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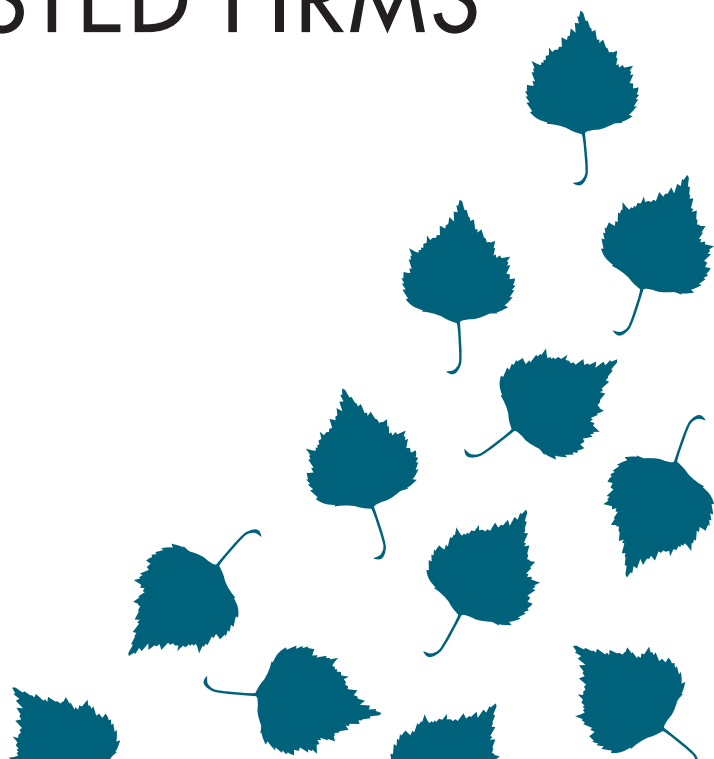
FOUR ESSAYS ON CORPORATE FINANCE OF CHINESE LISTED FIRMS

PENG WANG



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Four essays on corporate finance of Chinese listed firms

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To Tan Jiang and Yijie Li

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I still remember clearly the day that I went to Finland on 12.09.2008. I woke up at around 5 am, I took the airport bus at 6 am in Tianjin, and I arrived at the Beijing Capital International Airport at about 8:30 am, when I even remembered that I texted a message to my friend saying that "So damn fast! I have already arrived at the airport!" The flight was directly from Beijing to Helsinki, after 7.5 hours in the air, I arrived at Helsinki airport at about 2:30 pm Helsinki time. I took the bus to Tikkurila station, at which a nice Finnish lady helped me to call my friend in Vaasa and to buy the train ticket. Finally at around 8 pm, I successfully arrived in Vaasa. Three days later I met my Master advisor Professor Johan Knif and the journey has begun.

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1 INTRODUCTION

This dissertation consists of four self-contained papers. The first two of them concern pyramidal ownership structure, the third one deals with dual-board system, and the last one explores the contemporaneous relation between foreign investment flows and local equity returns. I choose the Chinese stock market as my laboratory. China will soon become the largest economy in the world, and China's domestic stock markets are growing up rapidly since their establishment in the early 1990s. According to the World Federation of Exchanges (WFE), the number of listed companies in the two domestic stock markets, i.e., the Shanghai Stock Exchange and the Shenzhen Stock Exchange reaches 2,491 with a total market capitalization of 3.7 trillion of U.S. dollars at the end of 2012. Despite this fast growth, extant studies on the Chinese stock market are still limited in scope. Perhaps because researchers' perceptions on Chinese listed firms still remain with older patterns, such as the dominance of state-owned enterprises (SOEs), the corrupted bureaucracy, the politically-appointed executives, and a market that is inaccessible to foreign investors. In this regard, one of my objectives in this dissertation is to provide some new insights into the modern corporate finance issues among Chinese listed firms. In this introductory chapter, I will discuss the theoretical background of three topics that I pursue in the papers that follow, respectively.

1.1 Pyramidal ownership structure

Previous literature considers various types of firm ownership structures, such as large block ownership (Claessens et al. 2002), family ownership (Villalonga and Amit, 2006), foreign ownership (Dahlquist and Robertsson, 2001), and managerial (employee) ownership (Morck et al., 1988, Chang and Mayers, 1992). Needless to say, ownership plays an important role in corporate finance literature, and researchers explore the implications of ownership structure from a variety of perspectives.

The issue of separation of ownership and control was first raised by Berle and Mean (1932). Berle and Mean (1932) contend that in the modern corporate world, those who legally have ownership over companies have been separated from control of those firms. Note that Berle and Mean's assumption is based on the assumption of widely-dispersed ownership, but some researchers find that in contrast to the US, ownership is much more concentrated in some other countries. For example, Faccio and Lang (2002) investigate 5,232 corporations in the Western European countries, and find that family controlled firms are common in the continental Europe while widely held firms dominate in the UK and Ireland. Claessens et al. (2000) find an even higher level of ownership concentration in nine East Asian countries: more than two thirds of the firms in their sample (2,980 firms) are controlled by a single shareholder. Even in Canada which is an Anglo-Saxon country, ownership is highly concentrated. (see, e.g., Attig et al. 2006).

So how does a large shareholder control a firm? Of course, the ultimate controller can obtain the same amounts of cash flow rights as to the voting rights, but they often tend to use control-enhancing mechanisms to acquire control with less than proportional economic interest in the firm, henceforth, to achieve the deviation from cash flow rights to control rights. There are three major types of control-enhancing mechanisms, namely, dual-class equity structures, stock pyramids and cross-ownership. In this dissertation, I pursue the stock pyramid ownership as in China, pyramidal shareholding is the main method to achieve such a separation. Non-voting shares or

other devices for discriminating against different shareholders are not permitted. While multiple shares are common in Chinese firms, the difference classes are required to carry the same voting rights. Cross shareholding in Chinese listed firms is rare (Fan et al. 2005).

The use of pyramidal structures to retain control has been documented around the world by several authors. For example, pyramidal shareholding represents nearly 20% of the ownership in the Western European firms (Faccio and Lang, 2002). The use of pyramidal ownership structure is even more widespread in Eastern Asia: 67% of the firms in Indonesia are pyramidal affiliates, 55% in Singapore, 49% in Taiwan and 37% in Japan (Claessens et al., 2000). However, in the U.S., the corresponding figure is only 9% (Attig et al., 2004). According to Fan et al. (2005), 61% of the listed firms on the Chinese main boards are affiliates.

To illustrate the pyramid structure both theoretically and empirically. I first present an example of how pyramid structure can achieve the deviation between cash flow rights and control rights. Consider the pyramidal holding of two companies, where a shareholder holds a controlling stake in a holding company, which in turn holds a controlling stake in an operating company (an affiliated company). Assume that the owner holds a fraction α_1 of the shares in company A, company A holds a fraction α_2 of the shares in company B, and so on. The assets are placed in company n. The owner can thus exercise formal control over the assets, whereas, the owner holds a fraction s of the cash flow right as shown in Equation (1),

$$s = \prod_{i=1}^{n} a_i \tag{1}$$

As we can see, the presence of the pyramid allows an owner to control a company's assets completely without having more than the fraction s of the company's cash-flow rights. The product s becomes lower as the number of layers (n) grows. For further illustration, consider a boundary case in which the owner has to hold at least 50% of the voting rights in order to exercise formal control over a firm on each pyramidal layer, $s=(0.5)^n$. When n equals 4, i.e., the number of pyramidal layers is four, the ultimate owner of the firm has only $1/2^4$ (6.25%) of its cash-flow rights, but 50% of its voting rights.

Next, I illustrate a real-life example of pyramid ownership of the firms in my sample. Figure 1 shows how the couple Zhou Qinzhi and Zhao Yilan controls Zhejiang Narada Power Source Company Limited through three intermediate companies-- Hangzhou Nandu, Shanghai Nandu Group and Shanghai Yidu. Zhou owns 60.53% of Hangzhou Nandu and 27.84% of Shanghai Nandu Group while Zhao owns 64.25% in Shanghai Yidu. Shanghai Yidu has a 56.67% stake in Shanghai Nandu Group which owns 39.47% of Hangzhou Nandu. The weakest link in the control chain is 20.75%+8.16%+10.24%=39.15%. However, cash-flow ownership is more complicated since each chain has to be multiplied separately, i.e. ((0.6053*0.2075+0.2784*0.0816+0.2784*0.3947*0.2075)+ (0.6425*0.1024+0.6425*0.5667*0.0816+0.6425*0.5667*0.3947*0.2075))*100%=29.64%. Thus, this company is ultimately controlled by Zhou and Zhao through a pyramidal holding. In this case, there is a 9.51% difference between the control rights and cash flow rights due to the existence of the pyramid.

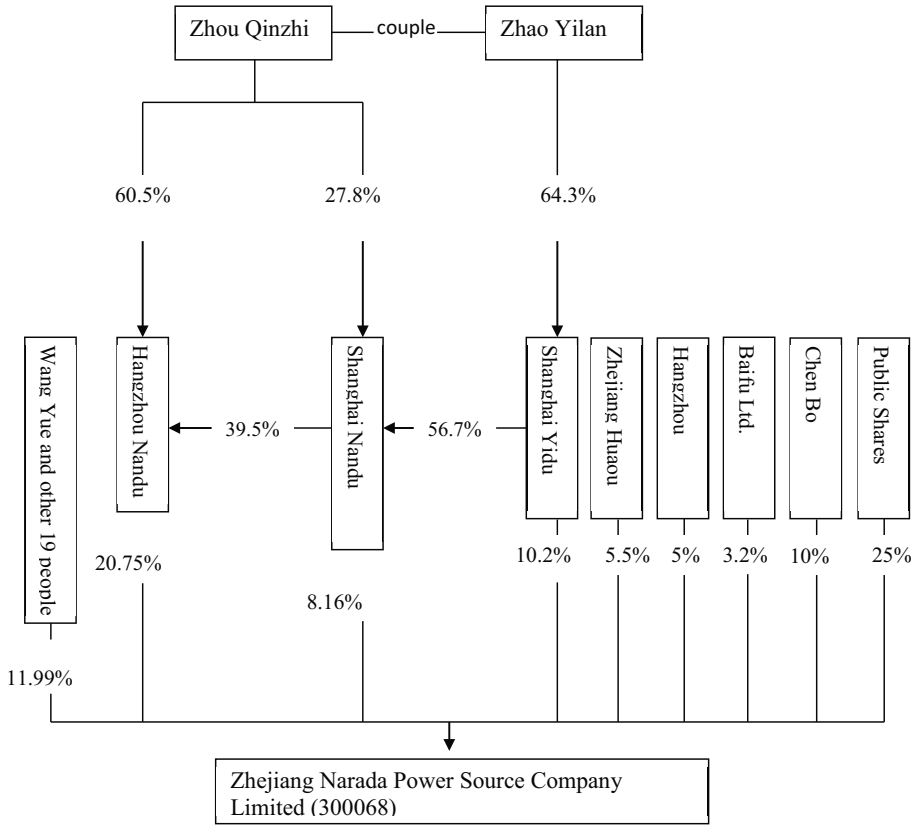

Figure 1 An example of pyramid ownership on the Growth Enterprise Market

Pyramid business groups can both positive and detrimental consequences. Below I will review some selective papers based on the both points of view.

On the dark side, Bertrand et al. (2002), Bae et al. (2002) and Morck et al. (2005) show that pyramid groups create a wedge between control rights and cash flow rights, which can facilitate expropriation of minority shareholders through various tunneling activities. Bertrand et al. (2002) try to quantify the extent of tunneling, as they introduce a general procedure inspired by the brain imaging technique PET (Positron Emission Tomography), in which the scanner tracks blood flow in the brain by following the path of radioactively tagged material for that has been injected into the blood. Similarly, they follow the flow of money through the pyramid by tracking the propagation of exogenous shocks to different firms in the pyramid. Their results suggest a significant amount of tunneling between firms in the pyramid business groups. They find that the top-most firms benefit most of all from shocks to lower down firms. Bae et al. (2002) also find evidences of tunneling by examining merger and acquisition in Korean business groups. They show that minority shareholders of chaebol firms making acquisitions typically lose from the acquisitions, but the controlling shareholders of these firms gain from them. Morck et al. (2005) also take a skeptical view on business pyramidal groups. They argue that at the country level, the extensive control of corporate assets by few families distorts capital allocation and reduces the rate of innovation, which results in an economy-wide misallocation of

resources, and hinder the economic growth. They also contend that family groups acquire and perpetuate economic dominance by cultivating powerful political influence, which enable them to entrench their market positions, often at the expense of economic, institutional and capital market development.

In contrast, on the bright side of pyramid groups, Almeida and Wolfenzon (2006) provide theoretical arguements for how pyramid groups possess a financing advantage created by their internal capital markets, and how they are thus better able to support the funding requirements of new firms in underdeveloped markets. Khanna and Yafeh (2005) elaborate that such internal capital markets facilitate risk-sharing and intra-group financial support. The business groups will also help create reputation and credible implicit guarantees within the groups which helps them overcome external capital constraints and the associated risk of financial distress.

By using a comprehensive data set of 28,039 firms in 45 countries, Masulis et al. (2011) investigate motivations for family-controlled business groups. Their most striking finding is that the firm performance measures increase down a pyramidal chain, being the strongest at the bottom of the group, where the divergence of cash flow from control rights is more pronounced. This indicates that the bottom tier of a pyramid is populated by capital-intensive, low free cash flow, growth firms, where the scope for consumption of private benefits of control is seriously constrained. They also find, however, that the group firms that are controlled by using dual-class shares suffer from a valuation discount. They conclude that costs and benefits of group affiliation differ at different positions within a pyramid structure.

In a more recent paper, Bena and Ortiz-Molina (2013) investigate the role of pyramidal ownership in the creation of new firms. Their empirical results support the theoretical arguments raised by Almeida and Wolfenzon (2006), that pyramids arise because they provide a financing advantage in setting up new firms when the pledgeability of cash flows to outsider financiers is limited. Bena and Ortiz-Molina (2013) also document that the financing advantage of pyramids is pronounced in many countries.

With respect to pyramid groups in China, Fan et al. (2005) examine pyramid structure of companies controlled by both local governments and private owners. They suggest that pyramidal behavior is likely affected by different property right constraints of the two types of owners. On one hand, local governments are constrained by Chinese laws that prohibit free transfer of state ownership. Pyramidal ownership thus allows them to credibly decentralize the firm decision rights to firm management without selling off the ownership. On the other hand, private owners are constrained by their lack of access to external funds. Pyramidal ownership can alleviate the financing constraints.

He et al. (2013) employ a comprehensive data set that covers all firms from Shanghai and Shenzhen Stock Exchanges. They find that internal capital market is more likely to help those affiliated firms that are either private or local government owned, relative to those owned by the central government, or those located in regions with a well-developed institutional environment. They provide evidence of the role of business groups in risk sharing among affiliated firms, but they also find that business groups have no impact on firm accounting performance.

The literature on the main determinants of decision to separate cash flow rights from voting rights this issue is surprisingly limited. Adams and Ferreira (2008) offer an excellent review on the general topic, but most of the papers they mention focus on the determinants of dual-class structures. Examples include Taylor and Whittred (1998),

Smart and Zutter (2003), and among others. Among the few papers in Adams and Ferreira (2008) that analyze the determinants of pyramid ownership, Claessens et al. (2000) and Faccio and Lang (2002) are mostly descriptive. The clear message from the latter paper is that the overall separation between votes and cash flow rights that is achieved via pyramids, cross-ownership, and dual-class shares is often small, especially in Europe. Almeida and Wolfenzon (2006)'s theoretical model also suggests that pyramids are set up for reasons other than to retain control.

1.2 Corporate board

Having a board of directors is one of the legal requirements for corporations in most countries. An important property of the corporate board is the board size which often refers to the total number of directors on board. After the seminal paper by Yermack (1996), board size has received a lot of attention. Most researchers agree the inverse relationship between board size and firm valuation, and empirical evidence of it can be found in different countries and samples. For instance, Yermack (1996) finds that board size is significantly negatively correlated with the firm's valuation in 452 large US industrial corporations. Eisenberg et al. (1998) study the board size–performance relationship in small unlisted firms, using a sample of approximately 900 Finnish firms, they find an inverse relationship between board size and firm performance. Mak and Kusnadi (2005) and Guest (2009) also find similar evidence in Singapore, Malaysia and the U.K. Lipton and Lorsch (1992) conclude that there are two reasons for the ineffectiveness of large boards. First, owing to communication and coordination costs, it is harder for larger boards to arrange meetings, reach a consensus, and react rapidly. Second, a large board size hinders the abilities and incentives of able board members to control management.

Another important property is the independence of board. Board independence is required by law in some countries, where the law stipulates that the board of directors should consist of certain proportion of independent directors. Researchers also usually use the proportion of independent directors on the board as a proxy for independence. Table 1 illustrates some requirements of the proportion of independent directors on the board in some countries.

Table 1 Requirements of Independent directors for countries

Brazil	France	Russia	Singapore	U.K.	U.S.	China
As many as possible	At least 50% of board	At least 25% of board	At least 33% of board	At least 50% of board	Substantial majority of board	At least 33% of board

Clarke (2006) gives a good definition of an independent director:"...one who has no need or inclination to stay in the good graces of management, and who will be able to speak out, inside and outside the boardroom, in the face of management misdeeds in order to protect the interests of shareholders." A traditional theory suggests that independent directors are better able to monitor management than other directors, and that firm's performance should be better if the proportion of outsiders is higher. However, empirical results on the relation between the board independence and firm performance are mixed. For example, Baysinger and Butler (1985) find that companies

perform better if the boards include more outsiders, but this view is not supported by Hermalin and Weisbach (1991), who find no relation between firm performance and the fraction of outside directors. In a study of board structure of bank holding companies (BHC), Adams and Mehran (2004) find no significant relationship between the proportion of outsiders on the board and firm performance which is measured by Tobin's Q. However, they find a positive and significant relation between an outsider-dummy (equals to one if the fraction of outside directors on the board is greater or equal to 50% and 0 otherwise) and firm performance.

Dual board structure consists of a board of directors and a supervisory board. The German dual board system, along with Anglo-Saxon unitary board system, is generally recognized as the most effective governance mechanisms. (Shleifer and Vishny, 1997) With respect to the functions of the two boards, Adams and Ferreira (2007) show that in the unitary board system, the board of directors assumes an advisory as well as a monitoring role, whereas in the dual board system, the board's monitoring role is separated from the advisory role. That is, as an independent entity in the firm, the supervisory board takes on the monitoring role while the board of directors takes on the advisory role.

With respect to the board independence of the dual board structure, Adams and Ferreira (2007) argue that in the sole board system, the advisory and monitoring roles of boards are not separate, increasing director independence may have adverse consequences because managers are less willing to share information with a sole board as its monitoring intensity increases. As a result, even an independent board cannot monitor effectively with less information. In contrast, in a dual board system, the advisory and monitoring roles are separate and the incentives for managers to share information are not affected by the independence of the supervisory board, therefore, increasing the independence of supervisory board will increase shareholders' value.

1.3 The contemporaneous relationship between foreign investment flows and local equity returns

What are the consequences for an equity market when it is opened to foreign investors? On one hand, Stulz (1999) argues that liberalizing a stock market can reduce the country's cost of equity capital by allowing for risk sharing between domestic and foreign investors. On the other hand, De Long et al. (1990) contend that trading by foreign investors could lead to excess volatility, and potentially have a destabilizing effect.

However, a trend that we can clearly observe is that more and more countries reduce or even eliminate the barriers to international investments. Thus the research in this area is necessary and essential. In their seminal paper, Froot et al. (2001) explore daily international portfolio flows into and out of 44 countries. They find some stylized facts about the behavior of the flows. The international flows appear to be stationary, but far more persistent than returns. They are strongly influenced by past returns, and foreign inflows tend to have positive forecasting power for future equity returns especially in emerging markets. However, a potential shortcoming of Froot et al. (2001)'s data is that they do not fully describe foreign investments as Froot et al. (2001) rely on the trades of one particular custodian, State Street Bank and Trust. Richards (2005) employs a dataset that is composed of total foreign investments in six Asian equity markets, and finds that foreign flows into these countries exhibit a pattern of strong

positive feedback trading with respect to foreign returns (especially from the United States) rather than local market returns.

More recently, Jinjarak et al. (2011) extend the literature by examining bond investments. They explore the dynamics of international bond investment and its interaction with equity returns. The authors find that past equity returns contain useful information for forecasting bond flows, and that bond flows also impact future equity returns. Ülkü and Weber (2013) employ daily data on trading flows of a rich breakdown of investor types and obtain new insights concerning trading done by various investor types. In particular, Ülkü and Weber (2013) find that merchant trading has both significant informational content and forecasting ability. Private investors tend to be positive feedback traders but their trading has limited informational content. Foreign investors are positive feedback traders and their trading also has significant informational content.

2 SUMMARY AND CONTRIBUTION OF EACH ESSAY

2.1 Paper I: Ownership structure of the Chinese Growth Enterprise Market

In the first paper, I use hand-collected detailed ownership data of all firms listed on the Chinese NASDAQ- Growth Enterprise Market (GEM) in 2010 to explore the ownership structure and the holders of ultimate control. Surprisingly, I find that 46% of the firms listed on the GEM are set up in a pyramid, whereas in Europe, the typical pyramidal firm is a large, old firm in a mature industry (see e.g. Holmén and Högfeldt, 2009). Compared to the state-owned pattern on the main board in China, 90% of the companies on the GEM are owned by individuals/families. This can be viewed as evidence of willingness of the Chinese government to speed up the country's process of privatization and transition to market economy. I also illustrate the differences in listing rules between GEM and the main board.

My empirical results indicate that larger size and poorer profitability increase the probability of the rise of pyramids. Pyramidal firms' Tobin's Q is on average 30% lower, and this is robust to two different measures of Tobin's Q. I view this as evidence of pyramids creating rent-seeking opportunities for the ultimate owners at the top of the ownership chain. They may be investing in risky or unprofitable projects to fit their own utility, which leads to expropriation of minority shareholders. This result is thus consistent with the dark side of the pyramidal structure. I also construct a variable wedge that measures the length of the ultimate ownership chain, and my results indicate that family-owned and less developed firms set up more intermediaries in the pyramidal structure whereas the state-owned firms tend to use more simple structures.

This paper contributes to the literature in two ways. First, I am the first one to investigate the detailed ownership of the firms listed on the Chinese Growth Enterprise Market. My results show that 90% of the GEM firms are owned by families or individuals and about half of the firms are set up in a pyramid structure. Second, my finding of a negative relation between pyramidal dummy and Tobin's Q supports the dark side of the pyramid structure, indicating the ultimate owners may seek to separate themselves from their affiliate subsidiaries, thereby giving them the opportunity to engage in potentially damaging business practices.

2.2 Paper II: Pyramid IPOs on the Chinese Growth Enterprise Market (joint with Martin Holmén)

The second paper compares the IPO process between pyramid firms and non-pyramid firms. We examine the interaction of pyramid structure and the IPO process in light of Adams and Ferreira (2008). Adams and Ferreira (2008) point out that the empirical literature on the determinants and the effects of the actual decision to separate cash flow rights from voting rights is surprisingly small. Previous studies mainly investigate dual-class IPOs, for example, Taylor and Whittred (1998), and Amoako-Adu and Smith (2001). However, to the best of our knowledge, no prior studies on pyramid IPO exist. Our paper aims to fill this gap and complements the literature.

We use the same data set as in paper I. In addition, we include some variables that are important during the IPO process such as oversubscription rate, IPO underpricing rate, (subscription) price to book ratio. We note that there are two important features in the

IPO regulation on the GEM: (1) Exactly 25% of firm must be sold at IPO, (2) 80% of shares sold at IPO must be sold to individual investors. Our main variable of interest is a pyramid dummy that equals one if the firm is in a pyramid structure and zero otherwise. In order to control for the fact that original owners endogenously decide whether to set up the firm in a pyramid structure, we estimate a treatment effect model, where we use total number of employees as an instrument for pyramid dummy.

Our results can be summarized as follows. We first document that that pyramid IPOs are discounted before the IPO. The subscription price to book ratio is significantly lower for pyramid IPOs compared to stand-alone IPOs. Thus, the discount on pyramid firms documented by e.g. Claessens et al. (2002) appears to be driven, at least partly, by an ex ante risk-premium associated with investing in pyramids, and not only by majority shareholders actually expropriating minority shareholders.

Furthermore, we find that the underpricing is higher for pyramid IPOs. We conclude that investors demand a higher risk-premium when investing in pyramid IPOs and this translates into a higher underpricing. Individual investors' interest in IPOs appear not be affected by pyramid structures. Institutions, on the other hand, are keener to pyramid firms than standalone firms. Rock's (1986) theoretical model can explain this, informed investors (institutions) has an opportunity to profit from superior information by bidding for "mispriced" securities (pyramidal IPOs). They are compensated for their costly information processing about e.g. complicated pyramid structure, by larger first day returns.

This paper contributes to the existing literature in at least two dimensions. First, most prior studies use information about mature pyramidal firms and document that at least under some conditions, pyramid structures are associated with lower firm value and worse firm performance (see e.g. Claessens et al., 2002, Lemmon and Lins, 2003 and Fan et al. 2005). These results are often interpreted in terms of expropriation of minority shareholders by the controlling shareholder. Our IPO results supplement these results and suggest that pyramid-affiliated firms are discounted already at the IPO stage.

