trillion won.

Every year, chaebol firms are required to report ownership data in detail. They report the status of affiliate shareholders and persons with special interest and the financial status of group companies. In a given year, if a new company appears in the ownership data, we track back the company in order to find out whether it is acquired or newly established. We exclude firms that are set up as new companies in a business groups and include only those that were once stand alone, but later are acquired by business groups. The acquired firms are either private or public. In case of private companies, accounting data before the acquisition is limited. Firms without

information on profitability which is the main performance measure are excluded from the sample. Firms missing industry code are also omitted. Finally, we keep only the acquired firms that have accounting data for at least two years after the acquisitions and one year before the acquisitions. This results in 133 acquired firms and 9547 non acquired firms.

4.2.2. Variables

To measure performance change of acquired firms, we examine change in profitability. *Profitability* is defined as operating income divided by total assets. As an outcome variable of matching estimator, we employ before-and-after differences in profitability. We measure before-profitability at time $t-1$ and after-profitability at time t , $t+1$ and $t+2$, where t is the year of acquisition. These "difference-in-differences" estimates are more like the cross-sectional estimates in Ordinary Least Squares (OLS) regressions.

The treatment here is whether a firm becomes affiliated to a business group. When a firm is acquired by a business group, it is treated. The treatment indicator, which is denoted by *Acquired Dummy*, is one for firm-years in which a firm is affiliated to a business group, zero for firm-years in which a firm is stand alone, not affiliated to a business group. For OLS regressions, we measure the treatment indicator in two ways: (1) *Acquired Dummy* is one for after acquisition-years starting at t and (2) *Acquired Dummy* is one at acquisition-years starting at $t+1$. Usually, one may expect to see the effect of acquisition one year after the actual acquisition, but the effect may start to appear from the year of acquisition. Additionally, we can compare the size of effect, if any, between t and $t+1$. If there is a beneficial effect from business group acquisition, we may see greater performance increase at $t+1$ compared to at t .

Firm characteristics we try to match between treated firms and control firms are: (1) *Profitability*, defined above, (2) *Size*, defined as log of book value of assets, (3) *Investment*, defined as Capital expenditure scaled by book value of assets and (4) *Leverage*, defined as book value of total debt divided by book value of assets. Additionally, we use log of net sales, *Sales*, in regression analyses.

4.3. Empirical Methodology

The research question that we attempt to answer in this article is whether performance of acquired firms improves due to being affiliated to a business group. One way to tackle this question is to use a parametric regression approach, where the difference between the group of interest and another group is captured by a dummy variable. Under this approach, the difference is estimated by a coefficient of the dummy, specifically in this paper Acquired Dummy. The regression model is specified by a simple and linear representation of a particular theory. Firm characteristics may be added as control variables to capture additional source of heterogeneity in performance. The coefficient of the dummy in the regression may bring a wrong conclusion since the dummy may explain both the selection into business groups and the true effect of being affiliated to business groups. Importantly, the inclusion of control variables in the regression per se does not address the fact that the two groups being compared may have very different characteristics. This can be particularly problematic where there is a poor distributional overlap between the two groups.

The challenge is to gauge performance had they not been acquired by business groups. We need to estimate the difference between “counterfactual” outcomes and those that are observed. Thus, we employ matching estimators, which more closely resembles an experiment than standard regression approaches. For matching estimation, we form a control group based on some firm characteristics and compare performance change between the control and the treated firms. In other words, we create the counterfactuals that shows how the treated would turn out to be if they were not acquired by business groups. The firm characteristics are selected from estimating propensity to be acquired.

We employ the Abadie and Imbens (2002) estimator (full covariate) as our main matching estimator. The Abadie-Imbens estimator allows one to match a treated firm with a control firm, with matching being made with respect to both categorical and continuous variables. The estimator enables us to produce exact matches on categorical variables, but not exact matches on continuous variables (though they should be close). Since Abadie and Imbens find in their simulations that four matches perform well in terms of mean-squared error, we also choose to use four matches. For robustness, we also run not only other matching estimators but also standard regression.

We try to make sure that variables that might influence the selection into treatment and observed outcomes are appropriately accounted in the estimation. The treatment is being

acquired by business groups. While there is no study that investigates which firm is likely to be acquired by business groups, there are few studies that examine what firm characteristics attribute a firm to be a target of merger and acquisition (M&A). Although there is no consistent factor that determines which firm is likely to be a target in every M&A, firm size, profitability and leverage are, not all together, shown to affect the M&A decisions. Specifically, a smaller or less profitable or highly levered firm is likely to a target. Since Almeida et al. (2011) show that firms with high investment needs are likely to be affiliated to business groups, we also consider investment. Thus, our non-categorical (continuous) variables are profitability, size, investment and leverage. Additionally, categorical variables are three-digit industry classification code and year. Those covariates usually have significant influence over profitability and capture a lot of otherwise unobserved firm heterogeneity. By virtue of the full-covariate matching approach, our estimations account for all variable interactions.

