THREE ESSAYS ON FINANCIAL MANAGEMENT

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DEDICATION

I dedicate this dissertation to my husband, Qing (David) Guo, my lovely sons Chang and Jerry, my mother, Yuqing Yu, my father, Junling Dai, my older sister Ye Dai, and my younger sister Weihua Dai for their unconditional love, support and encouragement.

THREE ESSAYS ON FINANCIAL MANAGEMENT

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This dissertation consists of three chapters that examine firm's financial management. Chapter one studies the impact of regulatory protection for minority shareholders during minority buyouts. Specifically, we find that a reverse book building process implemented in India in 2003 has increased the gains to minority shareholders. Chapter two examines the impact of off-balance-sheet hedge on firm value. We report a negative relation between firm value and duration gap. Chapter three examines whether the capital structure theories developed in Western countries apply to Chinese listed companies. We find that Chinese companies' financing behaviors are becoming more akin to those in the developed market with increasing integration and financial liberalization.

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CHAPTER ONE: PROTECTING THE WEAK: EFFICACY OF THE MANDATED AUCTION IN MINORITY BUYOUTS

1. Introduction

Good corporate governance systems are crucial to the development of financial markets and the economy.[1] Minority shareholder rights constitute an important component of corporate governance, since they provide assurance to small investors that they will be treated fairly, and thereby they facilitate firms' access to external equity capital. Protection for minority shareholders gains added importance in the context of a minority buyout in which a corporation's controlling, majority stockholders bid for the remaining minority equity. There has been much debate among economists and legal scholars about whether minority shareholders are vulnerable in such buyouts. In this paper, we examine the impact of changes in Indian regulations intended to bolster the position of minority shareholders by modifying the process used to determine the buyout price.

While it is important to protect minority shareholders, it is equally important that firms have flexibility in adjusting their corporate structure in response to changing business conditions. Going private can generate significant gains for public companies due to improved operational flexibility by dispensing with the approval of key decisions by dispersed shareholders, reduction in transaction costs related to shareholder communications such as holding general body meetings, elimination of agency costs arising from divergence of objectives between the controlling shareholder and outside investors, and reduced disclosure requirements. Onerous

[1] Hasan, Wachtel, and Zhou (2009) provide evidence on the crucial role of property rights and financial markets in fostering economic growth in a transition economy.

regulations that prevent firms from exiting from public equity markets can hinder timely and economically beneficial restructuring of business operations.

Prior to 2003, procedures in India for minority buyouts were essentially similar to those in the U.S. and many other countries. Indian firms were allowed to delist their shares from stock exchanges, if non-insider ownership fell below a threshold level, typically 10%.[2] A firm seeking to delist its shares from stock exchanges announced a price at which it was willing to buy out minority shareholders, who could choose not to accept the offer. However, if other shareholders accepted the offer and the stock was delisted, investors who retained their shares would have difficulty in liquidating them subsequently. This situation raises concerns that minority shareholders are coerced into selling their shares below their own assessment of the stock's value.

Explicit principal-agent conflicts arise in minority buyouts, since the price paid to minority shareholders is effectively determined by majority shareholders. The majority shareholders typically dominate the company's board of directors, which officially sets the buyout price. Bebchuk and Kahan (2000) suggest that controlling shareholders gain systematically at the expense of minority shareholders, because controlling shareholders have better information about the fundamental value of the firm than the general public shareholders. Thus, the controlling shareholder may freeze out minority shareholders on unfavorable terms. Bates et al. (2006) call this the bid capture hypothesis and propose a competing hypothesis, namely, the minority bargaining power hypothesis. While the bid capture hypothesis implies that a controlling shareholder captures a disproportionate share of the gains, the minority bargaining power hypothesis postulates that minority shareholders can exert bargaining power

[2] The threshold level depended upon the listing agreement between the firm and the stock exchange. For some firms, this is set at 25%.

and get at least a fair share of the gains. Bates et al. (2006) find support for the minority bargaining power theory by examining US deals and conclude that market mechanisms provide adequate protection to minority shareholders.

Croci and Petmezas (2010) analyze a sample of increase-in-ownership transactions drawn from 43 countries and observe that minority shareholders receive smaller wealth gains in countries with less developed stock markets. In 2002, the Securities Exchange Board of India (SEBI) constituted a committee to examine whether procedures for minority buyouts ensured fair treatment of minority shareholders. The committee concluded that firms should be able to delist their shares but recommended procedural changes in the determination of the buyout price. These regulatory changes, which became effective in 2003, mandated a reverse book building (RBB) process, wherein minority shareholders bid the price at which they were willing to sell their shares. The exit price that the firm had to pay minority shareholders was determined as the price at which the maximum number of shares were tendered, the modal price of the bids. Controlling shareholders could withdraw their buyout offer, if they deemed the exit price to be excessive.

Motivated by Bates et al. (2006), we examine whether the requirement of determining the exit price through the RBB process helped or hurt minority shareholders in minority buyout deals. Under this mechanism, minority shareholders have a meaningful say in the price determination process, and therefore they should gain more from RBB deals than from non-RBB deals. On the other hand, the promoter is not obligated to accept the price discovered through the book building process. Minority shareholders do not have a clear indication about the price that

the controlling shareholders are willing to pay. If the RBB process yields an unrealistically high price which is rejected by the promoters, then minority shareholders may be worse off.[3]

Using the minority buyouts before the regulatory changes as a benchmark, we assess the impact of instituting the RBB process on three measures: the success rate of the deals, the premiums received by minority shareholders, and the stock price reactions to the announcement of the buyouts. We identify 75 RBB minority buyout deals and 42 pre-RBB minority buyout deals during the 1997-2012 period for which the data necessary for our analysis are available. On average, controlling shareholders own 72% of the firm and seek to buyout shareholders holding the remaining 28% stake. The controlling shareholder is a multinational firm in about half the deals.

The success rate of the deals provides useful information, since the RBB process would not be beneficial to minority shareholders, if it had a tendency to yield high exit prices which were rejected by the controlling shareholders. Analyzing this sample, we find that RBB deals are more likely to be successful; 56 of the 75 RBB deals are completed compared to only 20 of the 42 pre-RBB deals. The significantly higher failure rate of the pre-RBB deals suggests that the premiums offered by the controlling shareholders are inadequate. However, it also reveals that minority shareholders are not stampeded into accepting such low offers. Thus, it is unclear whether they needed added protection.

Both pre-RBB and RBB minority buyout deals bring significant wealth gains to minority shareholders. As expected, completed RBB deals have a lower exit price compared to rejected RBB deals, since high premiums are more likely to be rejected by the controlling shareholders. Considering only completed deals, the mean premium received by minority shareholders in RBB

[3] Stock prices experience significant declines when buyout deals fail.

deals is 67% compared to 32% in pre-RBB deals. This evidence supports the notion that the RBB process improved the prices received by the minority shareholders.

The observed premium differences between pre-RBB and RBB deals could be driven by differences in deal and firm characteristics. To address this possibility, we control for a number of deal and firm characteristics such as ownership level of controlling shareholders, whether the controlling shareholder is a multinational firm which may be more motivated to shed minority investors, share liquidity, and stock performance prior to deal announcement. Tests controlling for these characteristics confirm that minority shareholders receive higher premiums in completed RBB deals. These results are consistent with the RBB process improving protection for minority shareholders.

Surprisingly, despite the observed differences in the premiums between pre-RBB and RBB deals, the stock price reaction at deal announcement is very similar. The mean announcement abnormal return is close to 26% for both deal types.[4] Announcement period abnormal returns reflect the market's assessment of not only the offer price but also the probability of success of the buyout deals. One possibility is that the stock market was uncertain about assessing these values for RBB buyout deals, since it was a new mechanism.

We examine the evidence for learning effects in stock price reactions, as market participants adapt to the unfamiliar RBB mechanism introduced by regulatory changes. The RBB process was not used in Indian financial markets and certainly not in the context of stock repurchases. Both minority shareholders and controlling shareholders would have to learn how the RBB process worked. There was considerable uncertainty involved in the case of RBB deals. Controlling shareholders do not reveal any information about the price that they are willing to

[4] The success of the offer is not known at the time of the offer, though the market may have assessments of the probability of success. However, restricting the sample to only deals that were eventually successfully completed yields similar results.

pay. Further, in contrast to pre-RBB deals, if the offer failed to attract a sufficient number of shares, then the controlling shareholders could not buy any shares. The RBB mechanism also contained an unusual feature in that the exit price determined through the process was the modal price of the bids rather than a market-clearing price. Examining the time-series of RBB deals, we find that minority shareholders' gains increase over time. While the increase in premiums can be potentially explained by firm and deal characteristics, there is clear evidence that the stock price reactions to initial announcements are higher for later RBB deals compared to pre-RBB deals.

To summarize, our study makes three contributions. It provides the first examination of the efficacy of using a reverse book building process to determine the price paid in minority buyouts. Second, it provides evidence that there is a learning period immediately after regulations introduce a new, unfamiliar mechanism. After the learning period, the stock price reactions to RBB deals were significantly higher compared to pre-RBB deals. Third, the evidence presented here provides a caution that evaluations of regulatory changes and associated new mechanisms should be careful to allow for a learning period during which the market participants learn to adapt to the new mechanism.

The rest of the paper is organized as follow: Section 2 discusses the regulation of minority buyouts in India. Section 3 discusses literature addressing protection of minority shareholders, especially in the context of minority buyouts. Section 4 discusses the sample selection and data utilized in the study. Section 5 presents the empirical analysis, and Section 6 contains the conclusions.

2. Overview of Indian delisting and minority buyout regulations

Indian firms which wanted to go private had to provide an exit opportunity for minority shareholders and seek approval from stock exchanges for delisting their stocks. Although there

was no specific regulation governing company delistings prior to 2003, firms had to be in accordance with the principles stated in the "SEBI Substantial Acquisition of Shares and Takeovers Regulations, 1997" (also called "the 1997 Takeover Code"), which governed investors seeking to increase their ownership stake in a firm.[5] Though this takeover code kept silent on the delisting of securities, shareholders who held more than 55% of a firm had to make a public announcement before acquiring any additional shares, even if such an acquisition was done through a privately negotiated block transaction.

If the ownership of other unaffiliated investors fell below the threshold contained in the listing agreement with the exchange (either 10% or 25%), the acquirer had to make an offer to purchase the remaining shares at the same price that was paid previously to acquire shares.[6] Controlling shareholders could consolidate their holdings through multiple open offers and eventually get the companies delisted once public ownership fell below the threshold in the listing agreement. Thus, barring the transaction costs of additional offers, there was no pressure on controlling shareholders to increase their offer price beyond what they had paid previously.

Under these rules, public minority shareholders whose shares are sought by the controlling shareholders face a dilemma: either surrender their shares and lose a good investment opportunity or retain their shares which may become illiquid if the stock gets delisted. Even if the response to the controlling shareholders' offer was less than what was needed for immediate delisting, the reduced float would impair share liquidity. Under these circumstances, public

[5] Firms which were traded on multiple stock exchanges and which desired to delist from stock exchanges other than the stock exchange located in the region of their headquarters had to abide by guidelines prescribed in a SEBI circular dated April 29, 1998. However, these stocks continued to trade on at least one stock exchange and hence remained publicly traded. Also, firms could compel minority shareholders, to sell in a process subject to judicial review under Section 100 of the Companies Act, 1956. However, SEBI amended rules in 2003 so that listed firms had to seek approval from stock exchanges before initiating these offers. The objective of this change was to prevent listed firms from using coercive offers. Unlisted firms have resorted to this method and received judicial approval subject to fairness considerations.

[6] If the acquirers did not want the stock to be delisted, they could choose to sell shares to increase public ownership above the threshold in the listing agreement.

investors may accept an offer price even if the offer price is below their assessment of share value. In 2002, the SEBI constituted a committee in 2002 to examine whether additional measures were needed to safeguard minority shareholders' interests.

The political impetus for this action was generated by the fact that several multinational companies were seeking to buy out Indian investors and delist the stocks of their Indian subsidiaries. Nonetheless, the committee rejected singling out multinational firms for additional restrictions. Instead, it suggested modifying the process for minority buyouts. These recommendations constituted the basis of SEBI's "Delisting of Securities Guidelines" issued on February 17, 2003.

The most important change of the new delisting guidelines is that the offer price must be determined by a reverse book building (RBB) process instead of by the controlling shareholder. The delisting proposal must be approved by the board of directors, a majority of minority shareholders, and regulators. After obtaining these approvals, the offer is mailed to each shareholder alongside a public announcement, which includes the opening and closing dates of the offer and the minimum/floor offer price, based on historical prices. The offer has to be open for a minimum of three days. The floor price must be at least the average of the weekly high and low prices on the stock exchange where the shares of the company are most frequently traded during the 26 weeks preceding the date of the public announcement (base date). The 2009 SEBI delisting regulations further changed the base date to the date when the company informed the stock exchange about the board meeting in which the delisting proposal was considered. Importantly, the controlling shareholders' offer could not specify a maximum price.

The controlling shareholder (acquirer) appoints a merchant banker and a trading member for receiving public shareholders' bids on an online electronic system. The cash required to

acquire the shares at the floor price is placed in an escrow account. Public shareholders submit their sell orders, and they can revise their bids till the offer closes. The process is subject to monitoring by regulators to ensure transparency and prevent manipulation. The merchant banker makes a public announcement to announce offer prices after the offer is closed. The offer price is determined as the price at which the maximum shares are tendered for purchase.

The promoter/controlling shareholder also has the option to accept or reject the price determined by the RBB process if the discovered price is higher than floor price. It is important for investors to submit a reasonable price that the promoter is likely to accept. If the discovered price is accepted by the controlling shareholder, all shareholders who bid at or below the discovered price receive the discovered price for their holdings. If the stock is delisted, then the remaining shareholders have the option to sell their shares at the RBB price within the next six months. This option is valuable to shareholders, since they do not have to fear being stuck with illiquid shares.

The deal fails if the controlling shareholder rejects the discovered price or if the number of shares submitted at prices below or equal to the discovered price will not result in public ownership falling below the threshold (10% or 25%) set in the listing agreement. If the offer fails, the acquirer is not allowed to buy any shares tendered under the offer and all shares will be returned to the shareholders. In this way, the RBB deals were effectively "all or nothing" propositions.

Another significant difference between RBB and pre-RBB deals is whether the offer is required to get approval from the minority shareholders. All RBB deals must obtain a majority of the minority shareholders' approval, while pre-RBB deals did not require minority shareholder approval. In 2009, SEBI further updated the 2003 delisting guidelines and tightened norms and

issued the 2009 delisting regulation, making it harder for companies to get delisted from Indian bourses. For example, in the 2003 guidelines, shareholders' approval for the delisting is taken in the extraordinary general meeting, while the updated 2009 delisting guidelines require that public shareholders, unaffiliated with the controlling shareholders, approve the delisting proposal through a postal ballot by a two-thirds majority rather than a simple majority. Further, the threshold for acquiring shares through the RBB process was increased; the number of shares submitted at or below the discovered price had to be greater than 50% of the minority shares outstanding and should allow controlling shareholders to increase their ownership to at least 90%. The post-delisting period during which shares could be sold by any remaining minority shareholders to the controlling shareholders at the price determined by the RBB process was extended from six months to a year. Due to these additional requirements, the number of companies initiating minority buyout deals has dropped each year since 2010.

An unusual feature of the RBB process, as prescribed by the SEBI, is that the exit price is determined as the price at which the maximum number of shares is tendered rather than the price at which sufficient number of shares can be bought to allow delisting. For instance, under the 2003 guidelines, the controlling shareholder has to acquire sufficient shares so that public shareholders' stake falls to less than 10%. The SEBI's formulation of the RBB process could lead to excessive failures, even under the less stringent 2003 guidelines. Let us say that a controlling shareholder holds an 85% stake and makes an offer to acquire the remaining 15%. Assume that 4.01% is tendered at the floor price, and the remaining 11% is distributed at higher prices so that there is no more than 4% at any price. In this case, the exit price will be determined to be the floor price, and since the shares that can be acquired at or below the exit price will not

result in the public shareholding to fall below 10%, the controlling shareholder cannot acquire any shares and the offer will fail.

The introduction of the new mechanism raises the question of how quickly the market participants adapt to it. Individual investors' perception of the complexity of the RBB process may inhibit participation leading to insufficient number of shares submitted in the auction process. Minority shareholders had to decide on the price they were willing to bid. While they would not want to bid low, a high exit price determined through the RBB process ran the risk of being rejected. Similarly, controlling shareholders had to learn whether to accept or reject the price determined through the bookbuilding process, given the benefits of going private.

A dissenting member of the SEBI committee that suggested the RBB mechanism noted several reservations about the mechanism.[7] He pointed out that, in contrast to an initial public offering, the investors eligible to bid in the auction are restricted to current shareholders. Thus, it is not completely a free market mechanism and is subject to manipulation. A few motivated shareholders could collude and set the exit price at an unrealistic level. The other shareholders would be exposed to such manipulation and the rejection of the offer by the controlling shareholder. The reservation price of the acquirer is not revealed and minority shareholders are not assured of receiving the highest price that the acquirer is willing to pay. These reservations raise concerns about whether the RBB process would lead to more failed deals. A second question is whether the RBB mechanism results in price improvements for the minority shareholders.

[7] See Section 4.24 (pages 18 and 19) of the Report of the Committee on Delisting of Shares, Part I, SEBI. http://www.sebi.gov.in/commreport/delistes.pdf

3. Related literature

3.1. Motivations for minority buyouts

Before discussing the issue of protection of minority shareholder rights, it is useful to review the motivations cited in the literature for minority buyouts. If the only reason for minority buyouts is that majority shareholders want to force minority shareholders out at an unfair price, then there is an obvious need for tight regulation to provide assurance to minority shareholders and encourage their participation in equity markets.

Previous research on minority buyouts identifies a number of economically justifiable motivations for minority buyouts. DeAngelo, DeAngelo, and Rice (1984) argue that going private avoids significant annual listing, registration, and shareholder servicing costs. They propose that private firms will face reduced agency costs of debt, since they will have long-term relationships with creditors. Finally, they also hypothesize that private firms face reduced agency costs of equity, since private firms can provide better managerial incentives. The recent furor over executive compensation in banks and other publicly traded firms as well as shareholder votes on compensation packages indicates that public firms face limitations in setting compensation policies. Private firms have greater flexibility in making timely operational and financial decisions, such as mergers, acquisitions, and asset sales, since they are not burdened by the need to get approval of dispersed shareholders of key decisions.

Kaplan (1989 a,b) provides evidence that management buyouts enhance value by reducing taxes and improving operating performance. Lehn and Poulsen (1989) find evidence that firms increase leverage after going private and reduce agency costs associated with excessive free cash flow. Travalos and Cornett (1993) conclude that shareholders wealth gains are attributable to elimination of agency costs after going private.

Multinational companies which own 100% of the subsidiary have greater freedom in choosing transfer prices and financial policies that reduces taxes and enhance firm value, since they do not have to contend with the possibility of shareholder litigation against managerial decisions (Dodd and Ruback (1979)). In India, multinational firms were forced by the Indian government to sell equity in their Indian subsidiaries to public shareholders in the late seventies and eighties. Following liberalization in the nineties, foreign firms were allowed 100% ownership in most industries and several multinationals launched efforts to shed Indian stockholders of their subsidiaries.

3.2. Potential for exploitation of minority shareholders

While there are several valid motivations for minority buyouts, such buyouts can also be driven by the controlling shareholders' attempts to exploit minority shareholders. Controlling shareholders possess informational advantages relative to minority shareholders about the future prospects of the firm. These informational advantages endow controlling shareholders with a free call option on the minority stake, which they will exercise when the firm's future prospects brighten. In the complete absence of legal safeguards, they can also manipulate the call option's exercise price and set the price paid to minority shareholders arbitrarily low.

La Porta et al. (1997) present evidence that strong legal protection for investors is essential for financial market development, a prerequisite for economic growth. Claessens and Yurtoglu (2012) review a large body of research which also points to the vital role of good corporate governance in facilitating access to external capital for firms in emerging economies. They also conclude that the effectiveness of a firm's governance policies is weakened, if the country has poor a governance system.

Exploitation of minority shareholders constitutes a cardinal violation of good corporate governance that can prevent the development of viable public equity markets and is a matter of serious concern to policy makers. DeAngelo, DeAngelo, and Rice (1984) cite Securities and Exchange Commisioner A.A. Sommer, Jr, who in 1974 was vexed by going private transactions and felt that the "unfair, and sometimes disgraceful" practices would increase individual shareholders' hostility to securities markets. Bierman (2006) presents case studies where insiders bought out public shareholders and questions the motives of the insiders in these transactions. He calls for restrictions on such transactions and suggests a Dutch auction as a possible mechanism for determining the price paid to public shareholders.

Given the inherent conflicts of interest in minority buyouts, most countries provide for legal protection to minority shareholders. Under Delaware law, minority buyouts have to be negotiated by an independent committee and minority shareholders are entitled to a judicial review of the fairness of the buyout proposal. Similar procedures are employed in most countries. There is considerable and continuing discussion among economists and legal scholars about the procedures to be followed in such judicial reviews. (e.g. Subramanian (2005) and Cain and Davidoff (2011)).

Finally, we note that there is a stream of literature which argues that vulnerability of minority shareholders is important for efficient reallocation of assets in a dynamic economy. In widely cited research, Grossman and Hart (1980) show that in the absence of a disadvantage for minority stakes, shareholders will attempt to free ride on gains generated by takeovers and will not tender their shares in a takeover deal. If all individual shareholders acted this way, the takeover will fail and prevent efficient corporate restructuring. Their work suggests that takeovers should be structured as a two-step process in which shareholders, who did not tender

shares in the first step, will be forced out in the second step or face losses. Several papers have extended Grossman and Hart (1980) to provide viable solutions (e.g. Bebchuk (1989), Amihud, Kahn, and Sundaram (2004), and Maug (2006))[8]. In our analysis, we exclude minority buyouts undertaken as a follow-up to a merger or acquisition bid.

3.3. Empirical evidence on impact of minority buyouts

The first paper that systematically examines freeze-outs in the U.S. is DeAngelo, DeAngelo, and Rice (1984). They find that minority shareholders experience a significant, positive wealth change around the going-private proposals. They also find that higher cumulative abnormal returns around the announcement are associated with the lower management pre-offer ownership. Smith and Amoako-Adu (1992) examine minority buyout deals in Canada, which have to be approved by 90% of the minority shareholders. They find that stock price increases in response to buyout offers made by controlling shareholders are similar to the response to offers made by non-controlling shareholders, and they conclude that minority shareholders are not disadvantaged. Bates, Lemmon, and Linck (2006) also find that minority shareholders experience positive wealth changes. They note that minority buyouts do not involve control changes, and therefore it is important to recognize and account for the lower wealth gains generated by such transactions. They estimate the proportion of total wealth gains allocated to minority claimants and find that minority shareholders are able to receive at least a proportionate gain freeze-out bids by exercising significant bargaining power. They conclude that minority shareholders are adequately protected by existing market and legal mechanisms.

[8] Amihud, Kahn, and Sundaram (2004) argue that the free-rider problem can be solved by setting the price to be paid in the second step to be no more than the price paid to tendering shareholders in the first step. Note that the Indian RBB process provides an option to holders of delisted stocks to sell their shares at the price paid for shares accepted in the RBB buyout. If these stockholders receive a higher price, it will remove the incentive to tender in the RBB process.

In the US, minority freezeouts are generally subject to an "entire fairness review", which covers the fairness of dealings and the price. Following the *Siliconix* case in 2001, tender-offer freeze outs are no longer subject to the entire fairness review which still applies to merger freeze-out bids. Subramanian (2007) examines the post-Siliconix freezeouts and finds that controlling shareholders pay less to minority shareholders in tender offers compared to one-step mergers. Nonetheless, he finds that merger freezeouts are more common than tender-offer freezeouts. Basu, Dimitrova, and Paeglis (2009) analyze mergers involving newly public firms and conclude that interests of families having a high ownership stake are better aligned with the interests of minority shareholders.