Second, our approach and the use of detailed information about the IPOs on GEM allow us to document a more complete picture than that in prior studies. The analysis of i) price to book ratio at the subscription price, ii) underpricing, and iii) oversubscription ratios also provides a consistent story. Higher underpricing could be due to a large interest in the IPO which creates overvaluation once the firm shares begin to trade. Alternatively, a higher underpricing could be due to underwriters setting a lower subscription price in order to attract investors. The results for pyramid IPOs on the GEM suggest that the second explanation is more plausible.

2.3 Paper III: The effectiveness and independence of supervisory board: evidence from China 2000-2009

In this paper, I study the dual board structure in all Chinese listed firms from 2000 to 2009 by focusing on the potential interplay between the supervisory board and the board of directors. I first show that both board of directors' size and supervisory board's size are significantly negatively associated with firm valuation (Tobin's Q), which suggests that as the board increases in size, corporate valuation decreases. This result complements the literature on the relation of supervisory board size and corporate valuation, indicating that supervisory board faces similar problems as those

documented in board of directors, such as the communication/ coordination problem and the free rider problem.

I then test the relationship between firm valuation and independence of supervisory board. Adams and Ferreira (2007)'s theoretical model suggests that in the dual board system, enhancing the independence of supervisory boards has no effect on the incentives of managers to share information. Thus, given the supervisory board is (well) informed, increasing its independence will increase shareholder's value. In the spirit of prior studies, (e.g., Hermalin and Weisbach (1991), and Bhagat and Black (1999)), I define a proxy for independence of supervisory board, named S/B ratio. The variable represents the number of supervisors divided by the sum of the number of directors and the number of supervisors.

My results indicate that Tobin's Q and ROA first decline, then rise when S/B ratio increases. My interpretation is that, when the proportion of supervisors on the board (S/B ratio) is low, the supervisory board is not sufficiently independent. It may even hinder the firm due to either distraction of directors or free-rider problem. Once the proportion achieves a threshold, the separation between the two roles of the board becomes more clear. The supervisory board becomes more independent and more effective in monitoring. The advantage from the independence of a supervisory board thus overcomes the free-rider and coordination/ communication problems, and eventually the firm benefits from a more independent supervisory board. My results are robust to using different models (i.e., OLS and fixed-effect model), and other robustness tests.

2.4 Paper IV: Foreign institutional investor trading in Chinese A-share markets (*Managerial Finance*, forthcoming)

In this paper, I use a comprehensive data set that contains all foreign institutional transactions in the QFII scheme to answer these three questions: 1. Is there any relationship between foreign institutional investor trading and the equity returns in Chinese A-share markets? 2. If so, what is the cause of this relationship, i.e., do foreign institutional investor trading destabilize the market or do they have informational advantage? 3. Are foreign institutional investors in the A-share markets positive or negative feedback traders?

The QFII scheme received a lot of attention since its introduction to China in 2002, because this scheme enables licensed foreign institutional investors to transact directly in the A-share markets that were formerly closed to foreign investors. Before the QFII scheme, foreign investors in China were only allowed to trade in the B-share market where only a small subset of Chinese firms is available for trading .

My data contain quarterly transaction records of each QFII for all non-financial firms listed on the A-share markets from 2005Q1 to 2011Q4. I calculate the total foreign institutional holdings of a particular stock in a particular quarter by aggregating the percentage of tradable shares owned at the firm level for each quarter. Foreign institutional investor ownership for a specific stock I, FOWNi, is defined as follows:

$$FOWN_{i,t} = \sum_{m=1}^{M} \textit{percentage of tradable shareholdings of any foreign institutional investor } m \textit{ at quarter } t_m.$$

And I obtain the foreign flow data by simply taking the first order of difference of FOWN: $FLOW_{it,} = FOWN_{i,t} - FOWN_{i,t-1}$ (2)

My empirical results show firstly that there exists a strong and positive contemporaneous relationship between foreign flows and equity returns. This relation holds in both the bi-variate OLS regressions and OLS regressions with a set of control variables. I then deepen the analysis by constructing 10 portfolios as follows: at the end of each quarter, from the 2005Q1 to 2011Q4, I sort stocks into 10 portfolios based on the percentage of foreign investment. I then aggregate these stocks to obtain 10 portfolios with different levels (from lowest to highest) of foreign flows. Portfolio 1 is thus composed of stocks with the least foreign institutional investment (or the largest foreign divestments) for each quarter, whereas Portfolio 10 contains the stocks with the largest foreign institutional investment for each quarter.

For each portfolio, I employ the bivariate VAR model. According to AIC, I choose the lag length as one, so the bivariate VAR specification is

$$\begin{bmatrix} Flow_t \\ \mathrm{Re}t_t \end{bmatrix} = \begin{bmatrix} c_1 \\ c_2 \end{bmatrix} + \begin{bmatrix} \varphi_{11} & \varphi_{12} \\ \varphi_{21} & \varphi_{22} \end{bmatrix} \begin{bmatrix} Flow_{t-1} \\ \mathrm{Re}t_{t-1} \end{bmatrix} + \begin{bmatrix} e_1 \\ e_2 \end{bmatrix}. \quad (3)$$

The VAR model has been widely applied in the associated literature (e.g., Froot et al., 2001; Karolyi, 2002; Richards, 2005; Ülkü and Weber, 2012; Jinjarak et al., 2013). One benefit of using the VAR model is the model's ability to test for contemporaneous causality between foreign flow and equity return.

The results from the VAR model show that equity returns are significantly correlated with previous quarter's foreign flows but not vice versa, indicating that foreign institutional investors are neither positive nor negative feedback traders. However, their trading has a strong effect on future equity returns. There are two possible explanations for this result. First one is the price pressure hypothesis, and the second one is the information asymmetry hypothesis. Price pressure is defined as trading caused by a certain type of investor (e.g., foreign investors) that can result in price movements that are unrelated to the underlying fundamentals and hence lead to excess volatility, and that can potentially have a destabilizing effect (Froot and Ramadorai, 2008). Information asymmetry hypothesis indicates that if foreign institutional investors have informational advantage, then they can pick stocks that have higher expected returns.

Following Griffin et al. (2004), I incorporate the contemporaneous foreign flow into the portfolio quarterly return equation:

$$\mathrm{Re}t_t = \alpha + \beta_1 Flow_t + \beta_2 Flow_{t-1} + \beta_3 \mathrm{Re}t_{t-1} + \varepsilon. \quad (4)$$

My results support the asymmetric information hypothesis, as foreign institutions in China appear to be better informed than local investors. The predictive power of foreigners on future equity returns thus seems to mainly result from an informational advantage but not a result of price pressure from their trading.

This paper's contribution to the existing literature is twofold. First, the paper complements the limited literature concerning the contemporaneous relationship between foreign flows and local equity returns. The VAR model suggests that the transactions of foreign institutional investors should Granger cause the local equity

returns, but not vice versa. Second, to the best of my knowledge, this paper is the first to examine the extent to which equity returns are associated with the magnitude of foreign flows. I further document the existence of different links between the two components. Specifically, a permanent and strong price impact is found in the portfolios with the most negative foreign investments (the largest foreign divestments), whereas a temporary but strong impact is found in the portfolios with moderate foreign investments, and a permanent but weak impact is found in the portfolios with the largest foreign investments.

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Section 2

Ownership Structure of the Chinese Growth Enterprise Market

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ABSTRACT: In this paper, I provide a preliminary detailed examination of ownership structure in the Chinese Growth Enterprise Market (GEM), which was launched in 2009. Specifically, I trace the ownership of each company and identify each company's owner in terms of type and controlling stake. Through this examination, I show that for 46% sample firms, organizational structure takes the form of a pyramid. Further, I demonstrate that the owners of most firms in the GEM are families, which stands in stark contrast with the firms listed on the main board in China, which are state-owned. Taken together, this study's results suggest that pyramidal ownership structures are detrimental to firm valuation.

JEL: G32 G38

Keywords: pyramid ownership structure, Growth Enterprise Market, China

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1 INTRODUCTION

In this paper, I investigate the ownership structure of firms listed on the Chinese NASDAQ- Growth Enterprise Market (GEM). Launched only in 2009, the GEM has yet to receive substantial attention from researchers. Given this oversight, many questions surround the firms that comprise the GEM. For example, who are the owners of the firms listed on the GEM and what do the ownership structures of those firms look like? The purpose of this paper is to address these questions and illustrate the ownership structure of the GEM.

During the recent transformation of the Chinese economy, the Chinese government called for an industry transition intended to prompt more efficient economic growth. More specifically, the primary goal of this transition was to transform the Chinese economy such that industries from the old 'three-high' industries—which are characterized by high pollution, high energy consumption, and high water consumption—are more consistent with demands for sustainable growth. GEM offers Chinese entrepreneurs, particularly those in the high-technology sector, a better opportunity to raise funding. In this way, it is possible that companies in the GEM will serve as prototypes for modern, large corporations in China. GEM is also one of the fastest growing stock exchange markets in the world; the market value of the GEM has increased dramatically from 160 billion Yuan (US $25.7 billion) in 2009 to 1306 billion Yuan (US$ 207.3 billion) in 2012.

To gain a clearer understanding of the ownership structure of the firms listed on the GEM, I collected the annual reports and evaluated the detailed ownership structure for each firm. The sample consisted of 173 observations from the year 2011. Of the 173 firms I evaluated, 73 (42.2%) adopted a pyramid structure, and state-owned enterprises (SOEs) accounted for only 11 (6.4%) of the firms in the sample. These findings contradict traditional views, both internationally and domestically. Traditional perspectives dictate that the typical European pyramidal firm is large, old, and operates in an established industry (Holmén and Högfeldt, 2009). Moreover, research has suggested that SOEs dominate China's economy, as the government has controlling rights over as many as 76% of firms on the main board (Fan and Wong 2004). My result also supports the view expressed by some media that firms listed on the GEM are not entirely entrepreneurial in kind.

In addition, I explored the relationship between pyramidal structure and firm performance by measuring the distance between the ultimate owner of a firm and its pyramid affiliate in the GEM. This analysis revealed two notable findings. First, I found a strong negative relationship between pyramidal structure and firm performance, suggesting that pyramidal ownership depresses the corporate value of affiliated firms. This result was largely consistent with extant literature in this domain (see Claessens et al. 2002, Volpin 2002, Attig et al. 2004, Jong et al. 2009). I interpret this finding as suggestive that organizations that are pyramid-structured can facilitate the misuse of internal capital on the part of firm owners (e.g., stripping assets from affiliates, making aggressive-risk decisions to expropriate minority shareholders). Second, past research has largely neglected to focus on the distance (wedge) between the ultimate owner of a firm and its affiliate. As a result of this shortcoming of the literature, I develop and leverage a new variable which represents the ratio of the ultimate rights of control to the ultimate rights of cash-flow. This variable served as a proxy to measure distance, thereby facilitating the performance of a regression analysis. Results of this regression analysis suggest that whereas family-owned and less-developed firms are likely to

establish intermediaries with a pyramid structure, state-owned firms are more likely to utilize simpler structures.

To explore these issues in greater detail, I have organized the remainder of this article in a number of interrelated sections. Section 2 briefly introduces the concepts of SOEs and Chinese stock markets, and reviews salient literature in this domain. In Section 3, I describe the theoretical framework to be employed in my analyses. Section 4 features a description of the data; and results of the analyses are presented in Section 5. Finally, I offer some concluding remarks in Section 6.

2 CHINA'S STOCK EXCHANGE MARKETS

Relative to other developing countries, Chinese stock markets opened quite late in the early 1990s. At the inception of the Chinese stock market, only 13 companies (with a total market capitalization of $160 million) were listed. By 2009, the number of companies listed on the Chinese stock markets had reached 1740, and their collective total market capitalization had grown to $3573 billion. According to the World Federation of Exchanges (WFE), China ranks second only to the United States in terms of domestic market capitalization value.

There are two principal stock exchange markets in China: the Shanghai Stock Exchange and the Shenzhen Stock Exchange. Stock listings on these exchanges include A-shares, B-shares, and H-shares. Whereas A-shares and B-shares are most commonly traded in exchanges on the Chinese mainland, H shares are primarily traded on the Hong Kong Stock Exchange. Originally, A-shares were developed for residents of the Chinese mainland and B-shares were developed for foreign investors. Although B-shares are denominated in Renminbi, they are payable in foreign currency, making them both accessible and attractive to foreign investors.

Although the Shanghai Stock Exchange and Shenzhen Stock Exchange share a number of common standards, they are characterized by a few differences as well. For example, in the Shanghai Stock Exchange, transactions related to B-shares are conducted using U.S. dollars. In the Shenzhen Stock Exchange, however, B-share transactions are conducted with Hong Kong dollars. In another key difference, investors in the Shanghai Stock Exchange must specify a broker as an appointed trustee when opening an account. This broker can be changed only by closing the trading account with the previous security company. In contrast, in the Shenzhen Stock Exchange, investors can open accounts with several brokers, but stocks must be sold through the same broker with which they were bought.

Table 1 Domestic market capitalization in 2010 (in million dollar)

1	NYSE Euronext (US)	13 394 081.8
2	NASDAQ OMX	3 889 369.9
3	Tokyo SE Group	3 827 774.2
4	London SE Group	3 613 064.0
5	NYSE Euronext (Europe)	2 930 072.4
6	Shanghai SE	2 716 470.2
7	Hong Kong Exchanges	2 711 316.2
8	TSX Group	2 170 432.7
9	Bombay SE	1 631 829.5
10	National Stock Exchange India	1 596 625.3
11	Australian Securities Exchange	1 454 490.6
12	Deutsche Börse	1 429 719.1
13	Shenzhen SE	1 311 370.1
14	SIX Swiss Exchange	1 229 356.5
15	BME Spanish Exchanges	1 171 625.0

The GEM is often considered a second-tier stock exchange that is specially designed for small and medium-sized emerging companies that are currently not qualified to list on

the main board. These emerging companies are provided with opportunities for financing and growth in the GEM. Though the GEM affords emerging companies with opportunities to which they might otherwise lack access, GEM-listed companies can apply for listing on the main board whenever they meet the standards. (Table 2) illustrates the differences in listing rules between the two markets. Although the listing standards for the GEM are lower than those for the main board, the GEM is nonetheless highly regulated. For example, the GEM requires a company to disclose any transactions (e.g., equity) worth either 5 million Yuan (or more) or 10% of the company's total revenue of the latest audited fiscal year. In contrast, the main board requires all transactions worth an absolute amount of 10 million Yuan to be disclosed. Moreover, according to The Company Law of the People's Republic of China, directors, supervisors, and senior managers cannot buy or sell their own firms' shares until the firm has been listed for more than one year, or until six months have passed since they have left their positions. This rule applies to companies listed on both the main board and the GEM. Still, the owners of companies on the GEM are much more restricted; they are unable to sell or repurchase their shares for a period of three years from the date of listing.

Table 2 Listing rules of GEM and the main boards

Market	GEM	Main board
Firm age	At least three-year operating history	At least three-year operating history
Total asset& Total revenue standard	The company profits for the last two years and the net income is at least 10 million Yuan; or, The company profits for the last year and the net income is at least 5 million Yuan, the sales of the last year is at least 50 million Yuan; the growth rate of the sales for the last two years is at least 30% per year. No accumulated losses for the last year. Net asset of at least 20 million	The company profits for the last three years and the net income is at least 30 million Yuan; or, Net cash flow of at least 50 million Yuan for the three most recently completed fiscal years; or, sales of at least 300 million Yuan for the three most recently completed fiscal years. No accumulated losses for the last year. Intangible asset of at most 20% of total asset. Stockholders' equity of at least 30 million before listing.
Equity standard	Stockholders' equity of at least 30 million after listing. At least 200 total holders.	Stockholders' equity of at least 50 million after listing. At least 1000 total holders.
Publicly held shares standard	The percentage of publicly held shares of at least 25%. In the case the total equity of the company exceeds 400 million, the percentage of publicly held shares is at least 10%	The percentage of publicly held shares of at least 25%. In the case the total equity of the company exceeds 400 million, the percentage of publicly held shares is at least 15%
Corporate governance	No major changes in the main business, directors or senior managers of the company for the last two years. No change of the actual controller of the company for the last two years.	No major changes in the main business, directors or senior managers of the company for the last three years. No change of the actual controller of the company for the last three years.

3 THEORETICAL FRAMEWORK: SEPARATION OF CASH-FLOW RIGHTS AND CONTROL RIGHTS

Based on the notion of widely dispersed ownership, Berle and Means (1932) first argued that in the modern corporate world, those who have legal ownership over companies have been largely separated from control of those firms. However, Shleifer and Vishny (1986) and Morck et al. (1988) have demonstrated that even among the largest American corporations, some concentration of ownership exists. In addition, by tracing firms' respective chains of ownership to determine who has the most significant voting rights in those firms, La Porta et al. (1999), Claessens et al. (2000), and Faccio and Lang (2002) showed even greater degrees of ownership concentration exists in many developed and developing countries. Their findings suggest that the separation of ownership and control can benefit the large shareholder. Bebchuk et al. (1999) argued that there are three principal ways to achieve this separation of ownership: dual-class share structures, stock pyramids, and cross-ownership ties. Further, they dubbed this pattern of ownership a controlling-minority structure. In China, non-voting shares or other mechanisms for discriminating against holders of different types of shares are not permitted. In this way, B-shares and H-shares carry the same voting rights as A-shares. Moreover, cross-ownership is very rare among Chinese corporations. As a result, pyramidal shareholding appears to be the dominant method for achieving the separation of cash-flow rights and control rights.

Several researchers have documented the use of pyramidal structures to retain control in firms (see La Porta et al. 1999, Claessens et al. 2000, Faccio and Lang 2002) For example, nearly 20% of firms in Western Europe are characterized by pyramidal shareholding (Faccio and Lang 2002). In the U.S., only 9% of firms employ pyramidal structures (Attig et al. 2004). In Eastern Asia, however, the use of pyramidal structures is significantly more widespread; 67% of Indonesian firms, 55% of Singaporean firms, 49% of Taiwanese firms, and 37% of Japanese firms are pyramidal affiliates (Claessens et al. 2000). China is no exception to this trend; according to Fan et al. (2005), 60.92% of the listed firms are pyramidal in structure.

In pyramidal structuring of two companies, a shareholder holds a controlling stake in a holding company. In turn, the holding company has a controlling stake in an operating company (an affiliated company). For example, assume that the owner holds a fraction $\alpha 1$ of the shares in company A, company A has a fraction $\alpha 2$ of the shares in company B, and so on. Also, assume that assets are placed in company n. The owner can thus exercise formal control over the assets with respect to cash-flow rights. The owner holds a fraction s, where

$$s = \prod_{i=1}^{n} a_i \ .$$

As evidenced by the formula above, a pyramidal structure allows the owner of a firm to completely control the company's assets without having more than the fraction s of the company's cash-flow rights. The product s can be as low as possible if the number of layers is large enough, i.e., by setting n large enough. Consider a case in which the owner of a firm must possess at least 50% of the firm's voting rights to exercise formal control of a firm in each pyramidal layer, i.e., s = (0.5)n. When there are four pyramidal

layers (i.e., n = 4), the ultimate owner of the firm has only 1/24 (6.25%) of its cash-flow rights, but 50% of its voting rights.

4 DATA

4.1 Data source

In 2002, the China Security Regulatory Commission (CSRC) required all listed companies to report their ownership structures in their annual reports. Specifically, firms are required to include the names of their controlling owners and classify them in state, legal person, or individual categories. Information related to the 10 largest shareholders for each corporation must also be reported. Ownership of Chinese listed companies is heavily concentrated; the five largest shareholders of each firm commonly control the majority of the voting rights for their respective corporations (Xu and Wang 1999).

In 2011, 259 companies were listed on the GEM Shenzhen. However, 86 of these companies were relatively newly listed in that year. As such, their ownership information has yet to be made available. After removing these companies from the initial sample, the final sample consists of 173 firms. I collected the 2010 financial statements for each of these companies from the Thomson One Database. Further, I made industry classifications for each firm on the basis of the China Securities Regulatory Commission (CSRC) Industry Classification.

By evaluating their annual reports, I can easily identify the ultimate owners for all firms in the sample. The annual reports also indicate whether a company does not have an ultimate owner. In these cases, I defined the firm as widely-held. If the ultimate owner of the company is a family (or an individual), then I defined the firm as family-owned. Similarly, if the firm's ultimate owner is the state, I classified the firm as state-owned. When no single ultimate controller exists, it is nevertheless possible for the annual report to indicate that several blockholders have developed a contract to be 'Persons Acting in Concert (PACs)' to acquire or consolidate control of the firm. I treat these blockholders as a single firm owner and classify their firm as family-owned. Most of the companies listed on the GEM are manufacturing or high-tech firms. There are no financial or utility firms in the sample.

Table 3 Firm characteristics under different types of ultimate owners

In this table, I report firm characteristics under different types of ultimate owners. The sample consists of 173 firms listed on the growth enterprise market (GEM) in China in the year of 2010. Accounting data are collected from Thomson One Banker, and ownership information is manually collected by the author. The types of ultimate owners include family, state and widely-held respectively, the classification method is introduced in section 4.1. MVE stands for market value of equity; asset is the book value of total asset in year 2010, sales is the total sales in year of 2010. All figures are in million dollars.

	Family-owned			State-owned			Widely-held		
Number	156			11			6		
%	90.17%			6.36%			3.47%		
	MVE	Asset	Sales	MVE	Asset	Sales	MVE	Asset	Sales
Min	40	21.26	9.99	54.8	82.59	35.81	89.79	93.84	27.35
Max	1088.6	496.67	554.06	812	434.75	128.43	432	451.27	102.19
Mean	251.20	152.31	62.95	348.83	195.79	72	263.74	245.54	60.20
Median	211.06	125.14	44.70	285.12	147.04	58.02	230.18	198.23	53
s.d.	183.23	99.78	67.64	77.55	32.62	32.42	125.97	137.54	11.97

As shown by Table 3, whereas family-owned firms represent more than 90% of the sample, only 6% of the firms are state-owned. This is in stark contrast to the findings of Fan et al. (2005), who found that the government owned roughly 76% of publicly listed firms in China in 2001. This difference suggests that the GEM is not only a place for small and medium sized high-tech companies to raise funding, but also a platform for the Chinese government to encourage private corporations to list their shares publicly. On average, widely-held firms possess the greatest amount of total assets. Given that SOEs remain dominant in the Chinese market, it is not surprising that state-owned companies are larger in size than family-owned firms.

4.2 Illustration of the separation between cash flow rights and control rights

I calculated the cash-flow rights and control rights for each firm/owner using the same method as Faccio and Lang (2002). This method is illustrated in (Figure 1), which shows that Zhou Qinzhi and Zhao Yilan control Zhejiang Narada Power Source Company Ltd. through three intermediaries: Hangzhou Nandu, Shanghai Nandu Group, and Shanghai Yidu. Zhou owns 60.53% of Hangzhou Nandu and 27.84% of Shanghai Nandu Group while Zhao owns 64.25% in Shanghai Yidu. Shanghai Yidu has a 56.67% stake in Shanghai Nandu Group, which owns 39.47% of Hangzhou Nandu. Control rights are easily calculated by the weakest link in the control chain (i.e., 20.75% + 8.16% + 10.24% = 39.15%). However, the calculation of cash-flow rights is much more complicated since each chain has to be multiplied separately, i.e., ((0.6053*0.2075+0.2784*0.0816+0.2784*0.3947*0.2075) + (0.6425*0.1024+0.6425*0.5667*0.0816+0.6425*0.5667*0.3947*0.2075))*100%=29.64%. This company is ultimately family-owned through a pyramidal holding structure. The existence of the pyramid structure is responsible for a 9.51% difference between the control rights and cash-flow rights associated with this firm. 41% (64 out of 156) firms are affiliates in the sample of the family owned firms.