Finally, we compare changes in profitability of the treated and control groups after the treatment, rather than levels of profitability. In other words, we perform difference-in-differences estimations. Although we try to match on profitability prior to the event defining the experiment, the profitability levels of the treated and controls could be different prior the event, and continue to be different after that event. Also, even if we find perfect matches for treated firms based on the firms characteristics that we choose, there may be unobservable firm-specific factors which we fail to control. Then, our inferences could be potentially biased by these uncontrolled firm-specific differences if we simply compare levels of profitability.

4.4. Empirical results

Table 1 reports results from ordinary least squares (OLS) regressions. It shows that performance of acquired firms improves after being acquired by business groups when compared to other stand alone firms which are not acquired, after controlling for other firms characteristics and industry and year fixed effects. The first column reports estimates where Acquired Dummy is 1 for the after acquisition years excluding the year of acquisition (from $t+1$) and The second column reports estimates where Acquired Dummy is 1 for the after acquisition years including the acquisition year (from t). Both Panels show that the coefficient of Acquired Dummy is significantly positive. It suggests that profitability of acquired firms improves after they are

acquired by business groups and the performance increase is significantly larger than the counterpart of other stand alone firms which are not acquired by business groups.

As discussed in the previous section, a dummy regression does not address that acquired firms are selected into the treatment, being acquired. We need to discuss about what firm characteristics attribute a firm to be a target of business group acquisition. We estimate the probability of being acquired by business groups using probit model. The maximum likelihood estimates of the probit coefficients are reported in Table 2. Business groups are likely to acquire larger, less profitable and investment-intensive firms. Leverage is not significant in explaining the acquisition decision. Additionally, industry and year play an important role in explaining the acquisition decision. These variables explaining the probability are used as matching variables.

Panel A of Tables 3 shows that acquired firms (treated firms) are indeed very different from non-acquired firms (non-treated firms), especially in profitability and investment. Treated firms are on average less profitable, slightly larger and making a lot more investment than non-treated firm. It is consistent with what we show in Table 2. If values of matching variables are in very different ranges between the two groups, it is impossible to find perfect or even close matches. For example, the maximum investment of the treated sample is 1.51, but the corresponding maximum of the non-treated sample is 0.79. There is no close match among non-treated firms for the treated firm with investment of 1.51. Thus, we trimmed both samples of treated and non-treated firms in order to make sure that profitability and investment of two samples are in similar ranges. In other words, we try to make the minimum and maximum values of profitability and investment of two samples similar. This results in 77 treated firms. As discussed above, we match four control firms per one treated firm. If two observations are equally close to that being matched, both will be used. Thus, the total number of control firms will be greater than or equal to the number of treated firms multiplied by 4. Panel B of Table 3 reports values of matching variables after full-covariate matching. It shows that treated firms have similar values of matching variables to control firms. Now, we may assume that the control firms may represent the counterfactuals of treated firms, what the treated firms have been if they were not acquired by business groups.

Table 4 shows main results of our study and it reports estimates for whether business groups help their affiliated firms to perform better than stand alone firms. Although our estimator is Abadie and Imbens' nearest neighbor matching estimator, we also report estimates from other

matching estimators such as propensity score matching estimator and Becker and Ichino's nearest neighbor matching estimator to make sure robustness of our main finding. Finally, for comparison, estimates for coefficients of Acquired Dummy from OLS regressions are reported as well. The reason the OLS coefficients are different from those reported in Table 1 is that in Table 4, Acquired Dummy represents only one year ($t+2$ or $t+1$ or t) where as Acquired Dummy in Table 1 represents all years after the acquisition. We present three time points: $t+2$ (two years after the acquisition), $t+1$ (one year after) and t (in the year of acquisition). And the outcome variable that we compare between the two groups is not the level of profitability, but the before-and-after difference in profitability. For example, in the first row, we compare ($\text{Profitability}_{t+2} - \text{Profitability}_{t-1}$) between the treated and the control. As shown in the last row, the relative advantage in profitability of acquired firms is positive, but not significant in the year of acquisition. It is plausible that the effect of business groups does not start to appear right after being affiliated to the groups. However, the matching estimates are significant for $t+1$ and $t+2$ and the estimates for $t+2$ are significant for all estimation methods. The size of estimates grows as we move from t to $t+2$ in all columns. As the duration of stay as being affiliated to business groups grows, the difference in profitability between the two groups is more pronounced. At $t+2$, two years after the acquisition, the difference in profitability is about 0.06. Considering that the average profitability of all firms two years ago is about 0.073, the difference is much economically significant as well. The results strongly suggest that business groups are actually beneficial to their affiliated firms in making the affiliated firms perform better than stand alone firms. Also, the affiliated firms receive more benefit from being affiliated to a business group as they stay longer in the group, at least in short term (2 years).

Taken together, even after we account for the differences between acquired firms and non-acquired firms, we can conclude that business groups are actually beneficial to their affiliated firms in helping the affiliated firms perform better stand alone firms which are outside business groups.