The above studies examine how minority shareholders are affected by buyouts in North America and, for the most part, conclude that they are adequately protected. However, studies of other countries offer a different perspective. Djankov et al. (2008) document the variation in protection for minority shareholders variation across countries. Nenova (2003) and Dyck and Zingales (2004) find that prices for shares with greater voting rights is higher in countries with lower investor protection and less developed stock markets, indicating the vulnerability of minority shareholders to expropriation. Croci and Petmezas (2010) examine deals drawn from 46 countries in which large stockholders increase their ownership and find that the minority shareholders in target companies gain significantly less in countries with low stock market development.[9] Atanasov, Black, Ciccotello, and Gyoshev (2010) examine Bulgarian freeze out deals before and after securities law changes in 2002 which increased protection for minority shareholders. They find that price ratios in freezeouts quadruple in the new regulatory environment. They conclude that changes in a country's securities law can have a large impact

[9] Parisi, Mathur, and Nail (2009) fail to find gains associated with voluntary early adoption of mandated changes in Chile designed to enhance minority investor protection. They attribute this finding to effective monitoring of governance by institutional investors in the non-early adopters.

on the degree of expropriation in freezeouts. This evidence raises the questions of whether minority buyouts in India were affected by the regulatory changes that introduced the RBB process to better protect minority shareholders.

3.4. Testable Hypotheses

We examine the impact of the RBB process by addressing the impact on three measures: success rates of buyout offers, premiums received by minority shareholders, and stock price reactions to deal announcements. We also examine whether there were learning effects for the RBB process as evidenced by differences in these measures between early and late RBB deals.

3.4.1. Impact on deal completion rates

In pre-RBB buyouts, the controlling shareholders state a price at which they are willing to buyback minority shares. These buyouts could fail if the price offered to minority shareholders was too low to attract sufficient shares from minority shareholders. The RBB process allowed minority shareholders to determine the price paid to acquire minority shareholders. However, it introduced uncertainty about whether the controlling shareholders will accept the exit price determined through this bidding process. We examine whether deal failure rates changed due to the requirements of the RBB process.

Hypothesis 1: The failure rates are similar between pre-RBB and RBB minority buyouts.

3.4.2. Impact on premiums paid to minority shareholders

The stock price reactions to deal announcements reflect the market's assessment of both the premiums received by the minority shareholders as well as the probability of deal completion. Smith and Amako-Adu (1992) assess the fairness of minority buyout deals by

analyzing the premiums paid to minority shareholders in addition to examining stock price reactions. Since the price paid in RBB deals is unknown at the time of the deal announcement, it is useful to examine premiums directly.

Hypothesis 2a: Minority shareholders receive similar premiums in pre-RBB and RBB minority buyouts.

If controlling shareholders offer minority shareholders unfair prices in minority buyouts, then their power to exploit should increase in proportion to their ownership levels. If this is the case, we expect that minority shareholder wealth gains are negatively related to controlling shareholders' pre-offer ownership levels. Bates, Lemmon, and Linck (2006) fail to find such an effect in U.S. freezeout deals. Smith and Amoako-Adu (1992) also report similar evidence in Canadian deals; however, the power of Canadian controlling shareholders is limited by the requirement that more than 90% of the minority shareholders have to vote in favor of a buyout deal. Croci and Petmezas (2010) find a negative but insignificant impact for pre-offer acquirer ownership levels. Their sample includes a mix of developed and emerging countries. It is useful to address this issue in the context of an emerging economy such as India, and examine the impact of the RBB process on the relationship.

Hypothesis 2b: There is no relationship between controlling shareholders' pre-offer ownership levels and premiums received by minority shareholders.

Hypothesis 2c: The RBB process has no impact on the relationship between controlling shareholders' pre-offer ownership levels and premiums received by minority shareholders.

If the exit price paid determined through the RBB process is too high, it will be rejected by the controlling shareholders and minority shareholders will receive nothing. We examine these hypotheses using all announced deals as well as subsamples that exclude failed RBB deals.

3.4.3. Impact on stock reactions to deal announcements

Following earlier studies, we assess the impact of the process on minority shareholders' wealth by also considering stock reactions to deal announcements. If the RBB process improved the fairness of prices paid to minority shareholders, we would expect to see larger stock price reactions for RBB deals. If minority shareholders had adequate protection in the pre-RBB period and they were treated fairly, then stock price reactions to pre-RBB and RBB deal announcements should be similar.

Hypothesis 3a: Stock price reactions to deal announcements are similar between pre-RBB and RBB minority buyouts.

Hypothesis 3b: There is no relationship between controlling shareholders' pre-offer ownership levels and minority shareholder wealth gains.

Hypothesis 3c: The RBB process has no impact on the relationship between controlling shareholders' pre-offer ownership levels and minority shareholder wealth gains.

3.4.4. Tests of learning effects for the RBB process

The book building process introduced was a new, unfamiliar mechanism to market participants in India. It was not used in the context of mergers or stock buybacks. Minority shareholders needed to learn how to bid. While they did want to settle for a low price, bidding too high would lead to the exit price being rejected by the controlling shareholders. The latter had to learn about how to react to the exit price determined by the RBB process and how much they needed to pay to acquire minority shares in the new regime. Rejecting the exit price would imply that they could not realize the benefits of going private.

We hypothesize that there was a learning period during which market participants adapted to the new regime. We examine this possibility by reexamining the hypotheses described above after allowing for differential behavior between early and late RBB deals.

4. Data and methods

4.1 Sample selection and data sources

We collect our RBB sample companies from the Bombay Stock Exchange (BSE) website. Since the data on the BSE website only includes proposals that were approved by shareholders and able to start the RBB process, we also checked the Securities Data Company (SDC) Indian merger and acquisition database for all deals that were announced between 2003 and 2012 and labeled as "acquiring remaining interest". However there is only one RBB proposal in the SDC data that was rejected by shareholders and therefore not included in the BSE data.

To identify the date of the first news about the deal, we search information about these deals in the Lexis/Nexis database and merger and acquisition news in the Orbits database. If the required information is not available in Lexis/Nexis and Orbits, we then search through Google to find the news releases from various Indian newspapers' web sites. The main information includes the bid announcement date, the outcome announcement date, the controlling shareholder's ownership stake and multinational/domestic status. Daily closing prices, trading volumes and market capitalizations are collected from the CMIE's Prowess, an Indian private database, which includes comprehensive information on Indian private and public firms.

We require that the events (company/year) retained in the sample at least have the following information: the initial announcement date, and historical stock prices and trading

volumes. The companies excluded from our sample mainly are listed in small local exchanges (i.e. CSE and DSE) and/or are thinly traded. We further eliminate companies that were not traded for more than 20 days during the 30 trading days prior to initial proposal announcement. We exclude the infrequently traded companies because it is hard to measure abnormal returns. We also eliminate repeat bids of the same company proposed less than one year after the initial proposal, since the market could have anticipated these announcements. This condition excludes buyout offers that are announced as a follow-up to a merger or acquisition bid within the previous year. We end up with 75 RBB deals. Table 1-1 provides the distribution of these deals by year.

To compare minority shareholders' wealth effects before and after the adoption of the RBB process, we also collect data on pre-2004 minority buyouts in India from the SDC database and SEBI's official website. We only include the offers announced for the Indian public targets between 1997 and 2003. We limit our analysis to firms, whose historical stock prices and trading volumes are available in the Prowess database. These criteria yield a sample of 38 pre-RBB deals. We also searched the Securities Exchange Board of India (SEBI) website and found an additional 4 pre-RBB deals that meet our criteria. Thus, we obtain a sample of 42 pre-RBB deals. We obtain the announcement dates, offer prices, and promoter shares, from the SDC database. We also check news stories from Lexis/Nexis and major Indian newspapers to correct some errors in the SDC data.

4.2. Control variables

Stock price reactions to deal announcements and premiums paid to minority shareholders may be affected not only the process employed for the buyout but also by additional deal

characteristics. Based on previous studies, we select several relevant deal characteristics to use as control variables in assessing the impact of the RBB process. The first variable considered is the pre-offer ownership level of the acquirer/controlling shareholder (*ControlShare*). A negative relationship between this variable and minority shareholder gains indicates that shareholders owing larger stakes exert greater bargaining power in squeezing out minority shareholders. On the other hand, if the acquirer already owns most of the shares, the cost of additional payments to the smaller remaining shares is reduced. While this variable has a negative coefficient in Bates, Lemmon, and Linck (2006), Croci and Petmezas (2010), and Smith and Amoako-Adu (1992), the coefficient is not statistically significant in any of these studies.

The next control variable we consider is the liquidity of the stock. Holders of illiquid stocks may appreciate the opportunity to sell their shares and may settle for a lower buyout price. We measure liquidity using average rupee trading volume during the 90-trading-day period proceeding to initial delisting announcement (*Volume*). This measure not only captures liquidity, but also captures the effect of the firm size. Controlling shareholders may have less bargaining power in larger firms with an associated larger minority shareholder base. We also consider whether the controlling shareholder is a multinational/foreign company, by using an indicator variable (*MNC*). These acquirers may be more motivated to go private, due to the increased flexibility in transfer pricing, operations, and financial policies. Prior to liberalization, these firms were forced by the government to sell some shares in their Indian subsidiaries to local investors. Minority shareholders would anticipate the larger incentives for multinational to go private and demand a higher premium. Croci and Petmezas (2010) find that minority shareholders gain significantly less when the transaction involves a domestic acquirer.

To examine whether stock price measures of the deal impact are affected by news leakage, Bates, Lemmon, and Linck (2006) and Croci and Petmezas (2010) include in their models the cumulative abnormal stock return during a pre-announcement window starting on day -42 relative to the deal announcement ($Runup_{(-42,-6)}$). This variable is negative and significant in the first study suggesting news leakage, but it is not significant in the Croci and Petmezas (2010) study. We search electronic databases carefully to identify the first news about the deal. We include this variable to identify whether news leakage is an issue in our sample and, if so, to control for it. We also use an 11-day event window to measure stock price reactions to allow for some delays in media reporting and as well as price adjustment, especially since some firms in our sample may be small with poor stock liquidity.

Croci and Petmezas (2010) also include the raw stock return during the year prior to deal announcement and find a significant, negative relationship with announcement period stock returns. If the stock price has appreciated in the past, there may be less (unanticipated) price gains from taking the firm private. In India, the floor price for RBB deals is set as the average of the weekly highs and lows during the 26 week period prior to the offer. To capture this feature, we include the cumulative raw return ($Raw\ Ret_{(-120,-43)}$) during the period (-120,-43) relative to announcement. We exclude the period after day -43 to ensure no overlap with the *Runup* variable capturing news leakage. Since we use the earliest date with news about the buyout deal as the offer announcement data, there is a significant gap between offer announcement and the closing date of the offer, since the buyout deal has to receive approval at various levels and also allow for sufficient notice to stockholders. In the RBB process, the exit price is determined by shareholder bids which can be influenced by overall stock market returns during this period. Hence, we also include the market index return between deal announcement and offer

completion. In pre-RBB deals also, stockholder response to the offer can be affected by the market return.[10]

Panel A of Table 1-2 contains the descriptive statistics for the control variables using the entire sample. In Panels B and C, we report the statistics separately for pre-RBB and RBB deals. The pre-offer ownership level of the controlling shareholders is high, as expected in these minority buyout transactions; the average is 63% for pre-RBB deals and 78% for RBB deals. The striking difference between pre-RBB and RBB deals is that the controlling shareholders in most of the pre-RBB deals are multinational companies. They account for 71% of the pre-RBB offers compared to only 29% for RBB deals. The median daily trading volume of stocks in pre-RBB deals is smaller compared to that for RBB deals. Stock returns (*Runup* and *Raw Ret*) during the pre-announcement period are not strikingly large, on average, although there are some big outliers. In RBB deals, the offer has to include a floor price, which is based on the average price during the 26 days preceding the official offer announcement. This premium ranges from -43% to 114%, indicating considerable variation in stock performance during the six months prior to the buyout offer. We also observe considerable variation in market index returns from offer announcement to the offer closing date.

Unsurprisingly, trading volume has considerable right skewness; we use the log transformation of this variable in subsequent analysis. The mean and median values for other variables are quite similar, indicating the absence of notable skewness. Nonetheless, there are some large outliers as indicated by the minimum and maximum values for the return variables. To avoid distortion by such outliers, we winsorize the control variables in our multivariate analysis; we choose the 5% level, given the relatively small sample sizes.

[10] We use the index return without incorporating the market model parameter estimates, since the put option provided to stockholders in the buyout deal can alter the stock's risk.

4.3. Assessing stock price reaction to deal announcement

We estimate the wealth effects of the delisting proposal announcement on minority shareholders using the standard event study method. The wealth effects are measured by the abnormal returns. We use the market model with the BSE 200 as the market index to calculate abnormal returns. BSE 200 is a value-weighted index and represents the broad Indian market. First, we estimate each company's beta using a control period of days (-250, -43) interval using market model as follows:

$$R_{i,t} = \alpha_i + \beta_i * R_{m,t} + \varepsilon_{i,t} \quad (1)$$

where $R_{i,t}$ is firm i' s daily return on day t and $R_{m,t}$ represent the BSE 200 index return on day t. We use the estimated parameters to calculate daily abnormal returns on days in the event period as follows:

$$AR_{i,t} = R_{i,t} - (\hat{\alpha}_i + \hat{\beta}_i * R_{m,t}) \quad (2)$$

We measure the announcement price effects using cumulative abnormal returns (CAR (-5, +5)) during the eleven-day period surrounding the initial announcement. [11]

5. Empirical evidence

In this section, we present the empirical evidence on the efficacy of the mandated RBB process for minority buyouts. First, we address whether the RBB process adversely affected the success rates of the deals. Next, we assess the impact of the RBB process on the minority

[11] In their international study of minority buyouts, Croci and Petmezas (2010) use 5 day, 11 day, and 21 day windows surrounding announcements and get consistent results. They argue that in emerging markets, prices may adjust slowly to news. The larger window also allows for delays in media reporting of news.

shareholders' wealth. Finally, we examine evidence for learning effects, by studying differences between the outcomes for early versus late RBB deals.

5.1. Are RBB deals more prone to failure?

In pre-RBB deals, a controlling shareholder promoter can buy shares that are tendered, and there is no requirement on the minimum number of shares that can be acquired. However, in RBB deals, if the post-offer public ownership does not fall below the threshold in the listing agreement (75% or 90%), then no shares can be acquired through the offer. To ensure comparability of success rates across the two regimes, we define a deal as unsuccessful (incomplete) if the controlling shareholders could not delist the stock, since they do not reach the threshold level of ownership required for delisting.

Of the 42 pre-RBB deals, 22 deals did not succeed, translating into a failure rate of 52.4%. In comparison, RBB deals had a failure rate of only 25.3% (19 of 75 deals). Based on a binomial test, the difference in these failure rates is statistically significant at the 1% level. The difference in failure rates could possibly be driven by deal characteristics. Table 1-3 presents a logit model for deal completion, with the dependent variable set to 1 if the offer succeeds, and 0 otherwise. We include an indicator variable, *RBB*, which captures the deal type. We control for deal characteristics presented in Table 1-2 and described in Section 4.2.

Estimates of Model 1 indicate a positive coefficient for the *RBB* indicator variable, suggesting that RBB deals are more likely to be completed. Model 2 includes an additional variable, *Offer Premium*. After controlling for *Offer Premium*, the statistical significance of the positive coefficient is greatly increased. Overall, consistent with Hypothesis 1, there is no

evidence that RBB deals are more prone to failure. There is mild evidence that RBB deals are more likely to succeed.

While other control variables have statistically insignificant effects, *Offer Premium* has a significant, negative coefficient indicating that deal success is negatively related to offer premium. The offer premium in RBB deals is determined by the minority shareholders and the controlling shareholders are more likely to reject exorbitant premiums. Models 3 and 4 estimate the determinants of deal success separately for RBB and pre-RBB deals, respectively. For RBB deals, higher exit prices determined through the RBB process have a significant, negative effect on success of the offer, consistent with controlling shareholders rejecting excessively high exit prices. In the model for pre-RBB deals, the offer premium has a puzzling, negative coefficient; however, none of the variables are significant, likely due to the small sample size.

5.2. Offer premiums for pre-RBB and RBB deals

Table 1-4 presents the premiums for minority shares by deal type. For pre-RBB deals, the premium is based on the premium in the buyout offer price relative to the stock price 5 days before the deal announcement. For RBB deals it is based on the exit price determined by the RBB process relative to the pre-announcement stock price.[12]

The mean (median) premium offered by the controlling shareholders in the pre-RBB deals is only 41% (36%).[13] Compared to this, the average premium embedded in the exit price determined by the RBB process is 77% with a median of 60%. However, when the exit price premium is high, RBB deals are more likely to be rejected by the controlling shareholders. The mean (median) premium for rejected deals is 105% (93%) compared to 67% (56%) for

[12] In case stock are not traded that day, we use sixth, seventh and eighth day.
[13] Surprisingly, but consistent with estimates of Model 4 in Table 3, the mean and median premiums in failed pre-RBB deals is higher than that for completed pre-RBB deals.

completed deals. Thus, inclusion of rejected RBB deals inflates the premiums for minority shareholders, although they cannot benefit from them. Comparing completed RBB deals with all or completed pre-RBB deals, we find that RBB deals still generate higher premiums for minority shareholders. This preliminary evidence indicates that the RBB process improved the minority shareholders' wealth gains in buyout deals.

Since the higher premiums in completed RBB deals may be driven by differences in deal characteristics, we repeat the comparison after controlling for their impact. The key question is whether the RBB process increases the premiums compared to those offered by the controlling shareholders in the pre-RBB deals. Thus, the appropriate comparison is between completed RBB deals and all pre-RBB deals. If pre-RBB deals failed because the premiums selected by the controlling shareholders were too low, such choices should be included in the comparison between the two regimes. It could be argued that the pre-RBB regime protected minority shareholders' interests by providing them the opportunity to turn down low offers. In this view, the appropriate comparison is between completed deals in both regimes. Table 1-5 contains the analysis for these two comparisons. We include the comparison of premiums between all announced pre-RBB and RBB deals merely for the sake of completeness.

We present two models in Table 1-5 for each of the comparisons. In the first model, the impact of the RBB process is measured by the indicator variable, *RBB*. This variable has a positive coefficient with a high level of statistical significance in all the comparisons. This evidence confirms that premiums are significantly higher in completed RBB deals compared to pre-RBB deals, thus rejecting the hypothesis that premium are similar between the two deal types (Hypothesis 2a). Consistent with prior studies, the controlling shareholders' ownership level is not statistically significant (Hypothesis 2b). Of the other control variables, only prior

stock performance is statistically significant at the 5% level. Premiums are lower for stocks that have already appreciated prior to offer commencement. There is no indication of systematic news leakage effects in the sample.

In the second model, we examine whether the RBB process influences the relationship between the premium and the controlling shareholders' ownership level by estimating the coefficient for an interaction term using the *RBB* indicator variable and this ownership level.[14] In this second model, the coefficient for the ownership level is negative but insignificant. However, the interaction variable has a positive coefficient, with strong statistical significance. This result indicates that in RBB deals controlling shareholders have to pay a larger premium if their pre-deal ownership stake is larger. (Hypothesis 2c). This result can be interpreted in two ways, based upon the exit price level compared to fair value. When there are fewer minority shareholders (as indicated by their ownership level), it is easier for them to band together, assert their rights and obtain fair value. The second interpretation is that it is easier for the minority shareholders to implicitly collude and extract a premium above fair value. The first interpretation is more plausible, since the controlling shareholders' have the option to reject the exit price and withdraw their offer.

5.3. Stock price reactions to deal announcements

We measure the market reaction to initial announcements of minority buyout deals as the sum of the cumulative abnormal returns ($CAR_{(-5, +5)}$) during the eleven days surrounding the announcement. Table 1-6 contains the stock price reactions for the RBB and pre-RBB

[14] Ideally, we would like to include the RBB indicator variable in this model also to separate the overall influence of the RBB process from its impact on this relationship. However, the correlation between RBB and the interaction variable is 0.97 and precludes the inclusion of both variables.

subsamples. Since the eventual completion status of the deal is unknown at announcement, we do not segments these subsamples based on whether the deal succeeded or failed.

Minority buyout deals are accompanied by significant, positive stock price reactions of 26%. Consistent with Hypothesis 3a, the reactions are strikingly similar between pre-RBB and RBB deals, judged by both mean and median values. None of the differences in announcement returns between the subsamples are statistically significant. This result is surprising given the prior evidence on the higher premiums and lower failure rates observed for RBB deals, and it raises the question of whether the market was able to correctly assess these values for RBB deals, given that it was an unfamiliar mechanism.

Table 1-7 contains the analysis of stock price reactions after controlling for deal characteristics. We drop the market index return from offer announcement to offer completion, since they are not relevant for stock price reactions at announcement. After controlling for deal characteristics in Model 1, the coefficient for the *RBB* indicator variable suggests that the stock price reaction to RBB deals is 5.7% higher compared to pre-RBB deals; however, the coefficient fails to attain statistical significance (Hypothesis 3a). Interestingly, the results suggest that the market has a lower reaction when the ownership of the controlling shareholder increases (Hypothesis 3b). Estimates of Model 2 reveal that the market expects the RBB process to attenuate this negative effect, as indicated by the significant, positive coefficient for the variable capturing the interaction between the RBB process and the level of controlling ownership (Hypothesis 3c). This result is consistent with evidence observed for offer premiums in Table 1-5. Overall, the comparison of data for the RBB and the pre-RBB deals indicates that the strikingly larger offer premium in RBB deals does not lead to a similar difference in stock price reactions to deal announcement. This dissonance between the results for offer premiums and

stock price reactions at announcement raises the issue of whether there are learning effects for market participants in assessing the value of the RBB process to the minority shareholders. We address this issue in Section 5.5.

5. 4. Impact of ownership structure of minority shares and auction participation rates

The main concern in minority buyouts is whether individual minority shareholders are stampeded into selling their shares too cheaply. This concern should be lessened if a significant portion of the minority shares is owned by institutional investors/corporations who are more likely to successfully resist an unfair, low buyout price. On the other hand, it could be argued that such institutional investors could collude and may succeed in extracting an exorbitant premium especially in RBB deals. We study this issue by examining whether the offer price is affected by the ownership structure of the minority shares.

We are able to obtain data on ownership structure of the minority shares for 28 pre-RBB and 71 RBB deals from sources such as the offer letters; such data is unavailable for several early deals. Table 1-8, Panel A reports summary statistics on the percentage of minority shares owned by institutional investors and other corporations. The mean institutional ownership is 20.87%. When corporate ownership of minority shares is also included, the percentage of minority shares owned by both types of entities is 43.11%. The patterns are roughly similar across pre-RBB and RBB deals.

Table 1-9 presents evidence on the impact of institutional and corporate ownership of minority shares. Models 1 and 2 analyze the impact on offer premiums, while Models 3 and 4 analyze the impact on stock price reactions to buyout announcements. There is no evidence in

any of the models that higher ownership by institutions and corporations affects either the offer price or the stock price reaction to announcements.[15]

An additional issue we examine is whether the rate of minority shareholders participation in the RBB process influences the outcome. The RBB process requires adequate participation from minority shareholders to ensure that the offer price is not distorted by a few bidders. However, the complexity of the RBB process could be daunting for some stockholders and they may let the offer price be determined by other minority shareholders who elect to participate in the RBB process. Data on participation rates in the RBB process is available on the BSE website since 2008 for 43 offers; related summary statistics are presented in Panel B of Table 1-8. On average, 53.14% of the minority shares were tendered in the RBB bidding process. The correlation between corporate and institutional ownership and the participation rates in the bidding process is 0.45 indicating that these investors are more likely to submit bids. Although the sample size is limited, there is some evidence for an increasing rate of participation for later deals (2101-2012) compared to earlier deals (2008-2009), as judged by the yearly mean and median participation rates. The mean participation rate is 57.87% in the 32 completed offers compared to only 39.63% in the 11 failed offers; the median participation rates for completed and failed offers are 60.33% and 39.4%, respectively.