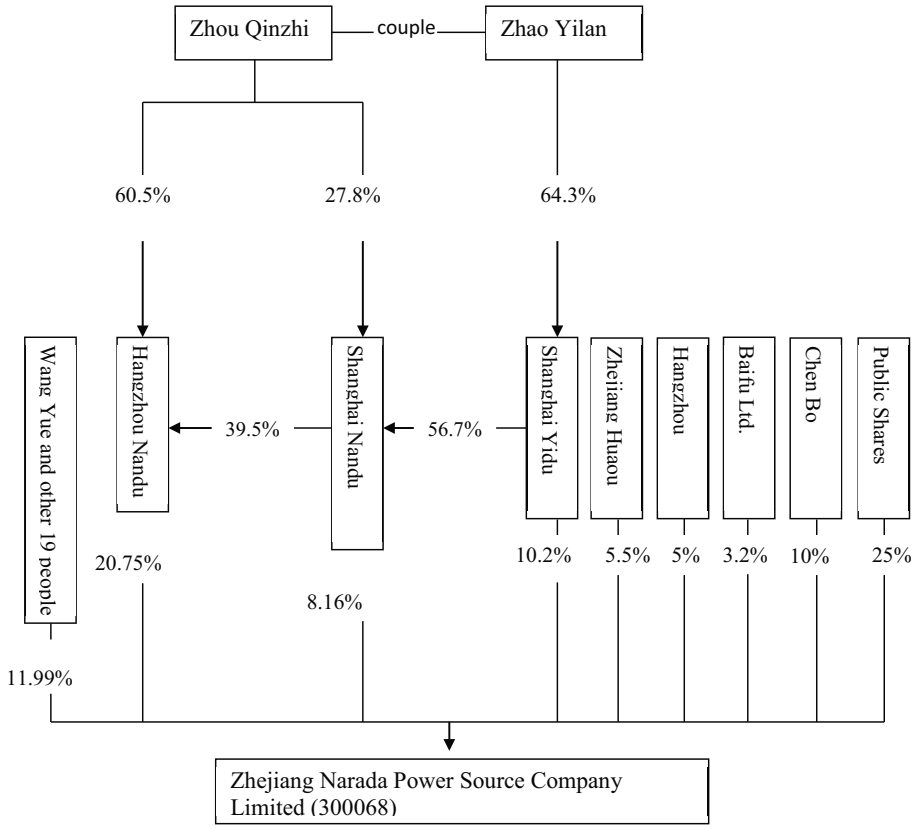

Figure 1 An example of pyramid ownership on the Growth Enterprise Market

Figure 2 demonstrates how the state can control a listed company through a pyramidal structure. In this case, the State-owned Assets Supervision and Administration Commission of the State Council (SASAC) owns 100% of China Electrics Corporation, which in turn, possesses a 50% stake in China Integrated Circuit Design Corporation (CICDC). CICDC possesses a 27.5% stake in a listed company—Nationz Technologies (300077). As a result of this ownership chain, the SASAC is the ultimate owner of Nationz Technologies. Through the weakest chain, the controlling rights are 27.5% and the cash flow rights are calculated as 50%*27.5% = 13.75%. Thus, the pyramid structure accounts for a 13.75% difference between the control rights and cash flow rights.

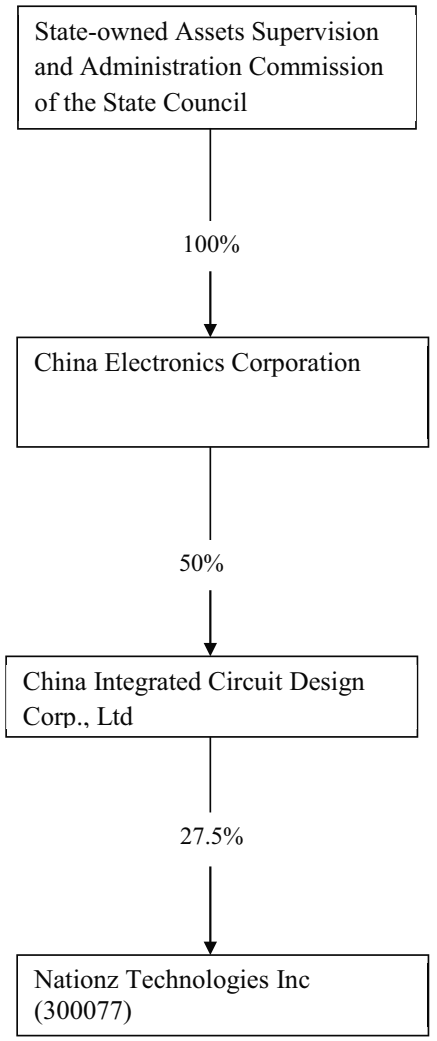

Figure 2 Another example of pyramid ownership on the Growth Enterprise Market

Figures 1-2 collectively demonstrate that either individuals or the state may (directly or indirectly) control listed companies. Because most of them are subsidiaries of SOEs, 9 out of 11 of the state-owned companies in our sample are controlled indirectly or through a pyramid. Firms that are directly controlled by the state are typically affiliates of universities or research institutes.

4.3 Definition of variables

In this section, I define and motivate the variables I used in my analyses. I calculate Tobin's Q using two alternative methods. The first method follows Chung and Pruitt (1994), which omits PS, allowing Q1 = (MVE+DEBT)/BVTA. The second method is a bit more complicated, as Q2 = (MVE+BVLTD+BVINV+BVCL-BVCA)/BVTA. For these calculations, BVLTD represents the book value of long term debt; BVINV is the book

value of inventory; BVCL is book value of current liabilities; and BVCA refers to book value of current assets. Q1 is actually a brief form of Q2, but as shown by Chung and Pruitt (1994), Q1 can explain 96.6% of the variance in the Tobin's Q that would be calculated by Q2. In addition to the variables outlined above, I also employ a dummy variable called pyramid which is equal to one if the ownership structure of the firm is pyramidal and zero otherwise.

To account for the influence of other variables to firm performance, I also incorporated a number of controls into my analysis. Since large firms may have severe agency cost and hinders the firm performance (Sun and Tong 2003), I include Sales which denotes the logarithmic form of the firm's total sales (in Chinese Yuan) in 2010 to control for firm size. Leverage may affect firm performance from different directions, such as increasing interest burden, magnifying business operating risk (Morck et al. 1988). I thus include Leverage as the ratio of the firm's total debt to its total assets in 2010. As a proxy for stock market risk, I also included a measure of stock market volatility (Volatility). Wang and Xie (2009) find that capital expenditures are negatively associated with firm value if firms are controlled by entrenched large shareholders in China, thus I include CAPEX which represents the capital expenditure over property, plants, and equipment. Feltham and Ohlson (1995) show that growth in net operating assets affect future profitability and firm value, to control for the firm's potential growth ability, I constructed two variables Salesgrowth and Assetsgrowth, which were estimated as the firm's total sales (assets) in 2010 divided by total sales (assets) in 2009 minus one. State ownership is traditionally viewed as contributing to corporate operational inefficiency (Dewenter and Malatesta, 2001). To control for the effect of state ownership, I created a dummy named State which adopted the value of one if the firm was ultimately controlled by the state and zero otherwise. ROA represents return on assets, and is calculated as after-tax net income divided by total assets. ROE signifies return on equity, and is calculated as after-tax net income divided by total shareholder's equity. Both ROA and ROE are widely used as corporate operational performance (Morck et al. 1988). OCF refers to operating cash flows in the year 2010. Descriptive statistics associated with the control variables are reported in Panel A of (Table 4). Similar control variables were also used by Masulis et al (2011), Fan et al. (2005), and Attig et al. (2004).

5 RESULTS

5.1 Descriptive statistics

Panel A of (Table 4) shows the summary statistics for all variables. When comparing the two measures of Tobin's Q, we see that the first calculation method generally produces a larger Q than the second. In addition, the negative value of the minimum Q2 indicates some firms on the GEM possess assets that can exceed their total market values. (Table 4) contains only those firms which operate in industries in which there are ten or more companies. Machinery and equipment firms account for the largest proportion (26%) of firms in the sample. Firms in the information technology (IT) industry represents 21.4% of the sample. Given the substantial number of firms in each industry, it is clear that the GEM is an important marketplace for manufacturing and high-tech enterprises. Panel B of (Table 4) illustrates that there exist no serious concerns about multicollinearity between the independent variables used in the regression analysis.

Table 4 Panel A:Descriptive statistics

In panel A of table 4, I report summary statistics for the sample. The sample consists of 173 firms listed in the growth enterprise market (GEM) in China in the year of 2010. Accounting data and stock market data are collected from Thomson One Banker, industry classification is from China Securities Regulatory Commission (CSRC) Industry Classification, and ownership information is manually collected by the author. *Q1* and *Q2* are two alternative calculation of Tobin's Q respectively. The main variable of interest, *Pyramid*, is a binary variable that takes the value of one if the firm is in a pyramid structure and zero otherwise, there is no change in the ownership structure in our sample during 2010. *State* is a dummy variable equals to one if the ultimate owner is the state, and zero otherwise. *Sales* denotes the total sales in Chinese Yuan of the firm in 2010 in logarithmic form. *ROA* stands for return on asset, and is calculated as after tax net income over total assets, *ROE* stands for return on equity, and is calculated as after tax net income over total shareholder's equity. *Leverage* is equal to the firm's total debt divided by total asset in the year of 2010, and it is in a percentage scale. *CAPEX* is equal to the capital expenditure over property plant and equipment. *Volatility* is equal to the yearly stock market volatility and it is estimated as the standard deviation of daily stock returns from February 2011 to September 2011 of each firm multiplied by the square root of 252. *Salesgrowth* is the growth of total sales in 2010. *Assetsgrowth* is the growth of total assets in 2010. *OCF* stands for operating cash flows in year 2010. Only the industries that have the number of firms larger than 10 are reported.

Variable	Mean	Median	Maximum	Minimum	Std.Dev.
Q1	1.911	1.732	5.823	0.402	0.924
Q2	1.172	1.083	5.215	-0.480	0.967
Pyramid	0.437	0	1	0	0.498
State	0.066	0	1	0	0.249
Sales (log)	3.882	3.827	6.317	2.302	0.674
ROA (%)	10.430	9.290	56	2.24	5.793
ROE (%)	14.612	11.940	66.59	2.5	9.926
Leverage	0.156	0.114	0.686	0.014	0.136
CAPEX	9.798	6.010	76.55	0	11.439
Volatility	0.492	0.488	0.920	0.286	0.098
Sales growth (%)	33.706	30.990	270.22	-43.67	37.476

Asset growth (%)	184.726	162.36	1074.22	-4.28	182.458
OCF	4.083	4.21	56.79	-80.56	12.521
Chemicals & petroleum	0.098	0	1	0	0.299
Electronics	0.098	0	1	0	0.299
Machinery & equipment	0.260	0	1	0	0.440
Pharmaceutical & biological products	0.075	0	1	0	0.264
IT industry	0.214	0	1	0	0.411
Services	0.058	0	1	0	0.234

Panel B: Correlation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)Q1	1.00								
(2)ROA	0.21	1.00							
(3)Salesgrowth	0.05	0.32	1.00						
(4)Leverage	0.14	0.18	0.25	1.00					
(5)Sales (log)	-0.05	-0.02	0.40	0.28	1.00				
(6)topcontrol	0.003	0.22	0.05	0.23	0.09	1.00			
(7)CAPEX	-0.002	-0.08	0.23	-0.02	0.44	0.02	1.00		
(8)State dummy	-0.01	-0.04	-0.07	-0.01	0.12	-0.12	-0.09	1.00	
(9)Volatility	-0.002	-0.27	0.11	-0.28	-0.05	-0.23	0.08	0.003	1.00
(10)OCF	0.06	0.25	-0.05	-0.13	-0.06	0.04	0.20	0.07	-0.03

5.2 Univariate test

(Table 5) presents a univariate comparison of variables between firms with pyramidal ownership structure and firms without them. The significance levels of the differences in means (medians) is based on two-tailed t-statistics (Wilcoxon signed-rank test). In 73 of the 173 firms (42.2%), the ultimate controller uses a pyramidal structure to control the listed companies. The Tobin's Q statistic for companies that employ a pyramidal structure is smaller than the Tobin's Q for those that do not. The difference in Q1 for firms with pyramidal and non-pyramidal structures was statistically significant ($p < .05$). The difference in Q2 was marginally significant ($p < .10$). These results suggest that (1) independent firms perform better than affiliated firms in China, and (2) pyramid-structured shareholdings depress the value of a firm. Similar findings were reported for Canadian firms (Attig et al. 2004).

This analysis also revealed that affiliated companies are typically larger in size than those that are unaffiliated, as they have significantly higher mean and median values for sales. This suggests that affiliated firms are more mature. In addition, these results suggest that the ultimate owners of affiliated firms largely possess experience in establishing and operating a company and access to established channels to secure funding. This finding is in line with a number of previous studies. For instance, Almeida and Wolfenzon (2006) argued that because pyramids can lead to overinvestment, affiliated firms should be associated with larger scales of capital investment. Other research has shown that affiliated firms tend to be larger than standalone firms in Italy (Bianchi et al. 2001) and East Asia (Claessens et al. 2002).

The mean and median of CAPEX (capital expenditure) is significantly higher for affiliated firms than independent firms, suggesting that affiliates are more investment-intensive. Past research has produced similar results with Canadian (Attig et al. 2004),

Italian (Volfin 2002), and Swedish (Holmén and Högfeldt 2009) data. Relative to firms on the main board (Fan et al. 2005), GEM firms have relatively lower leverage ratios. Further, among firms on the GEM, leverage is significantly lower for independent firms than affiliated firms. This finding suggests that affiliated firms are more prepared to secure funding through borrowing. Furthermore, sales growth was shown to be significantly higher for affiliated firms than independent firms, but differences in ROA, ROE, assets growth, and OCF were not statistically significant.

Table 5 Univariate test between pyramid companies and non-pyramid companies

In this table I report univariate test between pyramid firms and non-pyramid firms. The sample consists of 173 firms listed in the growth enterprise market (GEM) in China in the year of 2010. Accounting data and stock market data are collected from Thomson One Banker, industry classification is from China Securities Regulatory Commission (CSRC) Industry Classification, and ownership information is manually collected by the author. *Q1* and *Q2* are two alternative calculations of Tobin's Q respectively. *State* is a dummy variable equals to one if the ultimate owner is the state, and zero otherwise. *Sales* denotes the total sales in Chinese Yuan of the firm in 2010 in logarithmic form. *ROA* stands for return on asset, and is calculated as after tax net income over total assets, *ROE* stands for return on equity, and is calculated as after tax net income over total shareholder's equity. *Leverage* is equal to the firm's total debt divided by total asset in the year of 2010, and it is in a percentage scale. *CAPEX* is equal to the capital expenditure over property plant and equipment. *Volatility* is equal to the yearly stock market volatility and it is estimated as the standard deviation of daily stock returns from February 2011 to September 2011 of each firm multiplied by the square root of 252. *Salesgrowth* is the growth of total sales in 2010. *Assetsgrowth* is the growth of total assets in 2010. *OCF* stands for the operating cash flows in year 2010. The difference in mean test is one-tail t-test, median differences tested by means of Wilcoxon ranksum test, ***denotes significant at 1% level. ** denotes significant at 5% level. *denotes significant at 10% level.

variable	with pyramid n=73		no pyramid n=94		difference test	
	mean	median	mean	median	mean	median
Q1	1.774	1.652	2.049	1.942	-0.275**	-0.29
Q2	1.061	1.001	1.293	1.167	-0.232*	-0.166
Sales (in log)	4.154	4.065	3.664	3.566	0.49***	0.499***
ROA (%)	10.428	9.46	10.463	9.035	-0.035	0.425
ROE (%)	15.306	13.35	14.132	11.38	1.174	1.97
Leverage	19.925	14.537	14.665	10.312	5.260**	4.225**
CAPEX	11.892	8.07	8.025	4.8	3.967**	3.27***
Volatility	0.481	0.488	0.502	0.498	-0.021	-0.01
Salesgrowth (%)	0.408	0.336	0.278	0.278	0.130***	0.058*
Assetsgrowth (%)	1.744	1.624	1.797	1.527	0.533	0.097
OCF	4.342	5.015	4.146	3.87	0.196	1.145

5.3 Multiple regression analysis

5.3.1 Firm valuation and pyramid structure

Attig et al. (2004) argued that the equity holding of pyramidal ownership creates 'an opportunist veil' for the ultimate controllers to engage in expropriating behavior and

extract economic rents, the ultimate controller of the company may prioritize their own well-being over that of the affiliates and hence hamper the affiliates. To explore this possibility, I next investigate the relationship between firm performance and pyramidal ownership. To do so, I apply two measures of Tobin's Q as proxies for firm performance and respectively report the regression results based on both.

The results are reported in (Table 6). The coefficients associated with the binary variable associated with pyramidal ownership are significantly negative for both the Tobin's Q1 and Tobin's Q2 regression analyses. These results indicate that a pyramidal ownership structure for companies in the Chinese GEM can incite a 30% decline in Tobin's Q. This loss may be related to opportunistic behavior on the part of the firm's ultimate controllers. Among other control variables, I revealed that sales and assets growth were negatively related to Tobin's Q. In contrast, Leverage was significantly and positively related to Tobin's Q, indicating that the debt shield effect is substantial among firms in the GEM. The coefficient estimates associated with the state dummy are positive, but non-significant, offering no evidence for state-owned companies' inability to perform effectively. In addition, the relationships between OCF, salesgrowth, and CAPEX and the outcome variable are all positive in kind; however, it remains ambiguous as to whether Volatility is a positive predictor of Tobin's Q.

Table 6 OLS regression analysis of pyramidal shareholding and corporation valuation

The sample consists of 173 firms listed in the growth enterprise market (GEM) in China in the year of 2010. Accounting data and stock market data are collected from Thomson One Banker, industry dummies are created from China Securities Regulatory Commission (CSRC) Industry Classification, and ownership information is manually collected by the author. The dependent variables, *Q1* and *Q2* are two alternative calculations of Tobin's Q respectively, the calculation methods are illustrated in section 4.3. The most interested independent variable, *Pyramid*, is a binary variable that takes the value of one if the firm is in a pyramid structure and zero otherwise. *Sales* denotes the total sales in Chinese Yuan of the firm in 2010 in logarithmic form. *Leverage* is equal to the firm's total debt divided by total asset in the year of 2010, and it is in a percentage scale. *CAPEX* is equal to the capital expenditure over property plant and equipment. *Volatility* equals to the yearly stock market volatility and it is estimated as the standard deviation of daily stock returns from February 2011 to September 2011 of each firm multiplied by the square root of 252. *Salesgrowth* is the growth of total sales in 2010. *Assetsgrowth* is the growth of total assets in 2010. *OCF* stands for the operating cash flows in year 2010. *State* is a dummy variable equals to one if the ultimate owner is the state, and zero otherwise. Heteroskedasticity-consistent standard errors are presented in parentheses. *** denotes significant at 1%,** denotes significant at 5% and *denotes significant at 10%.

	Q1		*Q2*	
	I	II	III	IV
Pyramid	-0.3038*	-0.3299**	-0.293*	-0.3228**
	(0.1644)	(0.1586)	(0.1654)	(0.1605)
Sales(in log)	-0.2788**	-0.112	-0.3218**	-0.1465
	(0.1257)	(0.1328)	(0.1288)	(0.1368)
CAPEX	0.0041	0.0035	0.0075	0.007
	(0.0071)	(0.0075)	(0.0074)	(0.008)
OCF	0.0053	0.0049	0.0064	0.0054
	(0.0053)	(0.006)	(0.0056)	(0.0051)
Leverage	0.0075	0.0076	0.0142*	0.0138**
	(0.0072)	(0.006)	(0.0074)	(0.0062)
Volatility	-0.0193	0.1085	0.2392	-0.1043
	(0.8186)	(0.7814)	(0.8198)	(0.8032)
Salesgrowth	0.2394	0.3202	0.2196	0.3064

	(0.2399)	(0.2569)	(0.2553)	(0.2737)
Assetsgrowth	-0.0928*	-0.0699	0.1076	-0.0896**
	(0.0509)	(0.044)	(0.0523)	(0.0448)
State	0.1967	0.1616	0.1684	0.1588
	(0.271)	(0.2323)	(0.2812)	(0.234)
Industry dummies	Yes	No	Yes	No
Constant	3.3676***	2.3072***	2.7486***	1.6733***
	(0.7688)	(0.6013)	(0.7816)	(0.6153)
R-squared	0.2369	0.078	0.2766	0.1236

5.3.2 Wedge between control rights and cash flow rights

To empirically evaluate the distance between cash-flow rights and control rights (as well as those factors that may affect this distance), I constructed a dependent variable named wedge. Wedge refers to the ratio of the largest shareholder's ultimate control rights to his/her ultimate cash flow rights. An increase in this ratio indicates a greater deviation between ownership and management rights and a longer ultimate ownership chain. Results of the regression that incorporated wedge as an outcome measure are reported in (Table 8). Sales and volatility are positively correlated with the wedge ratio, indicating that larger, riskier firms tend to be characterized by a greater number of pyramidal layers.

I interpret this finding as an indication that owners of firms tend to establish a greater number of intermediaries to mask the negative consequences associated with their potential expropriating behavior or excessive risk-taking. The coefficients associated with leverage are negative across all regressions, suggesting that company owners prefer debt financing to equity financing if the deviation between control rights and cash-flow rights is small. Moreover, the negative coefficient associated with the state dummy variable indicates that family-owned firms establish a greater number of intermediaries in the pyramidal structure than state-owned. The signs for sales growth and asset growth are both negative, suggesting that less-developed firms are created through a greater number of layers in the pyramid. Finally, CAPEX was shown to be negatively associated with Tobin's Q, suggesting that firms are less investment intensive if their owners are separated by a number of pyramidal layers.

Table 7 OLS regression analysis of pyramidal shareholding and wedge

The sample consists of 173 firms listed in the growth enterprise market (GEM) in China in the year of 2010. Accounting data and stock market data are collected from Thomson One Banker, industry dummies are created from China Securities Regulatory Commission (CSRC) Industry Classification, and ownership information is manually collected by the author. The dependent variables, *wedge* is calculated as the ratio of ultimate control rights over ultimate cash flow rights of the largest shareholder. *ROA* stands for return on asset, and is calculated as after tax net income over total assets. *Sales* denotes the total sales in Chinese Yuan of the firm in 2010 in logarithmic form. *Leverage* is equal to the firm's total debt divided by total asset in the year of 2010, and it is in a percentage scale. *CAPEX* is equal to the capital expenditure over property plant and equipment. *Volatility* is equal to the yearly stock market volatility and it is estimated as the standard deviation of daily stock returns from February 2011 to September 2011 of each firm multiplied by the square root of 252. *Salesgrowth* is the growth of total sales in 2010. *Assetsgrowth* is the growth of total assets in 2010. *OCF* stands for the operating cash flows in year 2010. *State* is a dummy variable equals to one if the ultimate owner is the state, and zero otherwise. Heteroskedasticity-consistent standard errors are presented in parentheses. *** denotes significant at 1%,** denotes significant at 5% and *denotes significant at 10%.

	I	II
ROA	-0.003	-0.0022
	(0.003)	(0.0026)
Sales(in log)	0.1228***	0.1264***
	(0.0434)	(0.0402)
CAPEX	-0.0024	-0.002
	(0.0018)	(0.002)
OCF	0.0007	0.0004
	(0.0019)	(0.0018)
Leverage	-0.0003	0.0001
	(0.0021)	(0.0017)
Volatility	-0.0292	0.0595
	(0.1933)	(0.1655)
Salesgrowth	-0.0344	-0.0268
	(0.0638)	(0.0608)
Assetsgrowth	0.0091	0.0081
	(0.014)	(0.0132)
State	-0.0647	-0.0193
	(0.0953)	(0.0933)
Industry dummies	Yes	No
Constant	0.5826***	0.6199***
	(0.2184)	(0.1594)
R-squared	0.257	0.252

6 CONCLUSIONS

In this paper, I have presented some preliminary findings related to a new Chinese stock market for growth enterprises. The emerging enterprises on this stock market are of great importance to the future of China's economy. The Chinese Growth Enterprises Market (GEM) was established only in 2009, and as a result, there exists little information about the firms that are listed on it. To redress this shortcoming, I have manually collected data related to some of these firms and performed inferential analyses on them. These analyses have revealed that 90% of the companies in the GEM are owned by families. This demonstrates a willingness on the part of the Chinese government to catalyze the process of market privatization and transition to a market-based economy.

Further, I have analyzed the ownership structures of several firms listed on the GEM. Results suggest that pyramidal shareholding is the most common form of organizational structure for achieving separation of ownership and control among firms on the Chinese GEM. Pyramids allow ultimate owners to control organizational affiliates while providing a smaller portion of capital. Roughly 42% of the companies in the sample are affiliates held through pyramids, and these firms are characterized by a 30% lower Tobin's Q than unaffiliated firms, on average. This may indicate that pyramids create rent-seeking opportunities for ultimate owners. These owners may be more likely to invest in risky or unprofitable projects for their own purposes, which can lead to the expropriation of minority shareholders. Finally, I constructed a new variable (wedge) that measures the length of the ultimate ownership chain. Results of analyses that incorporated this new variable demonstrated that family-owned and less-developed firms establish a greater number of intermediaries through a pyramidal structure than state-owned firms, which employ simpler ownership structures.

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Section 3
Pyramid IPOs on the Chinese Growth Enterprise Market

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Abstract

This paper investigates Initial Public Offerings (IPOs) of high-tech firms on the Chinese Growth Enterprise Market (GEM). Almost half of the high tech IPOs on the GEM are set up in pyramid structures. The likelihood of a pyramid structure increases with the size of the IPO firm and state control. Our results do not suggest that pyramids are set up to overcome financial constraints. However, we document that pyramid IPOs are discounted before the IPO. The price to book ratio estimated at the subscription price is significantly lower for pyramid IPOs compared to stand-alone IPOs. Furthermore, the underpricing is higher for pyramid IPOs. We conclude that IPO investors demand a higher risk-premium when investing in pyramid IPOs which translates into a lower subscription price and higher underpricing.

Key words: pyramid ownership structure, Initial Public Offering, Growth Enterprise Market, Underpricing, Oversubscription

JEL: G32

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1 INTRODUCTION

This paper explores the causes and consequences of the decision to create a pyramid structure and separate cash flow rights from voting rights at Initial Public Offerings (IPOs). We document that pyramid firms are discounted already before the IPO, i.e. before majority shareholders could have expropriated any minority shareholders. Thus, the discount on pyramid firms documented by e.g. Claessens et al. (2002) appears to be driven, at least partly, by an ex ante risk-premium associated with investing in pyramids and not only by majority shareholders actually expropriating minority shareholders.