4.5. Tables

Table 4.1. OLS regressions

t-statistics are in parentheses. The year of acquisition is t.

Dependent variable: Profitability		
	t+1	t
Acquired	.0911709***	.0762613***
Dummy	(3.54)	(3.45)
Profitability _{t-1}	.5859675***	.5857077 ***
	(12.72)	(12.71)
Log Sales _{t-1}	-.0415695***	-.0409263***
	(-2.82)	(-2.80)
size	.0572726***	.0566703***
	(2.64)	(2.63)
Investment _{t-1}	.0108127	.0097677
	(0.15)	(0.13)
Leverage _{t-1}	.0169919***	.016962***
	(3.00)	(3.00)
Year FE	Yes	Yes
Industry FE	Yes	Yes
# of observations	10553	10553
R-sq	0.1014	0.1011

Significant at 1% (***), 5% (**) and 10% (*).

Table 4.2. Propensity to be acquired (Probit estimation)

t-statistics are in parentheses.

Dependent variable: AcquiredDummy					
	Model 1	Model 2	Model 3	Model 4	Model 5
size	.054677** (2.20)	.0524013* (1.91)	-.0161405 (-0.49)	.0526803** (1.98)	.0560832** (2.08)
profitability	-.2828711 (-1.50)	-.3654828** (-2.07)	-.2206432 (-1.05)	-.2431646 (-1.28)	-.26819 (-1.48)
investment	1.370513*** (4.67)	1.362049*** (4.59)	1.438052** (4.81)	.6257702* (1.80)	1.314911*** (4.41)
leverage	-.0164662 (-0.39)	-.002225 (-0.17)	-.010377 (-0.31)	.0030834 (0.36)	.0045227 (0.42)
constant	-3.225654*** (-7.19)	-5.43394*** (-9.47)	-8.44991*** (-8.92)	-5.57487*** (-9.24)	-4.38037*** (-7.18)
GDP		.2613414*** (5.46)	.1946236*** (4.81)	.2531921*** (5.28)	.1896922*** (4.49)
Industry average profitability		4.744113*** (3.44)			
Industry average size			.2767787*** (4.86)		
Industry average investment				8.11882*** (7.90)	
Industry average leverage					-.6220138* (-1.75)
# of obs	9680	9680	9680	9680	
Pseudo R-sq	0.0173	0.0362	0.0528	0.0755	0.0337

Significant at 1% (***), 5% (**) and 10% (*).

Table 4.3. Characteristics of Treated, Non-treated and Control (quality of matching)

p-values are reported for differences in mean and median.

	Profitability		Size		Investment		Leverage	
Panel A: Full samples								
	Treated	Non-Treated	Treated	Non-Treated	Treated	Non-Treated	Treated	Non-Treated
N	133	9547	133	9547	133	9547	133	9547
Mean	.044867	.056462	17.88198	17.59274	.0792961	.0413535	.4851348	.4937061
Min	-.530973	-2.11887	10.89856	10.86123	-.065478	-2.53321	.0010281	.0023311
Median	.032901	.061596	17.9138	17.53656	.0424643	.0182775	.4979138	.4455406
Max	.41195	.767755	23.13601	25.07092	1.510959	.794558	1.224019	90.29751
p-value for mean	0.3689		0.0393**		0.0000***		0.9278	
p-value for median	0.055*		0.055*		0.000***		0.162	
Panel B: Matched Samples								
	Treated	Control	Treated	Control	Treated	Control	Treated	Control
N	77	512	77	512	77	512	77	512
Mean	.075611	.071552	18.03583	18.27007	.0479376	.0450267	.513384	.433328
Min	-.013612	-.01494	13.2853	13.63843	-.042016	-.010821	.0010281	.010233
Median	.057226	.059896	17.79562	18.09309	.0232088	.0281853	.5385392	.463018
Max	.41195	.379827	23.13601	24.08581	.3361103	.4535057	1.012627	.944900
p-value for mean	0.6234		0.2309		0.6867		0.0015***	
p-value for median	0.819		0.320		0.165		0.216	

Significant at 1% (***), 5% (**) and 10% (*).

Table 4.4. Performance change (Average difference between treated and control)

t-statistics are in parentheses. The year of acquisition is t.

Dependent variable: Before and after Differences in Profitability				
	Nearest neighbor Matching Estimator (Abadie and Imbens)	Propensity score matching estimator	Nearest neighbor Matching Estimator (Becker and Ichino)	OLS
(t+2,t-1)	.0636777*** (5.98)	.0648206*** (3.91)	0.056*** (2.343)	.1382409** (2.05)
(t+1, t-1)	.039836*** (3.98)	.0460288*** (2.41)	0.043 (1.420)	.1143412** (2.02)
(t,t-1)	.0068496 (0.46)	.0082971 (0.58)	0.009 (0.654)	.0310324** (2.06)

Significant at 1% (***), 5% (**) and 10% (*).

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