Table 1-10 presents evidence on the impact of RBB participation rates on the offer premium. When we consider all RBB deals, there is no evidence that participation rates affect the offer premium. However, if we restrict our attention to completed RBB deals, we find that

[15] We also fail to find evidence that institutional and corporate ownership has a bigger impact in RBB deals. We examine this issue using a couple of approaches. First, we include an interaction term between institutional and corporate ownership and a RBB dummy variable. The high correlation between this interaction term and the RBB dummy necessitates the omission of the RBB dummy as a separate variable. Next, we restrict the sample to only RBB deals. The institutional and corporate ownership has no significant effect whether we consider all RBB deals or only completed RBB deals.

higher participation rates have a significant, positive impact on the offer premium. This result is consistent with promoters being willing to pay a higher offer premium, if such a premium is determined by a process with high participation rates. Controlling shareholders may reject the offer premiums in the 11 failed RBB deals due to distortions induced by low participation rates.

5. 5. Learning effects

Our sample period for RBB deals spans a ten-year period from 2003 to 2012. During the first five years, there were 30 RBB offers, and in the next five years there were 45 RBB offers. The increased frequency is consistent with market participants getting more comfortable with the RBB process. Furthermore, evidence in Panel B of Table 1-8 also indicates that minority shareholder participation in the RBB bidding process increased in later years. We examine evidence for learning effects particularly in the case of stock price reactions to deal announcements, by segmenting the RBB offers into early and late offers based on the two sub-periods.

Of the 30 early RBB offers, eight failed; in comparison, eleven of the 45 RBB deals during the latter sub-period failed. The failure rates between early and late RBB deals (27% and 24%) are similar. Controlling for deal characteristics does not alter this observation. Table 1-11 contains the estimates of a logit model for deal success allowing for separate indicator variables for early and late RBB offers. The coefficients for both *LateRBB* and earlyRBB are positive and significant at the 5% level, indicating that RBB deals in either sub-period are more likely to succeed relative to pre-RBB deals. However, there is no difference in success rates between early and late RBB deals.

Table 1-12 presents the offer premiums and stock price reactions separately for early and late RBB deals. Whether we use all RBB deals or only completed RBB deals, the premiums for minority shareholders are larger in the late RBB deals compared to the early RBB deals. Since these differences may be driven by differences in deal characteristics, we turn to multivariate analysis to compare, in particular, the late RBB deals with the pre-RBB deals. Table 1-13 presents the analysis of offer premiums allowing for learning effects. The results indicate that, relative to pre-RBB deals, offer premiums are higher in both the early and late RBB deals. Coefficients capturing the effects for the early and late RBB deals are very similar in magnitude and their difference is not statistically significant.

However, stock price reactions at announcements are higher for the late RBB deals compared to the early RBB deals. The mean announcement returns for the late RBB deals are 30.72% compared to 18.03% for the early RBB deals; the corresponding median returns are 28.37% and 19.07%. In Table 1-14, we examine announcement returns after controlling for differences in deal characteristics. We find that stock price reactions impound the beneficial effects of the RBB process for minority shareholders only in the case of the late RBB deals.[16] Estimates in Model 1 indicate the stock price reaction to late RBB deals is 8.7%; this coefficient is statistically significant at the 5% level. In comparison, the stock price reaction in early RBB deals is only 0.855%; this coefficient is statistically insignificant. Model 2 estimates which account for the impact of the controlling share ownership also indicate that the RBB process has significant effects in the case of the late RBB deals, but not in the case of the early RBB deals. Overall, this evidence suggests that stock price reactions to announcements reflect the higher

[16] Note that since the success or the failure of the deal is unknown at the time of the deal announcement, it is not meaningful to analyze stock price reactions based on deal completion status.

buyout premiums only after a learning period. Thus, caution exercise needs to be exercised in evaluating new mechanisms immediately after their introduction based on stock price reactions.

6. Conclusions

Previous research has established that good corporate governance and protection for minority shareholders is crucial to the development of strong financial markets, which play a critical role in economic development. Fairness for minority shareholders in the context of minority buyouts is a fundamental aspect of protection of minority shareholders, which provides them assurance and encourages their participation in equity markets. However, protection for minority shareholders should not prevent firms from undertaking efficient organizational restructuring in response to changing economic environments. Balancing these considerations is a key concern for regulators, especially in developing economies, and it has attracted considerable debate among economists, legal scholars, and practitioners.

Typically, the price paid in minority buyouts is set by controlling shareholders and the minority shareholders could choose to accept or reject the offer. This scheme raises concerns that minority owners may be coerced into selling their shares for liquidity reasons, even though the offered price may be considerably lower than their own assessment of share value. Indian regulators introduced a novel mechanism in 2003, wherein minority shareholders determined the price by submitting bids in a reverse book building process. The price discovered by this process could be rejected by the controlling shareholders. This mechanism had some unusual features and was unfamiliar to market participants. We evaluate the impact of this mechanism by comparing minority buyouts before and after the changes. The empirical evidence reveals that the new mechanism increases the wealth gains to minority shareholders. However, there was a

learning period, before the stock market reaction impounds these higher benefits. This result calls for caution in evaluating regulatory changes using stock price responses to these changes immediately after their introduction.

Table 1-1

Distribution of minority buyout deals in India by year

The table presents the distribution of deals in which controlling shareholders sought to acquire shares from all other shareholders in order to delist the stock and convert to private status. In 2003, regulations were changed to require that the price paid to minority shareholders be determined through a reverse book building (RBB) process, in which minority shareholders submitted bids indicating the price at which they are willing to sell their shares.

Year announced	Pre-RBB deals	RBB deals	Completed deals	Failed deals	Total deals
1997	1		1	0	1
1998	1		0	1	1
1999	3		1	2	3
2000	5		1	4	5
2001	17		8	9	17
2002	14		8	6	14
2003	1	2	3	0	3
2004		2	2	0	2
2005		8	4	4	8
2006		7	4	3	7
2007		11	10	1	11
2008		12	10	2	12
2009		12	9	3	12
2010		9	7	2	9
2011		8	6	2	8
2012		4	2	2	4
Total	42	75	76	41	117

Table 1-2

Summary statistics of deal characteristics

The table presents descriptive statistics about variables used in the empirical analysis. Panel A is for our entire sample. Panel B is for the RBB deals. Panel C is for the pre-RBB deals. ControlShare is the percentage of shares that the promoter owns prior to the announcement. Volume is the average of Rupee amount (in thousands) of shares traded over the period (-90, -2) before the initial announcement. *MNC* is the multinational indicator variable, which is 1 if the promoter is a multinational company and 0 otherwise. *Runup* $_{(-42, -6)}$ is estimated as daily abnormal returns summed over a daily interval from 42 days to 6 days before the deal announcement. *Raw Ret*$_{(-120,-43)}$ is the cumulative stock return over the period (-120, -43). *Market Index Return* is the cumulative market return over the period starting six days before the deal announcement and ending four days before the outcome announcement. *Floor Premium* is the premium of the floor price to the stock price five days prior to the initial announcement.

Variables	N	Mean	Median	Min	Max
Panel A: All deals					
ControlShare	117	0.72	0.75	0.38	0.98
Volume (Rs 'm)	117	17.66	0.73	0.00	1408.05
MNC	117	0.44	0.00	0.00	1.00
Runup$_{(-42, -6)}$	117	0.05	0.06	-1.76	1.17
Raw Ret$_{(-120, -43)}$	117	0.04	0.02	-0.69	1.27
Market Index Return	117	0.07	0.01	-0.57	1.98
Panel B: Pre-RBB deals					
ControlShare	42	0.63	0.64	0.38	0.90
Volume (Rs 'm)	42	2.50	0.26	0.00	48.55
MNC	42	0.71	1.00	0.00	1.00
Runup$_{(-42, -6)}$	42	0.10	0.08	-0.47	1.17
Raw Ret$_{(-120, -43)}$	42	0.01	-0.04	-0.42	1.14
Market Index Return	42	0.10	-0.02	-0.46	1.98
Panel C: RBB deals					
ControlShare	75	0.78	0.78	0.44	0.98
Volume (Rs m)	75	26.15	1.05	0.00	1408.05
MNC	75	0.29	0.00	0.00	1.00
Runup$_{(-42, -6)}$	75	0.02	0.04	-1.76	0.52
Raw Ret$_{(-120, -43)}$	75	0.06	0.07	-0.69	1.27
Market Index Return	75	0.06	0.04	-0.57	0.63
Floor Premium	75	0.11	0.06	-0.43	1.14

Table 1-3

Determinants of deal completion

This table presents estimates of logistic regressions examining determinants of deal completion. The dependent variable equals one if the proposed deal is completed and zero if the deal is failed. Model 1 is estimated using pre-RBB and RBB deals, while Model 2 estimates are based using only RBB deals. Offer premium is the premium of the offer price to the stock price five days prior to the initial announcement *ControlShare* is the percentage of shares held by the controlling shareholders prior to the announcement. *Logvolume* is the natural log of the average daily rupee trading value in thousands over the period (-90, -2) relative to the initial announcement. *MNC* is a multinational indicator variable, which is 1 if the controlling shareholder is a multinational company and 0 otherwise. *Runup* $_{(-42, -6)}$ is estimated as daily abnormal returns summed over a daily interval from 42 days to 6 days before the deal announcement. *Raw Ret*$(-_{120,-43})$ is the cumulative stock return over the period (-120, -43). *Market Index Return* is the cumulative market return over the period starting six days before the deal announcement and ending four days before the outcome announcement. P-values are reported in parentheses below the coefficients. Superscripts *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

	All deals		RBB deals	Pre-RBB deals
Variables	(1)	(2)	(3)	(4)
Offer Premium		-1.697***	-1.830***	-1.770
		(0.001)	(0.003)	(0.258)
RBB	1.081**	1.897***		
	(0.045)	(0.003)		
ControlShare	1.839	2.669	1.443	2.178
	(0.325)	(0.178)	(0.609)	(0.488)
Logvolume	-0.0618	-0.0739	-0.0693	-0.153
	(0.552)	(0.521)	(0.679)	(0.447)
Runup$_{(-42, -6)}$	1.881*	1.793*	1.997	1.780
	(0.069)	(0.094)	(0.200)	(0.292)
Raw Ret$_{(-120, -43)}$	0.205	-1.080	-2.378**	0.779
	(0.791)	(0.218)	(0.037)	(0.629)
MNC	-0.108	0.180	-0.0612	0.641
	(0.824)	(0.728)	(0.929)	(0.466)
Market Index Return	-0.382	-0.378	-1.376	0.205
	(0.711)	(0.730)	(0.429)	(0.900)
Intercept	-1.396	-1.445	1.774	-1.541
	(0.300)	(0.305)	(0.431)	(0.525)
N	117	117	75	42
Dependent variable:				
Completed (1)	76	76	56	20
Failed (0)	41	41	19	22

Table 1-4

Offer premiums

Offer premium is the premium of the buyout price to the stock price five days prior to the initial announcement. For pre-RBB deals, the offer premium is based on the price offered to minority shareholders by the controlling shareholders. For RBB deals, the premium is calculated using the exit price determined in the reverse book-building process. Minority shareholders do not receive this premium in failed deals, where the offer is not completed because the controlling shareholders reject this exit price. Panel A breaks down the entire sample into RBB and pre-RBB deals. Panel B breaks downs the entire sample into completed deals and failed deals. Panel C breaks down the RBB deals into completed deals and failed deals. Panel D breaks down the Pre-RBB deals into completed deals and failed deals.

	N	Mean	Median	Min	Max
Panel A: Breakdown of all deals by RBB and Pre-RBB					
All deals	117	63.93%	53.57%	-12.26%	317.91%
RBB	75	76.72%	59.80%	-12.26%	317.91%
Pre-RBB	42	41.09%	36.03%	-4.95%	111.27%
Panel B: Breakdown of all deals by completion					
Completed deals	76	57.88%	45.65%	-8.59%	317.91%
Failed deals	41	75.14%	65.36%	-12.26%	281.24%
Panel C: Breakdown of RBB deals by completion					
Completed deals	56	67.06%	56.06%	-8.59%	317.91%
Failed deals	19	105.19%	92.75%	-12.26%	281.24%
Panel D: Breakdown of Pre-RBB deals by completion					
Completed deals	20	32.18%	25.17%	0.90%	88.68%
Failed deals	22	49.19%	53.49%	-4.95%	111.27%

Table 1-5

Analysis of offer premium

The dependent variable, *Premium*, is the premium of the offer/exit price relative to the stock price five days prior to the initial announcement of the minority buyout. *RBB* is an indicator viable set equal to 1 for RBB deals and 0 for pre-RBB deals. *ControlShare* is the percentage of shares held by the controlling shareholders prior to the announcement. *Logvolume* is the natural log of the average daily rupee trading value in thousands over the period (-90, -2) relative to the initial announcement. *MNC* is the multinational indicator variable, which is 1 if the controlling shareholder is a multinational company and 0 otherwise. *Runup* $_{(-42, -6)}$ is estimated as daily abnormal returns summed over a daily interval from 42 days to 6 days before the deal announcement. *Raw Ret*$(-_{120,-43})$ is the cumulative stock return over the period (-120, -43). *Market Index Return* is the cumulative market return over the period starting six days before the deal announcement and ending four days before the outcome announcement. P-values are reported in parentheses below the coefficients. Superscripts *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

	All Deals	All pre-RBB and completed RBB	Completed Deals
Variables	(1)	(2)	(3)
RBB	0.383***	0.266**	0.341**
	(0.001)	(0.016)	(0.021)
ControlShare	0.394	0.282	0.311
	(0.312)	(0.468)	(0.515)
Logvolume	0.00624	-0.000935	-0.00989
	(0.764)	(0.963)	(0.702)
MNC	0.181*	0.0979	0.0828
	(0.068)	(0.323)	(0.507)
Runup$_{(-42, -6)}$	-0.121	0.0685	0.285
	(0.555)	(0.728)	(0.276)
Raw Ret$_{(-120, -43)}$	-0.708***	-0.625***	-0.564***
	(0.000)	(0.000)	(0.004)
Market Index Return	-0.0379	-0.0450	-0.0207
	(0.856)	(0.822)	(0.939)
Intercept	0.0500	0.157	0.0469
	(0.857)	(0.568)	(0.892)
N	117	98	76
Adj. R^2	0.221	0.169	0.146

Table 1-6

Stock price reactions to initial announcement of the minority buyout deal

Stock price reactions to the earliest news about the minority buyout is measured using the cumulative abnormal return during days (-5,+5) relative to the announcement date. The table present the stock price reactions separately for RBB and pre-RBB deals.

	N	Mean	Median	Min	Max
All deals	117	25.61%	21.90%	-12.17%	81.71%
RBB	75	25.65%	23.40%	-10.90%	81.71%
Pre-RBB	42	25.54%	21.17%	-12.17%	65.07%

Table 1-7

Analysis of announcement period abnormal returns

The dependent variable ($CAR_{(-5,+5)}$) is the cumulative abnormal return during the period (-5,+5) relative to the initial announcement date of the minority buyout. *RBB* is an indicator viable set equal to 1 for RBB deals and 0 for pre-RBB deals. *ControlShare* is the percentage of shares held by the controlling shareholders prior to the announcement. *Logvolume* is the natural log of the average daily rupee trading value in thousands over the period (-90, -2) relative to the initial announcement. *MNC* is the multinational indicator variable, which is 1 if the controlling shareholder is a multinational company and 0 otherwise. *Runup* $_{(-42, -6)}$ is estimated as daily abnormal returns summed over a daily interval from 42 days to 6 days before the deal announcement. *Raw Ret(-$_{120,-43}$)* is the cumulative stock return over the period (-120, -43). Superscripts *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Variables	All Deals
RBB	0.0571
	(0.146)
ControlShare	-0.172
	(0.204)
Logvolume	-0.00722
	(0.320)
MNC	0.0511
	(0.128)
$Runup_{(-42, -6)}$	-0.00950
	(0.894)
Raw $Ret_{(-120, -43)}$	-0.236***
	(0.000)
Intercept	0.328***
	(0.001)
N	117

Table 1-8

Summary statistics of minority ownership structure and investor participation rates

The table presents descriptive statistics about ownership structure and investor participation rate. % Institution is the ratio of the shares owned by non-promoter institution investors to the shares sought by promoters. % Institution & Corporate is one minus the ratio of the shares owned by individual investor to the shares sought by promoters. Participation rate is the number of shares submitted by public shareholders (non-promoters) divided by the number of shares sought by promoters.

Panel A:Public investor ownership

Variables	N	Mean	Median	Min	Max
Panel A: All deals					
% Institution	99	20.87%	10.63%	0.00%	87.00%
% Institution & Corporate	99	43.11%	37.85%	0.00%	100.00%
Panel B: Pre-RBB deals					
% Institution	28	20.32%	14.11%	0.00%	58.57%
% Institution & Corporate	28	39.20%	42.20%	12.12%	76.74%
Panel C: RBB deals					
% Institution	71	21.08%	9.71%	0.00%	87.00%
% Institution & Corporate	71	44.65%	37.70%	0.00%	100.00%

Panel B: Participation rate

B1: By year

Year	N	Mean	Median	Min	Max
2008	10	46.46%	43.97%	2.74%	81.82%
2009	12	41.64%	51.17%	0.00%	75.75%
2010	9	64.00%	60.07%	36.17%	89.90%
2011	8	61.92%	57.72%	39.40%	89.29%
2012	4	62.31%	60.45%	38.46%	89.89%
Total	43	53.14%	55.71%	0.00%	89.90%
B2: By completion					
Failed deals	11	39.63%	39.40%	0.00%	79.2%
Completed deals	32	57.78%	60.33%	0.72%	89.90%
Total	43	53.14%	55.71%	0.00%	80.90%

Table 1-9

Does institution Ownership have an impact on the offer premium and announcement period abnormal return?

The dependent variables, *Premium*, are the premium of the offer/exit price relative to the stock price five days prior to the initial announcement of the minority buyout, and $CAR_{(-5,+5)}$, the cumulative abnormal return during the period (-5,+5) relative to the initial announcement date of the minority buyout *RBB* is an indicator viable set equal to 1 for RBB deals and 0 for pre-RBB deals. *ControlShare* is the percentage of shares held by the controlling shareholders prior to the announcement. *Logvolume* is the natural log of the average daily rupee trading value in thousands over the period (-90, -2) relative to the initial announcement. *MNC* is the multinational indicator variable, which is 1 if the controlling shareholder is a multinational company and 0 otherwise. *Runup* $_{(-42, -6)}$ is estimated as daily abnormal returns summed over a daily interval from 42 days to 6 days before the deal announcement. *Raw Ret*$(-_{120,-43})$ is the cumulative stock return over the period (-120, -43). *Market Index Return* is the cumulative market return over the period starting six days before the deal announcement and ending four days before the outcome announcement. % Institution is the ratio of the shares owned by non-promoter institution investors to the shares sought by promoters. % Institution & Corporate is one minus the ratio of the shares owned by individual investor to the shares sought by promoters. P-values are reported in parentheses below the coefficients. Superscripts *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Variables	All pre-RBB and completed RBB Offer Premium	All Deals $CAR_{(-5, +5)}$
	(1)	(2)
RBB	0.339**	0.0477
	(0.015)	(0.325)
ControlShare	0.479	-0.0943
	(0.299)	(0.549)
Logvolume	-0.0137	-0.00625
	(0.582)	(0.471)
MNC	0.209*	0.0486
	(0.095)	(0.238)
$Runup_{(-42, -6)}$	0.0593	-0.00487
	(0.798)	(0.954)
$Raw\ Ret_{(-120, -43)}$	-0.656***	-0.219***
	(0.001)	(0.001)
Market Index Return	0.0211	
	(0.932)	
Institution& Corporate	0.158	-0.0405
	(0.496)	(0.624)
Intercept	-0.147	0.301**
	(0.687)	(0.019)
N	80	99
Adj. R^2	0.176	0.092

Table 1-10

Impact of minority investor participation rates in the RBB process on offer premium

The dependent variables, *Premium*, are the premium of the offer/exit price relative to the stock price five days prior to the initial announcement of the minority buyout. *RBB* is an indicator variable set equal to 1 for RBB deals and 0 for pre-RBB deals. *ControlShare* is the percentage of shares held by the controlling shareholders prior to the announcement. *Logvolume* is the natural log of the average daily rupee trading value in thousands over the period (-90, -2) relative to the initial announcement. *MNC* is the multinational indicator variable, which is 1 if the controlling shareholder is a multinational company and 0 otherwise. *Runup* $_{(-42, -6)}$ is estimated as daily abnormal returns summed over a daily interval from 42 days to 6 days before the deal announcement. *Raw Ret*$(-_{120,-43})$ is the cumulative stock return over the period (-120, -43). *Market Index Return* is the cumulative market return over the period starting six days before the deal announcement and ending four days before the outcome announcement. *Participation rate* is the number of shares submitted by public shareholders (non-promoters) divided by the number of shares sought by promoters. P-values are reported in parentheses below the coefficients. Superscripts *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Variables	All RBB	Completed RBB
	Offer Premium	Offer Premium
	(1)	(2)
ControlShare	2.303*	2.824**
	(0.053)	(0.017)
Logvolume	0.0327	-0.0217
	(0.504)	(0.657)
MNC	0.233	0.137
	(0.317)	(0.559)
$Runup_{(-42, -6)}$	0.158	0.674
	(0.760)	(0.201)
$Raw\ Ret_{(-120, -43)}$	-0.811**	-0.680
	(0.035)	(0.119)
Market Index Return	0.226	0.255
	(0.652)	(0.593)
Participation Rate	0.0697	0.948*
	(0.882)	(0.066)
Intercept	-1.123	-2.136**
	(0.264)	(0.033)
N	43	32
Adj. R^2	0.091	0.227

Table 1-11

Do RBB deal completion rates improve over time?

This table presents estimates of logistic regressions examining determinants of deal completion. The dependent variable equals one if the proposed deal is completed and zero if the deal is failed. Model 1 is estimated without including offer premium, while Model 2 includes offer premium. Offer premium is the premium of the offer price to the stock price five days prior to the initial announcement. *ControlShare* is the percentage of shares held by the controlling shareholders prior to the announcement. *Logvolume* is the natural log of the average daily rupee trading value in thousands over the period (-90, -2) relative to the initial announcement. *MNC* is a multinational indicator variable, which is 1 if the controlling shareholder is a multinational company and 0 otherwise. *Runup* $_{(-42, -6)}$ is estimated as daily abnormal returns summed over a daily interval from 42 days to 6 days before the deal announcement. *Raw Ret*$(-_{120,-43})$ is the cumulative stock return over the period (-120, -43). *Market index return* is the cumulative market return over the period starting six days before the deal announcement and ending four days before the outcome announcement. P-values are reported in parentheses below the coefficients. Superscripts *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

	All deals	RBB Deals	
Variables	(1)	(2)	(3)
Offer Premium	-1.696***	-1.812***	
	(0.001)	(0.003)	
Early RBB	1.899***		
	(0.009)		
Late RBB	1.895***	-0.291	-0.342
	(0.008)	(0.661)	(0.574)
ControlShare	2.670	1.526	0.0347
	(0.181)	(0.591)	(0.989)
Logvolume	-0.0739	-0.0753	-0.0849
	(0.521)	(0.653)	(0.553)
Runup$_{(-42, -6)}$	0.180	-0.0828	-0.453
	(0.729)	(0.904)	(0.473)
Raw Ret$_{(-120, -43)}$	1.794*	2.074	1.978
	(0.096)	(0.184)	(0.180)
MNC	-1.080	-2.466**	-0.965
	(0.221)	(0.034)	(0.342)
Market Index Return	-0.379	-1.549	-1.490
	(0.731)	(0.383)	(0.354)
Intercept	-1.446	1.892	1.561
	(0.308)	(0.405)	(0.459)
N	117	75	75
Dependent variable:			
Completed (1)	76	56	56
Failed (0)	41	19	19

Table 1-12

Offer premiums in early and late RBB deals

Offer premium is the premium of the buyout price to the stock price five days prior to the initial announcement. Panel A, B and C the summary statistics of offer premium. Panel A breaks down the RBB deals into early deals and late deals. EarlyRBB deals are announced during 2003-2007 and LateRBB are deals announced after 2007. Panel B breaks down the EarlyRBB deals into completed deals and failed deals. Panel C breaks down the LateRBB deals into completed deals and failed deals.