Mechanisms that separate voting rights from cash flow rights, e.g. pyramid structures, dual class shares and cross-shareholdings, are widespread around the world and this is well documented (see e.g. La Porta et al., 1999). However, Adams and Ferreira (2008) point out that the empirical literature on the determinants and the effects of the actual decision to separate cash flow rights from voting rights is surprisingly small.

Almeida and Wolfenzon (2006) provide a rationale for pyramidal ownership in family business groups. In their theoretical model a pyramid allows a family to use all retained earnings of a firm it controls to set up new firms. Furthermore, Masulis et al. (2011) argue that pyramids are used to alleviate financing constraints and lower the cost of raising external equity. The empirical literature on pyramid structures has, however, ignored the analysis of how pyramid structures initially were set up and instead focused on the performance and behavior of mature pyramid firms. Furthermore, the IPO literature has overlooked the effect of indirect ownership and pyramid structures on the IPO process.

By looking at the actual set-up of pyramid firms, i.e. the IPO, we shed light on the type of firms that become part of a pyramid. The original owners can choose between holding the controlling stake directly or through a pyramid structure. Based on Almeida and Wolfenzon's (2006) and Masulis et al. (2011) we derive hypotheses about capital constraints, firm size, and risk among pyramid IPO firms. We also derive hypotheses about the effect of pyramid structures on the IPO process based on the assumption that pyramid structures are associated with investor expectations about tunneling of corporate resources to the ultimate owner. If expected expropriation is discounted by external investors, they will only invest in pyramid structures if they receive an additional discount on pyramid IPOs.

We use the Chinese Growth Enterprise Market (GEM) in Shenzhen as our laboratory. The GEM was launched in 2009 in order to facilitate for young growing firms to go public and raise external equity. Surprisingly, 46 percent of the high tech IPOs on the GEM during 2010 were set up in pyramid structures. In Europe, the typical pyramidal firm is a large, old firm in a mature industry (see e.g. Holmén and Högfeldt, 2009).

Our sample consists of 173 IPOs on the GEM during 2010. We only find limited support for pyramid firms being capital constrained. The result indicating that pyramid firms have higher leverage is not robust in our sample. Furthermore, there are no indications that pyramid firms have higher capital expenditure. However, in line with Almeida and Wolfenzon's (2006) argument, pyramidal IPOs are significantly larger than the stand-alone IPOs. We find no indications that pyramidal IPOs are riskier than the stand alone IPOs.

Second, we investigate how pyramidal structures affect the IPO process. Using treatment effect models we document that the pre IPO (subscription) price to book ratio is significantly lower for pyramid IPOs. Furthermore, the underpricing, i.e. the price increase the first day of trading, is significantly higher for pyramid IPOs. These results are consistent with Almeida and Wolfenzon (2006) and Masulis et al. (2011). Minority shareholders demand compensation for expected expropriation which results in a larger discount on pyramidal IPOs.

Using detailed information about the IPO process we find evidence that the oversubscription rate among institutional investors is higher for the more underpriced pyramid IPOs. The oversubscription rate among individual investors is not significantly different for pyramidal IPOs. The results appear to be consistent with Rock's (1986) model where informed investors only subscribe to underpriced IPOs. Even if the better informed institutional investors subscribe to all IPOs on GEM, their demand is higher for the more underpriced IPOs.

This paper naturally relates to the literature on tunneling within Chinese pyramids on the main board (see e.g. Gao and Kling, 2008 and Cheung et al., 2009). However, we concentrate on the IPO process and do not investigate tunneling per se. Our results suggest that investors demand a higher risk premium when investing in pyramid structures on the GEM already at the IPO, i.e. before any tunneling could have taken place in the particular firm. Thus, the discount associated with pyramidal structures documented by e.g. Claessens et al. (2002) appears to be driven, at least partly, by an ex ante higher risk premium on pyramidal firms, and not by actual expropriation of minority shareholders.

Our analysis of IPOs on the GEM is also related to Gao's (2010) study of IPOs on China's main board. Gao's (2010) results suggest that underpricing is driven by overpricing of IPOs after listing and not by pre-market deliberate underpricing. Our results suggest that the additional underpricing of pyramid IPOs on the GEM might be related to a deliberate strategy.

The rest of the paper is organized as follows. The next section outlines our hypotheses. Section three gives a brief overview of the new Growth Enterprise Market in China. Section four presents the data while the empirical results are reported in section five. Section six puts our results in perspective and concludes.

2 HYPOTHESES

We explore the causes and consequences of pyramid structures at the IPO in light of Almeida and Wolfenzon (2006) and Masulis et al. (2011). Almeida and Wolfenzon (2006) argue that pyramid structures will be more prevalent among larger firms. The larger the firm is, the more difficult it is for a controlling shareholder with limited wealth to keep control of the firm without separating ownership and control. Furthermore, since dual class shares are not allowed in China, a pyramid structure is the natural choice for a controlling shareholder who wants to keep control of a large firm.

Hypothesis 1: The pyramid IPO firms are larger than the stand alone firms.

Masulis et al. (2011) argue that pyramids are used to alleviate financing constraints and lower the cost of raising external equity. Compared to direct funding, the pyramidal structure levers the internal capital under control which helps raise external funding for projects with large capital requirements and low initial cash flows. This argument is the basis for our second hypothesis.

Hypothesis 2: The pyramidal IPO firms are more financially constrained than the stand-alone IPO firms.

In the empirical analysis we will use capital expenditures and leverage as proxies for capital constraints.

Masulis et al. (2011) also argue that families have incentives to place risky firms in a pyramid. By using a pyramid structure the families can leverage their invested capital and control many firms but at the same time minimize the risk and this argument is particularly valid for risky firms. Similar arguments can be found in Almeida and Wolfenzon (2006) and Attig et al. (2004).

Hypothesis 3: The pyramidal IPO firms are more risky than the stand-alone IPO firms.

Almeida and Wolfenzon's (2006) pyramiding model combines the idea that the levered control over the firm's cash flow creates a financial advantage with the key assumption that tunneling of corporate resources is significant when protection of minority shareholders is weak. The controlling owner use the capital of an already existing firm together with new equity capital from external investors to finance a new firm that they also control at the pyramid level below. If the new external investors rationally anticipate the cost of expropriation they will only co-invest alongside the controlling shareholders in pyramid structures if they receive an additional discount when investing in pyramidal IPO firms. These arguments are the basis for our fourth hypothesis.

Hypothesis 4: The subscription price to book ratio is lower for pyramid firms compared to stand alone firms.

If the subscription price on pyramid IPOs is set low deliberately in order to attract investors it will lead to an expected larger initial returns, i.e. larger underpricing. Beatty and Ritter (1986) also argue that the expected initial return is an increasing function of the uncertainty investors feel about the market price of the IPO firm after listing. Thus,

if a pyramid structure increases the uncertainty investors feel about the IPO firm, it will translate into larger underpricing.

Hypothesis 5: The underpricing of pyramid IPO firms is higher than for stand-alone IPO firms.

3 THE SHENZHEN GROWTH ENTERPRISE MARKET

The Shenzhen Growth Enterprise Market (GEM) is an independent exchange market with the purpose to create a good platform for small-and-medium sized high-tech companies to raise equity funding. There are several differences between GEM and the Chinese main board market. For example, listing requirements, trading methods and regulations are different on the GEM. GEM encourages innovation-oriented enterprises, especially those with independent innovations, industrialization of agriculture, and regional characteristics to go public.

In order to protect investors, the Shenzhen GEM is highly regulated. For example, a firm listed on GEM must disclose a transaction with an absolute amount over 5 million Yuan or if it reaches 10% of the company's total revenue of the latest audited fiscal year. Moreover, the ultimate owners cannot sell or repurchase their shares for a period of three years from the date of listing.

Compared to growth markets in most other countries, the Shenzhen GEM also has the following features: i) a more stringent "net profit" requirement, i.e., the firm has to be profitable for the latest two years and the net income is at least 10 million Yuan, ii) higher requirement on firm size, net asset must be at least 20 million, iii) there shall be no accumulated losses in firms before listing, and iv) venture firms in seed stage are not eligible to list on the Shenzhen GEM (Source: website of Shenzhen Stock Exchange).

Shenzhen GEM is rapidly developing. New firms are listed almost every month. For instance, at the end of 2009 there were only 36 listed firms and in August 2013 the number has increased to 355. However, the Shenzhen GEM is still a small market in term of size. At the end of July 2013, the total market value of firms listed in Shenzhen GEM is 1,306,178 million of Chinese Yuan, which is only about 16.3% or 9.1% of the market value of Shenzhen Stock Exchange or Shanghai Stock Exchange, respectively.

4 DATA

4.1 Sample and data sources

Our sample consists of 173 firms that were listed on the GEM in 2010. These firms are typically young and in high-tech sectors. No financial or utility firms exist in the sample.

Starting in 2001, publicly traded firms in China have to report the detailed ownership information in their annual reports. The information includes a figure of the ownership structure of the firm, the name and status of the ultimate controlling owner as well as the other nine biggest shareholders for both tradable and non-tradable shares. This regulation makes it possible to identify the ultimate owner and the pyramidal chain if it is applicable. For a detailed example of a pyramidal structure on the Chinese growth enterprise market, see Appendix.

Since the largest shareholders of the firms are not allowed to sell their shares or buyback shares for at least three years after IPO, to date, there is no change in controlling shareholders in the sample. In addition to the manually collected ownership structure, we collect the financial data from Thomson Reuter, IPO data from RESSET (www.resset.cn) and industry classification is from China Securities Regulatory Commission (CSRC) Industry Classification.

4.2 The IPO process on Growth Enterprise Market

To date, the type of the investment banking contract in the IPO process on GEM is a standby commitment, with which the issuing firm and its underwriter first issue a preliminary prospectus and solicit interests from potential investors. After approval from the China Securities Regulatory Commission (CSRC), the issuing firm and its underwriter hold a pricing meeting where the offer price and the number of shares to be sold are agreed upon, and finally they reach the stage of the share issuance. Unlike other markets, the share issuance in GEM involves both on-line issuance and off-line issuance. The on-line issuance is mainly for individual investors. The procedure is, once an individual investor applies for a certain amount of shares, he or she receives a "lottery number". After the issuance of on-line shares, the firm announces the numbers that win the "lottery", and only investors with those numbers can actually get a certain amount of shares. The number of shares is usually much smaller than the amount that the investor applied for beforehand. And for those who do not win the lottery, the money is to be returned.

The off-line issuance is mainly aimed for institutions, and it basically follows the same rule as the on-line issuance. Since the number of institutions is much smaller than the number of individual investors, usually all of the eligible institutions can get a certain amount of shares of the IPO. The actual number of shares that each institution is able to acquire depends on the number the institutions that applied during the off-line issuance. Under a standby commitment contract, the underwriter is responsible for buying any remaining shares that are not subscribed in the two- to four- week standby period.

In China, non-voting shares or other devices for discriminating against different shareholders are not permitted. B-shares or H-shares carry the same voting rights as A-shares. Firms in GEM are too small to issue B-shares or H-shares. We also find that

two ratios are fixed. The portion of a firm sold at the IPO is fixed at 25% and the tradable shares sold to individual investors (i.e., online issuance) are fixed as four times that sold to institutions (i.e., offline issuance). These fixed ratios reflect the strict regulation features of GEM. In order to protect the investors, especially the minority shareholders, the owners can only sell a moderate portion of their firms at the IPO, i.e., 25%, and 80% of the tradable shares have to be sold to individual investors.

4.3 Sample, variables and summary statistics

We categorize the IPOs on GEM during 2010 into three groups with respect to the characteristics of the ultimate owners, i.e. family-owned, state-owned and widely held. In our sample 156 firms are family controlled , 11 firms are state controlled, and only 6 firms are widely held. Since the widely held firms do not have a controlling shareholder they can by definition not be set up in a pyramid structure and these 6 firms are not included in our tests of the probability of a pyramid structure. . Thus, our tests of the probability of a pyramid structure use 167 firms. State owned firms only make up 7 percent of our sample. In comparison, Fan et al. (2005) find that in 2001, the government was the ultimate owner of about 76% of Chinese publicly listed firms. This difference reflects that the Chinese government has encouraged more private corporations to list their shares publicly during the latest ten years.

The main variable of interest and dependent variables in the probit regressions is Pyramid. It is a dummy variable that takes the value of one if the firm is set up in a pyramidal structure and zero otherwise. 73 IPO firms (43.7%) are set up in a pyramid structure.

In the treatment effect regressions we use four different dependent variables. The first is the (subscription) price to book ratio pre IPO. PBpreIPO is calculated as the offering price divided by net asset value per share (NAP) before IPO. The second is the underpricing of the IPO. IPO underpricing rate is calculated as (Pc-Po)/ Po where Pc is first day closing price and Po is offering price.

The third and fourth dependent variables are the online and offline, respectively, oversubscription rates. The oversubscription online (offline) is defined as the number of shares individual (institutional) investors have applied for, divided by the number of shares available for sale to individual (institutional) investors.

Table 1 panel A provides summary statistics for the dependent variables. The numbers of Oversubscription online/offline as well as the IPO underpricing rate imply a very strong interest among investors toward the IPO firms on GEM. The average Oversubscription online (offline) is 149 (60), which is about 8 (3) times compared to that of IPOs in UK (Brennan and Franks, 1997). Furthermore, the average underpricing level is 0.463 which is higher than in most other markets (see e.g. Loughran et al., 1994).

Table 1 IPO characteristics of sample firms

In this table we report summary statistics for our sample. The sample consists of 173 firms that listed on the growth enterprise market (GEM) in China in 2010. Accounting data and stock market data are collected from Thomson One and IPO data are from RESSET (www.resset.cn), industry classification is from China Securities Regulatory Commission (CSRC) Industry Classification, and ownership information is manually collected by the authors. The main variable of interest, *Pyramid*, is a binary variable that takes the value of one if the firm is in a pyramid structure and zero otherwise, there is no change in the ownership structure in our sample during 2010. *PBpreIPO* refers to (subscription) price to book ratio pre IPO, and is calculated as the offering price divided by net asset value per share (NAP) before IPO. *IPO underpricing* is equal to $(P_c-P_o)/P_o$, where P_c is first day closing price and P_o is offering price. *Oversubscription online (offline)* is equal to the number of shares individual (institutional) investors have applied for, divided by the number of shares available for sale to individual (institutional) investors. *State* is a dummy variable equals to one if the ultimate owner is the state, and zero otherwise. *Sales* denotes the total sales in Chinese Yuan of the firm in 2010 in logarithmic form. *EMPL* stands for employee number, which is the logarithmic of total employee number of the firm. *Volatility* is equal to the yearly stock market volatility and it is estimated as the standard deviation of daily stock returns from February 2011 to September 2011 of each firm multiplied by the square root of 252. *Salesgrowth* is the growth of total sales in 2010. *Leverage* is equal to the firm's total debt divided by total asset in the year of 2010, and it is in a percentage scale. *CAPEX* is equal to the capital expenditure over property plant and equipment.

Panel A: Descriptive statistics Dependent variables

	25% percentile	Median	75% percentile	Mean	Standard deviation
Pyramid	0	0	1	0.437	0.498
PBpreIPO	9.189	11.455	14.444	12.456	5.094
IPO underpricing	0.176	0.364	0.718	0.463	0.398
Oversubscription online	99	144	188	149	67
Oversubscription offline	37	58	79	60	33

Panel B: Descriptive statistics Control variables

	25% percentile	Median	75% percentile	Mean	Standard deviation
State	0	0	0	0.066	0.249
Sales (in log)	3.420	3.827	4.270	3.882	0.674
Volatility (%)	41.9	48.8	55.6	49.2	9.8
Salesgrowth	0.142	0.310	0.480	0.337	0.355
Leverage (%)	6.897	12.527	21.305	16.830	14.530
EMPL (in log)	5.800	6.366	6.860	6.353	0.781
CAPEX	2.950	6.010	11.960	9.798	11.439

Our control variables include: Sales denotes the total sales of the firm in 2010 in logarithmic form and is used as a proxy for firm size. As an alternative size measure we use the number of employees in the firm (EMPL). Leverage is calculated as the firm's total debt divided by total asset in the year of 2010. CAPEX stands for the capital expenditures related to property plant and equipment and is used to proxy for the firm's investment. Leverage and CAPEX are used as proxies form capital constraints. We use yearly stock market volatility (Volatility) as proxy for risk. It is calculated as the standard deviation of daily stock returns from February 2011 to September 2011 of each firm and multiplied by the square root of 252 in order to have an estimate of yearly volatility. As a proxy for the firm's growth potential we construct a Salesgrowth variable. It is estimated as the total sales in 2010 divided by total sales in 2009 minus one. In order to control for the effect of state ownership, we construct a dummy named State which takes the value of one if the ultimate controller is the state, and zero otherwise. Similar control variables are used in earlier studies on pyramids, e.g. Masulis et al.'s (2011) international study, Fan et al.'s (2005) Chinese study and Attig et al.'s (2004) Canadian study.

Descriptive statistics for the control variables are reported in Table 1 panel B. The median IPO firm is growing rapidly and has relatively little debt. Median Salesgrowth is 0.310, median CAPEX is 6.01, and median Leverage is 12.527%.

5 EMPIRICAL RESULTS

5.1 Univariate comparison of pyramid, non-pyramid and widely-held firm characteristics

Table 2 reports the median difference tests for the firm characteristics of pyramid firms, non-pyramid firms and widely-held firms. The significance level of the difference in median is based on Wilcoxon ranksum test.

We first compare the pyramid firms to the closely held non-pyramidal firms. The Wilcoxon ranksum tests suggest some significant differences. Pyramidal firms i) are larger (Sales and number of employees (EMPL)), ii) invest more (CAPEX), iii) have higher Leverage, and iv) have higher Salesgrowth than non-pyramidal firms. We find no significant difference in terms of the other variables.

Second we compare the widely held firms to the closely held pyramid and non-pyramidal firms. Widely-held firms have significantly higher capital expenditures (CAPEX) than closely held firms. These are no significant differences between widely-held firms and closely held firms in other firm characteristics.

Table 2 Differences between pyramid firms, non-pyramid firms and widely-held firms, respectively

In this table we report difference in median test between pyramid firms, non-pyramid firms and widely held firms. The sample consists of 173 firms that listed on the growth enterprise market (GEM) in China in 2010. Accounting data and stock market data are collected from Thomson One and IPO data are from RESSET (www.resset.cn), industry classification is from China Securities Regulatory Commission (CSRC) Industry Classification, and ownership information is manually collected by the authors. *PBpreIPO* refers to (subscription) price to book ratio pre IPO, and is calculated as the offering price divided by net asset value per share (NAP) before IPO. *IPO underpricing* is equal to $(P_c-P_o)/P_o$, where P_c is first day closing price and P_o is offering price. *Oversubscription online (offline)* is equal to the number of shares individual (institutional) investors have applied for, divided by the number of shares available for sale to individual (institutional) investors. *Sales* denotes the total sales in Chinese Yuan of the firm in 2010 in logarithmic form. *EMPL* stands for employee number, which is the logarithmic of total employee number of the firm. *Volatility* is equal to the yearly stock market volatility and it is estimated as the standard deviation of daily stock returns from February 2011 to September 2011 of each firm multiplied by the square root of 252. *Salesgrowth* is the growth of total sales in 2010. *Leverage* is equal to the firm's total debt divided by total asset in the year of 2010, and it is in a percentage scale. *CAPEX* is equal to the capital expenditure over property plant and equipment. Median differences tested by means of Wilcoxon ranksum test. ***denotes significant at 1% level. ** denotes significant at 5% level. *denotes significant at 10% level.

	(1)With Pyramid	(2)No Pyramid	(3)Widely Held	Wilcoxon ranksum test		
variable	n=73 median	n=94 median	n=6 median	(1) and (2)	(1) and (3)	(2) and (3)
PBpreIPO	11.390	11.500	13.946	-0.110	-2.556	-2.446
IPO underpricing	0.346	0.397	0.261	-0.051	0.085	0.136
Oversubscription online	136	153	136	-17	0	17
Oversubscription offline	50.3	58.9	54.9	-8.7	-4.6	4.0
Sales (in log)	4.065	3.566	3.970	0.499***	0.095	-0.404
EMPL (in log)	6.522	6.226	6.359	0.296***	0.163	-0.133
Volatility (%)	48.8	49.8	49.6	-1.0	-0.8	0.2
Salesgrowth	0.336	0.278	0.270	0.058*	0.066	0.008
Leverage	14.537	10.312	11.760	4.225**	2.777	-1.448
CAPEX	8.070	4.800	11.050	3.270***	-2.980*	-6.250***

5.2 Causes of pyramids

We first estimate a probit regression to analyze what factors that influence the ultimate owners' endogenous decision to set up the IPO firm in the pyramid structure or not. The dependent variable is the pyramid dummy, which equals one if the IPO firm is part of a pyramid structure, and zero otherwise.

Our first hypothesis is that larger firms are more likely to be set up in a pyramid structure. We use Sales or EMPL as proxies for firm size. Our second hypothesis is that pyramidal firms are capital constrained. We therefore include capital expenditure over property plant and equipment (CAPEX) and the ratio of total debt over total asset (Leverage) as independent variables in the regressions. Finally, our third hypothesis states that pyramidal firms are more risky and we therefore include our proxy for firm risk, stock market volatility after listing (Volatility), as an independent variable.

To control for growth opportunities we include Salesgrowth. In China, state-owned companies (SOEs) still dominate the economy, so we include a State dummy to capture the potential governmental effect. In some estimated models we also include 16 industry dummies based on the industry classification by China Securities Regulatory Commission (CSRC). Thus, we estimate the following probit regression.

$$Pyramid_i = \alpha + \beta_1 Size_i + +\beta_2 CAPEX_i + \beta_3 Leverage_i + \beta_4 Volatility_i + \beta_5 Salesgrowth_i + \beta_6 State_i + \sum_{j=1}^{16} \gamma_j Industry_j + \varepsilon_i$$

The results are reported in table 3. In line with our first hypothesis, Sales and EMPL are positive and significant in most of the estimated models indicating that larger size increases the likelihood that a firm will be set up in the pyramidal structure. The result that pyramid firms are larger in size is supported by the theoretical arguments in Almeida and Wolfenzon (2006) and can also be found by Attig et al. (2004) and Masulis et al. (2011).

We do not find any support for our second hypothesis stating that pyramidal firms are capital constrained. CAPEX and Leverage are insignificant in all estimated models. Thus, while CAPEX has been found to significantly increase the likelihood of pyramid structures on the Chinese main market (Fan et al., 2005), in Canada (Attig et al., 2004), and in multiple countries (Masulis et al., 2011), it does not appear to be significant on GEM. One possible explanation is that almost all firms on the GEM are rapidly growing high-tech firms. They are all investing intensively and it might be difficult to document a difference between pyramidal firms and stand-alone firms even if differences exist.

Earlier results concerning the relation between leverage and the likelihood of pyramid structures are mixed. Masulis et al. (2011) find that leverage is negatively related to the likelihood of pyramids. Attig et al. (2004), on the other hand, find no significant relation between leverage and the likelihood of pyramid structures.

Similarly, we find no support for our third hypothesis that pyramidal firms are riskier. Earlier results concerning the relation between firm risk and the likelihood of pyramid structures are mixed. Masulis et al. (2011) find that risk is positively related to the pyramid layer. Attig et al. (2004), on the other hand, find no significant relations between risk and the likelihood of pyramid structures.

State is positively significant and this finding is supported by the decentralization theory by Fan et al. (2005). They argue that the government cannot relinquish control by selling off its stake in the firm freely due to strict regulation prohibiting the dilution of state ownership. Therefore, a pyramid can serve as a device for the government to decentralize control rights to the firm managers. Salesgrowth is mainly insignificant in table 3. It is positive and significant at the 10 percent level in one of the estimated models.

Table 3 Probit regression, the dependent variable is the pyramid indicator variable

In this table we use 167 closely held firms that listed on the growth enterprise market (GEM) in China in2010. Accounting data and stock market data are collected from Thomson One, and ownership information is manually collected by the authors. The dependent variable, *Pyramid*, is a binary variable that takes the value of one if the firm is in a pyramid structure and zero otherwise. *EMPL* stands for employee number, which is the logarithmic of total employee number of the firm. *Salesgrowth* is the growth of total sales in 2010. *Volatility* is equal to the yearly stock market volatility and it is estimated as the standard deviation of daily stock returns

from February 2011 to September 2011 of each firm multiplied by the square root of 252. *State* is a dummy variable equals to one if the ultimate owner is the state, and zero otherwise. *Leverage* is equal to the firm's total debt divided by total asset in the year of 2010, and it is in a percentage scale. *CAPEX* is equal to the capital expenditure over property plant and equipment. Robust standard errors are reported in the parentheses. ***denotes significant at 1% level. ** denotes significant at 5% level. *denotes significant at 10% level.