	N	Mean	Median	Min	Max
Panel A: RBB offer premiums with deals classified by early and late year					
EarlyRBB	30	67.21%	58.93%	5.73%	210.91%
LateRBB	45	83.06%	69.87%	-12.26%	317.91%
Panel B: Offer premiums for Early RBB deals by completion					
Completed deals	22	57.83%	47.40%	9.09%	128.45%
Failed deals	8	93.01%	98.62%	5.73%	210.91%
Panel C: Offer premiums for Late RBB deals by completion					
Completed deals	34	73.03%	56.80%	-8.59%	317.91%
Failed deals	11	114.04%	82.21%	-12.26%	281.24%

Table 1-13

Analysis of offer premiums with learning effects for the RBB process

The dependent variable, *Premium*, is the premium of the offer/exit price relative to the stock price five days prior to the initial announcement of the minority buyout. *EarlyRBB* is equal to 1 for RBB deals announced during the period 2003 - 2007, and 0 otherwise. *LateRBB* is equal to 1 for RBB deals announced after 2007 and 0 otherwise. *ControlShare* is the percentage of shares held by the controlling shareholders prior to the announcement. *Logvolume* is the natural log of the average daily rupee trading value in thousands over the period (-90, -2) relative to the initial announcement. *MNC* is a multinational indicator variable, which is 1 if the controlling shareholder is a multinational company and 0 otherwise. *Runup* $_{(-42, -6)}$ is estimated as daily abnormal returns summed over a daily interval from 42 days to 6 days before the deal announcement. *Raw Ret*$(-_{120,-43})$ is the cumulative stock return over the period (-120, -43). *Market Index Return* is the cumulative market return over the period starting six days before the deal announcement and ending four days before the outcome announcement. P-values are reported in parentheses below the coefficients. Superscripts *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

	All Deals	All pre-RBB and completed RBB	Completed Deals
Variables	(1)	(2)	(3)
EarlyRBB	0.372***	0.263*	0.329*
	(0.006)	(0.054)	(0.058)
LateRBB	0.389***	0.267**	0.346**
	(0.002)	(0.022)	(0.025)
ControlShare	0.393	0.283	0.318
	(0.315)	(0.470)	(0.510)
Logvolume	0.00646	-0.000881	-0.00950
	(0.758)	(0.965)	(0.717)
MNC	0.182*	0.0977	0.0822
	(0.068)	(0.327)	(0.514)
Runup$_{(-42, -6)}$	-0.123	0.0687	0.285
	(0.550)	(0.728)	(0.280)
Raw Ret$_{(-120, -43)}$	-0.703***	-0.624***	-0.557***
	(0.000)	(0.000)	(0.007)
Market Index Return	-0.0328	-0.0445	-0.0156
	(0.877)	(0.826)	(0.955)
Intercept	0.0499	0.157	0.0425
	(0.858)	(0.572)	(0.903)
N	117	98	76
Adj. R^2	0.214	0.159	0.133

Table 1-14

Analysis of announcement abnormal returns with learning effects for the RBB process

The dependent variable ($CAR_{(-5,+5)}$) is the cumulative abnormal return during the period (-5,+5) relative to the initial announcement date of the minority buyout. *EarlyRBB* is equal to 1 for RBB deals announced during the period 2003 - 2007, and 0 otherwise. *LateRBB* is equal to 1 for RBB deals announced after 2008 and 0 otherwise. *ControlShare* is the percentage of shares held by the controlling shareholders prior to the announcement. *Logvolume* is the natural log of the average daily rupee trading value in thousands over the period (-90, -2) relative to the initial announcement. *MNC* is a multinational indicator variable, which is 1 if the controlling shareholder is a multinational company and 0 otherwise. *Runup* $_{(-42, -6)}$ is estimated as daily abnormal returns summed over a daily interval from 42 days to 6 days before the deal announcement. *Raw Ret*$(-_{120,-43})$ is the cumulative stock return over the period (-120, -43). P-values are reported in parentheses below the coefficients. Superscripts *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Variables	All Deals
EarlyRBB	0.00855
	(0.849)
LateRBB	0.0870**
	(0.036)
ControlShare	-0.177
	(0.184)
Logvolume	-0.00623
	(0.385)
MNC	0.0531
	(0.109)
$Runup_{(-42, -6)}$	-0.0178
	(0.800)
Raw $Ret_{(-120, -43)}$	-0.212***
	(0.000)
Intercept	0.332***
	(0.001)
N	117
Adj. R^2	0.171

CHAPTER TWO: ON-BALANCE-SHEET HEDGING AND FIRM VALUE

1. Introduction

Finance theory indicates that hedging increases firm value (Smith and Stulz, 1985). Much of the early literatures on hedging has focused on off-balance-sheet hedging strategies; that is, the use of derivatives. For example, Allayannis and Weston (2001) examine the effect of foreign currency derivatives on firm valuation and find that hedging is associated with an increase in firm value. Graham and Rogers (2002) find that derivatives-induced debt capacity increases firm value. However, little attention has been paid to the effect of on-balance-sheet hedging on firm value. We add to the hedging literature by examining how different firms choose a duration gap, and we consider the relation between duration gap and firm value for US nonfinancial firms. In particular, we examine the hypotheses that firms which match asset and liability duration have greater market values and are less sensitive to liquidity shocks.

Duration gap analysis has previously been used to estimate a bank's overall interest rate exposure on the balance sheet. Flannery (1981) shows that large commercial banks effectively hedge themselves against interest rate risk by assembling asset and liability portfolios with similar average maturities. Other studies, such as Kaufman (1984) Bierwag and Kaufman (1985), Lamm-Tennant (1989), Houpt and Embersit (1991), Iraj and Gordon (2000), and Beck et al. (2000) discuss duration gap management in financial firms.

However, interest rate risk affects nonfinancial firms as well as financial firms. Nonfinancial firms have financial assets and liabilities whose values change with interest rates, and in particular with changes in their cost of capital. Bartram (2002) studies a large sample of German nonfinancial firms during the period 1987-1995 and finds that many nonfinancial firms

are also strongly exposed to interest rate risk and that the interest rates exposure of these firms is determined by firm liquidity. Bodnar et al. (1998) find that only 35% of nonfinancial firms in their sample use derivatives to hedge financial risk. Covitz and Sharpe (2005) find that large nonfinancial firms tend to limit their interest rate exposure through their debt structure rather than the use of derivatives. Nance, Smith and Smithson (1993) also point out that nonfinancial firms can manage interest rate risk on their balance sheet by structuring their assets and liabilities.

A variety of theories suggest that firms tend to match the maturities of their debt to the maturities of their assets. Myers (1977) suggests that firms can reduce the underinvestment problem by matching the maturity of assets in place to that of liabilities. Hart and Moore (1994) analyze the contracting problem in an environment where the entrepreneur can threaten to withdraw valuable human capital from a project so as to extract debt forgiveness from the lender. Their model predicts that debt should be matched either with the return streams or with the rate of depreciation of the collateral. Emery's (2001) model shows that variability over the business cycle in demand and in the term premium can also cause firms to match debt and asset maturities.

In general, empirical evidence supports the prediction that firms make some effort to match the maturities of their assets and liabilities. For instance, Guedes and Opler (1996) examine new bond issues and find a positive relationship between the maturity of assets and the maturity of newly issued bonds. They find that the maturity of new debt issues increases by only 0.006 for a 1-year increase in asset maturity. Stohs and Mauer (1996) examine the empirical determinants of debt maturity structure and find that firms match the average maturities of assets and liabilities on their balance sheets. They find that debt maturity increases 0.22 years for a 1-

year increase in asset maturity. Demirgüç-Kunt and Maksimovic (1999) study firms from 30 countries and find strong evidence of maturity matching. Moreover, Graham and Harvey (2001) conduct a survey of 392 CFOs and find that CFOs consider asset-liability maturity matching when issuing new debt.

In contrast to existing studies, which mostly consider matching the maturity of debts and assets, we examine the duration gap. Although duration is related to maturity, duration takes into account the interim cash flows as well as the final payment. Bierwag and Kaufman (1985) argue that duration gap, rather than maturity gap, generally provides a more accurate and meaningful measurement of the interest rate sensitivity of financial institutions. The difference between maturity and duration may help to explain the somewhat mixed evidence on maturity matching in prior studies.

Compared to maturity, duration is more closely related to a firm's interest rate exposure, and there exists a direct relation between duration and the sensitivity of firm values to changes in interest rates. The duration gap, the difference between the duration of assets and the duration of liabilities, can be used to estimate the interest rate exposure of a firm. Specifically, if the duration of assets is either longer or shorter than the duration of liabilities, the firm has interest rate risk. Therefore the absolute value of the duration gap (abgap, hereafter) measures the interest rate exposure of a firm. Additionally, if a firm's assets have longer durations on average than its liabilities (a positive duration gap), the firm may be unable to pay its obligations on time. Therefore the signed duration gap may also be a useful measure of liquidity risk.

Using a large sample of 67,907 firm-year observations between 1988 and 2010 from the Compustat database, we examine the relation between firm value and duration gap. We use Tobin's Q to capture market valuation. A higher Q could be due to many other factors, so we

include a variety of control variables that theory suggests may also affect firm value in our multivariate regressions. We control for size, leverage, growth opportunities, corporate cash holdings, corporate governance, managerial ownership, credit quality, industry classification, and time effects. We find that both duration gap and abgap are negatively and significantly related to the firm value (Q), which suggests that firms with smaller gap/abgap are valued higher in the marketplace. These results are consistent with the hypothesis that hedging increases firm value.

However, an alternative explanation for this relation is that firms with high Qs tend to have low gap/abgap. That is, firms with higher Qs may have more incentives to hedge risks by matching the duration of their assets and liabilities. We therefore investigate the determinants of duration gap/abgap. As expected, variables which help determine debt maturity also help predict duration gap. Thus, this evidence is also consistent with firms that have high Q values, i.e. growth firms, choosing a lower duration gap.

To differentiate between these two relations, we consider a dynamic panel GMM model using lagged variables as instruments. This model suggests that there is a causal relation between lagged duration gap and Q values. Additionally, we consider an event study analysis using the Lehman Brothers bankruptcy as an exogenous shock to liquidity. Firms with higher duration gaps have more negative returns when this liquidity shock hits, again suggesting that that duration gap is related to liquidity risk and firm value.

The remainder of the article is organized as follows. Section 2 develops the hypotheses. Section 3 describes the data and variables. Section 4 presents our empirical results. Section 5 concludes.

2. Hypothesis Development

2.1 Duration Gap and Firm Value

We hypothesize that firms with smaller duration gaps or abgaps have greater value. Much of the previous literature focuses on off-balance-sheet hedging strategies, i.e. the use of financial derivatives. Smith and Stulz (1985) develop a theoretical model to show that hedging reduces tax liabilities, the expected cost of financial distress, and other agency costs. They argue that hedging lowers the probability that the firm faces financial distress by reducing the volatility of firm value, and thereby reduces the expected costs of financial distress. Bessembinder (1991) develops a model to show that corporate risk hedging with forward contracts increases firm value by reducing incentives to underinvest. He argues that hedging decreases the sensitivity of debt value to incremental investment, allowing equity holders to capture a larger portion of the incremental benefit from new investments and thereby reducing the underinvestment problem. Nance, Smith and Smithson (1993) provide evidence that hedging can control the underinvestment problem by reducing the probability that the firm defaults on its bond payments. Allayannis and Weston (2001) provide direct empirical evidence that foreign exchange hedging increases firm value. Graham and Rogers (2002) find that derivatives-induced debt capacity increases firm value by 1.1% on average. Similarly, we hypothesize that on-balance-sheet hedging increases firm value.

2.2 Debt Maturity Theory

Duration gap is closely (negatively) related to debt maturity. An existing literature considers how corporate debt maturity choice is a trade-off between the agency costs and term

premium of long-term debt, and higher liquidity risk (or refinance risk or rollover risk) of short-term debt.

Smith and Warner (1979) introduce the costly contracting hypothesis, wherein firms tradeoff between the cost of contracting for covenants and the agency costs of debt. Smith and Warner consider a number of possible ways that long-term debt creates agency costs and how covenants can reduce these issues. The agency conflicts they consider include excessive dividend payments, claim dilution, asset substitution, and underinvestment problems. Stulz (2000) argues that short-term debt can be a useful tool to monitor management as each possible rollover becomes an opportunity for debt holders to consider management's actions. Flannery (1986) suggests that issuing short-term debt sends a positive signal to investors about the firm's future credit quality, and this provides an additional incentive for firms to issue short-term debt.

Other theories favor the use of long term debt. For example, tax advantages to debt may lead to a preference for long-term debt. Brick and Ravid (1985) provide a tax-based rationale for an optimal maturity structure and show that long-term debt will increase the present value of the tax benefits of debt if the term structure of interest rates, adjusted for risk of default, is increasing. Diamond (1991) argues that debt maturity choice is a trade-off between the liquidity risk and the preference for short-term debt due to a borrower's private information of the firm's future credit worthiness. Diamond incorporates liquidity risk into his model and argues that long-term debt is preferred if firms are more concerned about liquidity risk. Johnson (2003) provides evidence that firms tradeoff the cost of underinvestment problems against the cost of liquidity risk when choosing short maturity.

A number of these theories suggest that debt maturity should match asset maturity. For example, Myers (1977) argues that matching the maturity of liabilities to assets in place can

reduce agency costs. Hart and Moore (1992) and Emery (2001) also develop models predicting that firms match the maturity of their assets and liabilities.

2.2.1 Duration Gap and Growth Opportunities

Myers (1977) argues that the use of long-term debt may cause the firm to underinvest in profitable projects, and thus that firms with more growth options may prefer short-term debt. Flannery (1986) instead suggests that high-growth firms may have large information asymmetry and therefore prefer issuing short-term debt. Several empirical studies support these prediction. Barclay and Smith (1995) and Guedes and Opler (1996) find a negative relation between debt maturity and growth opportunities. The liquidity risk hypothesis of Diamond (1991) suggests that growth firms should use long-term debt because they are more concerned about liquidity risk due to their substantial investments in intangibles. Johnson (2003) finds that firms tradeoff between underinvestment and liquidity effects when choosing the amount of short-term debt to use.

Duration gap and abgap are also related to firms' risk management, and can be used as an on-balance-sheet hedging tool. Nance, Smith and Smithson (1993) argue that hedging can control the underinvestment problem by limiting the states in which the firm would default on bond payments, Hence, firms with more growth opportunities are more likely to undertake a hedging strategy to reduce the variance of firm value. Based on this argument, firms with more growth opportunities are more likely to minimize both duration gap and abgap.

2.2.2 Duration Gap, CEO Ownership, and Corporate Governance

Managerial stock / option ownership is typically used to align the interests of managers and shareholders. Managers whose personal interests are more closely tied to firm performance may choose more short-term debt to reduce bondholder-stockholder conflicts. Datta et al. (2005) argue that managers whose personal interests are weakly aligned with shareholders would prefer to entrench themselves and therefore they choose long-term debt to reduce the potential discipline of external monitoring. They document a negative and significant relation between managerial stock ownership and corporate debt maturity. Additionally, CEOs with greater ownership may also be more concerned about the firms' liquidity risk if short-term debt holdings are too large. Morck, Shleifer and Vishny (1988) and McConnell and Servaes (1990) find a nonlinear relation between managerial ownership and firm value, which they interpret as reflecting increased alignment up to some ownership level, then increased entrenchment. We therefore hypothesize the existence of a nonlinear relation between ownership and duration gap.

Jiraporn and Kitsabunnarat (2007) suggest that if a firm has weaker shareholder rights, entrenched managers will prefer long-term debt so as to avoid more frequent monitoring by debt markets. In a similar vein, we predict that firms with stronger corporate governance have a more positive duration gap.

2.2.3 Duration Gap and Corporate Cash Holdings

Diamond (1991) shows that high quality firms tradeoff a preference for short-term debt due to knowing their credit ratings will increase against the greater liquidity risk inherent in short-term debt. Harford, Klasa, and Maxwell (2011) find that firms increase their cash holdings to mitigate the refinancing risk caused by shorter maturity debt. Higher cash balances may thus

be related to a lower duration gap, as cash is an asset with short (essentially zero) maturity. Alternatively, higher cash holdings may reflect greater liquidity risk from more short-term debts, and thus higher cash holdings may be positive related to duration gap.

3. Data Sources and Construction of Key Variables

3.1 Data Sources

We use five databases to create our sample: the Compustat industrial annual database, the executive compensation (Execucomp) database, the CRSP database, the Mergent Fixed Investment Securities Database (FISD), and the Riskmetrics IRRC Governance Legacy data. Our primary sample consists of all nonfinancial firms that are in the Compustat North America industrial annual database between the years 1988 and 2010 that have non-missing data on total assets, total liabilities, total current assets, total current liabilities, depreciation, and the number of common shares outstanding. We use CRSP returns data to estimate the beta and the cost of equity of a firm. A firm-year is included in our sample only when it is both in CRSP and Compustat databases. We exclude firms that have negative book value of equity or negative costs of goods sold. We obtained a total of 70,386 firm-year observations between 1988 and 2010. To estimate bond duration and bond book value, we collect bond issue data from Mergent Fixed Investment Securities Database (FISD). We then merge duration, yield-to-maturity, and bond issuance amount with the Compustat/CRSP merged data. We drop 2,479 observations with obvious contradictions between the data sets, i.e. if the total debt (the sum of long-term debt and current debt) is less than the book value of public bonds in FISD to get 67,907 firm-year observations. We winsorize all variables at the 0.5% level at each tail to ensure that our results are not driven by outliers.

3.2 Variables

3.2.1 Duration Gap

Duration gap analysis is typically used by financial institutions to measure interest rate risk (Flannery, 1981, Brewer, 1985, and Santomero and Babbel, 1997). Duration gap is equal to the difference between the Macaulay duration of assets and the duration of liabilities multiplied by the ratio of total liabilities to total assets. Macaulay duration is used for measuring the weighted average time to maturity of cash flows from a bond. The weight of each cash flow is determined by dividing the present value of the cash flow by the price of the bond, that is:

$$MacD = \sum_{i=1}^{n} \frac{t_i}{V(y_k)} * \frac{CF_i}{(1+{}^{y}/_{k})^{k-t_i}} \qquad (1)$$

In equation (1), t_i is the time in years until the i_{th} payment (cash flow) is received. $V(y_k)$ is the price of the bond; y is yield to maturity or discount rate; k is the coupon frequency or the number of cash flows received annually; and n is the total number of periods.

We also estimate the duration of total assets and total liabilities for our sample of nonfinancial firms. To calculate the Macaulay duration of total assets, we first estimate the value-weighted average maturity of total assets as in Stohs and Mauer (1996). We measure asset maturity as the book value weighted average of the maturities of current assets, net property, plant and equipment, and other intangible assets (excluding good will) divided by the annual flow for these items. That is, we estimate the maturity of current assets by the amount of current assets divided by the cost of goods sold. We estimate the maturity of net property, plant, and equipment by the book value of these assets divided by the annual depreciation expense. The maturity of other intangible assets is the amount of intangibles divided by the annual R&D expenses. We calculate the Macaulay duration of total assets assuming that operating cash flows

come in/out evenly over the life of assets at a daily frequency, so we set the k in equation (1) to 200 because the total number of the business days in one year is about 200.

We use the weighted average cost of capital (WACC) of the firm as the discount rate for assets. We estimate the WACC as follow: First, we estimate the beta of each firm for each month by running rolling regression using the prior 60 months stock returns. If the number of observations (months) is less than 24, the beta is dropped. The estimated betas are winsorized at the 5% level to avoid extreme large and small values. The cost of firm equity is estimated using a single factor capital asset pricing model using a 7% market premium. The WACC is the value weighted average costs of public bond, bank loans, and equity. The values used for the weights are the market value of equity and the book value of debt.

The cash flows (CF_i) in equation (1) are annual operating cash flows divided by 200. The number of periods (n) is equal to the average maturity of total assets multiplied by 200. We calculate the duration of the firm's total liabilities including all bonds, bank loans, and current liabilities. Unlike the operating cash flows which are hard to distinguish from different sources (assets), cash flows to liabilities claims are more certain and easier to identify. We estimate the durations of current liabilities, public bonds, and bank loans separately. As in Stohs and Mauer (1996), the maturity of current liabilities (MCL) is calculated by dividing the cost of goods sold by current liabilities, an estimate of the average time a firm's current liabilities are outstanding over a year.

We calculate the duration of firms' public bonds based on their cash flows (CF_i), which are based on the coupon rate, par value, and other features of bond. We use the yield to maturity at the time the bond was issued as the discount rate, and the durations do not change much with

changes in discount rates. For firms with multiple bonds outstanding, we calculate the value weighted average duration of all of the firm's bonds.

We calculate durations of bank loans based on the information available in the Compustat and FISD database. The Compustat database has the amount of long-term debt maturing in one through five years. Using the amount of public bonds maturing in each year from FISD, we estimate the amount of bank loans maturing in years one through five year by taking the difference. We assume that the balance of the firm's bank loans which mature after five years will mature in seven years. This maturity corresponds to the average maturity of bank loans in Dealscan with maturities over 5 years. We use the yield to maturity (YTM) of the public bond as the discount rate for the bank loan if the firm has a public bond outstanding. If the firm does not have any public bonds outstanding, we use the average YTM of all public bonds issued in that particular year with the same credit rating as the discount rate for bank loans.[17] We calculate a firm's bank loan duration assuming quarterly interest payments, i.e. we set the k in equation (1) equal to 4.[18]

The duration of total liabilities is then calculated as the value-weighted average duration of the debts, bank loans and current liabilities. Having estimated the average durations of total assets and total liabilities, we calculate the duration gap of all nonfinancial firms in our sample. Duration gap is calculated as (see, for instance, Iraj and Gordon, 2000):

$$\text{Duration Gap} = \text{Duration}_{\text{Total Assets}} - \text{Duration}_{\text{Total Liabilities}} * \text{Total Liabilities} / \text{Total Assets} \qquad (2)$$

[17] We only divide credit ratings into 5 categories: A, B, C, D and not rated.
[18] Based on DealScan Data, about half of corporate banks loans have a quarterly interest payments.

3.2.2 Firm Valuation

Our measure of firm performance and market valuation is based on Tobin's Q. Different Q estimates are used in the literature; however, in general, these different estimates of Q are closely correlated (see Chung and Pruitt, 1994). We estimate Q using the following equation:

$$Tobin's\ q = \frac{MV\ of\ Equity + liquidation\ value\ of\ preferred\ stock + Current\ \ liability + longterm\ debt}{BV\ of\ total\ assets} \quad (3)$$

3.2.3 Other Control Variables

We include a number of control variables in our multivariate tests. These include size, as measured by the log of total assets. We control for profitability using the ratio of operating profit to total assets. We include the ratio long-term debt plus short-term debt divided by total assets as a measure of leverage. We include variables for R&D spending as a fraction of total assets and advertising as a fraction of total assets, and we set these variables to zero if the firm does not report R&D or advertising expenses. We use the natural log of cash and cash equivalents to total sales to measure corporate cash holdings. We also include dummy variables for whether the firm's debt is investment grade, high-yield, and unrated.

The IRRC governance legacy database provides the G-index which measures the strength of a firm's antitakeover protection and is commonly used as a measure of corporate governance quality. We also extract the CEO's stock and option holdings from the Execucomp data. We use the percentage of firm's total equity owned by its CEO to measure managerial ownership and the square of CEO ownership to capture possible nonlinearities. We include two-digit SIC industry dummies and year dummies in all the regressions.

3.3 Descriptive statistics

Table 2-1 reports the descriptive statistics for variables used in the main regression models. The mean (median) Tobin's Q is 1.92 (1.36). The mean (median) duration gap and abgap are 0.91 (0.5) and 1.11 (0.610), respectively.

Table 2-2 reports the correlations between the key variables. The sign of the correlation coefficients between the dependent variables and the explanatory variables are generally consistent with expectations. Almost all correlations are significantly different from zero at 5% level. The correlation between Q and duration gap is -0.087, and the correlation between Q and abgap is -0.121. Duration gap is positively correlated to capital expenditures as firms with higher capital expenditure invest more on long term assets. Both Gap and abgap are negatively related to R&D and advertising expenses, and gap is negatively related to corporate cash holdings.

4. Empirical results

4.1 The determinants of duration gap and abgap

We examine the determinants of duration gap and abgap in Table 2-3. We primarily consider firm characteristics with a focus on variables that have previously been shown to effect debt maturity. We also include governance and managerial ownership variables as these have also been shown to effect debt maturity (see, for instance, Datta et al., 2005). We lag the independent variables to reduce simultaneity, and report standard errors with clustering by firm.

Models 1 and 2 of Table 2-3 examine the determinants of duration gap, and Models 3 and 4 examine the determinants of abgap. Models 1 and 3 are the basic regression models for gap and abgap, and models 2 and 4 add governance and CEO holdings variables.

We find a significant negative relation between lagged Q and gap/abgap in all the models. This finding is somewhat surprising given Myers (1977) suggestion that firms with more growth opportunities should more closely match their assets and liabilities durations. Gap is positively and significantly related to the capital expenditure of a firm. Firms which invest more have greater PPE, and therefore they have a higher duration gap. Firms with higher leverage have lower gap possibly because those firms which borrow more use more long-term debt to reduce liquidity risk (Diamond 1991). Highly leveraged firms may also have a greater need to balance their asset and liability durations, and this may lead to the negative relation between leverage and abgap. However, this relation is positive for the full sample which includes smaller firms while it is negative for the smaller sample which includes governance and ownership controls.

We find no significant relation between firm size and duration gap. The existing literature (see, for instance, Barclay and Smith, 1995 and Stohs and Mauer, 1996) finds that debt maturity rises with firm size. However firms' asset maturity also rises with size and therefore the gap has no significant relation with firm size.

Counter to the raw correlations, we find a positive and significant relation between gap and lagged cash holdings. Greater cash holdings may allow firms to use more short term debt, and this may account for the positive association between cash holdings and gap.

Consistent with Jiraporn and Kitsabunnarat (2007), who find that debt maturity decreases with stronger shareholder control, the relation between the Gindex and gap or abgap is negative. However, these coefficients are not significantly different from zero at the 5% level. Also, CEOs with greater equity ownership have a higher duration gap. This relation is consistent with CEOs with greater incentives using short term debt to reduce agency costs (also see Datta et al, 2005)

Following Harford et al (2008), we also run multivariate regressions to examine whether duration gap can predict corporate cash holdings. Specifically, we add a lagged duration gap or abgap variable into their regression model. The results are presented in Table 2-4. A larger lagged gap or abgap is associated with a higher ratio of cash holdings to sales. This is consistent with causation in both directions between cash holdings and duration gap. That is, if a firm has a higher duration gap, it will have greater liquidity risk, and it may choose to hold more cash to mitigate this risk. These results are consistent with Harford, Klasa and Maxwell (2011) who find evidence that firms increase their cash holdings and save more cash flows to mitigate the refinancing risk caused by shorter maturity debt.

4.2 Firm value and duration gap and abgap

4.2.1 Firm value and duration gap

We next examine the relation between firm value and duration gap while controlling for other variables. We again estimate pooled regressions with standard errors corrected for clustering at the firm level. We use lagged independent variables to help decrease lead-lag issues. Existing theories predict that hedging increases firm value, and empirical tests generally support this prediction. For instance, Allayannis and Weston (2001) find a positive relation between firm value (Tobin's Q) and the use of foreign currency hedging. Carter, Rogers and Simkins (2006) find that jet fuel hedging is positively related to airline firm value and that most of the hedging premium is attributable to the impact of hedging on investment.

Table 2-5 reports the empirical results of the relation between duration gap and firm value. All models include two-digit industry dummies and year dummies. Model 1 is the basic model which includes control variables based on previous studies. Model 2 includes three

additional variables related to agency theory: Gindex, CEO ownership, and the square of CEO ownership.

Models 3 and 4 add lagged Q to our existing specifications. These specifications more fully control for autocorrelation. Not surprisingly, Q is highly correlated to lagged Q with coefficients just over 0.6, and the R-squared roughly doubles after adding lagged Q. The coefficients on lagged gap are significant and negative in models 1 through 3, and significant at the 10% level in model 4. These results suggest that a higher duration gap is associated with lower firm value even after controlling for lagged Q. That is, hedging liquidity risk through lowering duration gap is associated with a higher firm value.

As in the existing literature, we find a significantly positive relation between CEO ownership and Q, and a marginally significant negative relation between the squared CEO ownership and firm value in model 2 of Table 2-5, suggesting that there exists an inverse U-shaped relationship between firm value and CEO ownership (Morck et al., 1988; McConnell and Servaes, 1990). The other control variables are also generally consistent with previous literature.

4.2.2 Firm value and the absolute value of gap

Table 2-6 reports the relation between firm value and the absolute value of gap. The coefficients on abgap are negative and significant in models 1 through 3, and negative with a p-value of 0.063 in model 4. Overall, our results indicate that lower abgap is associated with a higher firm value, which is consistent with the hypothesis that hedging interest rate risk through duration matching increases firm value. These results suggest that firms with better matched duration of assets and liabilities are valued higher in the market place. However, the results may

also be due to some simultaneity issues which are not fully accounted for in an OLS regression. We therefore turn to a dynamic system GMM to further test these results.

4.2.3 Robustness Tests: Panel Fixed Effect Models and System GMM

We run panel fixed-effect regressions clustered at the firm level for our Q regressions. We also consider a panel data model following Arellano and Bond (1991) for our Q regressions using lagged variables as instruments. The results are presented in Table 2-7.

For the firm fixed effect regressions in columns 1 and 2, the coefficients on gap and abgap are negative, although the abgap coefficient is only significant at the 10% level. These results more strongly suggest that within firm changes in duration gap affect Q.

In columns 3 and 4 of Table 2-7 we present our system GMM results. In column 3, we present the results using gap lagged two and three times as instruments. This regression meets the necessary autocorrelation criteria as the remaining residuals do not follow an AR(2) process. As in the other regressions a longer gap is associated with lower Q values, again suggesting that firms which have longer assets than liabilities have lower market values. In column 4 we consider a regression with abgap; however, for this specification using instruments with two and three lags did not provide a valid specification. The residuals had an AR(2) correlation structure. We therefore report a specification using only instruments lagged three times, however the estimated coefficient on abgap is now positive and insignificant. This may imply that we need better instruments to determine the relation between abgap and Q, or that the absolute value of gap does not have the same negative causal relation to Q that we find for the duration gap.

4.2.4 A Liqudity Event Study

Firms with large discrepancies between the duration of their assets and liabilities may be more sensitive to liquidity shocks. In particular, we hypothesize that a firm with long-term assets but short-term debt (a greater duration gap) will be highly vulnerable to liquidity shocks. We consider the Lehman Brothers Chapter 11 bankruptcy filing in 2008, just at the onset of the financial crisis, as a potential liquidity shock for this hypothesis. Lehman Brothers filed for Chapter 11 bankruptcy protection on September 15, 2008 as a result of holding large positions in subprime mortgage securities. The Dow Jones closed down over 500 points (−4.4%) on September 15, 2008, at the time the largest drop by points in a single day since the days following the attacks on September 11, 2001.

We use the market model to estimate the abnormal returns of all firms in our sample and examine whether firms with higher duration gap or abgap have experienced a larger drop in price. We run OLS and quantile regressions to test the effect of gap and abgap on abnormal return given this liquidity shock. The abnormal returns are very noisy with high kurtosis, therefore we winsorize them at the 5% for each tail for OLS, or instead perform quantile regressions to get the median effect. The regression results are in the panel A of the Table 2-8. A higher duration gap is significantly negatively related to abnormal returns. A similar result holds for abgap, although the results are significantly different from zero only using quantile regression, not OLS. These results show that firms with a greater duration mismatch had greater liquidity risk, and thus fared worse when a liquidity shock hit.

5. Conclusion and Summary

The paper investigates the determinants of firms' duration gap / abgap, and whether firms which better hedge their on-balance sheet liabilities have higher values. The determinants of duration gap are largely consistent with existing debt maturity theories, such as agency costs and liquidity risk. Specifically, our empirical tests show that duration gap is related to corporate cash holdings, growth opportunities, profitability, corporate governance and managerial ownership.

Moreover, we examine whether firms with better matched asset and liability duration are rewarded in the market place. We find a significantly negative relation between Tobin's Q (a proxy for firm value) and duration gap / abgap. This result is robust to various controls (size, profitability, cash holdings, credit, growth opportunities, industry, etc.), and also holds using a dynamic GMM estimation. In summary, hedging through on-balance-sheet strategies is associated with an increase in firm value. Additionally, as expected, firms with greater duration gaps fare worse during the well-documented liquidity shock around the Lehman Brothers bankruptcy.

Table 2-1

Summary statistics of key variables

This table reports the summary statistics of our main variables. Our sample consists of 64428 firm year observations between 1988 and 2010. Q is the Tobin's q. Gap is the duration gap between firms' total assets and total liabilities. Abgap is the absolute value of the Gap. Tangi is estimated as the ratio of PPE to total assets. Cashtosales is the ratio of total cash to total sales. In the regression, we use the natural log of Cashtosale (cash holdings). Profit is the ratio of total earnings before interest and tax to total assets. Size is the natural log of total assets. Advertising is the ratio of the advertising expense to total assets. R&D is the ratio of total R&D expenses to total assets. CapEx is the ratio of total capital expenditures to total assets. Leverage is the ratio of total debt to total assets. M/B is the ratio of market value to book value of common equity. CEO_Equity% is the percent of CEO ownership in the firm. CEO ownership is the percentage of equity owned by CEOs. Gindex is the corporate governance index developed by Gompers et al (2003). Abn_lhm is the abnormal return on September 15, 2008 when Lehman Brother filed for Chapter 11 bankruptcy protection.

Variable	N	Mean	Mdn	S.D.	Min	Max
Q	67907	1.92	1.36	1.71	0.44	13.29
Duration Gap	67907	0.91	0.5	1.52	-1.85	8.65
AbGap	67907	1.11	0.61	1.38	0.01	8.65
Cashtosales	67731	0.98	0.08	5.68	0.00	66.93
Profit	67498	0.00	0.06	0.23	-1.37	0.38
Size	67907	4.97	4.85	2.03	0.51	10.61
Advertising	67907	0.01	0.00	0.04	0.00	0.31
R&D	67907	0.06	0.00	0.12	0.00	0.83
CapEx	67340	0.06	0.04	0.06	0.00	0.41
Leverage	67907	0.2	0.17	0.19	0.00	0.77
CEO_equity(in %)	18612	3.42	0.86	7	0.00	48.04
Gindex	15940	8.7	9	2.66	3	16
abn_lhm (in %)	2510	0.18	0.74	-4.41	57.89	19.64

Table 2-2

Pairwise Pearson correlations

Correlations in bold are significantly different from zero at the 5% level.

		1	2	3	4	5	6	7	8	9	10	11	12
Q	1	1											
Gap	2	**-0.087**	1										
AbGap	3	**-0.121**	**0.922**	1									
Cashtosales	4	**0.164**	**-0.016**	**-0.034**	1								
Profit	5	**-0.219**	**0.092**	**0.095**	**-0.296**	1							
Size	6	**-0.150**	**0.130**	**0.173**	**-0.088**	**0.381**	1						
Advertising	7	**0.012**	**-0.069**	**-0.068**	**-0.045**	**0.020**	**-0.028**	1					
R&D	8	**0.372**	**-0.170**	**-0.210**	**0.285**	**-0.609**	**-0.252**	**-0.054**	1				
CapEx	9	**0.014**	**0.331**	**0.312**	**-0.061**	**0.075**	**0.058**	-0.006	**-0.116**	1			
Leverage	10	**-0.248**	**0.035**	**0.207**	**-0.091**	**0.075**	**0.203**	**-0.049**	**-0.254**	**0.106**	1		
CEO_equity(in %	11	**0.075**	**-0.007**	**-0.031**	0.008	**0.040**	**-0.228**	**0.056**	**-0.033**	**0.078**	**-0.106**	**1**	
Gindex	12	**-0.114**	**0.027**	**0.046**	**-0.044**	**0.040**	**0.201**	**-0.043**	**-0.101**	**-0.041**	**0.097**	**-0.191**	**1**

Table 2-3

Determinants of duration gap and abgap

This table examines the determinants of firms' duration gap and the absolute value of gap (abgap). All explanatory variables are lagged one period. Standard errors are estimated with clustered errors at the firm level. P-values are reported in parentheses below the coefficients. Superscripts *, **, and *** indicate significance at 5%, 1%, and 0.1% levels, respectively. Though not reported, all models include credit rating dummy, industry dummy, and year dummy as well as an intercept term. All variables are defined in Table 2-1.

	Dependent Variable: Gap_{t+1}		Dependent Variable: $Abgap_{t+1}$	
	(1)	(2)	(3)	(4)
Q_t	-0.0199***	-0.0390***	-0.0124**	-0.0314**
	(0.000)	(0.000)	(0.003)	(0.002)
Cash $holdings_t$	0.0360***	0.00367	0.0212***	-0.00187
	(0.000)	(0.793)	(0.000)	(0.882)
$Profit_t$	0.455***	0.388**	0.321***	0.373**
	(0.000)	(0.008)	(0.000)	(0.006)
$Size_t$	0.00715	0.0239	0.00888	0.0342
	(0.462)	(0.394)	(0.324)	(0.177)
$Leverage_t$	-0.801***	-1.704***	0.245***	-0.272*
	(0.000)	(0.000)	(0.001)	(0.046)
$Advertising_t$	-1.587***	-2.869***	-1.175***	-2.102***
	(0.000)	(0.000)	(0.000)	(0.000)
$CapEx_t$	3.460***	3.325***	2.509***	2.528***
	(0.000)	(0.000)	(0.000)	(0.000)
$Gindex_t$		-0.0152		-0.0108
		(0.096)		(0.180)
$CEO\_equity\%_t$		0.0130*		0.0110
		(0.048)		(0.067)
$Square\_ceoeqt_t$		-0.000220		-0.000174
		(0.162)		(0.221)
N	57147	10926	57147	10926
adj. R-sq	0.401	0.504	0.398	0.498

Table 2-4

Corporate cash holdings and duration gap

This table examine the relation between firms' cash holdings and duration gap / abgap. All explanatory variables are lagged one period. Standard errors are estimated with clustered errors at the firm level. P-values are reported in parentheses below the coefficients. Superscripts *, **, and *** indicate significance at 5%, 1%, and 0.1% levels, respectively. Though not reported, all models include credit rating dummy, industry dummy, and year dummy as well as an intercept term. All other variables are defined in Table 2-1.

	Dependent Variable: Cashholdings $_{t+1}$		
	(1)	(2)	(3)
Cashholding $_t$	0.688***	0.687***	0.687***
	(0.000)	(0.000)	(0.000)
Gap $_t$		0.0288**	
		(0.009)	
Abgap $_t$			0.0269*
			(0.025)
Gindex	-0.00861*	-0.00787	-0.00805
	(0.050)	(0.072)	(0.065)
Ceo_equity %	0.000916	0.000834	0.000793
	(0.545)	(0.580)	(0.599)
Size	0.0851***	0.0848***	0.0851***
	(0.000)	(0.000)	(0.000)
Leverage	-0.492***	-0.444***	-0.481***
	(0.000)	(0.000)	(0.000)
M/B	0.00682*	0.00733*	0.00719*
	(0.047)	(0.036)	(0.038)
Cftoasset	0.0927	0.0989	0.0942
	(0.372)	(0.341)	(0.364)
Wcapt	1.485***	1.519***	1.513***
	(0.000)	(0.000)	(0.000)
R&D	1.365***	1.402***	1.399***
	(0.000)	(0.000)	(0.000)
capxtoasset	-1.308***	-1.357***	-1.332***
	(0.000)	(0.000)	(0.000)
aqc1	-0.425**	-0.428**	-0.421**
	(0.002)	(0.002)	(0.002)
div	-0.121***	-0.122***	-0.122***
	(0.000)	(0.000)	(0.000)
std_cf	0.0540***	0.0537***	0.0537***
	(0.000)	(0.000)	(0.000)
N	7884	7884	7884
adj. R-sq	0.807	0.807	0.807

Table 2-5

Firm value and duration gap

This table examines the relation between firm value (Q) and duration gap using pooled regressions with standard error adjusted for clustering at the firm level. All explanatory variables are lagged one period. P-values are reported in parentheses below the coefficients. Superscripts *, **, and *** indicate significance at 5%, 1%, and 0.1% levels, respectively. Though not reported, all models include credit rating dummy, industry dummy, and year dummy as well as an intercept term.

	Dependent Variable: Q_{t+1}			
	(1)	(2)	(3)	(4)
Q_t			0.616***	0.626***
			(0.000)	(0.000)
Gap_t	-0.0496***	-0.0428**	-0.0220***	-0.0122
	(0.000)	(0.002)	(0.000)	(0.063)
Cash holdings $_t$	0.123***	0.166***	0.0282***	0.0346***
	(0.000)	(0.000)	(0.000)	(0.000)
$Profit_t$	0.0713	4.831***	-0.152**	1.053***
	(0.549)	(0.000)	(0.009)	(0.000)
$Size_t$	-0.0636***	-0.0150	-0.0258***	-0.00585
	(0.000)	(0.512)	(0.000)	(0.572)
$Leverage_t$	-0.667***	-0.690***	-0.126***	-0.177*
	(0.000)	(0.000)	(0.000)	(0.024)
$Advertising_t$	1.209***	1.645*	0.562***	0.685*
	(0.000)	(0.016)	(0.001)	(0.026)
$R\&D_t$	3.977***	6.693***	1.504***	2.398***
	(0.000)	(0.000)	(0.000)	(0.000)
$CapEx_t$	2.200***	1.468***	0.203*	-0.199
	(0.000)	(0.001)	(0.026)	(0.380)
$Gindex_t$		-0.00773		0.00130
		(0.287)		(0.689)
$CEO\_equity\%_t$		0.0216**		0.00354
		(0.005)		(0.373)
$Square\_ceoeqt_t$		-0.000547**		-0.00000983
		(0.008)		(0.929)
N	57147	10926	57147	10926
adj. R-sq	0.227	0.366	0.541	0.636

Table 2-6

Firm value and abgap

This table examines the relation between firm value and the absolute value of duration gap using pooled regression. All explanatory variables are lagged one period. Standard errors are estimated with clustered errors at the firm level. P-values are reported in parentheses below the coefficients. Superscripts *, **, and *** indicate significance at 5%, 1%, and 0.1% levels, respectively. Though not reported, all models include credit rating dummy, industry dummy, and year dummy as well as an intercept term.

	Dependent Variable: Q_{t+1}			
	(1)	(2)	(3)	(4)
Q_t			0.617***	0.626***
			(0.000)	(0.000)
$Abgap_t$	-0.0373***	-0.0398**	-0.0189***	-0.0137
	(0.000)	(0.009)	(0.000)	(0.063)
Cash holdings $_t$	0.123***	0.166***	0.0279***	0.0345***
	(0.000)	(0.000)	(0.000)	(0.000)
$Profitability_t$	0.0690	4.836***	-0.153**	1.054***
	(0.563)	(0.000)	(0.009)	(0.000)
$Size_t$	-0.0643***	-0.0150	-0.0260***	-0.00576
	(0.000)	(0.512)	(0.000)	(0.578)
$Leverage_t$	-0.607***	-0.620***	-0.0980**	-0.158*
	(0.000)	(0.000)	(0.002)	(0.038)
$Advertising_t$	1.246***	1.670*	0.575***	0.687*
	(0.000)	(0.014)	(0.000)	(0.025)
$R\&D_t$	3.999***	6.700***	1.510***	2.397***
	(0.000)	(0.000)	(0.000)	(0.000)
$CapEx_t$	2.104***	1.421**	0.168	-0.206
	(0.000)	(0.001)	(0.063)	(0.365)
$Gindex_t$		-0.00750		0.00133
		(0.302)		(0.681)
CEO_equity% $_t$		0.0215**		0.00354
		(0.005)		(0.373)
Square_ceoeqt $_t$		-0.000545**		-0.00000954
		(0.008)		(0.931)
N	57147	10926	57147	10926
adj. R-sq	0.227	0.366	0.541	0.636

Table 2-7

Robustness tests

This table examines the relation between firm value, and gap and the absolute value of gap using panel fixed-effect clustered at firm level (models 1 and 2) and Arellano-Bond dynamic GMM models (models 3 and 4). Standard errors are estimated with clustered errors at the firm level. P-values are reported in parentheses below the coefficients. Superscripts *, **, and *** indicate significance at 5%, 1%, and 0.1% levels, respectively. Though not reported, all models include credit rating dummy, industry dummy, and year dummy as well as an intercept term.

Dependent Variable:	Q_{t+1}		Q_t	
	Panel Fixed Effect Models		Arellano-Bond GMM Models	
	(1)	(2)	(3) [19]	(4) [20]
Q_{t-1}			0.0398	0.390
			(0.726)	(0.174)
Gap_t	-0.0324**		-0.0834*	
	(0.008)		(0.023)	
$Abgap_t$		-0.0239		0.0168
		(0.068)		(0.685)
Cash holdings $_t$	0.0373***	0.0371***	-0.0979	0.115
	(0.000)	(0.000)	(0.141)	(0.435)
$Profit_t$	0.692***	0.691***	1.062	0.0710
	(0.000)	(0.000)	(0.120)	(0.972)
$Size_t$	-0.482***	-0.484***	-0.298*	-0.0873
	(0.000)	(0.000)	(0.013)	(0.746)
$Leverage_t$	-0.294***	-0.246**	-0.972	-2.851
	(0.000)	(0.001)	(0.269)	(0.169)
$Advertising_t$	0.265	0.274	-19.05**	9.957
	(0.603)	(0.590)	(0.007)	(0.459)
$R\&D_t$	2.830***	2.835***	2.514	3.579
	(0.000)	(0.000)	(0.435)	(0.490)
$CapEx_t$	0.647***	0.605***	1.498	1.085
	(0.000)	(0.000)	(0.244)	(0.786)
N	57298	57298	55903	55903

[19] The lag 2 and lag 3 of gap are used as instruments. P-value of the Sargan test is 0.242 and P-value of Arellano-Bond test for AR (2) is 0.292.