	M1	M2	M3	M4	M5	M6
Sales	0.603***	0.552***	-	-	0.756***	-
	(0.216)	(0.194)			(0.166)	
EMPL	-	-	0.151	0.268*	-	0.377***
			(0.152)	(0.145)		(0.138)
Salesgrowth	0.356	0.348	0.588	0.605*	-	-
	(0.353)	(0.322)	(0.392)	(0.354)		
Volatility	-1.969	-1.331	-2.230*	-1.404	-	-
	(1.244)	(1.08)	(1.229)	(1.160)		
State	0.910*	1.087**	1.190***	1.307**	-	-
	(0.472)	(0.466)	(0.454)	(0.468)		
Leverage	0.006	0.006	0.010	0.010	-	-
	(0.009)	(0.008)	(0.011)	(0.0078)		
CAPEX	0.007	0.009	0.017	0.014	-	-
	(0.012)	(0.012)	(0.011)	(0.001)		
Constant	-1.407	-2.030**	-0.164	-1.779	-3.100***	-2.559***
	(1.1)	(0.885)	(1.209)	(1.094)	(0.651)	(0.889)
Industry Dummies	Yes	No	Yes	No	No	No
Pseudo-R^2	0.2348	0.1393	0.2057	0.1204	0.1009	0.0383
N	167	167	167	167	167	167

5.3 Treatment effect models

In this section we analyze whether and how the decision to set up IPO firms in pyramid structures affects the investors' interest and valuation in the IPO. Endogeneity concern is an important issue in studies of corporate and investor behavior, respectively, and ownership structure (Demsetz and Lehn, 1985). In order to control for the fact that original owners' endogenous decide whether to set up the firm in a pyramid structure we estimate treatment effect models. Treatment effect models consider the effect of an endogenously chosen binary treatment--the pyramid dummy--on another endogenous continuous variable, conditional on two sets of independent variables. Related papers, for example, Villalonga and Amit (2006) and Masulis et al. (2011) also apply treatment effect models. The treatment effect model consists of two steps. The first step is a probit model with the binary treatment variable (i.e., the Pyramid dummy) as the dependent variable, and instrument(s) as independent variable(s). The second step is a regression of the continuous dependent variable, y, on the Pyramid dummy controlling for Salesgrowth, firm risk (Volatility), State ownership, firm size (Sales), and industry effects. Thus, we estimate

$$y_i = \alpha + \beta_1 Pyramid_i + \beta_2 Salesgrowth_i + \beta_3 Volatility_i + \beta_4 State_i + \beta_5 Sales_i + \sum_{j=1}^{16} \gamma_i Industry_j + \varepsilon_i$$

where y_i represents i) the pre IPO Price to book ratio (PBPreIPO), ii) Underpricing, iii) Oversubscription online, and Oversubscription offline, respectively.

In the first step we use EMPL as our instrument variable since i) Almeida and Wolfenzon's (2006) theoretical model suggests that pyramidal firms are large, ii) in our sample, pyramidal firms are indeed larger in size and have more employees than stand-alone firms, iii) EMPL is orthogonal (unrelated) to all the dependent variables in the second step (see table 4). Our other size measure, Sales turned out to be highly correlated with oversubscription rates.

Table 4 Validity of instrument

This table reports the results of the bivariate regression between dependent variables in the second step of treatment effect models and the instrument. The instrument is *EMPL*, which is the logarithmic of total employee number of the firm. Our dependent variables are: *PBpreIPO* refers to (subscription) price to book ratio pre IPO, and is calculated as the offering price divided by net asset value per share (NAP) before IPO. *Underpricing*, is equal to $(P_c-P_o)/P_o$, where P_c is first day closing price and P_o is offering price. *Oversubscription online (Oversubscription offline)* is equal to the number of shares individual (institutional) investors have applied for, divided by the number of shares available for sale to individual (institutional) investors, note that both measures are in logarithmic form. Robust standard errors are reported in the parentheses.

	PBPreIPO	*Underpricing*	*Oversub. online*	*Oversub. offline*
EMPL	-0.255	-0.034	-0.029	0.065
	(0.366)	(0.035)	(0.051)	(0.065)
R^2	0.0016	0.0045	0.0018	0.0053
p-value F	0.486	0.334	0.572	0.319
N	167	167	167	167

In the first step, the treatment $Pyramid_i$ is modeled as the outcome of an unobserved latent variable, $Pyramid_i^*$.

$$Pyramid_i = \begin{cases} 1, & if\ Pyramid_i^* > 0 \\ 0, & otherwise \end{cases}$$

All models are estimated with Maximum Likelihood and reported with heteroskedasticity corrected standard errors in parenthesis (White, 1980).

5.3.1 Subscription price to book ratio before IPO

We start by testing our fourth hypothesis stating that the subscription price to book ratio is lower for pyramid firms. PBpreIPO is used as the dependent variable and it is calculated as the subscription (offering) price divided by net asset value per share (NAP) before IPO. Thus, it is an ex ante measure which should capture the underwriters' information about the investors' interest in the IPO. A lower PBpreIPO, ceteris paribus, is consistent with investors using a higher discount rate when valuing the firm. Holmen and Högfeldt (2004) run similar tests on Swedish IPOs.

The results are reported in table 5 model 1. In line with hypothesis 4 we find that the coefficient on the pyramid dummy is negative and significant. The result suggests that underwriters anticipate that the investors will discount the price of pyramidal firms due to concerns of expropriation or asset appropriation. Wang (2013) finds that, other things being equal, pyramidal structures on GEM have a detrimental effect on firm performance, while Gao and Kling (2008) document that a firm belonging to a pyramidal business group will experience exacerbated asset appropriation on the

Chinese main market. Among other variables, only Salesgrowth is significantly associated with a higher subscription price to book ratio pre IPO.

Table 5 Treatment effect models with the (subscription) price to book ratio pre IPO (PBpreIPO) and IPO underpricing, respectively, as dependent variables.

In this table we use 167 closely held firms that listed on the growth enterprise market (GEM) in China in 2010. Accounting data and stock market data are collected from Thomson One and IPO data are from RESSET (www.resset.cn), industry classification is from China Securities Regulatory Commission (CSRC) Industry Classification, and ownership information is manually collected by the authors. In M1, the dependent variable, *PBpreIPO* refers to (subscription) price to book ratio pre IPO, and is calculated as the offering price divided by net asset value per share (NAP) before IPO. In M2, the dependent variable, *IPO underpricing*, is equal to $(P_c-P_o)/P_o$, where P_c is first day closing price and P_o is offering price. *Sales* denotes the total sales in Chinese Yuan of the firm in 2010 in logarithmic form. *Salesgrowth* is the growth of total sales in 2010. *Volatility* is equal to the yearly stock market volatility and it is estimated as the standard deviation of daily stock returns from February 2011 to September 2011 of each firm multiplied by the square root of 252. *State* is a dummy variable equals to one if the ultimate owner is the state, and zero otherwise. The endogenous binary variable, *Pyramid*, takes the value of one if the firm is in a pyramid structure and zero otherwise. The models are estimated by Maximum Likelihood, and robust standard errors are reported in parentheses. ***denotes significant at 1% level. ** denotes significant at 5% level. *denotes significant at 10% level. We use *EMPL* (employee number) as the instrument in the first step. In order to save space, only the results from the second step of treatment effect model are reported.

	Model 1 Second step *PBpreIPO*	Model 2 Second step *IPO underpricing*
Pyramid	-8.265*** (2.263)	0.446** (0.178)
Salesgrowth	2.986** (1.262)	-0.054 (0.291)
Volatility	-0.384 (3.215)	1.504*** (0.291)
State	1.814 (1.677)	0.371*** (0.141)
Sales	0.419 (0.663)	-0.081* (0.046)
Constant	15.872*** (3.371)	-0.093 (0.195)
Industry dummies	*Yes*	*Yes*
N	167	167

5.3.2 IPO underpricing

We next test hypothesis 5 stating that underpricing of pyramid IPO firms is higher than for stand-alone IPO firms. The motivation for investors to take the potential additional risk associated with co-investing along with the controlling shareholder in a pyramid structured IPO might be that they are compensated by larger returns during the first days of stock listing, i.e. higher underpricing. The lower price to book ratio of pyramid IPOs suggests that this might be the case. The dependent variable is calculated as (Pc-Po)/Po where Pc is first day closing price and Po is offering (subscription) price.

The results are reported in table 5 model 2. In line with hypothesis 5, the coefficient on the Pyramid dummy is indeed positive and significant, suggesting that underpricing is more substantial for pyramid firms. We interpret this result from both the investors' and the underwriters' points of views. First, from the investors' side, this result is consistent with Beatty and Ritter (1986) who argue that the expected initial return is an increasing function of the uncertainty investors feel about the market clearing price of an IPO. Investors anticipate or seek more compensation when uncertainty is larger. For example, the uncertainty to invest in a relatively more complicated firm structure (pyramid firms) is larger than to invest in a relatively simpler structured firm (stand-alone firm). Second, from the underwriters' point of view, a pyramid structure should increase the likelihood that investors might not be interested in the IPO and not subscribe to shares. Thus, in order to reduce the risk of not being able to sell all shares, the underwriters intentionally underprice pyramid IPOs more.

In line with earlier research (e.g. Habib and Ljunqvist, 2001) larger IPOs in terms of total sales are associated with significantly lower underpricing. And in line with e.g. Gompers et al. (1996), more risky firms experience significantly higher underpricing. Furthermore, the coefficient over the State dummy is positive and significant. One interpretation of this result is that state-owned firms tend to underprice more in order to benefit investors, consistent with the "helping hand" hypothesis of central government as controlling shareholder. Cheung et al. (2010) find that consistent with the helping hand hypothesis, central government connections benefit the minority shareholders of listed firms. In contrast, consistent with the "grabbing hand" hypothesis, the minority shareholders in firms controlled by the local government are expropriated as they lose up to half of the value of related party transactions.

5.3.3 Online/Offline oversubscription rate

We have shown above that pyramidal firms are discounted already before the IPO. Underwriters of firms in pyramids appear to be aware of the potential risk of not being able to sell all the shares and therefore intentionally underprice pyramid IPOs more. So do investors actually stay away from pyramid IPOs due to concerns of expropriation? Or do investors show higher interest in pyramid IPOs in order to obtain higher first day initial returns? We next examine if and how the pyramid structures affect the IPO subscription online and offline.

We report the results in table 6 models 1 (online) and 2 (offline). The coefficient of the Pyramid dummy is insignificant in model 1 but significantly positive in model 2. Recall that online subscription is mainly for individual investors while offline subscription is mainly for institutional investors, and that a higher oversubscription rate implies a larger interest among investors.

The results suggest that individual investors' interest in IPOs appear not be affected by pyramid structures. Institutions, on the other hand, are keener on pyramid firms than standalone firms. Institutional investors' larger demand for the more underpriced pyramid IPOs appear to be in line with the general perception that institutional investors, compared to individual investors, have more experience, expertise, and better information. On the one hand and in line with Rock's (1986) theoretical model of underpricing of IPOs, informed investors (institutions) has an opportunity to profit from superior information by bidding for "mispriced" securities (pyramidal IPOs). They are compensated for their costly information processing about e.g. complicated pyramid structure, by larger first day returns. On the other hand, individual investors

are usually regarded as less sophistication and they might have little knowledge about the pyramid structure. For example, Feng and Seasholes (2003) examine a sample of 90,478 actively investing individuals in China, and document that Chinese individual investors are much younger and have less investing/trading experiences than typical individual investors in U.S.

In addition, Volatility is positive and significant suggesting that investors regard IPO investments as lotteries with positively skewed returns. The likelihood that a particular IPO will be the next Apple increases with firm risk and therefore risk might increase investor interest.

Table 6 Treatment effect models with oversubscription rate online/offline as dependent variables

In this table we use 167 closely held firms that listed on the growth enterprise market (GEM) in China in 2010. Accounting data and stock market data are collected from Thomson One and IPO data are from RESSET (www.resset.cn), industry classification is from China Securities Regulatory Commission (CSRC) Industry Classification, and ownership information is manually collected by the authors. In M1 (M2), the dependent variable *Oversubscription online (Oversubscription offline)* is equal to the number of shares individual (institutional) investors have applied for, divided by the number of shares available for sale to individual (institutional) investors, note that both measures are in logarithmic form. *Salesgrowth* is the growth of total sales in 2010. *Volatility* is equal to the yearly stock market volatility and it is estimated as the standard deviation of daily stock returns from February 2011 to September 2011 of each firm multiplied by the square root of 252. *State* is a dummy variable equals to one if the ultimate owner is the state, and zero otherwise. The endogenous binary variable, *Pyramid*, takes the value of one if the firm is in a pyramid structure and zero otherwise. The models are estimated by Maximum Likelihood, and robust-standard errors are reported in parentheses. ***denotes significant at 1% level. ** denotes significant at 5% level. *denotes significant at 10% level. We use *EMPL* (employee number) as the instrument in the first step. In order to save space, only the results from the second step of treatment effect model are reported.

	Model 1 Second step *Oversubscription online*	Model 2 Second step *Oversubscription offline*
Pyramid	0.085	1.033***
	(0.259)	(0.161)
Sales growth	-0.196	-0.038
	(0.148)	(0.095)
Volatility	1.722***	3.058***
	(0.439)	(0.360)
State	0.116	0.595
	(0.147)	(0.183)
Sales	-0.103	-0.171*
	(0.072)	(0.095)
Constant	4.192***	2.588***
	(0.375)	(0.503)
Industry Dummies	Yes	Yes
N	167	167

5.4 Additional tests

We have performed a battery of unreported robustness test. First, we have deleted the 11 state owned firms from all tests. Our main results remain unchanged. Second, we have included CAPEX and Leverage in the second step of treatment effect models. It

does not alter our main results. Third, we include Return on Assets (ROA) in the models but it does not change our main results.

Furthermore, Masulis et al (2011) argue that pyramid structures might be used to overcome financial constraints. In the reported tests we have used CAPEX and Leverage to proxy for financial constraints. Another measure of financial constraints is of course dividend payments. Financial constrained firms should be less likely to pay dividends. However, we note that most firms in our sample are rapidly growing firms and most of them do not pay dividends, or pay very small dividends, irrespective of being within a pyramid structure or not.

Almeida and Wolfenzon (2006) argue that pyramids are set in order to derive private benefits of control and expropriate minority shareholders. Proxies for the value of the private benefits of control are difficult to construct using public information since they are by definition private (Zingales, 1998). The most commonly used measures, the voting premium on high voting stock and the premium at block transfer transactions, are not possible to construct for our sample since all firms are one share - one vote and no major ownership changes have taken place in the sample yet. However, we try to construct a measure by collecting the salaries paid by the IPO firms to the ultimate owners. Paying herself a very large salary could be one private benefits of control. We do not find any significant difference between pyramids firms and stand-alone IPOs in terms of the salaries paid to the ultimate owner.

The ultimate owner may of course place friends and relatives on well-paid executive positions in the (pyramidal) firms as well and this would be another type of private benefits of control. However, as far as we understand, this is very uncommon in China since it would generate an outcry among investors.

We have also considered various interaction effects. For example, inspired by Khanna and Palepu (1997) and Attig et al. (2004), we have included the interaction effects of Pyramid and Salesgrowth, and Pyramid and Volatility in OLS regressions. The interaction terms are insignificant and the other results are not changed in a significant way.

Finally, we have replaced the pyramid dummy with the actual separation of control rights from cash flow rights created by the pyramid structure. This variable is not significant in similar tests as the ones reported above. Thus, it appears as if the pyramid structure has an indicator effect at the IPO, i.e. there is no linear relation between the actual degree of separation of control rights from cash flow rights and price to book, underpricing, and oversubscription.

6 CONCLUSION AND DISCUSSION

In this paper we have investigated Initial Public Offerings (IPOs) of high-tech firms on the Chinese Growth Enterprise Market (GEM). As far as we know, this is the first paper that investigates the IPO process in combination with pyramidal structures on the new GEM in China. We first show that almost half of the high-tech IPOs on the GEM are set up in pyramid structures.

Based on Almeida and Wolfenzon (2006) and Masulis et al (2011) we formulate five hypotheses and we find support for three of them. The likelihood of a pyramid structure increases with the size of the IPO firm (Hypothesis 1). The subscription price to book ratio is significantly lower for pyramid IPOs compared to stand-alone IPOs, i.e. pyramid IPOs are discounted before the IPO (Hypothesis 4). Furthermore, the underpricing is higher for pyramid IPOs (Hypothesis 5). We conclude that investors demand a higher risk-premium when investing in pyramid IPOs and this translates into a higher underpricing. Our results do not suggest pyramid IPOs are capital constrained (Hypothesis 2) or riskier (Hypothesis 3).

We think our results contribute to the existing literature along at least two dimensions. First, most prior studies use information about mature pyramidal firms and document that at least under some conditions, pyramid structures are associated with lower firm value and worse firm performance (see e.g. Claessens et al., 2002, Lemmon and Lins, 2003 and Fan et al. 2005). These results are often interpreted in terms of expropriation of minority shareholders by the controlling shareholder. Our IPO results supplement these results and suggest that pyramid affiliated firms are discounted already at the IPO.

Second, we think our approach and the use of detailed information about the IPOs on GEM let us document a more complete picture than is typically done. The analysis of i) the price to book ratio at the subscription price, ii) the underpricing, and iii) oversubscription ratios also provides a consistent story. A higher underpricing could be due to a large interest in the IPO which creates overvaluation once the firm shares begin to trade. Or, a higher underpricing could be due to underwriters setting a lower subscription price in order to attract investors. Our results for pyramid IPOs on the GEM suggest that the second explanation is more plausible.

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Section 4
The effectiveness and independence of supervisory boards: Evidence from China

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Abstract

This study examines board effectiveness and independence by studying all firms listed in China from 2000 to 2009. I find a significant inverse relationship between supervisory board size and firm performance. This result indicates that large supervisory board size *per se* causes free-rider and communication or coordination problems, as occurs with boards of directors. In addition, I employ a novel measure of supervisory board independence based on the relevant literature. I find evidence of a significant nonmonotonic relationship between board independence and firm performance, that is, Tobin's Q and return on assets first decline and then increase as supervisory board independence increases. I argue that for supervisory boards to be efficient and independent, the number of supervisors should not be lower than 25% of the total number of board members.

Key words: Two-tier board structure, Monitoring role, Advisory role, Supervisory board

JEL classification: G18 G34 G38

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1 INTRODUCTION

This study investigates the roles of supervisory boards of all firms listed in China from 2000 to 2009, with a particular focus on supervisory board effectiveness and independence. It is well known that firms in China employ the German dual board system; this system and the Anglo-Saxon unitary board system are generally recognized as the most effective governance mechanisms (Shleifer and Vishny, 1997). Boards play different roles in these two systems. For example, Adams and Ferreira (2007) show that in the former, the board of directors assumes an advisory as well as a monitoring role, whereas in the latter, the board's monitoring role is separated from the advisory role. That is, as an independent entity in the firm, the supervisory board takes on the monitoring role while the board of directors takes on the advisory role.

However, to date, corporate governance literature tends to focus on the unitary board system (see Shleifer and Vishny, 1997, for reviews) and studies about supervisory boards are surprisingly rare. Especially in China, supervisory boards have attracted little academic attention (Tam, 1999). In addition, firms listed in China have a board of directors and a supervisory board while being required to have outside (independent) directors, making China one of the few jurisdictions to implement a combination of the German and Anglo-Saxon styles of corporate governance. Given the particular setting of the board structure of Chinese listed firms, a study that can bridge the supervisory board and the board of directors is indeed necessary and meaningful.

By examining a comprehensive data set on 1325 firms listed in China during the 2000 to 2009 period, I find a significant inverse relationship between supervisory board size and firm valuation (proxied for by Tobin's Q). This finding contributes to the literature on the relationship between the supervisory board size and firm valuation. It appears that a large supervisory board per se is associated with problems occurring when the size of the boards of directors is large. Namely, it causes coordination/communication and free-rider problems. For example, Yermack (1996) discusses two main sources of the board-size effect: increased problems of communication and coordination as group size increases and the decreased ability of the board to control management, thereby leading to agency problems stemming from the separation of management and control.

Most prior studies on supervisory boards also overlook the effect of the size and composition of boards of directors; in this paper, I propose a measure of supervisory board independence to explore the potential interplay between both tiers in light of Adams and Ferreira (2007). Their theoretical model suggests that in a dual board system , increasing the independence of supervisory boards has no effect on the incentives of managers to share information. Thus, increasing its independence will increase shareholder value.

However, few previous empirical studies have focused on measuring supervisory board independence. For example, Xi (2006) only argues that the nomination of outside supervisors should improve supervisory board independence, while Firth et al. (2007) suggest that larger supervisory boards are more independent and exhibit increased monitoring efficiency. They further argue that large supervisory boards are more likely to stand up against a CEO who wants to take aggressive or even wrong actions.

Nevertheless, size alone is an incomplete measure of supervisory board independence, not only because large supervisory boards are often associated with large boards of directors (Cho and Rui, 2009), but also because large supervisory boards are inefficient.

As such, on considering the board of directors, it is plausible for the supervisory board to be more independent if the proportion of supervisors among all board members is higher. In line with prior studies measuring the independence of board of directors, (e.g., Baysinger and Butler, 1985; Hermalin and Weisbach, 1991; Bhagat and Black, 1999), I create a variable named S/B ratio to proxy for supervisory board independence. After controlling for other firm characteristics, I find that corporate performance as well as valuation (measured by return on assets (ROA) and Tobin's Q, respectively) has a non-monotonic relationship with S/B ratio. ROA and Tobin's Q first decrease and then increase as the proportion of supervisors on the board increases.

My interpretation of the results is that when the proportion of supervisors on the board is low (S/B ratio is low), the supervisory board is not sufficiently independent. Even if the supervisory board is well informed, the monitoring effect might still be limited. Furthermore, the participation of supervisors in board of directors' meetings could increase coordination/communication problems because supervisors need to ask questions or make suggestions when attending meetings. In addition, the inclusion of a supervisory board report in the annual report (see, e.g., Dahya et al. 2003) could distract the board of directors and cause the firm to suffer from severe free-rider and coordination/communication problems. However, once the proportion of supervisors reaches a certain threshold, the separation between the advisory and monitoring roles of the board becomes significant, allowing the supervisory board to become more independent and increasing its monitoring effectiveness. The advantage of supervisory board independence thus overcomes its drawbacks related to free-rider and coordination/communication problems, allowing firms to eventually benefit from having more independent supervisory boards.

In addition, I suggest a way to interpret the results that is consistent with the "rejection" and "enhancement" theories of supervisory boards in China (see Xi, 2006, for a detailed discussion of both theories). My results suggest that supervisory boards should be abolished when the S/B ratio is lower than 0.25 because ROA and Tobin's Q are inversely related to this ratio. In contrast, in line with the enhancement theory, once the S/B ratio exceeds 0.25, the relationship between firm valuation and the S/B ratio becomes positive and statistically significant and the firm benefits from a more "enhanced" (or, in the present study, a "more independent") supervisory board.

This study also has policy implications because it sheds light on corporate board reform required in China. For example, China's Company Law requires at least one-third of a firm's board to be independent directors. However, there is no regulation specifying the required proportion of supervisors and directors within the dual board structure. My results suggest that for supervisory boards to become more efficient and independent, the proportion of supervisors within the two-tier board system should be no less than 25%.

The remainder of the article is organized as follows. Section 2 presents the institutional background of China's two-tier board system and reviews the relevant literature. Section 3 introduces the data set. Section 4 presents the empirical results, and Section 5 concludes the paper.

2 INSTITUTIONAL BACKGROUND AND LITERATURE REVIEW

2.1 China's two-tier board structure

China has employed the German two-tier board system since the 1990s when the country's two main stock exchanges (the Shanghai and Shenzhen Stock Exchanges) were established, and all listed firms are required to have a board of directors as well as a supervisory board. In 2006, in order to follow the best practices of more mature economies, the Company Law was amended further and all listed companies were required to appoint independent board directors.

Indeed, several authors argue that this board structure is distinct from the two-tier board system employed in Germany, Japan, and some European countries. For instance, Xi (2006) contends that in China, the method of appointing board members and director accountability structures are both different from those of typical two-tier boards. He points out that directors are appointed at general shareholder meetings, and not by the supervisory board, and are accountable to the shareholders rather than to the supervisory board. Dahya et al. (2003) indicate that unlike German supervisors, Chinese supervisors are not authorized to appoint and dismiss directors and executives. Tam (1999) even concludes that corporate governance in China follows the Anglo-Saxon unitary board system rather than the two-tier one.

Therefore, questions are raised about the extent to which supervisory boards can generate incremental effectiveness. Notably, in the 1990s, the Japanese Corporate Governance Forum suggested the abolition of supervisory boards. Its opinion was that if the number of independent directors exceed half of the total number of board members, the supervisory board should be abolished and a supervisory committee consisting only of independent directors should assume the monitoring role in place of the supervisory board. A similar organ existing in the sole board systems of the United States and United Kingdom is the audit committee (see, e.g., Adams and Ferreira, 2007). This approach stems from the somewhat overlapping functions of supervisors and independent directors, and in 2002, Japan's Company Law was ultimately amended accordingly.

In China, some scholars do support the rejection theory and favor abolishing supervisory boards entirely, as they consider such boards to be inefficient (Yu and Ma 2000). Some suggest that firms meeting certain criteria should be allowed to choose whether they require a supervisory board (Shao 2003).

In analyzing the characteristics of historical-path dependency in the evolution of the independent director and supervisory board systems, Wang and Liu (2006) demonstrate the necessity of reinforcing supervisory board governance; enhancing supervisory board performance could serve as a breakthrough in optimizing the governance structures of Chinese firms. With respect to supervisory board reform, Xi (2006) emphasizes that supervisory boards need more authority in order to enhance their monitoring capacity. First, supervisory boards should take part in the appointment of directors and the determination of their remuneration. Second, supervisors should have the right to question, propose, and take preventive action when attending board of directors' meetings.