[20] The lag 3 of abgap is used as instrument. P- value of the Sargan test is 0.360 and P-value of Arellano-Bond test for AR(2) is 0.305

Table 2-8

Duration gaps and the Lehman Brothers bankruptcy: an event study analysis

This table reports the regression results of the event of Lehman Brother Bankruptcy. The dependent variable is the abnormal return on September 15, 2008 when Lehman Bankruptcy filed for Chapter 11 bankruptcy protection. [21]

	Dependent Variable: Abn_lhm			
	OLS regression		Quantile regression	
	(1)	(2)	(3)	(4)
Gap	-0.0792*		-0.106**	
	(0.037)		(0.003)	
AbGap		-0.0585		-0.112**
		(0.160)		(0.006)
_cons	0.357***	0.350***	0.829***	0.879***
	(0.000)	(0.000)	(0.000)	(0.000)
N	2512	2512	2512	2512

[21] The abnormal return is left skewed with a mean of 0.18% and a median of 0.75%.

CHAPTER THREE: REEXAMINING CAPITAL STRUCTURE THEORY- EVIDENCE FROM CHINESE LISTED COMPANIES

1. Introduction

Capital structure policy remains as one of the most puzzling but interesting topics in finance research, particularly for transition developing countries. The major purpose of this paper is to reexamine capital structure decisions of companies in the largest emerging economy, China. We intend to extend our knowledge of how structural reforms implemented in China during the last decade impact financing behaviors of its publicly-listed nonfinancial companies and to what extent their financing behaviors are in line with the main stream capital structure theories, namely the trade-off and pecking order theories.

Both trade-off and pecking order theories explain capital structure by examining the impact of market frictions. The former theory emphasizes costs of bankruptcy, financial distress and agency problems and predicts that trade-offs of those costs against benefits of debt (including tax advantage and reducing free cash flow agency costs) imply an optimal capital structure in firms. In contrast, the pecking order theory focuses on the cost of imperfect information and predicts no well-defined target capital structure. Instead, it suggests that information asymmetries that exist between the managers of a firm and potential investors cause adverse selection problems, which in turn lead to a financing hierarchy where internal financing is preferred over external financing and debt is preferred over equity. These two theories have intrigued much interest of researchers for the last few decades and an enormous body of empirical studies has been developed to examine the effectiveness in their explanations, with the

majority being conducted in the context of developed markets.[22] However, capital structure issues in transition economy have not been widely investigated and have still remained ambiguous.

It is important for academics, financial managers, and policy makers to examine financing practices of publicly listed companies in transition countries and compare them to those in developed markets. This will offer new insights about how growing market forces and financial privatization transform the dynamics of companies' capital structure choices. In transition markets, government and state-owned commercial banks play a considerable role in the financial system and capital allocation, and this role implies a structural imbalance and market inefficiency in the economy. Very recently these transition countries have been implementing a series of structural reforms to shift towards the free market economy to improve the efficiency and competitiveness of the economy. This kind of structural transformation yields a big impact on firms' financing behaviors and therefore allows us to examine the impact of institutional changes on capital structure choices in transition economies. Undoubtedly, China has become the most successful transitional economy in the last decade and emerged as a major world economic power. In particular, since entering the new Millennium, China has intensified its efforts to enhance the openness of its economy and liberalized its financial system by establishing a series of new structure reforms, and gained significant achievements.[23] Hence, China offers an ideal ground for testing the explanatory power of the two capital structure theories and examining their practical implications for transition economies.

Although several studies investigate capital structure of Chinese listed companies (e.g., Qian et al. (2009)), we are far from reaching a well-accepted conclusion, prompting a necessity

[22] For example, Shyam-Sunder and Myers (1984), Bradley et al (1984), and Leary and Robert (2005)
[23] For example, the 2005 share structure reform implemented in 2006 has significantly changed investors' ability to trade corporate equities and improved market efficiency.

to extend our knowledge of Chinese financing behaviors using novel empirical models and more recent data. Specifically, main motivations for this study are as follows. First, most of existing studies testing the trade-off theory in Chinese markets assume that the observed leverage ratio is optimal and examine the determinants of optimal capital structure using static models (e.g., Chen (2004), Huang and Song (2006), and Qian et al. (2008)). Qian et al. (2009) argue that the presence of adjustment costs may prevent firms from quickly moving back to their optimal leverage levels, causing actual (observed) leverage ratios to differ from the optimal levels. They follow Flannery and Rangan (2006) and employ a dynamic trade-off model (a.k.a. the partial adjustment model), which allows for a gradual adjustment of the leverage ratio toward the target level. Qian et al.(2009) show that Chinese firms adjust their leverage towards the target at a very slow rate of 0.185 during the period from 1999 to 2004, which is far slower than the speed with which firms in the developed countries undertake leverage adjustment as documented by Shyam-Sunder and Myers (1999), De Miguel and Pindado (2001), Flannery and Rangan (2006), and Byoun(2008), Dang (2013). [24] However, the aforementioned empirical studies testing the trade-off theory in Chinese markets focus on periods before the completion of the recent share structure reform.[25] Campello et al .(2012) argue the share structure reform that was launched in 2005 and scheduled to be completed in 2006 has significantly changed corporate behaviors in China. Incorporating the post-reform data gives us an opportunity to examine whether the explanatory power of capital structure theories is enhanced with the improvement in market efficiency and privatization.

Second, the existing empirical studies in Chinese market ignore the fact that costs of adjusting leverage may also change as firms move toward target leverage (See Maddala (2001)

[24] It is well documented in the literature that firms in the developed markets (e.g. US, UK, German, French, Spain, etc) adjust toward their target leverage at a speed of more than 0.3.

25 The existing empirical studies that test Chinese listed companies have been based on the data before year 2005.

and Dang (2013)). Correspondingly, the long term effect of the target leverage ratio on the current leverage ratio, which may offer us new insights on their financing practices, has never been tested for Chinese listed companies. Last but not least, previous empirical studies in the Chinese market only test the pecking order or trade-off theories separately. Recent research nests both theories in a single specification and examines them simultaneously (e.g., Shyam-Sunder and Myers (1999), Leary and Roberts (2005), Flannery and Rangan (2006), and Dang (2010, 2013)). This novel empirical methodology allows us to examine both theories jointly and decide which one is better in explaining the capital structure in Chinese listed firms.

We contribute to the literature in the following four areas. First, this is the first paper to include most recent data to examine the impact of China's recent share structure reform[26] on firms' financing behavior. Specifically, our sample period spans from 2000 to 2011. We divide the sample into two sub-samples, Pre-reform (2000 – 2006) and Post-reform (2007-2011), and run regressions for the two periods separately. Unlike Qian et al (2009), our analysis of the full sample shows that Chinese firms adjust to target capital structure at a speed comparable to those in developed markets. More interestingly, we find that the speed of adjustment in the Pre-reform period is consistent with the findings in Qian et al (2009) but Chinese firms accelerate their adjustment speed during the Post-reform period. Intuitively, increasing liberalization and privatization in Chinese financial market reduce agency problems between shareholders and creditors and give business managers more flexibility in financing choices, leading to lower costs that firms face to adjust towards their target leverage and hence higher speed of adjustment.

Second, we adopt the error correction model (ECM) in the empirical test. To the best of our knowledge, this is the first paper using the error correction model to examine the target

[26] This is also called the split share structure reform, which mandated the conversion of previously non-tradable shares to tradable shares by year 2006.

adjustment theory of capital structure in Chinese listed firms. The co-integration test shows that firms' actual leverage and target leverage are co-integrated, which requires us to use the ECM to examine both the short-run adjustment dynamics towards the long-run target leverage ratio and the long-run relationship between the actual leverage ratios and the target leverage ratio. We find that there are potential short run and long run effects of the target leverage ratio on leverage adjustments among Chinese listed firms with short run adjustment corresponding to target leverage change being much faster than long run adjustment corresponding to the past divergence from target leverage.

Third, we employ various econometric methods to estimate our regression models. The classical OLS estimators and two-stage OLS estimators are biased when the underlying assumptions are violated. Specifically, the datasets for the capital structure test are usually characterized by large individual observations (large "N") and few time periods (small "T") with possibly endogenous independent variables, fixed effects, heteroskedasticity, and autocorrelation. In response to these issues, previous researchers suggest that fixed effect estimator may solve some of the above problems, whereas the dynamic panel data estimators (i.e. Difference GMM and System GMM) proposed by Arellano and Bond (1991) and Arellano and Bover (1995) and Blundell and Bond (1998)) may address all of these problems. Herein, we apply all three estimators-Fixed effect, Difference GMM, and System GMM -to estimate various specifications and compare the results.

Lastly, we not only examine the pecking-order and trade-off theories in isolation, but also nest two theories in one single specification to examine one theory against another for Chinese firms. Overall, our results suggest that financing behaviors of Chinese companies are not consistent with what is predicted by the pecking-order theory. Instead, the dynamic trade-off

theory can explain the financing behaviors of Chinese companies especially in Post-reform period.

The remainder of the paper is organized as follows. Section 2 reviews Chinese recent structural reforms. Section 3 provides a selected literature review. Section 4 describes the main data sources and provides descriptive statistics on capital structure variables. Section 5 presents the empirical methodology and test results of the pecking-order theory. Section 6 tests the static trade-off models and examines the determinants of capital structure of Chinese listed firms. Section 7 and 8 discuss the methodology and test results of two different types of the dynamic trade-off models, including the partial adjustment models and error correction models. Conclusions and empirical implications are provided in Section 9.

2. Overview of recent Chinese structural reforms

China launched its historical transition from a planned to a market economic system in 1978 and began to privatize the public sectors and state-owned industries in the late 1980s and 1990s. However, China, like other transition developing countries, relied on a state-supported route for economic development in the very beginning with a relatively small private corporate sector. Most of Chinese listed companies had a large percentage of non-tradable state shares and non-tradable legal person shares[27] until very recently. The significant roles of the government and the state ownership with excessive government involvement in the financial system adversely hampered the healthy growth of the capital markets and entire economy. As it entered into the new century, China intensified its efforts to increase the openness of the economy and sped up its privatization of the state-owned enterprises. For example, as a milestone in its reform

[27] Those are shares held by state-owned enterprises, institutions, authorized social groups or other entities that have been granted "legal person" status.

and opening-up policies, China joined the World Trade Organization (WTO) in December, 2001 and began to strengthen its integration with the international economy. As another sign that China is loosening its tight grip over the economy, the government began to gradually reform its currency policy in 2005 by increasing the flexibility of the exchange rates. The increasing integration with the measures that have been taken to improve financial liberalization (e.g. the introduction of Qualified Foreign Institutional Investor (QFII) program to lower entry barriers for foreign investors) brings new challenges and opportunities for Chinese firms to compete in the international market and thus, make it more urgent for their business managers to seek optimal financing plans for their investment activities in order to sharpen their competitiveness in the global markets.

The most significant reform is the share structure reform launched in 2005 to grant legitimate trading rights to the non-circulating state-owned shares. Over 70% of total shares in Chinese stock market were non-tradable in 2004. The 2005 split-share reform mandated a conversion of the non-tradable shares to tradable shares. Campello et al (2012) and Liao et al.(2014) document that most of Chinese listed firms completed the reform during 2005-2006 and only 2% of the firms failed to comply the deadline of the December 2006 (most of those complied in January 2007). It opened up the door to China's secondary privatization. Overall, the Chinese economic transformations and the extensive privatization that have unfolded since year 2000 offered business managers more flexibility in determining the capital structure of the companies and therefore, significantly changed their corporate financing behaviors.

The share structure reform significantly increased the trading activities in the secondary stock market, and improved the liquidity and depth of the Chinese stock market. On the one hand, as argued by Campello et al (2012), the increase in secondary market liquidity makes it easier and

cheaper for firms to obtain funding from the primary equity market, and potentially reduces the transaction (i.e. issuing or repurchase) costs of equity. This change in transaction costs due to the reform provides a perfect setting to test partial adjustment model. On the other hand, the increased trading volume and transactions may convey more information about firms' prospects (Bekaert and Havey (2000)) and potentially improve the transparency of financial market, which could change the driving force of the pecking-order behavior of corporate financing, namely the asymmetric information problems. Hence, China's economic transformation and privatization process provide an ideal ground for examining the explanatory power of capital structure theories. We expect that the financing practices of Chinese listed firms during last decade would be akin to those displayed in the developed markets and would be more consistent with theoretical predictions.

3. literature review

Early empirical capital structure research has concentrated on testing implications of two traditional theories: the static tradeoff theory (Bradley et al (1984) and the pecking-order theory (Myers (1984)). But the empirical results are far from conclusive. For example, Shyam-Sunder and Myers (1999) and Lemmon and Zender (2010) provide evidence supporting the pecking order theory, while Frank and Goyal (2003) and Leary and Roberts (2005) provide evidence against the pecking order theory. Literature on the static trade-off theory also provided mixed results (Graham and Harvey (2001) Graham (2000)) and Welch (2004)). Recently, researchers have recognized the potential for incomplete adjustment (i.e., the partial adjustment), which has moved the literature toward the test of the dynamic tradeoff model (Flannery and Rangan (2006),

Huang and Ritter (2009), DeAngelo and Roll (2011), Antoniou et al. (2008), Faulkender et al (2012), and Dang (2013)).

It is also worthy to mention that most studies of capital structure have used the data from developed countries with a few exceptions. Booth et al. (2001) study capital structure determinants of firms in 10 developing countries and find both similarities and differences across countries. Seifer and Gonenc (2010) examine 23 emerging market countries and find little support for the pecking order theory. China is the largest developing and transition economy, and the second-largest economy in the world, yet only a limited number of studies on capital structure have examined the Chinese market.

Studies of capital structures of Chinese companies have been focused on tests of static trade-off model. Huang and Song (2006) examine a broad dataset of over 1,200 Chinese listed companies during a period 1994-2003 and regress different leverage measures on a list of explanatory variables. They find that a static trade-off model can explain the capital structure decision of Chinese companies better than the pecking order theory. Chen (2004) examines the determinants of capital structure of 88 large Chinese listed companies during the period 1995-2000 and finds that neither theory provides a convincing explanation of the financing behavior of Chinese companies. Tong and Green (2005) examine the determinants of leverage, the relationship between leverage and dividends, and the determinants of corporate investment of a small sample of largest companies and find support for the pecking order hypothesis over the static trade-off theory. Their dataset only covers the top 50 listed companies published by the *People's Daily* for the period 2001-2003.

More recent studies of capital structure of Chinese companies have moved to test the dynamic trade-off model (Flannery and Rangan (2006)) and to more directly test the pecking

order model (Shyam-Sunder and Myers (1999)). Following the Shyam-Sunder and Myers (1999) model, Ni and Yu (2008) study 422 Chinese companies for the accounting year of 2004 and find that only big companies in China follow the pecking order theory, while small and medium companies don't follow the pecking order theory. Lien, Lo and Ni (2012) also use the Shyam-Sunder and Myers (1999) model, but they examine capital financing behavior of a much larger number of Chinese companies during the period 1994-2006 and find results similar to Ni and Yu (2008). Qian et al (2009) use a difference GMM estimator to test the dynamic trade-off theory. They examine 650 Chinese companies from 1999 to 2004 and find that Chinese companies tend to adjust to their target levels. But they also point out that the speed of adjustment to target ratio is very slow. These studies have provided some insights into financing behaviors of Chinese companies. However, none of these studies have studied possible changes in financing behaviors of Chinese companies due to the structural reform, nor have any studies nested the dynamic trade-off model and the pecking-order model in the single specification. Moreover, none of these studies have used an error correction model.

4. Data and descriptive summary of variables

Our raw data cover all non-financial companies in China during the period 2000-2011. We obtain our data from the China Stock Market and Accounting Research Database (CSMAR) and Bloomberg. We remove all firm-year observations with negative total assets or negative total liabilities. We only retain firms that have 5 or more years of observations since we need to use lagged variables as instruments in the difference GMM and system GMM model. The final total number of firm-year observations is 12,129 from 1,057 companies.

Table 3-1 contains the descriptive statistics of variables in our empirical analysis. Panel A of Table 3-1 reports the descriptive statistics for the full sample, while Panel B reports means and medians for the Pre-reform and Post-reform sub-periods. After the structural reforms, the state government ownership significantly decreased, the mean state ownership declined to 17.0% from 35.8%, and the median declined to 4.3% from 39.4%. Another notable difference between Pre and Post-reform is that Chinese companies used more debt after the reform and therefore have higher leverage ratio, compared the mean leverage of 11.1% for the Post-reform period with 6.6% for the Pre-reform. At the same time, firms have less tangible assets in the Post-reform period.

5. Testing Pecking Order Theory

The need for external funds arises when there is an imbalance between internal cash flow, net of dividends, and real investment opportunities. Under the pecking order framework, firms whose investment opportunities exhaust internal funds will turn to the capital market to raise money externally through debt financing (and equity is a last resort). Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) formulate a regression analysis to test the pecking order theory that views the issuance of equity as a residual financing source. They argue that firm's financial deficit should have a one-to-one relationship with firm leverage, implying that the financing deficit should be funded entirely by debt. By scaling the debt and the financial deficit by total assets as a precaution against heteroskedasticity and a method of controlling for differences in firm size, the above argument can be formalized as:

$$\Delta Debt_{it} = \alpha + \rho DEF_{it} + \varepsilon_{it} \quad (1)$$

where $\Delta Debt_{it}$ = $Debt_{it} - Debt_{it-1}$, is the amount of total debt issued by firm i at period t; $Debt_{it}$ is the total debt outstanding for firm i at period t; DEF_{it} = Dividend payment for period t + Capital expenditure for period t + net increase in working capital for period t + current portion of long-term debt at start of period t – Operating cash flows (after interest and taxes) for period t. Pecking order theory is summarized by the following null hypothesis:

$$H_0: \alpha = 0 \ \ and \ \rho = 1.$$

We estimate the parameters of panel regression analysis on (1) for both the full sample and the subsamples. Note that a Hausman test suggests the use of fixed effect model for our analysis.

Our empirical results are reported in Table 3-2. There is no supporting evidence for the pecking order theory in Chinese companies. Although the estimated coefficient on the deficit (DEF) variable is positive and statistically significant at the1% level, it is statistically significantly different from one. The F test statistics soundly rejects the null hypothesis. The coefficients are similar for Pre-reform (0.125) and Post-reform sub-periods (0.141). This finding suggests that other sources of external financing are combined with debt to finance a firm's funding deficit. More importantly, debt financing is dominated by equity financing, which is in stark contrast with the prediction of the pecking order theory.

This finding is in line with other studies of market based financial systems. Adedeji (2002) shows that UK firms use debt to finance only about 20% of their financing deficit. Nuri and Archer (2001) obtain similar results using data from UK and other European countries. Frank and Goyal (2003) conclude that equity issues are a significant component of external finance in the US and net equity issues are generally larger than net debt issues. The importance of equity financing over debt financing is also observed in emerging markets as documented by

Singh (1994). Finally, previous literature, including Ni and Yu (2008), finds no evidence that Chinese listed companies follow the pecking order when in need of funds to finance investment projects.

Table 3-2 also presents the regression results for subsamples grouped by firm size, leverage, and growth. There seems to be a considerable difference in the magnitude of estimated coefficients on financing deficit among different firm size, leverage, and growth groups. This suggests that firm size, firm leverage, and firm growth have important impacts on debt financing decisions. For subsamples grouped by firm size, leverage, and growth, the largest estimated coefficient on financing deficit is for large firms (0.199), for highly leveraged firms (0.153), and for high growth firms (0.145). These results are fairly consistent with what has been reported in prior tests of the pecking order (see Frank and Goyal (2003) and Lien et al (2012)).

The above standard pecking order regression assumes that the firm's reaction of changing debt issues to fund flow deficit ($DEF_{it} > 0$) and surplus ($DEF_{it} < 0$) is "symmetric" — firms would issue (retire) debt when they have a fund flow deficit (surplus). To examine how sensitive the firms are to their financial deficit and financial surplus and test for the symmetry assumption, we partition the symmetric pecking order regression into cases with a fund flow deficit situation and those with a fund flow surplus situation.

$$\Delta Debt_{it} = \alpha + \rho_1 Debit_{it} + \rho_2 Surplus_{it} + \varepsilon_{it} \qquad (2)$$

Where $Debit_{it} = DEF_{it}$, if $DEF_{it} > 0$; $otherwise\ Debit_{it} = 0$ and $Surplus_{it} = DEF_{it}$, if $DEF_{it} \le 0$; $otherwise\ Surplus_{it} = 0$

The results presented in Table 3-3 show that the estimated coefficients on both the positive financial deficit variable and negative financial deficit variables are both significantly positive at the 1% level, but higher for deficit variable than for surplus variable for full sample. Moreover, the F test rejects the null hypothesis that $\rho_1 = \rho_2$ significant at the 1% significance

level. The results suggest that the willingness of Chinese firms to expand debt when they face financial deficits is higher than that of retiring (reducing) debt when they face financial surpluses, indicating that the effects of the financial surplus and deficits on the change in total debt level are asymmetric. This "asymmetric" debt financing behavior in response to a fund flow deficit and a fund surplus situation is not predicted by the pecking order theory.

To summarize, equity tracks the financial deficit better than debt does in Chinese firms, implying that equity is not the last resort for external financing as predicted by the pecking order theory. Moreover, financial deficits and surpluses affect leverage differently. Chinese firms are more sensitive in expanding debt for meeting their financing needs than in using surplus for retiring debt.

6. Testing Trade-off Theory

In their pioneering papers on capital structure theory, Modigliani and Miller (1958, 1963) argue that a firm can maximize its value in a perfect capital market by using as much debt as possible. However, as documented by Kraus and Litzenberger (1973), Scott (1976), Kim (1978), and Bradley et al. (1984), the presence of bankruptcy and agency costs of debt prevents the unlimited use of debt and forces firms to trade off the costs and benefits of debt (i.e., tax savings and the reduction in the agency costs of free cash flow). Therefore, the trade-off theory predicts a well-defined optimal capital structure, chosen at the point where the marginal cost of debt equals to its marginal benefit.

The common approach has been to examine the determinants of optimal leverage ratio by regressing the observed leverage ratio against a number of explanatory variables. We follow the literature (Titman and Wessels (1988), Rajan and Zingales (1995), Wald (1999), Frank and

Goyal (2009)) and consider the six frequently adopted determinants of leverage: profitability (Prof), firm size (Size), non-debt tax shields (NOT), growth opportunities (Growth), tangibility (Tang), and state ownership (Ownership).

$$Debt_{it} = a + b_1 Size_{it} + b_2 \Pr of_{it} + b_3 Growth_{it} + b_4 Tang_{it} + b_5 NOT_{it} + b_6 Ownership_{it} + \varepsilon_{it} \quad (3)$$

Consistent with the previous literature on Chinese listed firms (Huang and Song (2006)), empirical results presented in Table 3-4 show that the determinants of optimal capital structure in China are generally similar to those documented for both developed countries and other developing countries. Below we discuss the effects of each determinant.

Firm size: The trade-off theory suggests that small firms tend to face high financial stress, agency costs, and transaction costs, therefore may rely less on debt financing while pecking order theory as suggested in Frank and Goyal (2005) predicts that small firms are more vulnerable to informational asymmetries and adverse selection problems, thus it may be more costly for them to access to the stock market. Our results show that the coefficients on firm size are significantly positive, with slightly higher magnitude for the more recent sample period. This finding is consistent with the prediction of the trade-off theory from the previous evidence on Chinese companies (Huang and Song (2006)).

Profitability: The trade-off theory predicts a positive relation between profitability and leverage because less profitable companies provide lower shareholder returns, and increased leverage increases the bankruptcy risk. In contrast, the pecking order theory predict a negative relation between profitability and leverage. More profitable companies have more cash flows and therefore use less debt and have smaller leverage. Our results show an insignificant relation for Full sample and the Post-reform subsample, a negative relation for the Post-reform subsample.

Growth opportunity: The trade-off theory predicts a negative relationship between debt and growth opportunity because growth firms face more severe underinvestment and overinvestment issues and hence use less debt. Stakeholders of high growth firms are more likely to invest in value-decreasing projects to shift risks to creditors, making debt more costly. Our results indicate a statistically significant positive relationship between growth and leverage, which is consistent with the well-documented evidence for Chinese firms. For example, Chen (2004) found growth potential proxied by the Market to Book ratio is positively related to debt in China. Titman and Wessels (1988) and Huang and Song (2006) used the percentage change of total assets and sales growth rate as a proxy for growth respectively and find similar results.

Collateral (Tangibility): We find that the collateral value of assets and leverage have a significant positive relationship (0.101 for the full sample, 0.071 for the period of 2000-2006, and 0.093 for the period of 2007-2011). The trade-off theory suggests that firms with more tangible assets face lower financial stress costs, and therefore tend to use more debt. Tangible assets can be used as collateral to avoid the asset substitution problem, leading to lower agency costs of debt. Empirically, this is also consistent with the Chinese evidence.

State Ownership: Ownership structure is one of the most significant institutional differences between China and the Western countries. Most of the Chinese listed companies now are still under the control of the state and face great intervention by the government. Jensen and Meckling (1976) predict that ownership structure may impact capital structure because agency costs could be minimized by the optimal structure of leverage and ownership. We document a positive relationship between state ownership and leverage (0.016) in the full sample. That is, firms with more non-circulating shares tend to have higher leverage ratio, which is consistent with the findings in Huang and Song (2006). However, this positive relationship is only observed

in year 2007 to 2011 while the first period sample documents an insignificant negative coefficient.

To summarize, the empirical results suggest that firm size, growth opportunities, ownership, and tangibility are positively related to leverage, while non-debt tax shields are negatively related to leverage. This conclusion suggests that the estimation coefficients on the variables of firm size, and tangibility, and non-debt tax shields are largely consistent with the explanations of trade-off theory, but not with the pecking order theory.

7. Testing the Partial Adjustment Model

Myers (1984), Fischer, Heinkel, and Zechner (1989), and Flannery and Rangan (2006) proposed that the presence of adjustment costs[28] may limit the firms' ability to move back to their target capital structure immediately and thus, firms may gradually adjust toward the target level. Target adjustment speed depends on the costs of adjusting leverage as well as on the benefits of moving back towards the target level (the costs of being far from the target level). The partial adjustment model allows for the firms' leverage ratio to not always equal the target level. This model suggests that firms make leverage adjustments if the costs of being away from the target leverage ratio are higher than those of moving toward the target; otherwise firms will not make leverage adjustments because the benefits of moving toward the target level is not big enough to cover the adjustment costs. We follow the spirit of previous research (Fama and French (2002), Flannery and Rangan (2006), and Dang (2013)) and employ a partial adjustment model of leverage to test the prediction of the trade-off theory.

[28] Adjustment costs refer to the costs that may occur when firms switch between debt financing and equity financing, including taxes, legal fee, registration fees, printing and accounting costs, and other fees paid to the market dealers for placing the issue (Olinear and Rudebusch (1992).

$$\Delta Debt_{it} = \alpha + \gamma\ DEF_{it} + \beta\ DTLR_{it} + \varepsilon_{it} \quad (4)$$

where $DTLR_{it}$ is defined as the difference between a firm's target leverage ratio at time t $(Debt_{it}^*)$ and its actual leverage ratio at time t-1 ($Debt_{it-1}$)and it measures the deviation from the target leverage ratio. The target leverage ratio is unobservable and is proxied by the predicted fitted values from the static model (3).

Specifically, we employed a two-stage estimation procedure: first we run the target leverage regression of model (3) and then on the second stage we estimate the partial adjustment model in (4) by using the fitted values from the first stage regression as a proxy for the target leverage ratio $(Debt_{it}^*)$. The coefficient β measures the speed of adjustment that captures how fast a firm moves its leverage ratio to the desired target level. As argued by Shyam-Sunder and Myers (1999), Fama and French (2002), and Leary and Roberts (2005), the speed of adjustment should be between 0 and 1 if there are positive adjustment costs. A large coefficient would suggest low adjustment costs for the firm and hence, it can adjust toward its desire leverage level quickly. When the coefficient is 1, the firm makes the adjustment instantaneously.

In addition, we also include the financing deficit variable in model (4) as an additional regressor in an effort to jointly test the trade-off and pecking order theories. This model predicts that firms' capital structure is more consistent with pecking order theory than with trade-off theory if the coefficient on financial deficit equals to 1 and the intercept equals to 0 while the coefficient on the TLR is insignificant.

We estimate model (4) by employing three econometric approaches: fixed effect model, Arellano and Bond's (1991) difference GMM, and Blundell and Bond's (1998) system GMM. For the GMM estimators, we use Arellano and Bond's AR2 test, the Sargan test, and the Hansen test to check the validity of the model specification. If AR2 test is rejected, there is evidence of

second autocorrelation, indicating that the instruments used in estimation are not appropriate. The rejection of the Sargan test or the Hansen test suggests that the GMM estimated results suffer from over-identification problems and therefore the results should be treated with caution. The empirical results are reported in Table 3-5. Column (1)-(3) and (4)-(6) report the results for the stand-alone trade-off model and the nested model that tests trade-off and pecking order theories, separately. Column (1) and (4) adopt the fixed effect estimator, Columns (2) and (5) use the difference GMM estimator, and Columns (3) and (6) adopt the system GMM estimator. Panels A, B, and C report the results for the Full, Pre-reform, and the Post-reform samples, respectively.

As shown in Panel A of Table 3-5, the Arellano and Bond's AR2 test, Sargan's test and Hansen's test all suggest that our dynamic panel data regression is well specified for the full sample. We find that the adjustment coefficient is both economically and statistically significant, which is strongly consistent with the trade-off theory's prediction. In economic terms, Chinese public firms adjust their leverage ratio toward the desired level at a speed ranging between 0.412 and 0.615. Flannery and Rangan (2006) regard coefficient of 0.30 or above as fast adjustment speeds. Therefore, our estimated adjustment speed indicates that Chinese public firms have a target leverage ratio and they quickly adjust their actual leverages to their target levels. Assuming that the speed of adjustment is constant, this result implies that it takes less than two years for Chinese firms to adjust half of the deviation of the actual leverage ratio from the target leverage ratio. This adjustment speed is about two times faster than the evidence documented in the previous literature on China's capital structure. For instance, Qian et al (2009) examines a sample of Chinese public firms over the period between 1999 and 2004 by using a one-stage procedure to estimate the partial adjustment model and report the speed of adjustment of 18.5%

per year for the book leverage ratio[29]. However, compared to previous studies on developed markets, we find that Chinese firms have comparable speeds of leverage adjustment during our sample period. For example, Dang (2013) shows that European firms (including French, German, and UK) have considerably faster speeds of leverage adjustment in the range of 0.425 - 0.517. Similar results are also observed on US firms, with adjustment speeds ranging between 0.25 - 0.557 (Jalilvand and Harris (1984), Leary and Roberts (2005), (Flannery and Rangan (2006), etc).

Including the financial deficit variable in Model (3), as shown in Columns (4)-(6) of Table 3-5 (Panel A), we find that the leverage adjustment coefficients remain statistically and economically significant, ranging between 0.394 and 0.688. The financing deficit coefficients are also quite similar to those obtained from Model (1), varying between 0.121 and 0.152. They are significantly positive but statistically and economically different from one. This suggests that Chinese firms make active leverage adjustment towards the target level but they finance their financial deficit mainly by equity. Overall, nesting the pecking order and target adjustment models in the same regression does not substantially impact the magnitude and the significance of the speed coefficient and the deficit coefficient. Hence, the trade-off theory explains Chinese firms' capital structure better than the pecking-order theory.

The results of two subsample periods are shown in Panel B and Panel C. The GMM specifications for both subsamples passed the Arellano and Bond's AR2 test, Sargan's test and Hansen's test. The financing deficit coefficients are similar in magnitude for the two subsample periods, although the two GMM estimators are statistically insignificant for the Pre-reform sample, but significant for the Post-reform subsample. The notable differences are for the

[29] Qian et al. (2009) substitute (3) into (2) and estimate the resulting model in one stage.

leverage adjustment coefficients. The leverage adjustment coefficients for the Pre-reform subsample are smaller than those for the full sample for four GMM model specifications as shown in columns (2), (3), (5) and (6). On the contrary, the leverage adjustment coefficients for the Post-reform subsample for all model specifications are larger than those for the Full sample, indicating that the results of the partial adjustment for the full sample are mainly driven by the Post-reform period. The coefficients for the Post-reform subsample are larger than those for the Pre-reform subsample in all six specifications. For example, the difference GMM estimator in column (2) presents that the leverage adjustment coefficient is 0.324 for the Pre-reform subsample and is 0.676 for the Post-reform. Similarly, the system GMM model in column (6) predicts that the leverage adjustment coefficient is 0.257 for the Pre-reform subsample and is 0.562 for the Post-reform subsample.

The empirical results so far suggest that the speed of adjustment in the Pre-reform period is quite consistent with the findings in Qian et al (2009) from the perspective of economic interpretation. However, Chinese companies adjust to their target leverage much faster after the 2006 structural reform since the adjustment speed is inversely related to transaction costs. Qian et al (2009) attribute their findings of slow adjustment during the period between 1999 and 2004 to relatively large transaction costs that firms face when they borrow from banks, which in turn result in higher agency costs between shareholders and creditors.

Similarly, the higher coefficients we observe in the Post-reform subsample period from 2007 to 2011 indicate that the cost of adjustment to target leverage for Chinese firms substantially declines after 2007. This might be possible for Chinese firms because China started its currency reform in 2005 and split-share reforms in 2006. On one hand, reform of China's forex system with the measures that have been taken to improve the investment environment (i.e.

the introduction of the qualified foreign institutional investor ("QFII") program) attracts more foreign capitals into Chinese equity and bond markets. On the other hand, the split-share reforms open up the door to China's secondary privatization, making it easier and cheaper for firms to obtain funding from the primary equity market. Further, these reforms reduce agency conflicts between controlling shareholders and minority shareholders in Chinese state-owned enterprises (see Yeh, et al. (2009)). Shareholders have more incentives to monitor behaviors of managers, and to ensure that they maximize shareholders' value. All these reforms reduce transaction costs of issuing both equity and debt and hence provide business managers more impetus to make a fast adjustment toward their optimal leverage ratio.

8. Testing the Error Correction Model

Recent studies also adopt an Error Correction Model (ECM) to examine whether the target leverage ratio has any long run effect on the current leverage ratio. It is noted that previous partial adjustment models assume that target leverage change has no impact on the costs of adjusting leverage. The error correction model captures changes in the target level as well as their effects on the dynamic leverage adjustment process. Both error correction models and partial adjustment models assume that the actual debt ratio deviate from the target level and firms adjust their leverage over time, but error correction model also controls for the change in the target leverage and allows for the examination of its short run effect on the actual debt ratio. We follow Dang (2013) and estimate the error correction model as:

$$\Delta Debt_{it} = a + \beta CTLR_{it} - \varphi LECT_{it} + \varepsilon_{it} \quad (6)$$

Where CTLR=$Debt^{*}_{it} - Debt^{*}_{it-1}$ is the change in the target debt ratio and its coefficient β represents the short-run effect of the target debt ratio on actual debt ratio. $LECT_{it}$

$= Debt_{it-1} - \gamma Debt^*_{it-1}$ is the leverage error correction term, which captures the deviation of actual leverage from the long-run target leverage ratio in the last accounting period. The coefficient, β, represents the equilibrium (long-run) effect of the target debt ratio on the actual debt ratio and, thus, also treated as the long term effect. While Dang (2013) artificially assumes the long term coefficient equals to the unity, we estimate the long run relationship between actual debt ratio and target debt ratio by regressing actual debt ratio on target debt ratio. Dickey-Fuller tests show that the residuals obtained from this regression are stationary, suggesting that the leverage ratios ($Debt_{it}$) and target leverage ($Debt^*_{it}$) are co-integrated. Therefore, there is a long term, or equilibrium relationship between these two variables. Correspondingly, the coefficient of LECT, φ, measures the speed of the leverage adjustment toward the target.

Table 3-6 reports the results for the error correction model. We use the error correction mechanism to test the trade-off theory of Model (6). Columns (1), (2), and (3) test Full sample, Pre-reform, and Post-reform sub-sample, respectively. Column (4) add interaction terms to test whether adjustments speeds are statistically different for Pre-reform and Post-reform subsample. We don't include GMM specifications because we are not able to find proper instruments (i.e., lagged terms) to insure the pass of specification tests (i.e., Sargen, AR 2 and Hansen).

The estimated coefficients on CTLR and LECT are both statistically significant at the 1% level. Significant coefficients on CTLR indicate that there are short run effects of the target debt ratio on actual debt ratio. We find that Chinese public firms undertake rapid short-run adjustment toward their target debt ratio in response to any changes in such target with the corresponding speed ranging from 0.760 to 0.771. On the contrary, the coefficient estimates of leverage error correction term (LECT) vary from 0.359 to 0.573, suggesting that Chinese public firms also correct the past deviation of their actual debt ratios from the long run target level very fast, with

about 40-60% of the divergence eliminated in the following accounting year. The F test regarding the null hypothesis that $\beta = \varphi$ is rejected at the 1 percent significant level, suggesting that the two speeds of adjustment are different. That is, Chinese firms make asymmetric adjustment towards the desired leverage and they respond more quickly to target leverage change in the short run than to the deviation from the long run target level in the last accounting period. All these findings are consistent with those in the developed markets. For example, Dang (2013) shows that firms in UK, Germany, and France respond to the past divergence from target leverage with the speed of adjustment varying from 0.390 to 0.454 while their adjustment speeds corresponding to target leverage change seem to be much faster, varying between 0.776 and 0.933.

Compared with Pre-reform subsample, Chinese companies' leverage ratios respond to the deviation from the long run target level in the last accounting period much more promptly after the split-share reform of 2006 as suggested by the significant and negative coefficient on Post*LECT. However, the speeds of adjustment to the change in target leverage ratio are similar for the two subsample periods.

9. Conclusion

We examine the trade-off and pecking order theories of capital structure using various methodologies in Chinese listed firms. We find strong evidence that is consistent with the trade-off theory: Chinese companies dynamically adjust to their target leverage ratios. They adjust to their target leverage more rapidly when transactions costs are lower after the 2006 share structure reform. These results further support the applicability of dynamic partial adjustment model.

This paper has four main contributions to the literature. First, we adopt the error correction model (ECM) in the empirical tests to examine the target adjustment theory of capital structure of companies in a transition economic. The ECM allows us to examine both the short-run adjustment dynamics towards the long-run target leverage ratio and the long-run relationship between the actual leverage ratios and the target leverage ratio. Second, we employ various econometric methods to estimate the regression models, i.e. fixed effect and the dynamic panel estimators (i.e. Difference GMM and System GMM) which may help reduce any bias that might result from the OLS estimation. Third, we not only examine the pecking-order and trade-off theories in isolation, but also nest the two theories in one single specification to examine one theory against the other for Chinese firms. Lastly, this is the first paper to consider the impact of China's recent share structure reform on firms' financing behavior. We find that Chinese firms adjust to target capital structure much faster in the Post-reform period than in the Pre-reform period. This result indirectly supports the dynamic trade-off theory as transaction costs are important factors affecting the speed of adjustment to target leverage.

Overall, our results suggest that the dynamic trade-off theory can better explain the financing behavior of Chinese companies than the pecking order theory.

Table 3-1

Summary Statistics of Capital Structure Variables

Leverage is the ratio of total debt divided by total asset. ***Tangibility*** is the ratio of fixed assets to total assets. ***NOT*** is the ratio of depreciation to total assets. ***Profitability*** is the ratio of EBITDA to total assets. ***Growth opportunity*** is defined as the market to book ratio. ***Firm Size*** is the log of total assets adjusted for price index. ***Ownership*** is the percentage of the shares owned by Chinese government or state agencies. ***DEF*** is the cash flow deficit, and defined as follow: DEF_t = Dividend payment for period t + Capital expenditure for period t + net increase in working capital for period t + current portion of long-term debt at start of period t –Operating cash flows (after interest and taxes) for period t. *DEF* is scaled by total assets.

Panel A. Full Sample

	Obs	Mean	Median	Std. Dev.	Min	Max
Leverage	12129	0.095	0.051	0.123	0.000	3.495
Tangibility	12129	0.290	0.262	0.183	-0.206	0.971
Non-Debt Tax Shields (NOT)	12129	0.024	0.021	0.019	-0.034	0.817
Profitability	12129	0.032	0.036	0.194	-18.918	0.715
Growth opportunity(Growth)	12129	0.511	0.504	0.388	0.010	27.928
Firm Size	12129	21.770	21.648	1.102	16.683	27.917
Ownership	12071	0.279	0.271	0.247	0.000	0.905
DEF	11841	0.034	0.025	0.245	-19.211	3.005

Panel B: Subsamples

	Year 2000-2006			Year 2007-2011		
	Obs	Mean	Median	Obs	Mean	Median
Leverage	7030	0.066	0.030	5099	0.111	0.059
Tangibility	7030	0.305	0.280	5099	0.269	0.234
Non-Debt Tax Shields (NOT)	7030	0.024	0.021	5099	0.025	0.021
Profitability	7030	0.036	0.038	5099	0.027	0.033
Growth opportunity(Growth)	7030	0.478	0.480	5099	0.556	0.540
Firm Size	7030	21.602	21.504	5099	22.115	21.999
Ownership	6997	0.358	0.394	5074	0.170	0.043
DEF	6742	-0.010	-0.013	5099	0.050	0.037

Table 3-2

Test of symmetric pecking order model

The dependent variable is $\Delta Debt_{it}$ which is defined as the amount of total debt issued by firm i at year t, i.e. $\Delta Debt_{it}$ = $Debt_{it} - Debt_{it-1}$; DEF_{it} is the financing deficit for firm i at year t[30]. Both variables are scaled by total assets. [31]

	Full Sample	Year 2000-2006	Year 2007-2011
DEF	0.130***	0.125***	0.141***
	(0.00)	(0.01)	(0.01)
_cons	-0.000	0.001	-0.003
	(0.00)	(0.00)	(0.00)
r2	0.1	0.09	0.11
F-test	0.00	0.00	0.00
N	11841	6742	5099
Dummy Year	Yes	Yes	Yes

	Size			Leverage			Growth		
	Large	**Medium**	**Small**	**High**	**Medium**	**Low**	**High**	**Medium**	**Low**
DEF	0.199***	0.128***	0.086***	0.153***	0.147***	0.093***	0.145***	0.142***	0.096***
	(0.008)	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)
_cons	-0.003	0.000	0.001	0.004*	0.000	-0.005**	0.001	-0.002	-0.000
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
r2	0.16	0.10	0.06	0.12	0.12	0.07	0.12	0.10	0.07
F-test	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N	3964	3940	3937	3916	3963	3962	3966	3958	3917
Dummy Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[30] DEF_t = Dividend payment for period t + Capital expenditure for period t + net increase in working capital for period t + current portion of long-term debt at start of period t –Operating cash flows (after interest and taxes) for period t

[31] Standard errors are reported in parentheses below the coefficients. Superscipts *, **, *** indicate significant at 10%, 5%, and 1% levels, respectively.

Table 3-3

Test of asymmetric pecking order model

The dependent variable is $\Delta Debt_{it}$ which is defined as the amount of total debt issued by firm i at year t, i.e. $\Delta Debt_{it}$ = $Debt_{it}$ – $Debt_{it-1}$; Debit is equal to *DEF* if the financing deficit is greater than zero and 0 otherwise. Surplus is equal to *DEF* if the financing deficit is less than or equal to 0, and 0 otherwise.[32]

	Full Sample	Year 2000-2006	Year 2007-2011
Debit	0.168***	0.187***	0.157***
	(0.01)	(0.01)	(0.01)
Surplus	0.059***	0.029**	0.105***
	(0.01)	(0.01)	(0.02)
Intercept	-0.005***	-0.005***	-0.005**
	(0.00)	(0.00)	(0.00)
R-square	0.10	0.10	0.11
F-test	0.00	0.00	0.02
N	11841	6742	5099
Dummy Year	Yes	Yes	Yes

[32] Standard errors are reported in parentheses below the coefficients. Superscipts *, **, *** indicate significant at 10%, 5%, and 1% levels, respectively.

Table 3-4

The determinants of optimal leverage ratio

All variables are defined in Table 1.[33]

	(1)	(2)	(3)
	Full Sample	**Year 2000 - 2006**	**Year 2007 -2011**
Firm size	0.032***	0.037***	0.042***
	(0.002)	(0.003)	(0.003)
Profitability	0.002	-0.037**	-0.011
	(0.014)	(0.017)	(0.021)
Growth	0.235***	0.217***	0.243***
	(0.006)	(0.009)	(0.012)
Tangibility	0.101***	0.071***	0.093***
	(0.008)	(0.010)	(0.015)
NOT	-0.624***	-0.516***	-0.165
	(0.091)	(0.111)	(0.170)
Ownership	0.016***	-0.005	0.019***
	(0.005)	(0.008)	(0.007)
cons	-0.746***	-0.831***	-0.987***
	(0.034)	(0.064)	(0.072)
F-test	0.00	0.00	0.00
R-square	0.25	0.20	0.21
N	12071	6997	5074

[33]Standard Errors are reported in parentheses below the coefficients. Superscripts *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Table 3-5

Test of the partial adjustment model

***DTLR**$_{it}$* is defined as the difference between a firm's target leverage ratio at time t ($Debt^{*}_{it}$) and its actual leverage ratio at time t-1 ($Debt_{it-1}$). It measures the deviation from the target leverage ratio. The target leverage ratio is unobservable and it is proxied by the predicted fitted values from the static model.[34]

Panel A: Full Sample

	(1)	(2)	(3)	(4)	(5)	(6)
DEF				0.121***	0.152**	0.119**
				(0.004)	(0.062)	(0.064)
DTLR	0.412***	0.615***	0.409***	0.394***	0.688***	0.514***
	(0.007)	(0.155)	(0.077)	(0.007)	(0.212)	(0.103)
cons	0.001		-0.141	-0.000		-0.294
	(0.002)		(0.111)	(0.001)		(0.216)
Estimators	FE	DGMM	SGMM	FE	DGMM	SGMM
AR2		0.36	0.40		0.09	0.90
Sargan test		0.06	0.23		0.21	0.91
Hansen test		0.23	0.45		0.74	0.66
T-test				0.00	0.00	0.00
R_2	0.25			0.32		
N	11019	9804	11019	11019	9804	11019

Panel B: Year 2000 - 2006

	(1)	(2)	(3)	(4)	(5)	(6)
DEF				0.118***	0.175	0.188
				(0.005)	(0.127)	(0.132)
DTLR	0.547***	0.324***	0.314*	0.522***	0.267**	0.257**
	(0.011)	(0.125)	(0.170)	(0.011)	(0.125)	(0.102)
cons	0.000		0.086	-0.001		0.067
	(0.001)		(0.284)	(0.001)		(0.273)
Estimators	FE	DGMM	SGMM	FE	DGMM	SGMM
AR2		0.15	0.67		0.27	0.51
Sargan test		0.41	0.41		0.72	0.43
Hansen test		0.34	0.50		0.72	0.62
T test				0.00	0.00	0.00
r2	0.33			0.40		

[34] Standard Errors are reported in parentheses below the coefficients. Superscripts *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Table 3-5 continued

N	5945	4838	5945	5945	4838	5945

Panel C: Year 2007 - 2011

	(1)	(2)	(3)	(4	(5)	(6)
DEF				0.108***	0.152**	0.180***
				(0.005)	(0.062)	(0.065)
DTLR	0.604***	0.676***	0.551**	0.571***	0.688***	0.562**
	(0.013)	(0.212)	(0.272)	(0.012)	(0.212)	(0.274)
cons	-0.001		-0.679	-0.007***		-0.621
	(0.002)		(0.899)	(0.002)		(0.774)
Estimators	FE	DGMM	SGMM	FE	DGMM	SGMM
AR2		0.99	0.98		0.59	0.70
Sargan test		0.30	0.32		0.64	0.43
Hansen test		0.39	0.63		0.95	0.96
T test				0.00	0.00	0.00
r2	0.37			0.43		
N	5074	4966	5074	5074	4966	5074

Table 3-6

Test of the error correction model

$CTLR_{it}$ is the change in the target debt ratio (i.e., $Debt^*_{it-1}$-$Debt^*_{it-1}$). $LECT_{it}$ is the leverage error correction term (i.e., $Debt_{it-1}$-$\gamma Debt^*_{it-1}$). *Post*CLTR* and *Post*LECT* are interaction terms where *Post* is equal to 1 if data year is great than 2006. [35]

	Full Sample	**2000-2006**	**2006-2007**	**Full Sample**
	(1)	(2)	(3)	(4)
CTLR	0.771***	0.766***	0.760***	0.760***
	(0.019)	(0.024)	(0.029)	(0.025)
LECT	-0.359***	-0.497***	-0.573***	-0.299***
	(0.008)	(0.012)	(0.014)	(0.012)
Post*CTLR				0.019
				(0.038)
Post*LECT				-0.124***
				(0.019)
cons	-0.000	-0.001	-0.001	-0.000
	(0.002)	(0.001)	(0.002)	(0.002)
Estimators	FE	FE	FE	FE
AR2				
Sargan test				
Hansen test				
r2	0.28	0.35	0.38	0.28
N	11019	5945	5074	11019

[35] Standard Errors are reported in parentheses below the coefficients. Superscripts *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

REFERENCES

Adedeji, T. "A cross-sectional test of Pecking Order Hypothesis Against Static Trade-off Theory on UK data." Available at SSRN 302827 (2002).