2.2 Board size and firm performance

Jensen (1993) and Lipton and Lorsch (1992) were the first to argue that larger boards are generally less effective than smaller boards. Lipton and Lorsch (1992) conclude that there are two reasons for the ineffectiveness of large boards. First, owing to communication and coordination costs, it is harder for larger boards to arrange meetings, reach a consensus, and react rapidly. Second, a large board size hinders the abilities and incentives of able board members to control management.

A large body of subsequent empirical research indicates an inverse association between board size and firm value. For example, by examining 452 large US industrial corporations from the Forbes 500 list, Yermack (1996) finds a significant negative relationship between Tobin's Q and board size. The result is very robust to numerous controls. Eisenberg et al. (1998) study the board size–performance relationship in small firms. Using a sample of approximately 900 small Finnish firms, they document an inverse relationship between board size and firm performance. In a recent study examining whether takeover threats influence board size, Cheng et al. (2008) demonstrate a significant association between smaller boards and better firm performance before the enactment of antitakeover laws in the United States in the 1980s but find a much weaker relationship after the takeover restrictions came into effect. Mak and Kusnadi (2005) provide further support for this inverse relationship in their investigation of listed firms in Singapore and Malaysia.

2.3 Two-tier board structure

The supervisory board has historically been regarded as an organization that is independent from the board of directors. The supervisory board oversees executive management policies and the firm's general course of affairs and advises the executive management. It also serves in a monitoring role to defend the interests of shareholders.

To date, in contrast to the abundance of studies that examine unitary boards, few studies examine the two-tier board structure empirically. Van Hamel et al. (1998) interview 25 senior executives and directors from the Netherlands. Their results support the effectiveness of the two-tier board structure. However, they also observe that opinions on the value of supervisory boards differ widely, ranging from these being considered a nuisance to being perceived as making a real contribution. Peck and Ruigrok (2000) summarize the views of 149 company chairpersons from the top 500 publicly listed companies in Germany on a number of significant issues relating to German corporate governance. They document that larger companies generally oppose reforms intended to make supervisory boards more independent and accountable for company performance. Through a series of interviews with directors, supervisors, and executives from 21 listed companies in China, Xiao et al. (2004) find that supervisory boards play different roles in the country's corporate environment, ranging from honored guests, friendly advisors, and censored watchdogs to independent watchdogs. Ding et al. (2010) examine whether the amendments to China's Company Law in 2005 improve the monitoring ability of supervisory boards with regard to executive compensation. Their results indicate that before the implementation of the new Corporate Law, the formation and functioning of supervisory boards did not affect executive compensation; however, after its implementation, the size and meeting frequency of supervisory boards do affect total executive compensation (TEC).

3 DATA

My data set consists of an unbalanced yearly panel of all firms listed on the Shanghai and Shenzhen Stock Exchanges from 2000 to 2009. In line with other studies (e.g., Yermack, 1996; Vafeas, 1999; Firth et al., 2007), financial firms are excluded because they have different accounting standards. That leaves me with a sample of 1325 companies and about 12 000 firm-year observations. The data are collected from RESSET (www.resset.cn).

I define the following variables to indicate board characteristics. BoD size indicates the total number of directors on the board. This variable includes the CEO, chairperson of the board, and independent directors. This classification is similar to the board director categorizations used by Hermalin and Weisbach (1991), Yermack (1996), and Bhagat and Black (2002). However, I do not consider gray directors (that is, those directors who, as defined by Yermack (1996), have substantial professional or personal relationships with a company and/or are relatives of corporate officers), because they are difficult to determine within Chinese corporate boards. SB size refers to the total number of supervisory board members. As mentioned in the introduction, the S/B ratio, calculated as SB size/ (BoD size + SB size), is a proxy for supervisory board independence.

With respect to corporate performance and valuation, consistent with prior studies (e.g., Yermack, 1996; Eisenberg et al., 1998; Adams and Ferreira, 2007) I use ROA and Tobin's Q as the dependent variables. The ROA variable equals total income divided by total assets and is used to measure accounting performance. I use the ratio of the firm's market value to its book value to proxy for Tobin's Q; the firm's market value is calculated as the book value of assets minus the book value of equity plus the market value of equity. As shown by Chung and Pruitt (1994), this estimation can explain 96.6% of variability in theoretical Tobin's Q, which is generally used to measure corporate valuation.

My control variables include Sales, which is the logarithm of total annual sales in RMB. I use the standard deviation of monthly stock returns multiplied by the square root of 12 to proxy for risk or annualized volatility. Leverage is calculated as total debt over total assets. In China, listed firms must disclose the total executive compensation (TEC) in their annual reports. Because information on CEO or executive ownership is not available in my data set. I use the TEC divided by total assets to proxy for executive ownership (Exeown). Similar control variables are used by Yermack (1996), Eisenberg et al. (1998), and Cheng (2008), among others.

Panel A of Table 1 presents summary statistics on board characteristics, corporate performance and valuation, and firm characteristics. On average, boards of directors in China are larger than those in the United States. According to Cheng (2008), the mean size of boards of directors in the United States is 9, while my data set shows that in China, it is about 12. The mean S/B ratio is 0.309, which indicates that boards of directors are, on average, twice as large as supervisory boards. The pair-wise correlations reported in Panel B of Table 1 show that there is no serious multicollinearity problem between variables used in the regression analysis. Panel C of Table 1 presents the mean values of Tobin's Q for different S/B ratios. At first glance, it is hard to identify a consistent pattern between the mean values of Tobin's Q and the S/B ratio. This suggests that the relationship between Tobin's Q and the S/B ratio might be nonlinear.

Table 1 Panel A, B and C: Descriptive statistics

In this table, I report summary statistics and pair-wise correlations for my sample. The sample includes unbalanced yearly panel data that consists of all firms listed on the main stock exchanges in China from 2000 to 2009; n = 1425 with about 12000 firm-year observations. Information about boards, accounting data, and stock market data are collected from RESSET (www.resset.cn). *BoD size* is equal to total number of directors on the board, including the CEO, the chairperson of the board, and independent directors. *SB size* refers to the total number of supervisors on the supervisory board. *S/B ratio* is calculated as *SB size* divided by *BoD size* plus *SB size*. *ROA* stands for return on assets and equals total income divided by total assets. I use the ratio of the firm's market value to its book value to proxy for *Tobin's Q*; the firm's market value is calculated as the book value of assets minus the book value of equity plus the market value of equity. *Sales* is the logarithm of the total annual sales of each firm in Chinese Yuan. *Volatility* is calculated as the standard deviation of monthly stock returns multiplied by the square root of 12. *Leverage* is equal to total debt over total assets. Because my data only contain total executive compensation (TEC), which includes all types of executive compensation (such as the total salary, shares, and options), I use TEC divided by total assets to proxy for executive ownership (*Exeown*).

Variables	Mean	Standard Deviation	25% percentile	Median	75% percentile
Board characteristics					
BoD size	11.985	5.047	9	12	15
SB size	5.342	2.697	3	5	7
S/B ratio	0.309	0.101	0.238	0.3	0.371
Firm characteristics					
ROA	2.898	14.888	0.995	3.393	6.328
Tobin's Q	2.473	2.817	1.333	1.845	2.807
Volatility	0.464	0.433	0.29	0.392	0.564
Leverage	0.689	0.263	0.371	0.513	0.645
Sales (in log)	6.771	1.542	5.843	6.725	7.657
Exeown (%)	0.356	7.627	0.03	0.081	0.201

Panel B: Pair-wise correlations

	BoD	SB	S/B ratio	ROA	Tobin's Q	Volatility	Leverage	log(sales)	Exeown (%)
BoD	1								
SB	0.4948	1							
S/B ratio	-0.3832	0.4697	1						
ROA	-0.0755	-0.0366	0.0273	1					
Tobin's Q	0.0091	-0.0001	0.0057	-0.0369	1				
Volatility	0.0861	0.0476	-0.0449	0.0231	0.1166	1			
Leverage	0.0181	0.0142	-0.0024	-0.0210	0.4739	0.0121	1		
Sales (in log)	0.0456	0.0353	-0.0324	0.1592	-0.3467	0.0054	-0.0521	1	
Exeown(%)	-0.0071	-0.0053	0.0045	0.4020	0.5543	0.0151	0.8252	-0.1010	1

Panel C: Mean value of Tobin's Q, grouped by level of S/B ratio

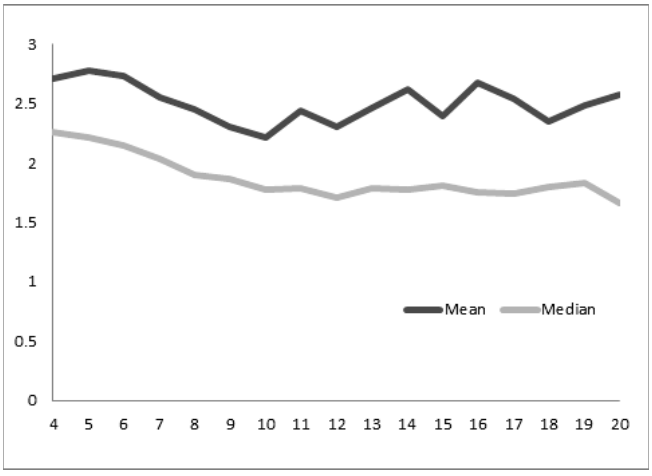
S/B ratio	Number of observations	Mean Tobin's Q	Standard Error of mean Tobin's Q
0–0.05	299	2.466	0.1110
0.05–0.1	103	2.588	0.2158
0.1–0.15	360	2.336	0.081
0.15–0.20	1196	2.456	0.0622
0.20–0.25	2096	2.465	0.0558
0.25–0.30	2193	2.524	0.0773
0.30–0.35	1965	2.514	0.0786
0.35–0.40	1719	2.566	0.0563
0.40–0.45	871	2.394	0.0703
0.45–0.50	669	2.367	0.0689
0.50–	616	2.318	0.0636

4 EMPIRICAL RESULTS

4.1 Board size and firm valuation

Figure 1 illustrates the mean and median values of Tobin's Q for firms sorted by BoD size (panel A) and SB size (panel B). Panel A clearly shows that the median Tobin's Q decreases almost monotonically over the range of BoD size. The mean Tobin's Q declines until BoD size reaches a value of 10 and fluctuates with no clear trend. The mean Tobin's Q peaks at a board size of five members. Similar evidence is also found by Yermack (1996) among Forbes 500 companies. Panel B shows a similar pattern for supervisory board size. The median Tobin's Q declines consistently over the range of SB size. The mean Tobin's Q first declines until SB size reaches three, increases until it reaches eight, and then decreases again.

Panel A



Panel B

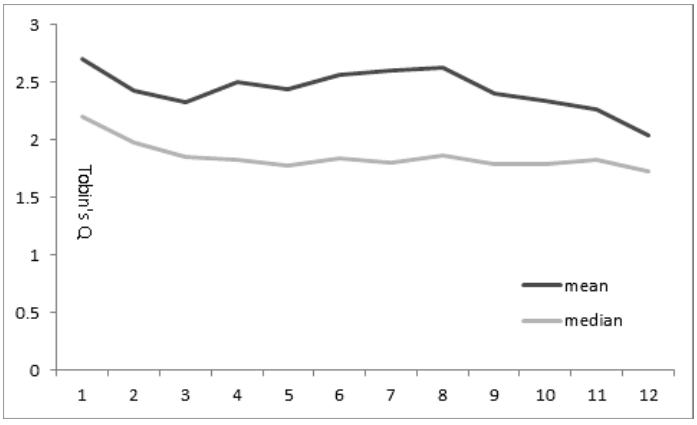


Figure 1 Relation between Tobin's Q and board size

In order to better understand the relationship between board size and firm valuation, I estimate the following estimation:

$$Tobin'sQ_{i,t} = \alpha + \beta_1 \ln BoDsize_{i,t} (\ln SBsize_{i,t}) + \beta_2 Sales_{i,t} + \beta_3 Leverage_{i,t} + \beta_4 ROA_{i,t} + \beta_5 Volatility_{i,t} + \beta_6 Exeown_{i,t} + \varepsilon_{i,t}$$

I use ordinary least square (OLS) and firm fixed-effects regressions to estimate. The regression results in Table 2 show that board of director and supervisory board sizes are significantly negatively associated with firm valuation (Tobin's Q), suggesting that as boards increase in size, corporate valuations decrease. The inverse relationship shows that supervisory board size matters; smaller boards should be more efficient in reaching consensus and monitoring management. As occurs with boards of directors, large supervisory boards can potentially suffer from communication/coordination and free-rider problems. The coefficients for other variables in Table 2 are generally significant. For example, sales, representing the total sales of the firm, is negatively associated with Tobin's Q. This is consistent with the evidence of Cho and Rui (2009) for China. Less-levered firms appear to have lower valuations than high-levered firms. Current profitability (measured by ROA) and executive ownership have positive associations with Tobin's Q; Yermack (1996) also finds similar evidence for the United States. In addition, risky firms appear to be better off relative to other firms.

The finding of the inverse association between the sizes of both the boards and firm valuation is insensitive to the estimation method. Most coefficients remain virtually unchanged when moving from the ordinary least squares (OLS) to a firm fixed-effects regression. Although the coefficient of SB size in the OLS regression is not significant, the fixed-effect regression shows that the coefficient of SBsize is very significant ($p < 0.01$).

Table 2 OLS and fixed-effects regressions between firm valuation and board size

The sample includes unbalanced yearly panel data that consists of all firms listed on the main stock exchanges in China from 2000 to 2009: n = 1425 with about 12000 firm-year observations. Information about boards, accounting data, and stock market data are collected from RESSET (www.resset.cn). Industry classifications follow the China Securities Regulatory Commission (CSRC) Industry Classifications. The dependent variable is *Tobin's Q*. *BoD size (in log)* equals the logarithm of the total number of directors on the board, including the CEO, the chairperson of the board, and independent directors. *SB size (in log)* refers to the logarithm of the total number of supervisors on the supervisory board. I use the ratio of the firm's market value to its book value to proxy for *Tobin's Q*; the firm's market value is calculated as the book value of assets minus the book value of equity plus the market value of equity. *Sales* is the logarithm of the total annual sales of each firm in Chinese Yuan. *Volatility* is calculated as the standard deviation of monthly stock returns multiplied by the square root of 12. *Leverage* equals total debt over total assets. Because my data only contain total executive compensation (TEC), which includes all types of executive compensation (such as the total salary, shares, and options), I use TEC divided by total assets to proxy for executive ownership (*Exeown*). Heteroskedasticity-consistent standard errors are presented in parentheses. *** denotes significance at 1%,** denotes significance at 5%, and *denotes significance at 10%.

	Dependent variable: Tobin's Q

BoD size (in log)	-0.144***	-0.362***	-	-
	(0.035)	(0.074)		
SB size (in log)	-		-0.046	-0.173***
			(0.029)	(0.062)
Sales (in log)	-0.438***	-0.530***	-0.441***	-0.566***
	(0.028)	(0.059)	(0.028)	(0.057)
Leverage	1.259***	1.208***	1.258***	1.201***
	(0.104)	(0.122)	(0.104)	(0.121)
ROA	0.032***	0.028***	0.032***	0.028***
	(0.007)	(0.008)	(0.008)	(0.008)
Volatility	0.572***	0.639***	0.560***	0.622***
	(0.143)	(0.158)	(0.139)	(0.153)
Exeown	0.743***	0.653**	0.738***	0.650**
	(0.218)	(0.322)	(0.219)	(0.322)
Constant	4.048***	5.725***	3.812***	5.377***
	(0.245)	(0.366)	(0.251)	(0.362)
Number of observations	11877	11877	11824	11824
R-squared	0.455	0.434	0.455	0.432
Industry dummy	Yes	No	Yes	No
Regression type	OLS	Fixed Effect	OLS	Fixed Effect

4.2 Nonmonotonic relationship between *S/B ratio* and firm valuation

In this section, I begin by showing the nonmonotonic relationship between the S/B ratio and firm valuation. I estimate piecewise linear regressions allowing for one change in the slope coefficient of the S/B ratio. In line with Morck et al. (1988), the variables are defined as follows:

SB.0to25 = S/B ratio if S/B ratio < 0.25,

= 0.25 if S/B ratio ≧ 0.25

SB.Over25 = 0 if S/B ratio < 0.25

= S/B ratio minus 0.25 if S/B ratio ≧ 0.25.

For example, when the S/B ratio is 0.20, then SB.0to25 = 0.20 and SB.Over25 = 0. When the S/B ratio is 0.40, SB.0to25 = 0.25 and SB.Over25 = 0.15. The threshold of 0.25 is partly motivated by the China Security Regulatory Commission's (CSRC) regulation requiring that no less than one-third of the directors on the boards of listed companies be independent. Although the theoretical justification for this threshold is not very strong, some countries (e.g., Singapore) also employ the one-third ratio. I focus on this particular threshold mostly because, as suggested by Morck et al. (1988), the S/B ratio between 20–25% in panel C of Table 1 has the lowest sum of squared errors. Although my chosen threshold is admittedly arbitrary, it is almost impossible to specify a certain point to clearly distinguish the down-and up-trend. However, the main

objective of this section is to find a relatively parsimonious way to describe the pattern in the data. The regression is estimated as follows:

$$Tobin'sQ_{i,t}(ROA_{i,t}) = \alpha + \beta_1 SB.0to25_{i,t} + \beta_2 SB.Over25 + \beta_3 Sales_{i,t} + \beta_4 Leverage_{i,t} + \beta_5 ROA_{i,t} + \beta_6 Volatility_{i,t} + \beta_7 Exeown_{i,t} + \varepsilon_{i,t}$$

The results of the panel data fixed-effects regression in columns 2 and 4 of Table 3 suggest that after controlling for other firm characteristics, for each 1% increase in the S/B ratio between 0% and 25%, Tobin's Q declines by an average of about 0.013 (t = 2.303) and ROA declines by an average of about 0.14% (t = 4.66). As the S/B ratio increases beyond 25%, for each 1% increase, I observe gradual increases in Tobin's Q and ROA averaging 0.013 (t = 3.160) and 0.11% (t = 4.646), respectively. Because a similar pattern can also be found using the OLS estimation (see results in columns 1 and 3 of Table 3), the piecewise linear relationship is insensitive to the estimation method. The interpretation of the results is as follows: When the S/B ratio is between 0% and 25%, the supervisory board is less independent and can be regarded as something of a figurehead (Xi, 2006). In this interval, the higher the proportion of supervisors, the more severe the free-rider problem.

When the S/B ratio is higher than 25%, the free-rider problem can still be severe, but it is dominated by the potential advantages of a more independent supervisory board that is more effective in its monitoring function. This finding is supported by Adams and Ferreira (2007), who argue that in the sole board system, the advisory and monitoring roles of boards are not separate, increasing director independence may have adverse consequences because managers are less willing to share information with a sole board as its monitoring intensity increases. As a result, even an independent board cannot monitor effectively with less information. In contrast, in a dual board system, the advisory and monitoring roles are separate and the incentives for managers to share information are not affected by the independence of the supervisory board, therefore, increasing the independence of supervisory board will increase shareholders' value. In addition, my empirical results supplement Adams and Ferreira's arguments by suggesting a threshold as the proportion of supervisors, after this threshold, enhancing the independence of supervisory board will benefit shareholders unambiguously. To ensure that these results are robust, in the next section, I present some robustness tests that include piecewise linear regressions by using a different threshold.

Table 3 Piecewise OLS and fixed-effects regressions between firm valuation/performance and S/B ratio

The sample includes unbalanced yearly panel data consisting of all firms listed on the main stock exchanges in China from 2000 to 2009; n = 1425 with about 12000 firm-year observations. Information about boards, accounting data, and stock market data are collected from RESSET (www.resset.cn). Industry classifications follow China Securities Regulatory Commission (CSRC) Industry Classifications. The dependent variables are *Tobin's Q* and *ROA*. Please refer to section 4.2 for the definition and calculation of *SB.0to25* and *SB.Over25*. I use the ratio of the firm's market value to its book value to proxy for *Tobin's Q*; the firm's market value is calculated as the book value of assets minus the book value of equity plus the market value of equity. *ROA* stands for return on assets and equals total income divided by total assets. *Sales* is the logarithm of the total annual sales of each firm in Chinese Yuan. *Volatility* is calculated as the standard deviation of monthly stock returns multiplied by the square root of 12. *Leverage* is equal to total debt over total assets. Because my data only contain total executive compensation (TEC), which includes all types of executive compensation (such as the total salary, shares, and options), I use TEC divided by total assets to proxy for executive ownership (*Exeown*). Heteroskedasticity-consistent standard errors are presented in parentheses. *** denotes significance at 1%,** denotes significance at 5%, and

*denotes significance at 10%.

	I Tobin's Q		II ROA	
SB.0to25	-0.56* (0.342)	-1.292** (0.561)	-9.895*** (2.076)	-14.130*** (3.035)
SB.Over.25	0.457*** (0.196)	1.324*** (0.419)	6.417*** (1.260)	11.721*** (2.523)
Sales (in log)	-0.44*** (0.028)	-0.562*** (0.055)	2.135*** (0.137)	2.414*** (0.404)
Leverage	1.258*** (0.104)	1.200*** (0.121)	-2.729** (1.298)	-2.160 (1.852)
ROA	0.033*** (0.007)	0.028*** (0.008)	-	-
Volatility	0.562*** (0.139)	0.623*** (0.154)	0.770 (0.663)	1.637** (0.720)
Exeown	0.739*** (0.219)	0.653** (0.322)	2.988*** (0.505)	2.886*** (0.711)
Constant	3.835*** (0.257)	5.247*** (0.370)	-10.382*** (1.525)	-11.727*** (2.617)
Number of observations	11917	11917	11922	11922
R-squared	0.454	0.432	0.270	0.254
Industry dummy	Yes	No	Yes	No
Regression type	OLS	Fixed Effect	OLS	Fixed Effect

4.3 Robustness check

4.3.1 Different threshold

In this section, I present an alternate specification with a threshold of 35% to address the potential arbitrariness of this specification.

Table 4 Piecewise OLS and fixed-effects regression between firm valuation and another S/B ratio

The sample includes unbalanced yearly panel data consisting of all firms listed on the main stock exchanges in China from 2000 to 2009; n = 1425 with about 12000 firm-year observations. Information about boards, accounting data, and stock market data are collected from RESSET (www.resset.cn). The dependent variable is *Tobin's Q*. Please refer to section 4.2 for the definition and calculation of *SB.0to35* and *SB.Over.35*. I use the ratio of the firm's market value to its book value to proxy for *Tobin's Q*; the firm's market value is calculated as the book value of assets minus the book value of equity plus the market value of equity. *ROA* stands for return on assets and equals total income divided by total assets. *Sales* is the logarithm of the total annual sales of each firm in Chinese Yuan. *Volatility* is calculated as the standard deviation of monthly stock returns multiplied by the square root of 12. *Leverage* is equal to total debt over total assets. Because my data only contain total executive compensation (TEC), which includes all types of executive compensation (such as the total salary, shares, and options), I use TEC divided by total assets to proxy for

executive ownership (*Exeown*). Heteroskedasticity-consistent standard errors are presented in parentheses. *** denotes significance at 1%,** denotes significance at 5% and *denotes significance at 10%.

	Dependent variable: Tobin's Q	
SB.0to35	-0.108 (0.205)	-0.218 (0.339)
SB.Over35	0.406*** (0.218)	0.977** (0.391)
Sales (in log)	-0.441*** (0.028)	-0.569*** (0.055)
Leverage	1.258*** (0.104)	1.197*** (0.121)
ROA	0.033*** (0.007)	0.028*** (0.008)
Volatility	0.560*** (0.139)	0.619*** (0.153)
Exeown	0.739*** (0.322)	0.653*** (0.153)
Constant	3.776*** (0.371)	5.199*** (0.372)
Number of observations	11917	11917
R-squared	0.454	0.432
Industry dummy	Yes	No
Regression type	OLS	Fixed Effect

The results in Table 4 show that the coefficients of the S/B ratio between 0% and 35% are insignificant, suggesting that it is difficult to discern a monotonic relationship between Tobin's Q and the S/B ratio when this ratio is lower than 35%. The benefits of the monitoring effect of supervisory boards may already surpass losses from free-rider problems. Therefore, a threshold set at 25% should be plausible. In addition, the coefficients of S/B ratios over 35% remain positive and significant.

4.3.2 Endogeneity

Generally, corporate board characteristics suffer from serious endogeneity problems. As stated by Hermalin and Weisbach (2003), "…firm performance is both a result of the actions of previous directors and itself a factor that potentially influences the choice of subsequent directors." Because board size and the S/B ratio are correlated with either observable or unobservable firm characteristics, the results are usually hard to interpret if the endogeneity issue is neglected. In order to eliminate any potential bias, prior studies employ the instrumental variable (IV) and event-study techniques. For example, Bennedsen et al. (2008) use an instrument that incorporate given by the number of children of the CEO. They find that standard OLS results provide valid and precisely estimated small negative board size effects. In a more recent study employing the event-study technique, Black and Kim (2012) use a legal shock to board governance as a basis to identify a connection between board structure and firm value, finding

evidence that board structure reforms can positively affect firm market values and perhaps firm performance.

To address the endogeneity concern, in line with Cheng (2008), I use board size, the S/B ratio, and other firm characteristics in the first year of the sample to explain firm valuations (Tobin's Q) over subsequent years. This method should mitigate concerns that firm valuations lead to changes in board size and the S/B ratio. Table 5 presents the results with Tobin's Q (lead-1) as the dependent variable. Although the sample size decreases to 10 600 firm-year observations, the results are very similar to those in Tables 2 and 3, showing that board size is significantly negatively associated with firm valuation and Tobin's Q first decreases and then increases as the proportion of supervisors on the board (the S/B ratio) rises. The results in Table 4 suggest that the relationships are causal; in addition, in unreported results, similar evidence is also found when using lead-2 and lead-3 Tobin's Q as dependent variables.

Table 5 Fixed-effects regression between lagged firm valuation and board size, S/B ratio

The sample includes unbalanced yearly panel data consisting of all firms listed on the main stock exchanges in China from 2000 to 2009; n = 1425 with about 12000 firm-year observations. Information about boards, accounting data, and stock market data are collected from RESSET (www.resset.cn). The dependent variable is *Tobin's Q* with lead 1. *BoD size (in log)* equals the logarithm of the total number of directors on the board, including the CEO, chairperson of the board, and independent directors. *SB size (in log)* refers to the logarithm of the total number of supervisors on the supervisory board. Please refer to section 4.2 for the definition and calculation of *SB.0to25* and *SB.Over25*. I use the ratio of the firm's market value to its book value to proxy for *Tobin's Q*; the firm's market value is calculated as the book value of assets minus the book value of equity plus the market value of equity. *ROA* stands for return on assets and equals total income divided by total assets. *Sales* is the logarithm of the total annual sales of each firm in Chinese Yuan. *Volatility* is calculated as the standard deviation of monthly stock returns multiplied by the square root of 12. *Leverage* is equal to total debt over total asset. Because my data only contain total executive compensation (TEC), which includes all types of executive compensation (such as the total salary, shares, and options), I use TEC divided by total assets to proxy for executive ownership (*Exeown*). Heteroskedasticity-consistent standard errors are presented in parentheses. *** denotes significance at 1%,** denotes significance at 5% and *denotes significance at 10%.

	Dependent variable: Tobin's Q (lead-1)		
BoD size (in log)	-0.407***	-	
	(0.074)		
SB size (in log)	-	-0.138**	
		(0.064)	
SB.0to25	-	-	-1.917***
			(0.575)
SB.Over25	-	-	2.190***
			(0.469)
Sales (in log)	-0.501***	-0.531***	-0.521***
	(0.055)	(0.052)	(0.052)
Leverage	0.754***	0.747***	0.749***
	(0.231)	(0.229)	(0.229)
ROA	0.028***	0.029***	0.029***
	(0.005)	(0.005)	(0.005)
Volatility	-0.204***	-0.226***	-0.212***
	(0.051)	(0.052)	(0.052)
Exeown	-0.314***	-0.312***	-0.312***
	(0.090)	(0.089)	(0.089)
Constant	6.435***	5.868***	5.872***
	(0.309)	(0.326)	(0.351)
Number of observations	10652	10624	10624
R-squared	0.271	0.274	0.273
Regression type	Fixed Effect	Fixed Effect	Fixed Effect

5 CONCLUSION

As one of the fastest-growing emerging economies in the world, China continues to work to enhance corporate governance effectiveness and efficiency. Indeed, this may be the only country that combines the Anglo-Saxon unitary and German two-tier board systems. In line with CSRC's efforts to improve monitoring effectiveness in China's listed companies through the coexistence of independent directors and supervisory boards, this study focused on supervisory boards. By using a rich data set that includes all firms listed on the main stock exchanges in China from 2000 to 2009, I investigated the relationship between the size of two-tier boards and corporate valuations, as well as the relationship between supervisory board independence and firm valuation. My findings are consistent with prior studies, as I find board size (sizes of board of directors and supervisory board) to be negatively associated with corporate valuation (Yermack, 1996; Eisenberg et al., 1998). In addition, I find that after a certain threshold, enhancing the independence of a supervisory board tends to increase shareholder value (Adams and Ferreira, 2007).

My results extend the literature in at least two ways. First, they contribute to the prominent empirical consensus that board size is negatively related to firm performance. Because most prior studies focus on the size of unitary boards, my result of the significant inverse association between supervisory board size and firm performance is complementary. Second, prior studies focus on the independence of boards of directors. Only the theoretical paper of Adams and Ferreira (2007) argues that enhancing supervisory board independence is beneficial. I suggested the S/B ratio, which is calculated as supervisory board size divided by board of director size plus supervisory board size, as a new measure of independence. This measure accounts for interactions between these two boards and serves as a proxy for supervisory board independence. I documented a significant nonmonotonic relationship between firm valuation and the S/B ratio. In addition, by virtue of the results, I suggest that in order to allow for more efficient and independent supervisory boards, the proportion of supervisors should be no less than 25% of total board members in a two-tier board system. Future research can address the determinants of the S/B ratio and investigate the relationship between the S/B ratio and CEO replacement, takeover bids, and other significant corporate events or decisions.

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Section 5

Foreign institutional investor trading in Chinese A-share markets

Peng Wang[1]

Forthcoming in Managerial Finance

Structured Abstract

Purpose. This paper addresses the topic "The interaction between financial institutions and firms in the nonfinancial sectors" in the special issue of "Banking and finance in China." The purpose of the paper is to examine the trading behavior and price effects of foreign institutions under the celebrated Qualified Foreign Institutional Investor (QFII) scheme on all non-financial firms in the Chinese A-share markets.

Design/methodology/approach. Using quarterly equity-level foreign institution transactions from 2005Q1 to 2011Q4 in the Chinese A-share market, the author finds a positive and significant contemporaneous relationship between foreign flows and equity returns. For each quarter, the author sorts the stocks into 10 portfolios based on the percentage of foreign flows, and employs the bivariate VAR model to examine the contemporaneous association in detail.

Findings. Foreign institutions in the Chinese A-share markets do not show positive or negative feedback trading; however, their flows have a strong impact on future equity returns because of informational advantage. Additionally, different associations are found between foreign flows and equity returns.

Research limitations/implications. Constraints on data availability exist, and a quarterly dimension is too coarse to provide a statistically precise result, although certain related papers use quarterly dimension data. Further research is required using higher frequency data.

Originality/value. This paper provides a first look at foreign institution trading patterns and price effects on local equity returns in the Chinese A-share markets. Additionally, the equity level data allow the author to exclude the stocks that were not bought by foreign institutions and to detect the “pure effect” of foreign flows on equity returns.

Keywords: foreign investor, institutional investor, Qualified Foreign Institutional Investor (QFII) scheme, Vector autoregression (VAR) model, China

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1 INTRODUCTION

Many countries have decreased or even eliminated obstacles to international portfolio investment in recent decades. Researchers have noted that foreign investors are active in developed and liberalized economies such as Finland, Japan, Korea, and Sweden (e.g., Choe et al., 1999; Kang and Stulz, 1997; Karolyi, 2002; Dahlquist and Robertsson, 2001, 2004; Grinblatt and Keloharju, 2000) and invest in risky and emerging markets in the European and Asian regions (Froot et al., 2001, Griffin et al., 2004, Richards, 2005, Diyarbakirlioglu, 2011). This article studies the foreign institutional investor flows in Chinese A-share markets under the celebrated Qualified Foreign Institutional Investors (QFII) scheme from 2005 to 2011 to provide empirical evidence of trading behavior and price effects on the A-share stock markets.

China is the focus of this study for two reasons. First, China is the largest market in the region and one of the fastest growing economies worldwide. China's domestic stock exchanges – the Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE) have experienced rapid development since their establishment in the early 1990s. According to the World Federation of Exchanges (WFE), the total number of listed companies in the two exchanges has reached 2,491 with a total market capitalization of 3.7 trillion US dollars in 2012. However, China's government still imposes substantial explicit barriers[1] to foreign investments. Prior to the QFII scheme, foreign investors were permitted to invest only in the foreign currency denominated B-share market, which is a very small and separate market.[2] Since the introduction of the QFII scheme, foreign institutional investors have been able to invest in all listed A shares, but only under the stipulation that they need to fulfill certain criteria to obtain the QFII license and comply with certain restrictions when trading equities. It is, therefore, necessary to investigate the influence of foreign institutional trading on equity returns when an equity market is less developed and relatively closed.

Previous studies concerning the trading behaviors of investors in China focused mainly on domestic individuals (Feng and Seasholes, 2003 and Ng and Wu, 2007) and domestic institutions (Ng and Wu, 2007); however, no study had examined the foreign institutions in the Chinese A-share market. This paper intends to complement the literature and fill this gap. Moreover, the data employed in this study facilitates the detection of the "pure effect" of foreign institutional investment on equity returns because the equity-level dataset excludes the equities not held by a foreign institution.

Moreover, this paper demonstrates that informational advantage and not price pressure provides a clearer explanation as to why foreign institutional investment predicts future equity returns. Price pressure is defined as trading caused by a certain type of investor (e.g., foreign investors) that can result in price movements that are unrelated to underlying fundamentals and hence lead to excess volatility, and that can potentially have a destabilizing effect (Froot and Ramadorai, 2008). Whether foreign investor trading has a price pressure effect is significant because a strand of existing literature is concerned with the consequences for an equity market when it is opened up to foreign investors (e.g., De Long et al. 1990 and Dornbusch and Park 1995). This concern likely explains why China's government introduced the QFII program rather than opening the A-share markets entirely to foreigner investors.

With respect to the information asymmetry of foreign investors, no consensus exists as to whether foreign (institutional) investors are better informed, and arguments persist that support both viewpoints on this issue. One argument is that foreign institutional

investors may hold an informational advantage because they possess sophisticated investment technology, experience, and expertise. Grinblatt and Keloharju (2000) find evidence in Finland that foreign institutional investors are the most sophisticated investors, followed by domestic institutional investors and household investors. Conversely, certain researchers argue that domestic investors may possess an informational advantage because of linguistic and cultural factors (Dvorak, 2005); domestic investors have an advantage over foreigners because regulators may be more tolerant of domestic investors or even biased against foreign investors (Choe et al., 2005). Hau (2001) utilizes German data and finds that foreign investors are at an informational disadvantage. Moreover, Kang and Stulz (1997) using Japanese data, and Dahlquist and Robertsson (2004) using Swedish data find little evidence that foreign investors possess an informational advantage or disadvantage.

My finding is consistent with foreign investor advantage because of superior information and greater sophistication documented by certain above-mentioned studies. This finding complements the relevant literature in China because previous literature investigates foreign investors in China by using data from the B-share markets only.

In general, this paper's contribution to the existing literature is twofold. First, the paper complements the limited literature concerning the contemporaneous relationship between foreign flows and local equity returns; the VAR model suggests that the transactions of foreign institutional investors should Granger cause the local equity returns, but not vice versa. Second, to the best of my knowledge, this paper is the first to examine the extent to which equity returns are associated with the magnitude of foreign flows. This study documents the existence of the different links between the two components. Specifically, a permanent and strong price impact is found in the portfolios with the most negative foreign investments (the largest foreign divestments), a temporary but strong impact is found in the portfolios with moderate foreign investments, and a permanent but weak impact is found in the portfolios with the largest foreign investments.

The rest of the paper proceeds as follows. Section 2 reviews China's QFII scheme. Section 3 reviews the related literature. Section 4 presents the data, and the empirical results are reported in section 5. Section 6 concludes the paper.

2 CHINA'S QFII SCHEME

The QFII scheme was originally designed as a transitional system to introduce foreign capital and gradually open domestic capital markets in a country where the currency is not fully or freely convertible. Emerging countries or regions such as Brazil, India, South Korea, and Taiwan have also employed the QFII program. China's QFII was launched in 2002 to allow licensed foreign investors to buy and sell all Yuan-denominated A shares in the SSE and the SZSE. The QFII scheme has developed rapidly. In 2002, the combined quota for QFII was only 10 billion US dollars, and there were only 10 foreign institutional investors. In 2007, the QFII quota was increased from 10 billion US dollars to 30 billion US dollars. In April 2012, the combined quota for China QFII reached 80 billion US dollars. Recently, in July 2013, the quota was dramatically increased to 150 billion US dollars and there were over 200 licensed foreign institutional investors.[3]

To qualify as a QFII, foreign candidates must fulfill certain requirements. The requirements include the following: (1) Candidates must have sound financial status, have good credibility, and meet the minimum asset scale set by the China Security Regulatory Commission (CSRC). (2) The employees of candidates must possess the relevant qualifications legally required in the candidate's home country or region. (3) Candidates should possess a sophisticated corporate governance structure and complete internal control system, and be free of significant punishment for the last three years. (4) The candidate's home country must possess a complete legal and supervision system, the home country or home area must sign a Memorandum of Understanding (MOU) with the CSRC, and the home country must maintain effective supervision cooperation. (5) Other requirements set by CSRC are based on prudence.[4] A QFII must entrust a domestic commercial bank as the custodian of its assets and entrust a domestic securities company for its domestic securities trading.[5] In general, the QFII scheme allows a single institutional investor to hold up to 10 percent of the A shares in one listed company, whereas total foreign shareholding held by a QFII in any one listed company should not exceed 20 percent.[6] The minimum investment quota applied to a single QFII investment is 50 million US dollars as required by the CSRC)and China's State Administration of Foreign Exchange (SAFE). The accumulated investment quota for a single QFII is currently capped at one billion US dollars.[7]

3 LITERATURE REVIEW

This paper builds upon the literature that explores the relationship between foreign investment flows and local equity returns. A positive contemporaneous relationship exists between the two components (Brennan and Cao, 1997; Bohn and Tesar, 1996). Froot et al. (2001) investigate whether foreign investments precede, move with, or follow the local market returns using daily data. They find that returns assist in the prediction of investments over and above the predictability of past investments (international investments are persistent). With respect to the prediction of returns, the authors find that the returns of emerging markets are predicted by foreign investments but that the effect is weak for developed countries. However, a potential shortcoming of Froot et al.'s data is that the data are only a partial measure of foreign investment because the data rely on the trades of one particular custodian, State Street Bank and Trust. Richards (2005) employs a dataset that is composed of total foreign investments in six Asian equity markets and finds that foreign flows into these countries demonstrate strong positive feedback trading with respect to foreign returns (especially from the United States) rather than local market returns. Richards' (2005) finding is consistent with the theoretical implications of Griffin et al. (2004), whose model predicts that equity investments toward a smaller country increase with larger market stock returns.

More recently, Jinjarak et al. (2011) extend the literature by examining bond investments. The authors explore the dynamics of international bond investment and its interaction with equity returns. The authors find that past equity returns contain useful information in forecasting bond flows and that bond flows also impact future equity returns positively. Ülkü and Weber (2013) employ daily data on trading flows of a rich breakdown of investor types and obtain new insights concerning the trading of various investor types. In particular, Ülkü and Weber (2013) find that merchant trading has both significant informational content and forecasting ability; private funds are positive feedback traders but their trading has limited informational content; foreign investors are positive feedback traders and they also have significant informational content.

4 DATA AND METHODOLOGY

I collected quarterly transaction records of each QFII for all non-financial firms listed on the A-share markets from 2005Q1 to 2011Q4. The exclusion of financial firms (CSRC Industry Code=I) is not unusual, especially in corporate finance, because these firms have different accounting standards. Such firms typically have much greater leverage and increased sensitivity to financial risk (e.g., Foerster and Sapp, 2005). As my sample covers the recent 2008 financial crisis, in which the equity returns of financial firms are extremely volatile, the exclusion of financial firms offers a more consistent result. Additionally, foreign institutions only allocated a small fraction to financial firms in the A-share markets; excluding them will only result in a loss of total observations of 3.4 percent. Dahlquist and Robertsson (2001) find similar evidence in Sweden, in which foreign institutions mainly invest in manufacturing and IT firms.

In the data set, each transaction record includes the date, the name of the stock and QFII, the total volume, market valuation, and the percentage of the tradable shares held by the QFII. For instance, in 2008Q2, the QFII Citi Bank held 71,850,806 shares in Vanke A (000002.SZ), and the market valuation of these shares was 647,370,000 RMB, which equaled 0.76 percent of total tradable shares of Vanke A. In China, foreign individuals are not permitted to directly transact stocks in the A-share markets; therefore, the QFII flows could be regarded as total foreign investor flows in the A-share markets. I calculated the total foreign institutional holdings of a particular stock in a particular quarter by aggregating the percentage of tradable shares owned at the firm level for each quarter. For example, foreign institutional investor ownership for a specific stock I, FOWNi, is defined as follows:

$$FOWN_{i,t} = \sum_{m=1}^{M} \textit{percentage of tradable shareholding of any foreign institutional investor m at quarter } t_{m.}$$

Table 1 illustrates some stylized facts of foreign institutional investor transaction data on a yearly basis. In the first two years of the QFII program (2003 and 2004), foreign institutions accumulated A-share stocks; in 2005, foreign institutions held a total of 1,612 million A shares and the overall volume increased dramatically to 3,181 million shares in 2006. However, stocks were dramatically divested in 2007 when only 1,107 million shares were retained. This abnormally substantial divestiture suggests significant foreign institutional concern with respect to the Chinese stock market bubble of 2007. On October 17, 2007, the Shanghai Composite Index peaked at the incredible number of 6,036.28; however, just one year later the bubble burst on November 06, 2008, and the Index dropped to 1,717.72, which represented only 29 percent of its peak value.

The market capitalization of foreign institutional ownership and net purchases are displayed in billions of RMB; the net purchase is calculated as the difference between foreign institutional purchases and sales for that year. Table 1 also presents the percentage of foreign institutional holding on tradable shares. On average, foreign institutions hold less than five percent of tradable shares of the stocks that they invest. Foreign institutions are selective when choosing stock; from 2005 to 2011, they held only 100 to 200 stocks per year, which is equal to 10 percent of the total number of listed stocks for the year.

Table 1 Descriptive statistics on QFII transaction data

	2005	2006	2007	2008	2009	2010	2011
Total volume of foreign institutional ownership	1612	3181	1107	1971	2253	4430	5060
Market capitalization of foreign institutional ownership	9.4	32.5	27.8	20.3	54.7	64.2	57.2
Market capitalization of net foreign institutional purchase	0.26	6.58	-1.64	-3.61	7.59	0.88	2.99
FOWN (average per stock)	3.86%	4.05%	3.19%	2.46%	1.79%	1.62%	1.95%
Number of stocks with a positive FOWN	127	198	152	123	209	219	135
Number of listed stocks on the SSE and SZSE	1387	1440	1530	1604	1700	2063	2342

FOWN indicates the total foreign institutional ownership on tradable shares, for a detailed description see Section 4. Total volume of foreign institutional ownership is in millions of shares. Market capitalization of foreign institutional ownership and market capitalization of net foreign institutional purchase are both in billions of RMB. The number of stocks with a positive FOWN refers to the number of stocks with a positive FOWN by the end of each year.

The main regression method used in this paper is the vector autoregression (VAR) model. Since Hasbrouck (1991) suggested that the bilateral interaction between flows and returns should be modeled as a VAR system, the VAR model has been widely applied in the associated literature (e.g., Froot et al., 2001; Karolyi, 2002; Richards, 2005; Ülkü and Weber, 2012; Jinjarak et al., 2013). One benefit of using the VAR model is the model's ability to test for contemporaneous causality between foreign flow and equity return. Previous studies concerning the causality show mixed results; for example, Richards (2005) finds that foreign inflows are both a cause and a consequence of the contemporaneous returns in six emerging countries. Contrastingly, Karolyi (2002) documents that, in Japan, foreign net flows are affected by a previous Nikkei 225 index, but not vice versa. Additionally, the impulse response analysis that is derived from the VAR model has the ability to separate temporary and permanent price effects induced by foreign investors, for example, Ülkü and İkizlerli (2012) illustrate that the price impacts of foreigners in the Turkish Stock Exchange are permanent.

The portfolio analyzed in the VAR model is constructed as follows: at the end of each quarter, from the 2005Q1 to 2011Q4, stocks were sorted into 10 portfolios based on the percentage of foreign investment. These stocks were then aggregated to obtain 10 portfolios with different levels (from lowest to highest) of foreign flows. Portfolio 1 was composed of stocks with the least foreign institutional investment (or the largest foreign divestments) for each quarter, whereas Portfolio 10 was composed of the stocks with the largest foreign institutional investment for each quarter. Before implementing the VAR analysis, I tested to determine if my time series was stationary because a non-stationary time serious could lead to spurious regression results in the VAR model. Table 2 reports the Dickey-Fuller tests of both foreign institutional investment and equity returns for each portfolio; accordingly, I can reject the null hypotheses of a unit root at the five percent level for the majority of the portfolios.

Table 2 Unit Root tests for foreign flow and quarterly return

Portfolio		t-statistic	P-value
Portfolio1	Flow	-3.605	0.0294
(Flow =-2.82)	Ret	-3.55	0.0343
Portfolio2	Flow	-3.567	0.0327
(Flow =-0.65)	Ret	-3.533	0.036
Portfolio3	Flow	-2.781	0.2039
(Flow =-0.13)	Ret	-3.096	0.1072
Portfolio4	Flow	-2.942	0.1489
(Flow =0.08)	Ret	-3.142	0.0965
Portfolio5	Flow	-3.439	0.0464
(Flow =0.29)	Ret	-4.171	0.005
Portfolio6	Flow	-3.787	0.0172
(Flow =0.50)	Ret	-5.44	0.00
Portfolio7	Flow	-3.504	0.039
(Flow =0.78)	Ret	-3.783	0.0174
Portfolio8	Flow	-3.888	0.0126
(Flow =1.24)	Ret	-4.022	0.0082
Portfolio9	Flow	-3.378	0.0543
(Flow =1.99)	Ret	-3.59	0.0307
Portfolio10	Flow	-3.628	0.0276
(Flow =4.24)	Ret	-4.134	0.0056
Full sample	Flow	-3.646	0.0262
(Flow =0.52)	Ret	-3.605	0.0295

Flow denotes the foreign flows that are calculated as the first order difference of foreign institutional ownership (FOWNi) for each quarter and Ret denotes quarterly returns. At the end of each quarter from 2005Q1 to the 2011Q4, stocks were sorted into 10 portfolios based on the percentage of QFII Flow. Portfolio 1 was composed of stocks with the most negative QFII investments (or the most QFII divestments) for that quarter, whereas Portfolio 10 was composed of the stocks with the largest QFII investments for that quarter. This table reports Dickey-Fuller unit root test results for Flow and Ret for each portfolio. The specification is $\Delta y_t=\alpha+\mu t+\lambda y_{t-1}+\varepsilon_t$, where t is a time trend, and α is a constant term. We test $H_0: \hat{\lambda}=0$, $H_1: \hat{\lambda}<0$, and report the t-statistic of $\hat{\lambda}$ in the third column. P-value is the Mackinnon approximate p-value for the associated t-statistic.

The identified VAR model can be specified as:

$$\Phi(L)y(t) = \varepsilon(t) \tag{1}$$

where $\Phi(L)$ is an $n \times n$ matrix polynomial in the lag operator L, $y(t)$ is the $n \times 1$ observation vector, and $\varepsilon(t)$ is the $n \times 1$ vector of structural disturbances (n is equal to two here). I use the Akaike information criterion (AIC) to determine the appropriate lag length; for the majority of portfolios, the AIC suggests a lag length of one (L=1). Therefore, for each portfolio, I employ the specified bivariate VAR (1) model as follows:

$$\begin{bmatrix} Flow_t \\ \mathrm{Re}t_t \end{bmatrix} = \begin{bmatrix} c_1 \\ c_2 \end{bmatrix} + \begin{bmatrix} \varphi_{11} & \varphi_{12} \\ \varphi_{21} & \varphi_{22} \end{bmatrix} \begin{bmatrix} Flow_{t-1} \\ \mathrm{Re}t_{t-1} \end{bmatrix} + \begin{bmatrix} e_1 \\ e_2 \end{bmatrix} \tag{2}$$

5 EMPIRICAL RESULTS

This section demonstrates the contemporaneous relation between foreign flows and equity returns (Tesar and Werner, 1995; Bohn and Tesar, 1996; and Brennan and Cao, 1997). This contemporaneous relation is examined further by the bivariate VAR model and impulse response analysis to address the two questions: 1) Do foreign flows forecast equity returns and vice versa? 2) Are foreign institutions in Chinese markets positive feedback or negative feedback investors?

5.1 The contemporaneous relationship between foreign flow and stock returns

The quarterly foreign flow data can be simply obtained by taking the first order difference of FOWN: . Panel A of Table 3 presents the results from the simple bivariate regression. The significant and positive coefficient on the foreign flow (Flow) indicates a strong contemporaneous relationship between firm-level foreign institutional investment and equity return.

The regression coefficient implies that foreign flow equivalent to one percent of market capitalization would be associated with a contemporaneous price increase of around 0.344 percent. Moreover, to alleviate the potential omitted variable problem in the simple bivariate regression, I included a set of control variables that are similar to those used by Gompers and Metrick (2001), such as book-to-market ratio (BM), market capitalization (MKTCAP), volatility (VOL), turnover rate (TURN), stock closing price (PRC), stock listing age (AGE), and dividend (DIV). The results are reported in Table 3. The adjusted R-squared of the equation increases substantially from 0.0029 to 0.1139 following the inclusion of the control variables, suggesting that the omitted variables might be a problem in the bivariate regression. However, the coefficient on foreign flow (Flow) remains statistically highly significant, concluding that it is a highly significant explanatory variable of the equity return and that there is a strong and robust contemporaneous relationship between foreign institutional investment and equity return.