Allayannis, George, and James P Weston. "The Use of Foreign Currency Derivatives and Firm Market Value." Review of Financial Studies 14, no. 1 (2001): 243-76.

Amihud, Y., Kahan, M., Sundaram, R. K., 2004. The foundations of freezeout laws in takeovers. *The Journal of Finance*, *59*(3), 1325-1344.

Antoniou, Antonios, Yilmaz Guney, and Krishna Paudyal. "The determinants of capital structure: capital market-oriented versus bank-oriented institutions."*Journal of financial and quantitative analysis* 43.1 (2008): 59.

Arellano, M. and S. Bond. (April 1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. The Review of Economic Studies, 58. pp. 277 – 297.

Arellano, Manuel, and Olympia Bover. "Another look at the instrumental variable estimation of error-components models." Journal of econometrics 68.1 (1995): 29-51.

Atanasov, V., Black, B., Ciccotello, C., Gyoshev, S., 2010. How does law affect finance? An examination of equity tunneling in Bulgaria. *Journal of Financial Economics*, *96*(1), 155-173.

Bali, Geetanjali, and Frank S Skinner. "The Original Maturity of Corporate Bonds: The Influence of Credit Rating, Asset Maturity, Security, and Macroeconomic Conditions." Financial Review 41, no. 2 (2006): 187-203.

Barclay, Michael J, and Clifford W Smith. "The Maturity Structure of Corporate Debt." The Journal of Finance 50, no. 2 (1995): 609-31.

Bartram, Söhnke. "The Interest Rate Exposure of Nonfinancial Corporations." European Finance Review 6, no. 1 (2002): 101-25.

Bates, T. W., Lemmon, M. L., Linck, J. S., 2006. Shareholder wealth effects and bid negotiation in freeze-out deals: are minority shareholders left out in the cold?. *Journal of Financial Economics*, *81*(3), 681-708.

Bebchuk, L. A., 1989. Takeover bids below the expected value of minority shares. *Journal of Financial and Quantitative Analysis*, *24*(02), 171-184.

Bebchuk, L. A., Kahan, M., 2000. Adverse selection and gains to controllers in corporate freezeouts. In *Concentrated corporate ownership* (pp. 247-264). University of Chicago Press.

Beck, Kristine L, Elizabeth F Goldreyer, and Louis J D'Antonio. "Duration Gap in the Context of a Bank'S Strategic Planning Process." Journal of Financial and Strategic Decisions 13, no. 2 (2000): 57-71.

Bekaert, Geert, and Campbell R. Harvey. "Foreign speculators and emerging equity markets." The Journal of Finance 55.2 (2000): 565-613.

Bessembinder, Hendrik. "Forward Contracts and Firm Value: Investment Incentive and Contracting Effects." Journal of Financial and Quantitative Analysis 26, no. 04 (1991): 519-32.

Bhaduri, Saumitra N. "Determinants of capital structure choice: a study of the Indian corporate sector." *Applied Financial Economics* 12.9 (2002): 655-665.

Bierman, H., 2006. Legal Highway Robbery: The MBO Strategy. *Johnson School Research Paper Series*, (05-06).

Bierwag, Gerald O, and George G Kaufman. "Duration Gap for Financial Institutions." Financial Analysts Journal (1985): 68-71.

Blundell, R.W., Bond, S.R., 1998. Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. Journal of Econometrics 87, 115-143.

Bodnar, Gordon M, Gregory S Hayt, and Richard C Marston. "1998 Wharton Survey of Financial Risk Management by Us Non-Financial Firms." Financial Management (1998): 70-91.

Booth, Laurence, et al. "Capital structures in developing countries." *The Journal of Finance* 56.1 (2001): 87-130.

Bradley, M., Jarrell, G.A., Kim, E.H., 1984. On the Existence of an Optimal Capital Structure: Theory and Evidence. Journal of Finance 39, 857-878.

Brewer, Elijah. "Bank Gap Management and the Use of Financial Futures." Federal Reserve Bank of Chicago, Economic Perspectives 9 (1985): 12-21.

Brick, Ivan E., and S. Abraham Ravid. "On the relevance of debt maturity structure." The Journal of Finance 40, no. 5 (1985): 1423-1437.

Cai, F., & Ghosh, A. (2003). Tests of capital structure theory: a binomial approach. Journal of Business and Economics Studies, 9(2), 20–32.

Cain, M. D., Davidoff, S. M., 2010, August. Form Over Substance? The Value of Corporate Process and Management Buy-Outs. In *5th Annual Conference on Empirical Legal Studies*.

Campello, Murillo, Rafael Ribas, and Albert Wang. "Is the Stock Market Just a Side Show? Evidence from a Structural Reform." Working paper 2012

Carter, David A, Daniel A Rogers, and Betty J Simkins. "Does Hedging Affect Firm Value? Evidence from the Us Airline Industry." Financial Management 35, no. 1 (2006): 53-86.

Chang, Xin, and Sudipto Dasgupta. "Target behavior and financing: how conclusive is the evidence?." *The Journal of Finance* 64.4 (2009): 1767-1796.

Chen, Jean J. "Determinants of capital structure of Chinese-listed companies."*Journal of Business research* 57.12 (2004): 1341-1351.

Choy, Elisa, Stephen Gray, and Vanitha Ragunathan. "Effect of Credit Rating Changes on Australian Stock Returns." Accounting & Finance 46, no. 5 (2006): 755-69.

Chung, K. and S. Pruitt (1994). "A simple approximation of Tobin's q." Financial Management 23(3).

Claessens, S., Yurtoglu, B. B., 2013. Corporate governance in emerging markets: A survey. *Emerging Markets Review*, *15*, 1-33.

Covitz, Daniel, and Steven Sharpe. "Do Nonfinancial Firms Use Interest Rate Derivatives to Hedge?". Finance and Economics Discussion Series Paper, no. 2005-39 (2005).

Creighton, Adam, Luke Gower, and Anthony J Richards. "The Impact of Rating Changes in Australian Financial Markets." Pacific-Basin Finance Journal 15, no. 1 (2007): 1-17.

Croci, E., Petmezas, D., 2010. Minority shareholders' wealth effects and stock market development: Evidence from increase-in-ownership M&As. *Journal of banking & finance*, *34*(3), 681-694.

Dang, V.A., 2010. Testing the Trade-off and Pecking Order Theories: A Dynamic Panel Framework, Working paper, Manchester Business School.

Dang, Viet Anh. "Testing capital structure theories using error correction models: evidence from the UK, France and Germany." *Applied Economics* 45.2 (2013): 171-190.

Datta, Sudip, Mai Iskandar-Datta, and Kartik Raman. "Managerial Stock Ownership and the Maturity Structure of Corporate Debt." The Journal of Finance 60, no. 5 (2005): 2333-50.

DeAngelo, H., DeAngelo, L., Rice, E. M., 1984. Going private: Minority freezeouts and stockholder wealth. *Journal of Law and Economics* , *27*, 367.

DeAngelo, Harry, and Richard Roll. "How stable are corporate capital structures." Unpublished Working Paper. University of Southern California and University of California Los Angeles, Los Angeles, CA (2011).

Delcoure, Natalya. "The determinants of capital structure in transitional economies." *International Review of Economics & Finance* 16.3 (2007): 400-415.

De Jong, Abe, Marno Verbeek, and Patrick Verwijmeren. "Firms' debt–equity decisions when the static tradeoff theory and the pecking order theory disagree." *Journal of Banking & Finance* 35.5 (2011): 1303-1314.

De Jong, Abe, Rezaul Kabir, and Thuy Thu Nguyen. "Capital structure around the world: The roles of firm-and country-specific determinants." *Journal of Banking & Finance* 32.9 (2008): 1954-1969

Demirgüç-Kunt, Asli, and Vojislav Maksimovic. "Stock market development and financing choices of firms." *The World Bank Economic Review* 10.2 (1996): 341-369.

Demirgüç-Kunt, Asli, and Vojislav Maksimovic. "Institutions, Financial Markets, and Firm Debt Maturity." Journal of Financial Economics 54, no. 3 (1999): 295-336.

De Miguel, Alberto, and Julio Pindado. "Determinants of capital structure: new evidence from Spanish panel data." Journal of corporate finance 7.1 (2001): 77-99.

Diamond, Douglas W. "Debt Maturity Structure and Liquidity Risk." The Quarterly Journal of Economics 106, no. 3 (1991): 709-37.

Djankov, S., La Porta, R., Lopez-de-Silanes, F., & Shleifer, A., 2008. The law and economics of self-dealing. *Journal of financial economics*, *88*(3), 430-465.

Dyck, A., Zingales, L., 2004. Private benefits of control: An international comparison. *The Journal of Finance*, *59*(2), 537-600.

Emery, Gary W. "Cyclical Demand and the Choice of Debt Maturity." The Journal of Business 74, no. 4 (2001): 557-90.

Fama, E.F., French, K.R., 2002. Testing Trade-Off and Pecking Order Predictions about Dividends and Debt. Review of Financial Studies 15, 1-33.

Faulkender, Michael, et al. "Cash flows and leverage adjustments." Journal of Financial Economics 103.3 (2012): 632-646.

Fischer, Edwin O., Robert Heinkel, and Josef Zechner. "Dynamic capital structure choice: Theory and tests." The Journal of Finance 44.1 (1989): 19-40.

Flannery, Mark J., and Kasturi P. Rangan. "Partial adjustment toward target capital structures." *Journal of Financial Economics* 79.3 (2006): 469-506.

Flannery, Mark J. "Asymmetric Information and Risky Debt Maturity Choice." The Journal of Finance 41, no. 1 (1986): 19-37.

Flannery, Mark J. "Market Interest Rates and Commercial Bank Profitability: An Empirical Investigation." The Journal of Finance 36, no. 5 (1981): 1085-101.

Frank, Murray Z., and Vidhan K. Goyal. "Testing the pecking order theory of capital structure." *Journal of financial economics* 67.2 (2003): 217-248.

Frank, Murray Z., and Vidhan K. Goyal. "Capital structure decisions: which factors are reliably important?." Financial Management 38.1 (2009): 1-37.

Gompers, Paul, Joy Ishii, and Andrew Metrick. "Corporate Governance and Equity Prices." The Quarterly Journal of Economics 118, no. 1 (2003): 107-56.

González, Jorge Arturo Martínez. "Tópicos De Investigación En Finanzas Modernas." Opciones 1, no. 1 (2010).

Graham, J. R. and C. R. Harvey (2001). "The theory and practice of corporate finance: Evidence from the field." Journal of Financial Economics 60(2): 187-243.

Graham, John R, and Daniel A Rogers. "Do Firms Hedge in Response to Tax Incentives?" The Journal of Finance 57, no. 2 (2002): 815-39.

Graham, John R. "How big are the tax benefits of debt?." The Journal of Finance 55.5 (2000): 1901-1941.

Graham, John R., and Campbell R. Harvey. "The theory and practice of corporate finance: evidence from the field." Journal of financial economics 60.2 (2001): 187-243.

Graham, John R., and Mark T. Leary. "A review of empirical capital structure research and directions for the future." *Annu. Rev. Financ. Econ.* 3.1 (2011): 309-345.

Grossman, S. J., Hart, O. D., 1980. Takeover bids, the free-rider problem, and the theory of the corporation. *The Bell Journal of Economics*, 42-64.

Guedes, Jose, and Tim Opler. "The Determinants of the Maturity of Corporate Debt Issues." the Journal of Finance 51, no. 5 (1996): 1809-33.

Hand, John RM, Robert W Holthausen, and Richard W Leftwich. "The Effect of Bond Rating Agency Announcements on Bond and Stock Prices." The Journal of Finance 47, no. 2 (1992): 733-52.

Harford, Jarrad, Kai Li, and Xinlei Zhao. "Corporate Boards and the Leverage and Debt Maturity Choices." International Journal of Corporate Governance 1, no. 1 (2008): 3-27.

Harford, Jarrad, Sandy Klasa, and William Maxwell. 2013. "Refinancing risk and cash holdings." The Journal of Finance, forthcoming.

Hart, Oliver, and John Moore. "A Theory of Debt Based on the Inalienability of Human Capital." The Quarterly Journal of Economics 109, no. 4 (1994): 841-79.

Harris, Milton, and Artur Raviv. "The theory of capital structure." *the Journal of Finance* 46.1 (1991): 297-355.

Holthausen, Robert W, and Richard W Leftwich. "The Effect of Bond Rating Changes on Common Stock Prices." Journal of Financial Economics 17, no. 1 (1986): 57-89.

Huang, Rongbing, and Jay R. Ritter. "Testing theories of capital structure and estimating the speed of adjustment." Journal of Financial and Quantitative analysis 44.02 (2009): 237-271.

Huang, Guihai, and Frank M. Song. "The determinants of capital structure: evidence from China." *China Economic Review* 17.1 (2006): 14-36.

Houpt, James V, and James A Embersit. "Method for Evaluating Interest Rate Risk in Us Commercial Banks, A." Fed. Res. Bull. 77 (1991): 625.

Iraj J. Fooladi, Gordon S. Roberts, (2000) "Risk management with duration analysis", Managerial Finance, Vol. 26 Iss: 3, pp.18 – 28

Jalilvand, Abolhassan, and Robert S. Harris. "Corporate behavior in adjusting to capital structure and dividend targets: An econometric study." The Journal of Finance 39.1 (1984): 127-145.

Jensen, Michael. "Agency cost of free cash flow, corporate finance, and takeovers." Corporate Finance, and Takeovers. American Economic Review 76, no. 2 (1986).

Jensen, Michael C, and William H Meckling. "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure." Journal of Financial Economics 3, no. 4 (1976): 305-60.

Jiraporn, Pornsit, and Pattanaporn Kitsabunnarat. "Debt Maturity Structure, Shareholder Rights, and Corporate Governance." Shareholder Rights, and Corporate Governance (July 7, 2007) (2007).

Johnson, Shane A. "Debt Maturity and the Effects of Growth Opportunities and Liquidity Risk on Leverage." Review of Financial Studies 16, no. 1 (2003): 209-36.

Kaplan, S., 1989a. The effects of management buyouts on operating performance and value. *Journal of Financial Economics, 24*(2), 217–254.

Kaplan, S., 1989b. Management buyouts: evidence of taxes as a source of value. *Journal of Finance, 44*(3), 611–632.

Kaufman, George G. "Measuring and Managing Interest Rate Risk: A Primer." Economic Perspectives, Federal Reserve Bank of Chicago 8 (1984): 16-29.

Kim, E. Han. "A mean-variance theory of optimal capital structure and corporate debt capacity." The Journal of Finance 33.1 (1978): 45-63.

Kraus, Alan, and Robert H. Litzenberger."A State-Reference Model of Optimal Financial Leverage." The Journal of Finance 28.4 (1973): 911-922s

Lamm-Tennant, Joan. "Asset/Liability Management for the Life Insurer: Situation Analysis and Strategy Formulation." Journal of Risk and Insurance (1989): 501-17.

Leary, Mark T., and Michael R. Roberts. "Do firms rebalance their capital structures?." *The journal of finance* 60.6 (2005): 2575-2619.

Lehn, K., Poulsen, A., 1989. Free cash flow and stockholder gains in going private transactions. *Journal of Finance, 44*(3), 771–787.

Lemmon, Michael L., and Jaime F. Zender. "Debt capacity and tests of capital structure theories." (2010): 1161-1187.

Liao, Li, Bibo Liu, and Hao Wang. " China's Secondary Privatization: Perspectives from the Split-Share Structure Reform." *Journal of Financial Economics,2014* Forthcoming.

Lien, Donald, Melody Lo, and Jinlan Ni. "Selective asymmetric capital financing behavior: Preference towards equity financing." *Annals of Financial Economics*7.01 (2012).

Lindenberg, E. B. and S. A. Ross (1981). "Tobin's q ratio and industrial organization." Journal of Business: 1-32.

Lopez-de-Silanes, F., Shleifer, A., Vishny, R. W., 1997. Legal determinants of external finance.

Macaulay, Frederick R. "Some Theoretical Problems Suggested by the Movements of Interest Rates, Bond Yields and Stock Prices in the United States since 1856." NBER Books (1938).

Maddala, 2001. Introduction to Econometrics. 3rd Edition, John Wiley and Sons.

Maug, E., 2006. Efficiency and fairness in minority freezeouts: Takeovers, overbidding, and the freeze-in problem. *International Review of Law and Economics*, *26*(3), 355-379.

McConnell, John J., and Henri Servaes. "Additional evidence on equity ownership and corporate value." Journal of Financial Economics 27.2 (1990): 595-612.

Modigliani, Franco, and Merton H. Miller. "The cost of capital, corporation finance and the theory of investment." The American economic review (1958): 261-297.

Modigliani, Franco, and Merton H. Miller. "Corporate income taxes and the cost of capital: a correction." (1963): 433-443.

Morck, Randall, Andrei Shleifer. and Robert W. Vishny, 1988, Management ownership and market valuation: An empirical analysis, Journal of Financial Economics 20, 293-315.

Myers, Stewart C. "Determinants of Corporate Borrowing." Journal of Financial Economics 5, no. 2 (1977): 147-75.

Myers, Stewart C. "The capital structure puzzle." *The journal of finance* 39.3 (1984): 574-592.

Nance, Deana R, Clifford W Smith, and Charles W Smithson. "On the Determinants of Corporate Hedging." The Journal of Finance 48, no. 1 (1993): 267-84.

Nenova, T., 2003. The value of corporate voting rights and control: A cross-country analysis. *Journal of Financial Economics*, *68*(3), 325-351.

Ni, Jinlan, and Miaomiao Yu. "Testing the pecking-order theory: evidence from Chinese listed companies." *Chinese Economy* 41.1 (2008): 97-113.

Nuri, J., and S. Archer. "Target adjustment model against pecking order model of capital structure." European Financial Management Association Annual Meeting, Lugano, Switzerland. Available at: http://www2.dse. unibo. it/bontempi/didattica/tesi/tommasoP/finance-PO&TO-Nuri Archer. doc. 2001.

Parisi, F., Mathur, I., Nail, L., 2009. Minority stockholders' protection in a new corporate control law: Market implications in an emerging economy. *Emerging Markets Finance and Trade*, *45*(6), 4-19.

Qian, Y., Tian, Y., & Wirjanto, T. S. (2008). An empirical investigation into the capital-structure determinants of publicly listed Chinese companies: A static analysis. University of Waterloo.

Qian, Yanmin, Yao Tian, and Tony S. Wirjanto. "Do Chinese publicly listed companies adjust their capital structure toward a target level?." *China Economic Review* 20.4 (2009): 662-676.

Rajan, Raghuram G., and Luigi Zingales. "What do we know about capital structure? Some evidence from international data." *The journal of Finance* 50.5 (1995): 1421-1460.

Santomero, Anthony M, and David F Babbel. "Financial Risk Management by Insurers: An Analysis of the Process." Journal of Risk and Insurance (1997): 231-70.

Scott Jr, James H. "A theory of optimal capital structure." The Bell Journal of Economics (1976): 33-54.

Seifert, Bruce, and Halit Gonenc. "Pecking Order Behavior in Emerging Markets*." *Journal of International Financial Management & Accounting* 21.1 (2010): 1-31.

Singh, A. (1994). `How do large corporations in developing countries finance their growth ? In The AMEX Bank Prize Essays: Finance and the International Economy, no. 8 (ed. Richard O'Brien). New York: Oxford University Press, pp. 121-35.

Smith, Clifford W, and Rene M Stulz. "The Determinants of Firms' Hedging Policies." Journal of financial and quantitative analysis 20, no. 4 (1985): 391-405.

Smith Jr, Clifford W., and Jerold B. Warner. "On financial contracting: An analysis of bond covenants." Journal of Financial Economics 7.2 (1979): 117-161.

Smith, B. F., Amoako-Adu, B., 1992. Minority buyouts and ownership characteristics: Evidence from the Toronto Stock Exchange. *Financial Management*, 41-51.

Stohs, Mark Hoven, and David C Mauer. "The Determinants of Corporate Debt Maturity Structure." Journal of Business (1996): 279-312.

Stulz, Rene M. "Financial structure, corporate finance and economic growth." International Review of Finance 1, no. 1 (2000): 11-38.

SEBI (Buyback of Securities) Regulations, 1998, http://www.sebi.gov.in/acts/buybackreg.html

SEBI (Substantial acquisition of shares and takeovers) regulations, 1997, http://www.sebi.gov.in/acts/act15a.pdf

SEBI (Report of the Committee on Delisting of Shares), 2002, http://www.sebi.gov.in/commreport /delistes.pdf

Shyam-Sunder, Lakshmi, and Stewart C Myers. "Testing static tradeoff against pecking order models of capital structure." *Journal of financial economics* 51.2 (1999): 219-244.

Subramanian, G., 2007. Post-Siliconix Freeze-Outs: Theory and Evidence. *The Journal of Legal Studies*, *36*(1), 1-26.

Subramanian, G., 2005. Fixing freezeouts. *The Yale Law Journal*, 2-70.

Titman, Sheridan, and Roberto Wessels. "The determinants of capital structure choice." *The Journal of finance* 43.1 (1988): 1-19.

Tong, Guanqun, and Christopher J. Green. "Pecking order or trade-off hypothesis? Evidence on the capital structure of Chinese companies." Applied Economics 37.19 (2005): 2179-2189.

Travlos, N. G., Cornett, M. M., 1993. Going private buyouts and determinants of shareholders' returns. *Journal of Accounting, Auditing & Finance*, *8*(1), 1-25.

Wald, J.K., 1999. How Firm Characteristics Affect Capital Structure: An International Comparison. Journal of Financial Research 22, 161-187.

Welch, Ivo. "Capital structure and stock returns." *Journal of Political Economy*112.1 (2004): 106-132.

Yeh, Y-H. et al., 2009, Non-tradable Share Refrom and Corporate Governance in the Chinese Stock Market, Corporate Governance: An International Review, 17(4), 457-475.

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