Table 3 Regression estimate of quarterly equity return and foreign flow

	Panel A
Flow	0.344***
	(0.103)
No. of observation	4219
R-squared	0.0029
	Panel B
Flow	0.387***
	(0.11)
BM	-0.009***
	(0.003)
MKTCAP	0.008***
	(0.002)
VOL	0.068***
	(0.005)
TURN	0.028***
	(0.003)
PRC	0.022***
	(0.005)
AGE	-0.001
	(0.003)
DIV	0.0002
	(0.0009)
No. of observation	3919
R-squared	0.1139

This table summarizes the results from the OLS regression of quarterly equity return (RET) and foreign flow (Flow). Flow denotes the foreign flow, which is calculated as the first order difference of foreign institutional ownership ($FOWN_i$) for each quarter. The dependent variable is firm quarterly return. Panel A reports the results from the regression with only intercept and Flow as independent variables. Panel B reports the results from the regression with Flow, intercept, and a set of control variables that are similar to those used in Gompers and Metrick (2001) as independent variables, e.g., BM is book-to-market ratio and it is winsorized at the 1st and 99th percentile, MKTCAP is market capitalization, VOL is the monthly volatility over the previous one year, TURN is average monthly turnover rate over the previous quarter, PRC is stock closing price, and is denoted in Chinese Yuan, AGE is firm age measured as the number of months from the first day of return appears on Wind, DIV is cash dividend (after tax) divided by stock closing price. Robust standard errors are in parentheses. *** denotes significant at the 1 percent level. ** denotes significant at the 5 percent level. * denotes significant at the 10 percent level.

5.2 VAR analysis of foreign institutional investment and equity return

After confirming the strong and positive contemporaneous relationship between foreign flows and equity returns, I employ the bivariate VAR model discussed in the above chapter. Table 4 displays the results from equation (2). First, foreign flows in the Chinese A-share markets are significantly related to the past values. The coefficients on the past foreign flow (Flow (-1)) in the full sample, and in nine out of the 10 portfolios, are statistically significant; a single standard deviation positive movement in the previous quarter's foreign flow in the full sample leads to a 0.486 standard deviation increase in the next quarter's foreign flow.[9]

Table 4 VAR model estimates of foreign flows and quarterly returns

Portfolio		Cons.	Flow (-1)	Ret (-1)	R^2	F-value Granger test	P-value
Portfolio1	Flow	-1.25**	0.559***	-1.698	0.375	0.443	0.506
(Flow =-2.82)	Ret	-0.025	-0.012	0.268	0.147	0.908	0.341
Portfolio2	Flow	-0.394***	0.411***	-0.816	0.230	0.611	0.434
(Flow =-0.65)	Ret	-0.001	-0.012	0.354*	0.148	0.163	0.687
Portfolio3	Flow	-0.102**	0.375**	-0.781	0.376	4.646**	0.031
(Flow =-0.13)	Ret	0.035	0.162	0.386*	0.159	2.362	0.124
Portfolio4	Flow	0.076	0.253	-0.25	0.108	0.316	0.574
(Flow =0.08)	Ret	-0.025	0.289**	0.366	0.262	4.912**	0.027
Portfolio5	Flow	0.111	0.51***	0.053	0.293	0.02	0.889
(Flow =0.29)	Ret	-0.001	0.151	0.083	0.127	2.189	0.139
Portfolio6	Flow	0.137	0.630***	0.77*	0.489	3.641*	0.056
(Flow =0.50)	Ret	-0.04	0.13*	-0.011	0.129	3.491*	0.062
Portfolio7	Flow	0.208*	0.668***	0.431	0.507	0.722	0.396
(Flow =0.78)	Ret	-0.072	0.12**	0.148	0.224	4.85**	0.028
Portfolio8	Flow	0.188	0.812***	0.259	0.631	0.133	0.716
(Flow =1.24)	Ret	-0.103**	0.098***	0.116	0.353	10.235***	0.001
Portfolio9	Flow	0.249	0.835***	0.348	0.693	0.149	0.699
(Flow =1.99)	Ret	-0.119**	0.07***	0.167	0.367	9.653***	0.002
Portfolio10	Flow	0.453	0.874***	-0.565	0.698	0.073	0.787
(Flow =4.24)	Ret	-0.059	0.021**	0.101	0.173	3.921**	0.048
Full sample	Flow	0.234**	0.486***	0.261	0.255	0.173	0.678
(Flow =0.52)	Ret	-0.037	0.098**	0.289*	0.243	4.643**	0.031

Flow denotes foreign institutional investments and Ret denotes quarterly returns. At the end of each quarter from 2005Q1 to 2011Q4, stocks were sorted into 10 portfolios based on the percentage of foreign institutional trading. Portfolio 1 was composed of stocks with the largest foreign institutional divestments for that quarter, whereas Portfolio 10 was composed of the stocks with the largest foreign institutional investments for that quarter. I report the average foreign flow in parentheses for each portfolio in column 1. This table presents, for each portfolio, the results from the VAR (1) regression (2), P-value is associated with the F-value of the Granger causality test. The null hypothesis of Granger tests are 1: Quarterly return (Ret) does not Granger cause foreign flow (Flow). 2. Foreign flow (Flow) does not Granger cause quarterly return (Ret). For the sake of brevity, standard errors are not reported. *** denotes significant at the 1 percent level. ** denotes significant at the 5 percent level. *denotes significant at the 10 percent level.

Second, I find significant evidence that equity returns are significantly correlated to previous foreign flows but not vice versa. The evidence is more pronounced in portfolios with positive foreign flows (investments); however, the evidence is not significant with negative foreign flows (divestments). The equations that use the quarterly returns as dependent variables show that the coefficients on lagged foreign flow are statistically and positively significant in Portfolios 4 to 10 in addition to the full sample, indicating that the previous foreign flow is a significant predictor of returns and that foreign institutional investors are buying before the stock price increases.

Surprisingly, the greatest impact of the lagged foreign flow does not appear on the portfolio with the largest foreign investment (i.e., Portfolio 10). The coefficient on Flow (-1) peaks at Portfolio 4 and then decreases gradually from Portfolios 4 to 10. One possible explanation for this phenomenon is that Portfolio 10 contains firms that are usually purchased or held by foreign institutions. It is, therefore, reasonable to observe

that the market shows only a moderate reaction to large foreign institutional investment in those firms; however, Portfolio 4 likely contains the firms in which foreign institutions are not interested, and the market reaction to foreign investment in those firms is substantial.

This result is somewhat consistent with Richards (2005), who finds median average returns of 0.33 percent on days with foreign inflows in six Asian emerging countries; however, I do not find evidence that foreign divestments will lead to negative equity returns. A comparison with related studies in China reveals that my result appears to contrast the finding by Ng and Wu (2007), who found that domestic institutional and individual trades do not have return predictive power.

Moreover, the Granger causality tests in Portfolios 4, 7, 8, 9, 10, and the full sample significantly reject the null hypothesis that foreign investment does not Granger cause quarterly return but not vice versa. I cannot reject the Granger in the opposite direction (i.e., quarterly return does not Granger cause foreign investment) at a conventional level of significance.

5.3 Impulse response analysis

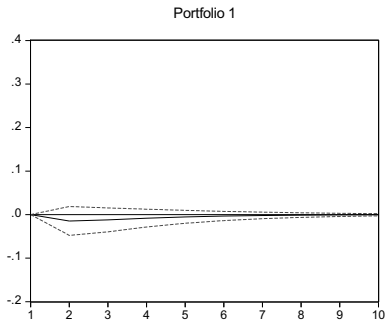
The potential advantage of this study's equity-level data is the ability to exclude the equities not held by any foreign institutions, and the ability to examine the pure price effects because it is plausible that the price of a stock will react minimally if the stock is not purchased by a foreign institution. The dataset facilitates an examination of the extent to which equity returns are associated with the magnitude of foreign investments.[8] For instance, ceteris paribus, should the price impact of foreign investment in firms with relatively larger foreign investments be greater than the foreign investment in firms with less foreign investments or those firms with the largest foreign divestments? I used the estimation from the VAR analysis to form impulse response functions (IRFs), shocking one innovation (one standard error) in each variable and examining the effects. The Kloek and Van Dijk (1978) Monte Carlo integration method was used to display the 95 percent confidence boundaries around the impulse response coefficients. To make the presentation of our results more concise, I only report the IRFs from Portfolios 1, 5, 10, and the full sample.

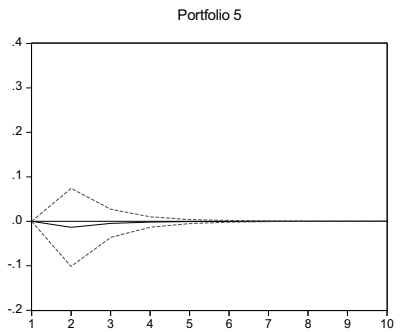
Panel A of Figure 1 presents the result that the response of foreign investment to one innovation of equity quarterly return is minimal. We cannot discern a consistent picture of the impact of past equity return on current foreign investments; for instance, one innovation in each of the Portfolios 1, 5, and 10 has a negative impact on foreign investment, whereas one innovation in the full sample portfolio has a positive impact. Panel A of Figure 1 suggests that foreign institutions in the Chinese A-share markets are neither positive nor negative feedback traders, although several articles find evidence of positive feedback trading for foreign investors (e.g., Brennan and Cao, 1997; Choe et al., 1999; Karolyi, 2002; Grinblatt and Keloharju, 2000). Contrastingly, Hamao and Mei (2001) suggest that foreign investors tend to be long-term contrarian investors in the Japanese market.

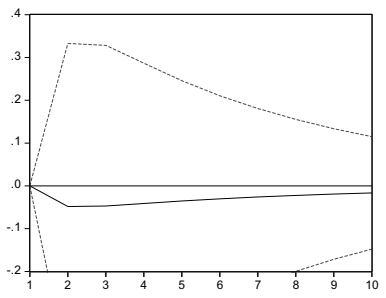
Panel B of Figure 1 confirms my inferences from the VAR analysis and offers a deeper understanding of this relationship. Recall that Portfolio 1 contains the highest foreign institutional divestments, the unit standard error of foreign sales leads to a 17 percent decrease in equity return within one quarter, which decays slowly to zero by quarter 10. Contrastingly, one innovation of foreign institutional investments in Portfolio 5 or 10

will lead to a 16 percent or two percent increase in return within one quarter, but the effect in Portfolio 5 dissipates more quickly by the sixth quarter than in Portfolio 10. Based on Table 4, I emphasize that different links exist between the level of foreign investment and the magnitude of price impact. When foreign institutions substantially sell equities they have a strong, negative, and permanent effect on equity returns; however, when foreign institutions purchase equities moderately, the price impact is strong but temporary. When foreign institutions purchase substantially, the price impact is surprisingly weak but permanent.

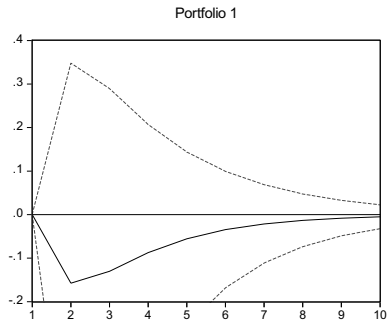
Panel A: Response of foreign investment to one innovation in equity quarterly return

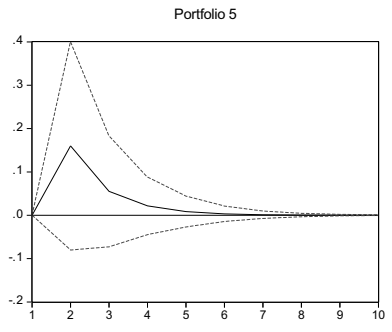


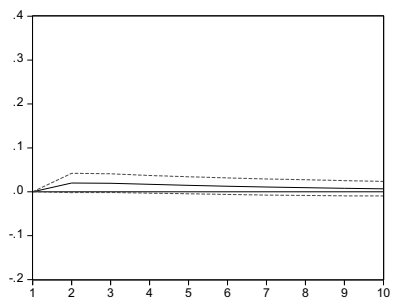


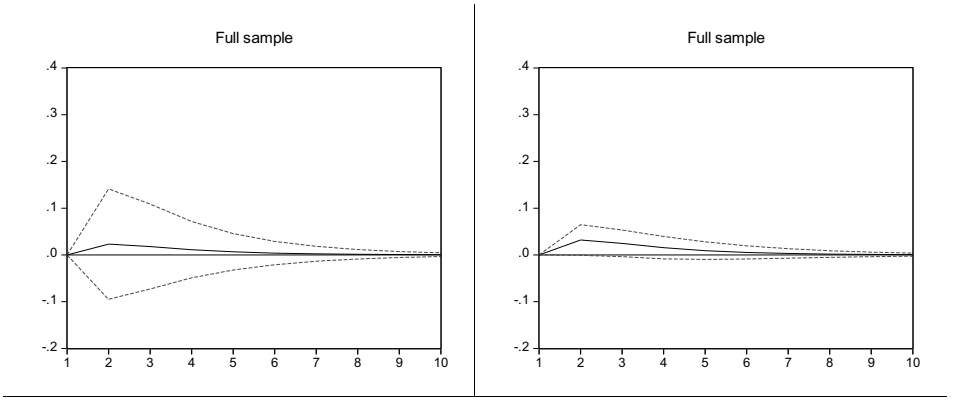


Panel B: Response of equity quarterly return to one innovation of foreign investment









Panel A presents the impulse response function of foreign investment to one standard deviation shock in portfolio quarterly return. Panel B presents the impulse response function of the portfolio quarterly return to one standard deviation shock in foreign investment. For conciseness, only Portfolios 1, 5, 10, and the full sample are reported. The detailed description of the VAR model is presented in Section 5.2, the time scale on the horizontal axis is in quarters. For each impulse response function, I also report the 95 percent confidence intervals (the dashed lines).

Figure 1 VAR impulse response analysis

5.4 Informational advantage or price pressure?

This study has demonstrated that foreign institutional investment predicts future equity returns. Could the cause of this relationship be better explained by asymmetric information hypothesis or price pressure hypothesis? If foreign institutions are better informed, they can choose stocks with higher expected returns; alternatively, if the price pressure is true, then their trading will destabilize future stock returns.

Griffin et al. (2004) argue that if foreign investors are better informed at the lagged time (t-1) with respect to returns at current time (t) than their domestic counterparts, foreign investments should still predict returns if I subsume contemporaneous flows into the return equation. However, if price pressure is driving the predictability of foreign investments to future equity returns, there should be a contemporaneous positive relationship between foreign flows and returns that would contain the lead-lag dynamic.

Considering Griffin et al. (2004), I incorporated the contemporaneous foreign flow into the portfolio quarterly return equation:

$$\mathrm{Re}t_t = \alpha + \beta_1 Flow_t + \beta_2 Flow_{t-1} + \beta_3 \mathrm{Re}t_{t-1} + \varepsilon \qquad (3)$$

The result in Table 5 shows that lagged flows are significant in six out of 10 portfolios in addition to the full sample; however, the contemporaneous flows are insignificant across approximately all of the regressions[10]. My results support the asymmetric information hypothesis that foreign institutions in China appear to be better informed than local investors.[11] The predictive power of foreigners on future equity returns is mainly a result of an informational advantage but not a result of price pressure from their trading. My finding is consistent with Schuppli and Bohl (2010) who find no

evidence of a destabilizing effect of the announcement of the QFII scheme in the Chinese stock market.

Table 5 OLS estimation of quarterly return equations with contemporaneous foreign flows included

Portfolio		Cons.	Flow	Flow (-1)	Ret (-1)	R^2
Portfolio1	Ret	-0.047	-0.017	-0.002	0.239	0.191
(Flow =-2.82)		(0.035)	(0.013)	(0.018)	(0.209)	
Portfolio2	Ret	-0.013	-0.031	0.0001	0.328*	0.173
(Flow =-0.65)		(0.023)	(0.030)	(0.047)	(0.188)	
Portfolio3	Ret	0.013	-0.216*	0.243*	0.218	0.260
(Flow =-0.13)		(0.026)	(0.111)	(0.176)	(0.176)	
Portfolio4	Ret	-0.033	0.097	0.265**	0.39	0.288
(Flow =0.08)		(0.034)	(0.1)	(0.105)	(0.26)	
Portfolio5	Ret	-0.004	0.029	0.137	0.081	0.129
(Flow =0.29)		(0.037)	(0.107)	(0.147)	(0.149)	
Portfolio6	Ret	-0.042	0.013	0.122*	-0.021	0.129
(Flow =0.50)		(0.041)	(0.07)	(0.067)	(0.193)	
Portfolio7	Ret	-0.071*	0.002	0.116**	0.156	0.222
(Flow =0.78)		(0.038)	(0.053)	(0.052)	(0.146)	
Portfolio8	Ret	-0.101**	-0.011	0.108**	0.119	0.355
(Flow =1.24)		(0.039)	(0.039)	(0.047)	(0.116)	
Portfolio9	Ret	-0.115**	-0.014	0.082*	0.172	0.370
(Flow =1.99)		(0.043)	(0.041)	(0.042)	(0.185)	
Portfolio10	Ret	-0.06	0.003	0.018	0.103	0.174
(Flow =4.24)		(0.052)	(0.016)	(0.022)	(0.224)	
Full sample	Ret	-0.034	-0.012	0.104*	0.292*	0.245
(Flow =0.52)		(0.04)	(0.046)	(0.056)	(0.149)	

Flow denotes foreign flow, and Ret denotes quarterly returns. At the end of each quarter from the 2005Q1 to 2011Q4, stocks were sorted into 10 portfolios based on the percentage of foreign flow. At the end of each quarter from 2005Q1 to 2011Q2, stocks were sorted into 10 portfolios based on the percentage of foreign institutional trading. Portfolio 1 was composed of stocks with the largest foreign institutional divestments in that quarter, whereas Portfolio 10 consists of the stocks with the largest foreign institutional investments in that quarter. Heteroskedasticity-adjusted standard errors are reported in parentheses. *** denotes significant at the 1 percent level. ** denotes significant at the 5 percent level. *denotes significant at the 10 percent level.

5.5 Foreign institutional investor portfolio performance

To test whether the performance of foreign institutions is superior to the Chinese market, I create a portfolio that includes all stocks held by foreign institutions for each quarter. I calculate the portfolio quarterly returns by using value-weighted foreign institutional holdings and aggregate them to a yearly basis. The market portfolio is proxied by the CSI300 Index, which represents about 70 percent of total market capitalization of the Shanghai and Shenzhen Stock Exchanges. Panel A of Table 6 reports the raw returns of foreign portfolio and market portfolio from the years 2005 to 2011. Comparing the market portfolio, foreign portfolio appears less volatile. For instance, during the bullish periods (2006, 2007, and 2009), foreign portfolio realizes less profit than the market, whereas in the bearish periods (2010, 2011) and the recent financial crisis (2008), foreign portfolio loses less than the market. However, there is no evidence to show that the foreign portfolio performs better. To test more formally, I regress the quarterly excess return of foreign portfolio on the quarterly excess return of

the market portfolio and report the results in Panel B of Table 6. The result remains the same: alpha is statistically insignificant and very close to zero indicating foreign portfolio does not outperform the market portfolio; beta is around 0.35 suggesting foreign portfolio is of less volatility.

Table 6 Performance of foreign institutional investor portfolio

Panel A: Raw returns		
Year	Foreign institutional holding portfolio	CSI300 Index (market portfolio)
2005	-0.03	-0.075
2006	0.266	0.924
2007	0.387	1.155
2008	-0.37	-0.94
2009	0.355	0.781
2010	0.014	-0.087
2011	-0.13	-0.269
Panel B: Regression results:		
Alpha	Beta	
-0.001	0.35***	
(0.008)	(0.036)	

Panel A reports annual return on the aggregate portfolio held by foreign institutions under the QFII scheme and market portfolio proxied by the CSI300 Index, for the period 2005 to 2011. Panel B reports the coefficients from a regression of quarterly excess returns of foreign portfolio on the quarterly excess returns of market portfolio. Heteroskedasticity-adjusted errors are reported in parentheses. *** denotes significance at the 1 percent level. ** denotes significance at the 5 percent level. * denotes significance at the 10 percent level.

6 CONCLUSION

By employing a comprehensive dataset that contains all foreign institutional transactions on all non-financial firms under the QFII scheme, this study analyzed the price effects and trading behavior of foreign institutions in an emerging market that is strictly restricted to foreign investors.

I first examined the contemporaneous relationship between foreign investments and equity returns. I then sorted the sample into 10 portfolios from the largest foreign institutional divestments to the largest foreign institutional investments to discover the different associations in detail. The results from the VAR model and the impulse response function (IRF) suggest that equity returns are significantly associated with past foreign investments but not vice versa. I further demonstrate that information asymmetry, not price pressure, provides a more accurate explanation for why foreign investments forecast future returns. With respect to the performance of the foreign institutional investors, I construct a portfolio that includes all stocks held by foreign institutions for each quarter and show that the portfolio does not outperform the market portfolio but it is less volatile.

The QFII scheme has received much attention from the media and practitioners since its introduction in China; however, current academic research on QFII remains limited. This paper intends to provide preliminary insight into the QFII scheme trading pattern and price effects on local equities. Further research can test whether different types of QFIIs have different price effects on different industries.

Notes

1. See Cooper and Kaplanis (1994) and Stulz (1981) with respect to the modeling of the effects of barriers.

2. Initially, only foreigners could trade in the B-share market. This restriction was eliminated in 2001; since then, Chinese residents have also been able to trade in the B-share market using foreign currencies. There are approximately only 110 stocks in the B-share markets. I note that issuing B-shares is not necessarily representative of firm quality. Mei et al. (2004) argue that political reasons may cause a firm to issue B-shares.

3. Please refer to this link to a latest list of QFIIs: http://www.csrc.gov.cn/pub/csrc_en/OpeningUp/RelatedLists/QFIIs/

4. Source: Regulation on Domestic Securities Investment by Qualified Foreign Institutional Investors, 2006

5. Source: Regulation on Domestic Securities Investment by Qualified Foreign Institutional Investors, 2006

6. Source: Notice on Issues concerning the Implementation of the Measures on the Administration of Domestic Securities Investments by Qualified Foreign Institutional Investors, 2006

7. Source: Regulations on the Foreign Exchange Administration of Domestic Securities Investments by Qualified Foreign Institutional Investors, 2009

8. However, previous studies did not examine such a relation, probably because of limitations to the countrywide flow data. (Froot et al., 2001, Richard, 2005)

9. Other studies, for example, Froot et al. (2001) and Griffin et al. (2004) find that the persistence of foreign flow also exists in high frequencies (i.e., daily).

10. It only appears to be negatively significant in Portfolio 3.

11. In contrast, Chan et al. (2008) suggest that prior to the QFII scheme; foreign investors in the B-share market are at informational disadvantages.

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PENG WANG

FOUR ESSAYS ON CORPORATE FINANCE OF CHINESE LISTED FIRMS

This dissertation consists of four self-contained papers. The first two of them concern pyramidal ownership structure, the third one deals with dual-board system, and the last one explores the contemporaneous relation between foreign investment flows and local equity returns. I choose the Chinese stock market as my laboratory. China will soon become the largest economy in the world, and China's domestic stock markets are growing up rapidly since their establishment in the early 1990s. According to the World Federation of Exchanges (WFE), the number of listed companies in the two domestic stock markets, i.e., the Shanghai Stock Exchange and the Shenzhen Stock Exchange reaches 2,491 with a total market capitalization of 3.7 trillion of U.S. dollars at the end of 2012. Despite this fast growth, extant studies on the Chinese stock market are still limited in scope. Perhaps because researchers' perceptions on Chinese listed firms still remain with older patterns, such as the dominance of state-owned enterprises (SOEs), the corrupted bureaucracy, the politically-appointed executives, and a market that is inaccessible to foreign investors. In this regard, one of my objectives in this dissertation is to provide some new insights into the modern corporate finance issues among Chinese listed firms.

The first essay examines the ownership structure of the Chinese Growth Enterprise Market (GEM). I show that 46% of sample firms are set up in the pyramidal structure. Further, I demonstrate that the owners of most firms in the GEM are families, which stands in stark contrast with the firms listed on the main board in China, which are state-owned. The second essay is naturally an extension of the first one, we investigate Initial Public Offerings (IPOs) of firms on the GEM. The likelihood of a pyramid structure increases with the size of the IPO firm and state control. Our results do not suggest that pyramids are set up to overcome financial constraints. However, we document that pyramid IPOs are discounted before the IPO. The price to book ratio estimated at the subscription price is significantly lower for pyramid IPOs compared to stand-alone IPOs. The third one examines board effectiveness and independence by studying all firms listed in China from 2000 to 2009. I find a significant inverse relationship between supervisory board size and firm performance. This result indicates that large supervisory board size per se causes free-rider and communication or coordination problems, as occurs with boards of directors. The last essay examines the trading behavior and price effects of foreign institutions under the celebrated Qualified Foreign Institutional Investor (QFII) scheme on all non-financial firms in the Chinese A-share markets. I find that foreign institutions in the Chinese A-share markets do not show positive or negative feedback trading; however, their flows have a strong impact on future equity returns because of informational advantage.

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